# TECHNOLOGICAL CHANGE AND INTERNATIONAL ECONOMIC INSTITUTIONS

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*By Sylvia Ostry, Centre for International Studies, University of Toronto*

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Comments should be addressed to:

Someshwar Rao, Director
Strategic Investment Analysis
Micro-Economic Policy Analysis
Industry Canada
5th Floor, West Tower
235 Queen Street
Ottawa, Ontario
K1A 0H5

Telephone: (613) 941-8187
Facsimile: (613) 991-1261

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## INTRODUCTION

Economic interdependence has increased sharply since the end of World War II when the architecture of international economic co-operation was constructed. The term "globalization" which became *au courant* during the 1980s, while never precisely defined, is meant to convey the increasing linkages among countries or the deeper integration of the world economy by trade, finance, direct investment and technology. Interdependence also involves an increasing interrelationship among major influences on the world economic system, with monetary policy affecting trade policy, feeding back into monetary and fiscal policy. This continuing force of globalization and, of course, the end of the Cold War, capture the essential yet stark contrast between the environment that generated the impetus for the institutions and the world of the 1990s. A rethinking of their *raison d'être* becomes necessary.

There has been a great outpouring of analysis on proposed reforms to the Bretton Woods institutions, the International Monetary Fund (IMF) and the World Bank.[1] There's considerable irony in the fact that the new World Trade Organization (WTO), a descendant of the ill-fated International Trade Organization (ITO) which was never born, is the first construct in a new post-Cold-War architecture of international co-operation. Indeed, the Uruguay Round itself reflected — in the inclusion of "new issues" such as trade in services, intellectual property and aspects of investment — the impact of globalization on the agenda of trade policy. The deeper integration of the world economy is pushing trade policy more and more inside the border, blurring the lines between international and domestic policies, and blurring the lines among the three engines of globalization: trade, investment and technology.

The GATT reflected the postwar world inherited from the disastrous tariff wars of the 1930s: the prime focus of GATT negotiations was to reduce border barriers. The WTO's major focus will be on "domestic" policies such as:

- domestic regulatory regimes;
- competition policy;
- structural impediments to mergers created by different models of corporate governances; and
- high-tech industrial policies.

Further, these policies of deeper integration[2] will be high on the agenda of new regional arrangements such as NAFTA and possibly APEC. And of course, Europe 1992, or the completion of the internal market of the (then) European Community, was the world's first experiment in a particular form of deeper integration.

As noted, there are three interrelated forces of globalization: trade, investment and technology. The interrelations among the globalization engines are complex and not fully understood. The revolution in information and communication technology (ICT) is both an enabling factor and a driver. It fosters innovation in products and production processes, and also in organization at the level of the firm and of the industry.

The multinational enterprise (MNE) is the main vehicle for transmission — not only of investment but also of trade and technology. While the history of the MNE goes back to the mid-nineteenth century, and foreign direct investment (FDI) increased markedly after World War II, an unprecedented surge took place in the second half of the 1980s, significantly intensifying the globalization trends of previous decades and marking the onset of a new phase of deeper integration.

Why a new phase? First, there were new actors, especially the MNEs from Japan. While U.S. dominance in FDI was steadily reduced after World War II, the Japanese were "late multinationalizers." Further, an increasing proportion of investment was in technology-intensive manufacturing and technologically sophisticated services (see tables 1, 2 and 3). These industries are dominated by a few large firms, *i.e.*, they are oligopolistic in structure. International rivalry intensified as corporations sought to:

- capture economies of scale and scope;
- customize products to satisfy consumer tastes;
- gain access to sophisticated, high-quality networks; and
- gain access to knowledge both technological and "tacit" (see below).

While somewhat oversimplified, it could be argued that continuous innovation (broadly defined) increasingly became the basic determinant of competitiveness.

This paper highlights policy issues stemming from these developments. No new institution is needed to deal with the ongoing impact of technological change, but the agendas of existing institutions should be adapted to reflect the importance of this change. Before turning to some suggestions for change, it is useful to review the main features of the intensification of globalization and the deeper integration as they emerged in the 1980s.

**Table 1**
**Sectoral distribution of foreign-direct-investment stock for the largest developed home countries and the largest developed and developing host countries, 1970-1990.**

(Billions of dollars and percentage)

| | 1970 | 1975 | 1980 | 1985 | 1990 | 1971-1975 | 1976-1980 | 1981-1985 | 1986-1990 | 1981-1990 | 1970 | 1975 | 1980 | 1985 | 1990 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Group of countries and sectors** | **Billions of dollars** | | | | | **Average annual growth rate (percent)** | | | | | **Share in percentage** | | | | |
| **A. Outward Stock** | | | | | | | | | | | | | | | |
| Developed Countries[a] | | | | | | | | | | | | | | | |
| Primary | 29 | 58 | 88 | 115 | 160 | 14.0 | 8.7 | 5.5 | 6.8 | 6.2 | 22.7 | 25.3 | 18.5 | 18.5 | 11.2 |
| Secondary | 58 | 103 | 208 | 240 | 556 | 11.7 | 15.1 | 2.9 | 18.3 | 10.3 | 45.2 | 45.0 | 43.8 | 38.7 | 38.7 |
| Tertiary | 41 | 68 | 179 | 265 | 720 | 10.4 | 21.4 | 8.2 | 22.1 | 14.9 | 31.4 | 27.7 | 37.7 | 42.8 | 50.1 |
| Total | 129 | 229 | 475 | 620 | 1436 | 11.7 | 15.7 | 5.5 | 18.3 | 11.7 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| **B. Inward Stock** | | | | | | | | | | | | | | | |
| Developed Countries[b] | | | | | | | | | | | | | | | |
| Primary | 12 | 17 | 18 | 39 | 94 | 4.7 | 5.9 | 16.7 | 19.2 | 18.0 | 16.2 | 12.1 | 6.7 | 9.2 | 9.1 |
| Secondary | 44 | 79 | 148 | 195 | 439 | 10.7 | 13.4 | 5.7 | 17.6 | 11.5 | 60.2 | 56.5 | 55.2 | 46.2 | 42.5 |
| Tertiary | 17 | 44 | 102 | 188 | 499 | 16.5 | 18.3 | 13.0 | 21.6 | 17.2 | 23.7 | 38.1 | 38.1 | 44.5 | 48.4 |
| Total | 73 | 140 | 268 | 422 | 1032 | 11.3 | 13.9 | 9.5 | 19.6 | 14.4 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Developing Countries/ Economies[c] | | | | | | | | | | | | | | | |
| Primary | .. | 7 | 17 | 31 | 46 | .. | 19.4 | 12.8 | 8.2 | 10.5 | .. | 20.6 | 22.7 | 24.0 | 21.9 |
| Secondary | .. | 19 | 41 | 64 | 102 | .. | 16.6 | 9.3 | 9.8 | 9.5 | .. | 55.9 | 54.6 | 49.6 | 48.6 |
| Tertiary | .. | 8 | 17 | 34 | 62 | .. | 16.3 | 14.9 | 12.8 | 13.8 | .. | 23.5 | 22.7 | 26.4 | 29.5 |
| Total | .. | 34 | 75 | 129 | 210 | .. | 17.1 | 11.4 | 10.2 | 10.8 | .. | 100.0 | 100.0 | 100.0 | 100.0 |

[a] Australia, Canada, France, Federal Republic of Germany, Italy, Japan, Netherlands, United Kingdom and the United States; together these countries accounted for almost 90 percent of outward FDI stock in 1990. Growth data for 1970 and 1971-1975 exclude Australia and France.

[b] Australia, Canada, France, Federal Republic of Germany, Italy, Japan, Netherlands, Spain, United Kingdom and the United States; together these countries accounted for approximately 72 percent of total inward FDI stock in 1990. Growth data for 1970 and 1971-1975 exclude Australia, France and Spain.

[c] Argentina, Brazil, Chile, China, Colombia, Hong Kong, Indonesia, Malaysia, Mexico, Nigeria, Philippines, Korea, Singapore, Taiwan, Thailand and Venezuela; together these countries accounted for 68 percent of total inward FDI in developing countries.

Source: UNCTAD, Programme on Transnational Corporations, foreign-direct-investment data base.

## Table 2
## Sources of services foreign direct investment in the four largest home countries, 1976-1990[a]

(Number and percentage)

| Item | United States[b] | | | Federal Republic of Germany[c] | | | Japan[d] | | | United Kingdom | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1977 | 1982 | 1989 | 1976 | 1984 | 1990 | 1977 | 1984 | 1990 | 1981[e] | 1987 |
| **Number of TNCs**: | | | | | | | | | | | |
| Total | 3 540 | 2 245 | 2 272 | 2 589 | 3 910 | 4 917 | 1 223 | 1 488 | 1 616 | .. | .. |
| Services | 1 204 | 925 | 901 | 1 097 | 1 841 | 2 523 | 409 | 541 | 575 | .. | .. |
| **Number of Foreign Affiliates**: | | | | | | | | | | | |
| Total | 24 666 | 18 339 | 18 899 | 9 059 | 14 657 | 19 352 | 3 589 | 4 937 | 7 986 | .. | .. |
| Controlled by service parents | 7 317 | 5 212 | 5 318 | .. | .. | .. | 1 538 | 1 916 | 2 965 | .. | .. |
| In services | 13 595 | 10 339 | 10 562 | 5 267 | 9 429 | 13 201 | 1 586 | 2 671 | 4 384 | .. | .. |
| **Stock of FDI as Percentage of Total FDI Stocks**: | | | | | | | | | | | |
| Controlled by service TNCs | 21 | 19 | 22 | 29 | 32 | 46 | .. | .. | .. | 24 | 33 |
| In services | 41 | 38 | 49 | 42 | 47 | 56 | 38 | 52[f] | 67 | 34 | 39 |

[a] These countries account for 80 to 85 percent of the FDI stock in services of the largest 10 home countries.

[b] Services include holding companies. The substantial decline in the total number of United States TNCs and their affiliates is most likely a result of changed reporting procedures. The cutoff point below which full data for foreign affiliates do not have to be reported was increased from $500,000 in 1977 to $3 million in 1982 and in 1989.

[c] Excluding individuals. Services include holding companies.

[d] Does not include banks and insurance companies.

[e] Does not include oil, banking and insurance companies.

[f] 1985.

Source: UNCTAD, Programme on Transnational Corporations, based on official sources.

**Table 3**
**Industrial distribution of foreign-direct-investment stock in the manufacturing sector for the nine largest home countries, by group of industries, 1975-1990[a]**

(Billions of dollars and percentage)

| | Amount (Billions of dollars) | | | | Share (Percentage) | | | |
|---|---|---|---|---|---|---|---|---|
| | 1975 | 1980 | 1985 | 1990 | 1975 | 1980 | 1985 | 1990 |
| **Natural Resource- and Labour-Intensive Industries** | 32.1 | 97.6 | 103.6 | 214.0 | 31.1 | 46.9 | 13.2 | 38.5 |
| Food, beverages and tobacco | 12.6 | 25.2 | 26.1 | 67.8 | 12.2 | 12.1 | 10.9 | 12.2 |
| Textiles, leather and clothing | 1.3 | 5.5 | 4.4 | 8.7 | 1.3 | 2.6 | 1.8 | 1.6 |
| Paper | 2.6 | 8.8 | 11.4 | 37.0 | 2.5 | 4.2 | 4.8 | 6.7 |
| Coal and petroleum | 1.3 | 23.3 | 22.0 | 24.5 | 1.3 | 11.2 | 9.2 | 4.4 |
| Rubber | 0.1 | 4.7 | 4.0 | 9.0 | 0.1 | 2.3 | 1.7 | 1.6 |
| Non-metallic minerals | 0.2 | 3.2 | 8.5 | 7.0 | 0.2 | 1.5 | 3.5 | 1.3 |
| Metals | 14.0 | 26.9 | 27.2 | 60.0 | 13.6 | 12.9 | 11.3 | 10.8 |
| **Capital- and Technology-Intensive Industries** | 51.2 | 95.5 | 115.4 | 284.6 | 49.6 | 48.1 | 51.2 | 51.2 |
| Chemicals | 18.8 | 40.2 | 48.2 | 112.3 | 18.2 | 20.1 | 20.2 | 20.2 |
| Mechanical equipment | 18.2 | 22.0 | 26.6 | 56.8 | 17.6 | 11.1 | 10.2 | 10.2 |
| Electrical equipment | 3.6 | 15.0 | 19.9 | 62.4 | 3.5 | 8.3 | 11.2 | 11.2 |
| Motor vehicles | 10.2 | 16.6 | 16.5 | 40.1 | 9.9 | 6.9 | 7.2 | 7.2 |
| Other transport equipment | 0.4 | 1.7 | 4.2 | 13.0 | 0.4 | 1.7 | 2.3 | 2.3 |
| **Other Manufacturing** | 19.2 | 14.8 | 20.9 | 55.8 | 18.6 | 8.7 | 10.0 | 10.0 |
| **TOTAL[b]** | 103.2 | 207.9 | 239.9 | 555.6 | 100.0 | 100.0 | 100.0 | 100.0 |

[a] Australia, Canada, France, Federal Republic of Germany, Italy, Japan, Netherlands, United Kingdom and the United States. These countries accounted for 90 percent of the worldwide outward FDI stock in 1990.

[b] Total may not add up because of unallocated industries.

Source: UNCTAD, Programme on Transnational Corporations, based on TCMD, 1993c.

## 1. GLOBALIZATION AND DEEPER INTEGRATION

For industrial countries, the value of total production increased at a rate of about 9 percent a year over the last three decades. The value of the exports of these nations grew at an average rate of 12 percent. This steady increase in trade flows has been accompanied by a significant change in the *sectoral composition* of trade, from low-tech to medium- and high-tech goods, especially in the developed economies.

- The share of low-technology goods in manufacturing exports declined from 45 percent in the mid-1960s to less than 35 percent at the end of the 1980s.
- While data are very scarce, trade in commercial services also increased — from a 17 percent share of exports in 1986 to a 21 percent share in 1992.

**Table 4**
**Export shares, revealed comparative advantage and import penetration in the developed economies, 1970 and 1990**

| | | Export Shares[a] | | RCA[b] | | Import Penetration[c] | |
|---|---|---|---|---|---|---|---|
| | | 1970 | 1990 | 1970 | 1990 | 1970 | 1990 |
| **United States** | High technology | 31.1 | 26.3 | 1.54 | 1.51 | 4.2 | 18.4 |
| | Medium technology | 21.7 | 15.4 | 1.07 | 0.89 | 5.6 | 18.5 |
| | Low technology | 13.4 | 13.3 | 0.66 | 0.76 | 3.8 | 8.8 |
| **Japan** | High technology | 13.2 | 21.1 | 1.20 | 1.41 | 5.2 | 5.4 |
| | Medium technology | 8.5 | 16.9 | 0.77 | 1.12 | 4.5 | 5.9 |
| | Low technology | 13.2 | 7.1 | 1.19 | 0.47 | 3.0 | 6.6 |
| **Germany** | High technology | 17.7 | 16.2 | 0.93 | 0.79 | 14.9 | 37.0 |
| | Medium technology | 23.1 | 24.7 | 1.22 | 1.20 | 17.2 | 29.5 |
| | Low technology | 15.0 | 17.9 | 0.79 | 0.87 | 11.1 | 20.9 |
| **France** | High technology | 7.7 | 8.7 | 0.83 | 0.84 | 21.6 | 31.6 |
| | Medium technology | 8.5 | 10.0 | 0.92 | 0.97 | 19.7 | 34.1 |
| | Low technology | 10.7 | 12.1 | 1.15 | 1.18 | 10.7 | 21.4 |
| **United Kingdom** | High technology | 10.5 | 10.2 | 1.01 | 1.16 | 17.4 | 42.4 |
| | Medium technology | 11.9 | 8.5 | 1.14 | 0.96 | n.a. | 39.4 |
| | Low technology | 8.9 | 8.5 | 0.85 | 0.95 | 12.4 | 19.8 |
| **Italy** | High technology | 5.5 | 5.1 | 0.75 | 0.59 | 16.2 | 22.8 |
| | Medium technology | 7.1 | 7.7 | 0.97 | 0.89 | 23.6 | 28.9 |
| | Low technology | 8.5 | 12.8 | 1.16 | 1.49 | 11.6 | 15.7 |
| **Canada** | High technology | 3.9 | 2.8 | 0.54 | 0.55 | 42.2 | 63.4 |
| | Medium technology | 8.9 | 5.9 | 1.22 | 1.14 | 42.9 | 53.3 |
| | Low technology | 7.0 | 6.1 | 0.96 | 1.19 | 12.1 | 16.8 |

[a] Share of OECD exports in each category.
[b] Revealed comparative advantage is calculated as a country's exports in an industry divided by its total exports, normalized by the same ratio for the OECD countries.
[c] Imports divided by total domestic demand (production plus imports less exports).

Source: *OECD, Economic Surveys, United States 1993*, Table 16, p. 87.

**Table 5**
**Bilateral intra-industry trade indices,[a] total products,[b] G-7 countries**

| | | Japan | Germany | France | U.K. | Italy | Canada |
|---|---|---|---|---|---|---|---|
| | 1970 | 32 | 44 | 52 | 52 | 34 | 63 |
| **United States** | 1980 | 31 | 48 | 59 | 55 | 42 | 71 |
| | 1990 | 48 | 64 | 69 | 63 | 56 | 71 |
| | 1970 | | 54 | 62 | 45 | 50 | 9 |
| **Japan** | 1980 | | 69 | 47 | 66 | 41 | 12 |
| | 1990 | | 77 | 31 | 62 | 44 | 9 |
| | 1970 | | | 72 | 77 | 55 | 16 |
| **Germany** | 1980 | | | 83 | 59 | 54 | 24 |
| | 1990 | | | 88 | 76 | 66 | 31 |
| | 1970 | | | | 66 | 63 | 19 |
| **France** | 1980 | | | | 69 | 59 | 30 |
| | 1990 | | | | 81 | 71 | 39 |
| | 1970 | | | | | 64 | 36 |
| **United Kingdom** | 1980 | | | | | 75 | 39 |
| | 1990 | | | | | 75 | 38 |
| | 1970 | | | | | | 14 |
| **Italy** | 1980 | | | | | | 22 |
| | 1990 | | | | | | 24 |

[a] Definition and measurement: intra-industry trade (IIT) is a measure of two-way trade within the same industrial or product classification. An example of intra-industry trade is where Japan exports laptop computers to the United States, while the United States exports mainframe computers to Japan. For a particular product of industry I, IIT is defined as the value of total trade (Xi+Mi) remaining after subtraction of the absolute value of net exports, (Xi-Mi). In order to be able to compare between industries, the measure is expressed as a percentage of each industry's combined exports and imports. A measure of interindustry trade is then expressed as 100[(Xi-Mi)/(Xi+Mi)] and the intra-industry trade measure is given by 100 [1-(Xi-Mi)/(Xi+Mi)]. The index varies between 0 and 100. If a country exports and imports roughly equal quantities of a certain product, the IIT index is high. If it is mainly one-way trade, whether exporting or importing certain products, the IIT index is low. For aggregation purposes, the measure can be summed over many industries.

[b] Figures are calculated from SITC Rev. 2, three-digit product categories and are adjusted for overall trade imbalances.

Source: *OECD, Industrial Policy in OECD Countries, Annual Review*, Paris, 1992, p. 209.

As shown in Table 4, the U.S. postwar dominance in medium-tech (capital-intensive sectors, such as autos, and technology-intensive components and equipment) as well as in high-tech has been increasingly challenged by Japan, and Europe even more so. Further, as is clear from Table 4, the real impact of the Japanese challenge over the last two decades has been rising import penetration rather than declining export share. But Japan's import share did not follow this trend. As a consequence of *le défi japonais*, international friction increased during the 1980s, and OECD countries made changes to their domestic policies (see below).

Another significant development linked with the growth of technology-intensive manufacturing has been the increase in intra-industry trade, *i.e*., trade within the same broad industry or product group (Table 5). This type of trade stimulates competition and pressure for continuous innovation. It is also an important channel for diffusion of technology embodied in sophisticated components and equipment. The use of foreign sources for such inputs increased rapidly in the 1980s in sectors whose products represented complex systems: automobiles, aerospace, communications, semiconductor equipment and computers.

Much of the intra-industry trade in components and equipment takes place within the multinational firm. Unfortunately, except for some American data, little information is available on this important aspect of globalization. Estimates indicate that, in 1989, nearly 40 percent of U.S. merchandise exports and over 40 percent of merchandise imports were intra-firm transactions.[3] The ratios for these transactions are highest in high-wage, technology-intensive sectors such as machinery, electronic equipment and transportation equipment.

But these figures do not capture the full impact of MNEs on the global economy. As may be seen from Table 6, worldwide sales of foreign affiliates in these host countries amounted to $4.4 trillion in 1989, which was nearly twice the value of world exports of goods and services. The rapid growth of these sales in the second half of the 1980s reflected the investment surge of that period to which we now turn.

After moderate growth in the 1970s and a slowdown in the first half of the 1980s, a remarkable and unprecedented surge of FDI flows took place after 1985. Part of this "bulge" was due to one-off factors, e.g., protectionist action in Europe and the United States directed at Japan, and the wide exchange rate swings of the decade. But the outflows also reflected the underlying structural changes described earlier. Investment growth in the second half of the 1980s averaged nearly 30 percent per year — four times the rate of world output and three times the rate of trade. Technology flows (as captured by the very inadequate measure of royalties and fees) also exploded, increasing from an annual growth rate of 0.1 percent in the first half of the decade to 19 percent in the second half.[4]

Eighty percent of the flow of investment was controlled by MNEs from the Triad: the European Union (EU), the United States and Japan (see Table 7). Throughout the 1980s, the United States was the primary host country, but for the first time in the postwar years, Japan became the major source of FDI outflow. The stark contrast between Japanese outflows and inflows exacerbated

**Table 6**
**Modalities of International Transactions, 1984-1992**
(Billions of dollars)

| Year | Sales of Foreign Affiliates | Sales Associated with Licensing with Unaffiliated Firms | Estimated Inter-firm Exports | Exports of Goods and Non-factor Services | Exports of Goods and Non-factor Services Excluding Estimates of Intra-firm Exports |
|---|---|---|---|---|---|
| 1984 | 2 500 | 30 | 770 | 2 310 | 1 540 |
| 1985 | 2 500 | 40 | 780 | 2 340 | 1 560 |
| 1986 | 2 900 | 50 | 860 | 2 580 | 1 720 |
| 1987 | 3 500 | 60 | 1 020 | 3 050 | 2 030 |
| 1988 | 4 200 | 80 | 1 090 | 3 270 | 2 180 |
| 1989 | 4 400 | 80 | 1 180 | 3 540 | 2 370 |
| 1990 | 5 500 | 110 | 1 370 | 4 110 | 2 750 |
| 1991 | 4 800 | 120 | 1 450 | 4 350 | 2 900 |
| 1992 | 5 800 | 120 | 1 570 | 4 720 | 3 150 |

**Table 7**
**Inward and outward averages, annual FDI flows for the G-7: 1981-85, 1986-90**
(Millions of U.S. dollars per annum and shares of G-7 total)

| | 1981-85 | | | | 1986-90 | | | |
|---|---|---|---|---|---|---|---|---|
| | Inward | | Outward | | Inward | | Outward | |
| | $ | % | $ | % | $ | % | $ | % |
| **United States** | 19 062 | 74.8 | 10 927 | 27.7 | 51 879 | 58.9 | 22 757 | 16.8 |
| **Canada** | -463 | -1.8 | 3 608 | 9.1 | 3 887 | 4.4 | 5 421 | 4.0 |
| **Japan** | 683 | 2.7 | 9 430 | 23.9 | 2 407 | 2.7 | 45 431 | 33.5 |
| **France** | 1 998 | 7.8 | 2 732 | 6.9 | 6 451 | 7.3 | 11 985 | 8.8 |
| **Germany** | 808 | 3.2 | 3 818 | 9.7 | 2 739 | 3.1 | 14 424 | 10.6 |
| **Italy** | 1 021 | 4.0 | 1 631 | 4.1 | 4 145 | 4.7 | 4 114 | 3.0 |
| **United Kingdom** | 2 375 | 9.3 | 7 323 | 18.6 | 16 547 | 18.8 | 31 413 | 23.2 |
| **G-7 Total** | 25 484 | 100.0 | 39 469 | 100.0 | 88 055 | 100.0 | 135 545 | 100.0 |

Source: *Country Tables, United Nations, World Investment Directory*, Volume 3: Developed Countries, New York, 1993.

the inherited asymmetry of inward and outward investment stocks between Japan and the rest of the Organization for Economic Co-operation and Development (OECD) (see Table 8) and created another source of friction with the United States. Since effective access to markets often involves an investment *presence*, especially in the high-tech and services sectors, impediments to investment will also act as impediments to trade and the acquisition of knowledge. This latter point requires further explanation.

It is well established in both the theoretical and empirical literature that foreign direct investment involves technology transfer to the host country. The growing ubiquitousness of the MNE involves increasing the diffusion of technology: globalization of investment means "techno-globalism"— a new term of the 1980s.

As well as the coded technological knowledge of new products and processes, this technology transfer includes what economists call "tacit knowledge." Tacit knowledge includes new forms of co-ordination and control of production, and new ideas in marketing — "wetware" is the new term for all the ideas stored in the "wet" computer of the brain.

But FDI is also a channel of knowledge *acquisition,* and MNEs are increasingly aware of the need to set up early warning systems to detect technological threats from their competitors in host country markets, especially in advanced markets with strong technological and scientific capabilities. While there is considerable variation by industry and home country ownership, and global research and development (R&D) is not yet widespread, it seems likely to increase, albeit with some lag

following the establishment of a foreign manufacturing base.[5] Techno-globalism is becoming a *two-way* channel.

One manifestation of this new techno-globalism was the enormous increase in strategic technology alliances which hardly existed in the1970s. Figure 1 shows the surge in these new forms of investment (as they are sometimes termed) in the three most significant current technologies: information, biotechnology and new materials. These alliances take place in a wide variety of organizational modes including:

- equity arrangements such as joint ventures;
- research corporations and minority investments;
- contractual joint development agreements; and
- R&D contracts.

The basic reason for these alliances is an exchange of complementary assets. The cost of R&D and the widening range of technologies which feed innovation mean that few firms want to undertake the risk of development alone and thus seek partners to reduce cost and spread risk. Often, these partners are competitors in final markets, and so the alliance is risky as well — one reason for the high failure rate reported in a number of case studies. Regardless, the trend to strategic alliances shows no sign of abatement and is accelerating**.**

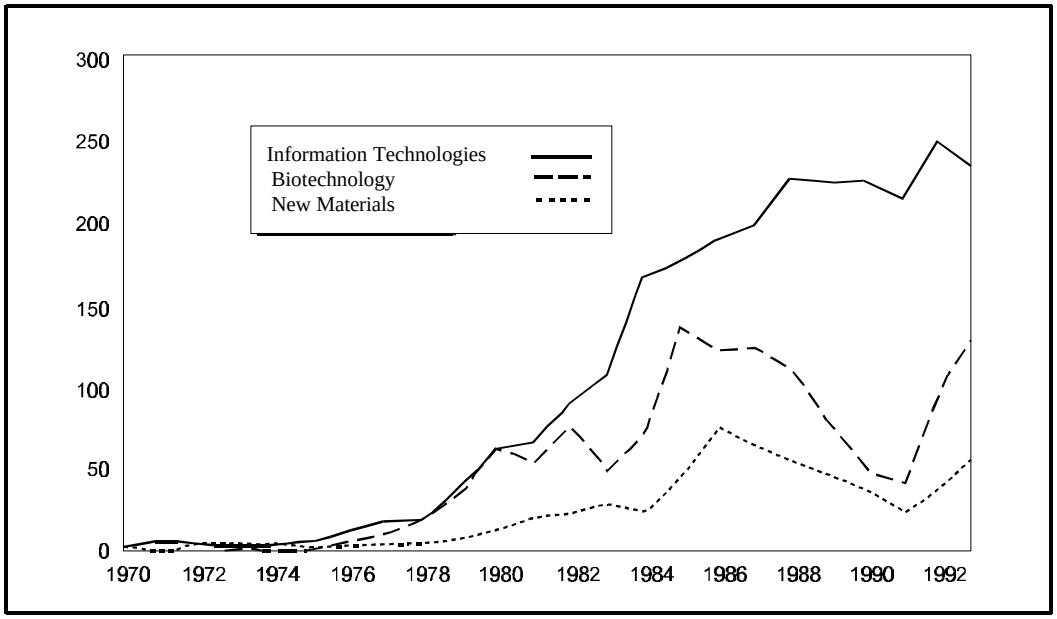
**Table 8**
**G-7, inward and outward stocks of FDI by regions and countries: 1980, 1985, 1990**

(Millions of dollars and world shares)

| | 1980 | | | | 1985 | | | | 1990 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Inward | | Outward | | Inward | | Outward | | Inward | | Outward | |
| | $ | % | $ | % | $ | % | $ | % | $ | % | $ | % |
| **United States** | 16 918 | 8.6 | 21 746 | 9.7 | 19 022 | 8.4 | 8 924 | 2.7 | 37 213 | 5.4 | 28 960 | 3.0 |
| **Canada** | 51 681 | 26.4 | 22 585 | 10.1 | 62 438 | 27.7 | 38 742 | 11.8 | 108 051 | 18.7 | 74 722 | 7.8 |
| **Japan** | 2 979 | 1.5 | 36 497 | 16.3 | 6 397 | 2.8 | 83 649 | 25.4 | 18 432 | 3.2 | 310 808 | 32.5 |
| **France** | 15 477 | 7.9 | 12 222 | 5.5 | 19 196 | 8.5 | 20 261 | 6.2 | 57 791 | 10.0 | 84 596 | 8.9 |
| **Germany** | 36 630 | 18.7 | 43 127 | 19.3 | 36 930 | 16.4 | 59 916 | 18.2 | 93 456 | 16.1 | 155 133 | 16.2 |
| **Italy** | 8 892 | 4.5 | 6 970 | 3.1 | 18 875 | 8.4 | 16 215 | 4.9 | 57 983 | 10.0 | 26 102 | 5.9 |
| **United Kingdom** | 63 057 | 32.2 | 80 785 | 36.1 | 62 587 | 27.8 | 101 236 | 30.8 | 205 884 | 35.6 | 245 069 | 25.7 |
| **Total** | 195 634 | 100.0 | 223 932 | 100.0 | 225 445 | 100.0 | 328 942 | 100.0 | 578 810 | 100.0 | 955 391 | 100.0 |

Source: *Country Tables, United Nations, World Investment Directory*, Volume 3: Developed Countries, New York, 1993.

**Figure 1**
**Growth of Newly Established Strategic Technology Alliances in Information Technologies, Biotechnology and New Materials, 1970-1993**




*Source*: MERIT-CATI.

As this review of the main features of globalization and especially the intensification in the 1980s demonstrates, increasingly fierce competition among the MNEs of the Triad created new strains among the major trading countries. One response was the implementation of domestic policies designed to foster innovation among domestic firms: the term "techno-nationalism" was invented as efforts were made to exclude or discriminate among foreign subsidiaries, *i.e.*, to halt or slow the diffusion of knowledge across borders. On the international front, a number of high-tech battles were fought, mostly between the United States and Japan (involving, for example, semiconductors, pharmaceuticals, government procurement for technologically advanced equipment and government standards for high-tech products) but also with Europe (for example, Airbus subsidies and the procurement of telecommunications equipment). While it is not necessary to detail these developments here,[6] it is important to explain the linkage between the ongoing process of globalization and the emerging policy template of deeper integration if suggestions for new ways to tackle some of the issues relating to technological change are to have any relevance.

## 2. THE NEW POLICY TEMPLATE OF DEEPER INTEGRATION

The growing interdependence among countries, which began in the postwar period, is the main reason for the changing policy focus toward deeper integration. Under U.S. leadership, the postwar architecture of international institutions, the Marshall Plan and the reconstruction of the Japanese economy set in play a process which produced, by the early 1970s, a rough parity or convergence in living standards and overall technological capabilities among the OECD countries. By definition, convergence involved the erosion of American postwar economic and technological dominance.

The most fundamental consequence of the erosion of hegemony was the growing view in the United States that the trading system of the General Agreement on Tariffs and Trade (GATT) was basically "unfair" because the U.S. market was structurally more open than that of other countries. This unfairness, or asymmetry of access, stemmed not from transparent border barriers — tariff or overt quotas — but from a range of other domestic practices by foreign governments. These practices impeded access for American exports into these markets or, by the spillover effects of these policies, into third-country markets. The Tokyo Round of the 1970s reflected this American view of unfairness in its focus on domestic subsidies as did the Common Agricultural Policy of the European Community.

The Tokyo Round was mainly a transatlantic negotiation. By the 1980s, the American view of asymmetry of access had shifted to Japan. One result was the high-tech battles just described, reflecting the growing awareness of innovation as a source of competitiveness and an expanding definition of unfair impediments to access by trade and investment.

Another result was the long and difficult effort to launch the Uruguay Round. The agenda of the Uruguay Round included, *inter alia*, the unfinished business of the Tokyo Round (especially agriculture) as well as a major transformation of the GATT system to restructure the scope of trading rules by including sectors, such as services, as well as intellectual property rights and investment. The original GATT covered only trade in goods and primary products. Trade in services would have been an oxymoron in 1950, and intellectual property rights were the domain of the World Intellectual Property Organization (WIPO). While the ITO would have included investment, it never came into existence. By the onset of the 1980s, trade in services was growing more rapidly than merchandise trade, and the United States was the leading exporter by a considerable margin. This lead status was also true in investment and technology. Thus, the basic structure of the GATT was "unfair" because it excluded sectors of fundamental importance to American comparative advantage in global markets. It required rebalancing.

But rebalancing involved more than broadening the scope of GATT coverage. In the case of the new issues, border barriers were largely irrelevant. Barriers to access stemmed from domestic regulatory and legal regimes. In the services sector, trade, investment and access to advanced information and communication technology are inextricably interwoven. In other words, the new

issues of the Uruguay Round exemplify the new policy template of deeper integration — or at least the outline of that template. The full dimensions of the regime will emerge over time.

Thus, it can be argued that the decline of U.S. economic and technological hegemony was the most important factor behind the launch of the most significant multilateral negotiations since the founding of the GATT. But the Uruguay Round was not the only "defining event" of the new trade policy regime. The high-tech battles, especially between the United States and Japan under the umbrella of U.S. unilateralism (Super 301 of the 1988 trade act), were of equal importance in establishing a new trade agenda which exemplified key characteristics of deeper integration. That is, the linkage was between effective access (by trade) and effective presence (by investment) and the focus was on domestic regimes or even entire systems rather than on border impediments. Indeed, at the end of the decade, the bilateral negotiations termed the Structural Impediments Initiative (SII) covered a wide array of domestic policies from land use regulation and retail distribution regulation, to broad framework policies, such as competition policy, and issues related to technology access. It is important to emphasize that the high-tech conflicts between the United States and Japan, as well as the SII, reflected a transformation of American trade policy in the 1980s from a single, overriding commitment to mutilateralism to a multi-track policy of:

- multilateralism (the attempt to launch the Uruguay Round);
- bilateralism (the Canada–U.S. Free Trade Agreement); and
- unilateralism (the various forms of section 301 of the 1974 trade act and the Super 301 of the 1988 trade act).[7]

These options, as alternative or complementary routes to deeper integration, remain part of U.S. trade policy today and are likely to remain so. We shall return to this issue in our discussion on policy in the WTO below.

Finally, the globalization of the 1980s in itself was a force for a new trade agenda. A consequence of the growing role of the MNEs is pressure on governments to reduce transaction costs associated with different regulatory and legal regimes, *i.e.*, pressure to harmonize different systems. The significant role of the MNEs generates another impetus to the harmonization trend on the part of many host governments because, increasingly, investment today is not tied to the location of natural resources or to supplying protected local markets. This invokes governmental fears of "footloose" firms or delocalization. Indeed, liberalization of both trade and investment policies has led to increasing competition for investment and unilateral reduction of "hassle costs" for the entry of MNEs, especially in many non-OECD countries.

But the fear of footloose investment has also raised concerns in advanced countries which could lead to new protectionist pressures. It has been argued that, with the narrowing of the margin of comparative advantage among MNEs from the OECD countries, footloose firms create greater "volatility" in competitiveness. As a result, comparative advantage today is also far more volatile — or knife-edged[8] — than in the past when it was basically determined by fundamental factors related to resource endowment.

The notion of knife-edged comparative advantage has provided additional impetus to policies designed to slow the diffusion of technology across borders and to enhance the innovation capacity of domestic MNEs. More broadly, the idea of "created" comparative advantage has generated an ongoing debate on the appropriate role for government science and technology (S&T) policy.[9] While there is full agreement that government support of basic research is essential to build the knowledge base necessary to sustain technological change, there is less agreement on the role of government support for technological development which is closer to the market implementation or innovation end of the knowledge continuum. We shall return to this point in our discussion of policy proposals to which we now turn.

## 3. TECHNOLOGICAL CHANGE AND THE POST URUGUAY ROUND POLICY AGENDA

Perhaps the major achievement of the Uruguay Round was the creation of a new institution, the World Trade Organization (WTO). It turned the GATT from a trade agreement into a membership organization with all the various pacts, codes and other arrangements that were negotiated by the GATT covered by one legal framework with a single, strong and effective dispute settlement mechanism. When it was launched in Punta del Este in September 1986, the goal of the Uruguay Round was to restore, renew and redesign the rules-based multilateral system which had seriously eroded during the 1970s and 1980s. The creation of the WTO was not part of the agenda. The Canadian proposal for the creation of a new institution was put forward in April 1990 and would not likely have succeeded without the strong support of the EU. The main reason for this change was growing apprehension over American unilateralism. This concern has not abated since the debate in the United States over the WTO as a threat to sovereignty.

American unilateralism was not the only challenge to the new liberalized regime. Rising structural unemployment in Europe evoked demands for protection from unfair competition by low-wage labour in developing countries and calls for harmonization of labour standards to prevent "social dumping." And some environmental non-governmental organizations (NGOs) have argued for the use of trade measures to prevent "downward harmonization" or a "race to the bottom" of environmental standards.

Thus, the completion of the Uruguay Round represents only the first step in the process of renewed multilateralism. It is a necessary but not sufficient condition for a sustainable rules-based system. Bridging the gap between necessity and sufficiency will require a number of policy initiatives rather than following the usual tradition of heaving a sigh of relief and marking time until the launch of the next decennial round. Some examples of WTO policy possibilities related to technology issues will be discussed below.

But the WTO is not the only game in town — and never will be. The flexibility necessary to adapt trade policy to the ongoing change inherent in the world today will require action in a number of fora, including regional arrangements such as NAFTA or APEC, and the OECD, which played a major role in the preparation of the Uruguay Round with its work on agriculture and services. Unlike other international economic institutions, the OECD has an array of programs in the innovation field and is well equipped to tackle some of the preparatory work for policy initiatives in the area of technology. Some suggestions along these lines will also be proposed. But it is essential that all regional, plurilateral and bilateral agreements be tabled in the WTO as part of an overall monitoring process. This would provide an opportunity for WTO members to keep abreast of policy evolution and to discuss whether and how policies should become multilateral and perhaps be linked.

The need to enhance the adaptiveness of trade policy making to continuing change in the international economy cannot be overemphasized. To avoid repeating errors of the past, the lessons of history should provide guidance. An appropriate motto for the Uruguay Round, which followed

the GATT tradition of decennial negotiations, could be "too much (almost) too late." The new international regime housed in the WTO provides an opportunity for an "evolutionary" approach to negotiations by policy monitoring and discussion, and for mini-negotiations endorsed by WTO ministers who are required to meet every two years. The key word is *opportunity*: none of this will take place without leadership from member countries. The suggestions put forward here are examples of what might be done in a key area of globalization, *i.e.*, technological change. The basic purpose of the suggestions is to initiate the evolutionary process of policy making afforded by the success of the Uruguay Round.

## 4. POLICY OPTIONS IN THE WTO

Three initiatives could be undertaken in the WTO to improve the Uruguay Round agreements in items related to technological change:

- R&D subsidies;
- government procurement; and
- intellectual property rights.

Since these three issues will continue to generate disputes, especially among OECD countries, plurilateral or even bilateral agreements could be negotiated and then extended, on a voluntary, conditional most favoured nation (MFN) basis to other members.

### R&D Subsidies

Traditionally, the U.S. government position regarding fair government R&D spending or subsidies tended to be relatively simple. Government support of "basic research" was completely fair. On the other hand, government funding of industrial applied R&D, where the objective was to help firms create new commercial products and processes, most certainly was not fair. Of course, governments could fund industrial R&D, if the objective was to create new products or technologies of use to the military. Commercial spillover from such projects was ignored. Also, government funding of applied research and development to improve agricultural technology was, somehow, quite acceptable. So also was, for a while at least, funding of R&D on nuclear power. But these complications tended to get pushed aside in statements of general principles. The essential position was that funding of basic research was fair, but anything that subsidized commercial technological development was not.

A rather dramatic change in the American line occurred as the Clinton administration came to power. No longer was a sharp line drawn between basic and applied research. And support of industrial research and development was now a perfectly legitimate act of government. As a result of these changes, a Uruguay Round agreement was reached which gave a "green light" for assisting research activities by firms, or higher education or research establishments on a contract basis with firms, if the assistance covers not more than 75 percent of the costs of industrial research or 50 percent of the costs of "precompetitive development activity." Permissible costs include:

- personnel costs (researchers, technicians and other supporting staff employed exclusively in the research activity);
- costs of instruments, equipment, land and buildings used exclusively and permanently (except when disposed of on a commercial basis) for the research activity;
- costs of consultancy and equivalent services used exclusively for the research activity, including bought-in research, technical knowledge, patents, etc.;
- additional overhead costs incurred directly as a result of the research activity; and

- other running costs (such as materials, supplies) incurred directly as a result of the research activity.

Compared with the levels set in an earlier (1991) draft agreement, under this Uruguay Round agreement permissible levels of government subsidies were doubled for precompetitive development activities and increased by half for "basic research." Indeed, the adjective "basic" was not used, and the definition of the activities was altered significantly to a more applied commercial orientation. In addition, the cutoff for activity which governments may fund was expanded to include creation of the first non-commercial prototype. More specifically, the code defined research subsidies as follows:

> The term "industrial research" (formerly basic industrial research) means planned search or critical investigation aimed at discovery of new knowledge, with the objective that such knowledge may be useful in developing new products, processes or services, or in bringing about a significant improvement to existing products, processes or services.
>
> The term "pre-competitive development activity" means the translation of industrial research findings into a plan, blueprint or design for new, modified or improved products, processes or services whether intended for sale or use, including the creation of a first prototype which would not be capable of commercial use. It may further include the conceptual formulation and design of products, processes or services alternatives and initial demonstration or pilot projects, provided that these same projects cannot be converted or used for industrial application or commercial exploitation. It does not include routine or periodic alterations to existing products, production lines, manufacturing processes, services, and other ongoing operations even though those alterations may represent improvements.[10]

The agreement also provides a mechanism for securing "green light" status through a review by a subsidies committee after notification of a program. Such notification is to be updated yearly and the entire provision is to be reviewed after five years.

It will be extremely difficult to get explicit, meaningful, binding rules regarding government research subsidies. Indeed, the issue was so contentious even within the United States that it threatened to hold up confirmation of the entire Round. For one thing, differences across industries are so great that rules for one may make no sense for others. For another, "national security" can be used as a reason for avoiding discipline even though this is not explicitly recognized in the new WTO code. And, of course, governments hold varying views on high-tech industrial policy although these differences have narrowed with the changes initiated by the Clinton administration but may re-emerge because of the Republican majority in Congress.

To preclude disputes in this potentially fractious field, a more precise and analytically rigorous agreement on definitions should be undertaken. The basis could be the definitions used in the OECD for its work on innovation policies. More specifically, over the last 30 years, the OECD Directorate for Science, Technology and Industry has developed and refined extremely detailed definitions to collect information on the measurement of human and financial resources devoted to R&D.[11] These same definitions are also used in some countries for income tax regulations.

The OECD definitions and methodology should form the basis for an early WTO subsidy committee review and for the WTO dispute settlement procedure. Indeed, just as the Uruguay Round provides for science advisory groups that may be called with regards to disputes over the environment, it might be useful to consider an expert group on innovation policy issues should the need arise before a new agreement on definitions is achieved. While this proposal may not solve all the difficult and complex definitional issues, it would promote constructive, plurilateral debate and perhaps foster progress on eventual harmonization of subsidy practices while helping to constrain serious bilateral and unilateral destabilizing friction.

**Government Procurement of High-Tech Goods**

While the new Government Procurement Agreement (GPA) in the Uruguay Round was a major improvement over the Tokyo Round code and opened access to a broad range of government contracts, most of the commitments are based on reciprocity and do not apply to all signatories, *i.e.*, the GPA is on a conditional MFN basis. But it provides a major opportunity for adding new members and for continuing expansion. Also, the Uruguay Round agreement included a commitment for new negotiations on procurement to begin before the end of the decade.

Thus, preparations could start for a new approach to government procurement for high-tech products on a plurilateral or even bilateral basis. The market-oriented sector-specific (MOSS) negotiations between the United States and Japan in the 1980s included a number of high-tech products such as medical equipment, pharmaceuticals, supercomputers and telecommunications equipment. Among the many areas of dispute, which essentially reflected fundamental differences in regulatory practices, was the issue of product specification. The American regulatory system focuses on performance norms; the Japanese system focuses on design specifications. Design specifications tend to be more intrusive and less transparent and, therefore, the Americans argued, more subject to possible government–business "collusion."

Since these disputes were never really resolved, and may well lead to more pressure for complete harmonization and for market share arrangements, a new initiative to lay the groundwork for negotiations in the WTO is worth consideration. This initiative would involve an agreement among an interested group of countries to launch an internationally funded centre to develop technical standards for performance evaluation to be applied under the GPA for procurement of specified products.

There are many precedents for adopting international product standards in the GATT code on technical barriers to trade. Further, in the United States, the Sematech Consortium has provided a central funding and testing organization for performance specifications for semiconductor equipment which has lowered adoption costs by reducing duplication among manufacturers.[12] The new international performance center should include government and business collaboration as well as funding, along the lines of Sematech or the EU's program of pre-normative research which deals with similar issues in the standards realm.

**Intellectual Property Rights**

The Uruguay Round made a major breakthrough by establishing comprehensive standards for domestic intellectual property laws and rigorous provisions for enforcement and dispute settlement. The inclusion of intellectual property rights (IPRs) was strongly opposed by a number of developing countries not only because it would involve higher costs of technology acquisition but because it would limit the use of industrial policy instruments such as compulsory licensing or technology transfer conditions on foreign investment. The "north–south" disputes are likely to recur, especially over the enforcement provisions. But there are also likely to be conflicts among some OECD countries and newly industrializing countries, such as Korea, because the accord did not achieve harmonization of IPR regimes.

There are good reasons for trying to make laws on national intellectual property rights more consistent. Most important, it would greatly simplify international business and reduce transaction costs, if companies and other inventors were able to deal with one basic legal code, rather than a collection of codes with significant differences from country to country.

The categories "strong intellectual property rights" and "weak intellectual property rights" do not characterize adequately the prevailing differences across the industrialized nations in their property rights laws. The United States currently awards patents to "the first to invent," while all other major industrial nations award patents to "the first to file." In most of Europe, and in Japan, patent applications are open to the public and to other parties to get their evidence heard before a decision. In some of Europe, and in Japan, there are provisions for compulsory licensing of patents under certain circumstances. In the United States, compulsory licensing mainly exists as a remedy after an antitrust case. European nations distinguish inventions in terms of the inventive step involved, and grant stronger and longer patent protection for inventions that represent a large step forward. The United States has no such provisions.

Patent lawyers tend to push the point of view that, without strong patent protection, firms or private inventors would have no incentive to invent. In fact, numerous studies have indicated strongly that elimination of patent protection would have little effect on R&D in a large number of industries. Thus, in sectors such as the aircraft, aircraft engine, computer and semiconductor industries, it would appear that the natural lead time of an innovator is the principal reason that innovation pays; the availability of patent protection does not add much. The industries producing fine chemical products and, in particular, pharmaceuticals, are exceptions. Here, patent protection almost surely is necessary for companies to have the incentive to do R&D. It is not surprising, therefore, that representatives of these industries have been the strongest and most vocal advocates for strengthened intellectual property rights. But for many high-tech industries, patent protection is a small part of the incentives for R&D aimed at creating new products and processes.

Of course, a major facet of globalization is that lead times in many areas are shrinking, and the number of companies capable of relatively quick imitation has grown. In particular, the number of countries with technologically sophisticated companies has expanded greatly. Much of the friction relating to intellectual property rights is associated with the rise of new industrial powers. Thus,

American firms which, over the years, have adopted a policy of not enforcing patents or cross-licensing them with their American peers, began to get upset when Japanese firms rose to prominence in their industries, clearly taking advantage of American creative technology. As Japan moved to the forefront, and countries such as Korea and Taiwan began to develop rapidly, Japanese firms which had been relatively passive about enforcing their intellectual property rights, became more aggressive.

However, strong intellectual property rights can cause difficulty for leading firms and for those trying to catch up. In many technologies, the intellectual property rights associated with a broad process, or a broad product configuration, tend to be spread out among a number of companies. When patents are strongly enforced and costly to license, no company may be in a position to design and produce the best possible product without courting lawsuits. This is the reason why, in many industries, intellectual property rights have been shared, or not strongly enforced.

As a result, the growing importance in high-technology industries of international trade and multinational operation, has significantly increased the transaction costs of dealing with a number of different national intellectual property rights systems. There is every reason to try for harmonization. The negotiations would also provide an opportunity to discuss the issues arising from the ongoing revolution of ICT as exemplified by the growing debate over the Internet and the protection of copyright. These formidable issues will not be easily resolved but they merit discussion in the WTO.

In the Uruguay Round, with the exception of intellectual protection of computer software and semiconductor chip design, the negotiators did not succeed in achieving much in the way of harmonization. It is interesting (and noteworthy) that, while the negotiators agreed that "copyright" is the way all nations should treat computer programs, in the United States many voices have been raised recently to the effect that copyright is a very awkward way of doing that job. Similarly, concerns have been expressed that the U.S. way of protecting integrated circuit design, which is implicitly accepted in the Uruguay agreement, won't do the appropriate job for very long. In short, not very much harmonization was achieved, and where there was agreement on a common standard, it is not at all clear that the right one was achieved.

Most of the issues impeding harmonization can be resolved in negotiations between the United States and Europe on the one hand, and the United States and Japan on the other hand. In many cases, the reforms ought to involve the U.S. law, rather than the law abroad. There are signs that U.S. policy makers are beginning to see it that way too. Thus, the United States has made noises about adopting a "first to file" system. With the increased propensity to patent computer software, many Americans are arguing for opening up the patent application evaluation process so the United States would look more like Europe in that regard. A number of suggestions have been made that the Americans, like the Europeans and the Japanese, ought to adopt a compulsory licensing clause regarding patents that block the use of other patented technology in the software industry and in several other areas.

A new initiative for harmonization could proceed on the basis of bilateral, trilateral or plurilateral negotiation and then could be extended on a conditional MFN basis to other countries

which agree to accept the standard. In this way, and by fostering discussion on the impact of continuing technological change on IPRs, an evolutionary policy approach could be launched.

These three examples of policy initiatives to be undertaken in the WTO could heighten the importance of understanding the pervasive influence of technological change in the international economy. There is scope for similar initiatives in the OECD. The first — strategic dumping — would also involve negotiations in the WTO and could establish a useful precedent for international institutional co-operation.

## 5. POLICY OPTIONS IN THE OECD

### Strategic Dumping

This issue generated continuing friction between Japan and both the EU and the United States during the 1980s. The 1988 statement of Willy de Clerq, then head of the European Economic Community's (EEC's) trade directorate, has often been cited:

> Dumping is made possible only by market isolation in the exporting country, due primarily to such factors as high tariffs or non-tariff barriers and anticompetitive practices. This prevents the producers in the importing country from competing with the foreign supplier on his own ground while allowing him to attack their domestic market by sales which are often made at a loss, or are financed from the profits made from the sale of the same or different products in a protected domestic market.[13]

More technical expositions of a similar model have been elaborated in the analysis of the U.S. colour television antitrust case in which Zenith sued Matsushita for predatory pricing.[14] Strategic dumping essentially involves subsidizing exports through higher home prices sustained by collusive price behaviour and a protected home market. In industries with significant dynamic economies of scale, high fixed costs, through such actions as co-ordinated R&D expenditures, would deter entry. Thus, the essential dimensions of strategic dumping are the exporting country's trade policy and its competition policy. The injury to the importing country's firms involves both restriction of exports and loss of dynamic efficiency gains (learning by doing) which may be cumulative and dispersed over a wide range of products.[15]

One option would be for the importing country to undertake a form of harassment as a deterrent — strategic antidumping. This would likely induce investment by the exporting firms into the importing country, as happened in autos and semiconductors during the 1980s. But this creates another set of problems. Domestic subsidy is also a possibility but it would require multilateral negotiations on a new subsidy code. A third option would be to tackle the root causes of the problem — the exporting country's trade and competition policy.

To remove the barriers to access into the exporter's market, the first step to be undertaken in the appropriate working party in the OECD would be to agree to a list of industry characteristics which might include:

- the degree of concentration as measured by the exporting firms' share of the home market;
- the exporting firms' share of world market (which would affect alternative third-country producers);
- the extent and nature of barriers to the entry of new firms or the expansion of existing firms;
- the degree of import penetration; and
- prices in the exporting country's home market relative to prices elsewhere.

Specific industries would be selected to focus proposed negotiations in the WTO on eliminating protection for sectors where strategic behaviour is feasible. These are high-tech industries, *i.e.*, sectors with oligopolistic structures, high entry barriers, significant static and dynamic efficiencies, and dominance in global markets.

From this agreed industry list, one could then assemble a group of products and compile a list of specific import barriers for these products. This should be done in co-operation with the WTO secretariat and would form the basis for a "zero for zero" negotiation, *i.e.*, the removal of all border restraints on a reciprocal basis. The negotiations could begin with a small group of countries, including the United States, the EU and Japan. They could decide whether the agreement should be conditional or full MFN. If conditional, the agreement should be open to all countries willing to accede to the zero tariffs.

The removal of trade barriers will not, on its own, remove the threat of strategic dumping which also requires action on competition policy in the exporting market. But convergence, however desirable, will be a lengthy process, although talks in the OECD have been under way since 1992, and competition policy is now also on the agenda of the WTO for future negotiations. In the meantime, a strong case could be made that, in the absence of a supranational authority, bilateral agreements to ensure a fair hearing for disputes involving enforcement where there is a charge of spillover on the trade front might be contemplated. Through transparency and international peer pressure, the speed of convergence would be enhanced. If this option is not pursued, extraterritoriality seems a likely alternative.[16]

**Strategic Alliances in R&D**

Transnational mergers and transnational joint ventures in high-tech sectors also emerged as competition policy issues during the 1980s. National governments may not be concerned about potential abuse of dominant position in their own country or, indeed, they may hold different views on the matter. So disputes are likely to become more frequent. In any case, globalization logically requires a supranational authority and dispute settlement mechanism. The proposed alliance between Boeing and Airbus to produce a new 800-seat super jumbo would create a monopoly in this product by firms with dominant positions in competing products. This is one example of what is likely to become a more common pattern in high-technology sectors. A hard look at the global welfare implications — the relationship between competition and innovation — will be increasingly difficult for national governments who want a "piece of the action" in leading-edge high-tech sectors. Further, in many R&D alliances designed to internalize the inter-industry externalities (multimedia ventures, for example), disputes over a division of the benefits are more likely and will involve a combination of competition and intellectual property issues. No international forum now exists to handle these disputes. A supranational competition policy body could, if required, have the right to establish advisory panels on intellectual property issues. In the absence of such a body, various proposals have emerged for interim bilateral or plurilateral agreements which are under discussion in the OECD and other fora such as the American Bar Association.

But policy initiatives related to alliances are unlikely in the foreseeable future. National governments have scarcely acknowledged the significance of the growth of strategic alliances especially in R&D. Yet this new feature of globalization is likely to accelerate not only within the OECD but more widely as new MNEs, for example, the overseas Chinese corporations, play a larger role in the international economy. A basic reason for lack of policy interest is that the information available on these alliances is woefully inadequate and since data are sparse, the analysis essential for policy debate is very limited. Thus, a high priority for the OECD should be to launch a project involving innovation policy experts and statistical agencies to explore avenues for data collection. The project would expand the information on these transnational alliances, including information by sector and location, on form (e.g., equity or non-equity, etc.), as well as on the major objectives where specified by written agreements. This data base would provide the necessary input for discussions on a number of issues related to competition policy and intellectual property, and provide a significant new dimension of techno-globalism. The information would also be important for domestic policy, especially for smaller countries which are concerned about technology access and whose national firms lack the strategic assets essential to global partnering.

The traditional channels of technology diffusion — trade and investment — have long been the focus of policy both in the GATT and the OECD. It's now necessary to look at this new feature of globalization, which, *inter alia*, also highlights the mismatch between the global economy and the policy architecture of the nation state and international institutions.

**R&D Consortia**

During the 1970s, Japan launched several co-operative research programs to promote technological advance in the private sector. This was in response to policies designed to catch up with the advanced industrialized countries, especially the United States. These joint government–private initiatives were aimed at "precompetitive generic technology" and were regarded, by at least some observers, as a successful strategy to promote technological advance by encouraging the sharing of costs and risks in this "middle" territory of the innovation continuum between basic research and market application.

During the 1980s, partly as a response to this Japanese policy "model," both the EU and the United States adopted research consortia as part of their broader innovation policy set.[17]

It seems likely that jointly funded research consortia will remain a standard feature of domestic high-tech policies in the OECD and will also be adopted in increasing numbers of newly industrializing economies (NIEs). There are, however, no internationally agreed guidelines for these consortia governing the membership of foreign subsidiaries. Different practices in different countries have already created considerable friction and, since ongoing globalization will increase flows of foreign investment (including new forms such as strategic alliances), a harmonization of membership rules for consortia should be negotiated in the OECD as expeditiously as possible. The OECD practice of involving the NIEs in working groups should be adopted with a view to transferring the agreed guidelines to the WTO.

There are no formal conditions for participation in EU projects governed by the Commission Framework Program on technology projects. But membership in consortia is negotiated on a case-by-case basis. There are three "unofficial" conditions which broadly govern foreign subsidiary access to technology consortia.

- The research must be carried out in Europe.
- Therefore, the firm must have R&D facilities in a member country.
- The first commercial application of any technology emanating from the program must be carried out in Europe.

The same criteria appear to apply to the Eureka program which is funded by national governments and the EU. It is open to other Western European countries, not just EU members. A form of "conditional national treatment" also applies in the United Kingdom and Australia.

In the United States, participation by foreign subsidiaries of multinationals is proscribed both in Sematech and in the "automobile partnership" launched by President Clinton in September 1993. Other government-sponsored technology programs do not prohibit foreign participation but condition such participation on *reciprocity, i.e.*, on how U.S. companies are treated in the home country of the firm as well as on other factors such as market access for U.S.-owned firms and protection of intellectual property rights.[18]

Thus, the rise of the competitiveness concerns of the 1980s has led to the introduction of "conditional national treatment" for investment in a number of OECD countries. There is, however, no full inventory of these programs and very little information on the nature of the conditions and how they are implemented.

In contrast, the shift to a more basic research orientation for consortia in Japan in recent years has also been accompanied by a move to encourage more international participation. Indeed, the term techno-globalism was coined in Japan to signal this "new look." This has been widely criticized as more rhetoric than reality, especially by the United States. Indeed, such consortia are becoming less important in Japan than they were in the past, and the bulk of Japanese R&D funding comes from the private sector. Japan is aware of growing criticism of the asymmetry of access for both investment and technology as compared with the United States and Europe.

In addition to the proposal on R&D subsidies, trying to achieve a degree of harmonization regarding the rules for participation of foreign-owned firms in government-subsidized research consortia is also worthwhile. The first priority should be to develop a comprehensive inventory on the rules governing membership of foreign subsidiaries in government-sponsored research consortia in OECD (and NIE) countries. This information would provide the basis for launching discussions on a harmonization code. The issue of national security exemptions would have to be tackled since it provides an enormous "loophole" for escaping international discipline. If national security is an escape from rules for one country, it will provide ammunition for an exemption for "strategic" technologies in others.

Should rules for foreign participation in research consortia be treated as part of a new multilateral investment agreement (MIA) in the OECD or as a separate "high-tech" policy item? The issue is open to debate. The likelihood of getting agreement on traditional national treatment by either the EU or the United States seems small, so some limited form of conditionality might be necessary to achieve harmonized and transparent rules on membership. Because such rules can only be meaningful if full transparency on existing arrangements is achieved, the need to launch a notification procedure as quickly as possible is underlined. Finally, while a binding dispute settlement mechanism may not be possible until the agreement becomes part of a new WTO investment agreement, an agreement for airing complaints about possible violations in a dedicated working group is a traditional OECD practice (in the Trade Committee, for example) which should be applied to the activity on research consortia.

## International Co-operation in Basic Research: A Global Public Good

There is a negative spillover of globalization and increased rivalry among high-tech firms and among national governments concerned with competitiveness. There also seems to be an erosion of support for basic and long-run research programs, both private and public. While firms in high-technology industries are, in many cases, forced to invest even more than they used to in product and process development, to stay ahead of or up with the pack, companies seem to be withdrawing their support from significant basic research. And governments seem to be shifting their research support away from fundamental research and toward the areas and kinds of projects that promise short-run, specific results.

While data are sketchy, there is considerable evidence, however anecdotal, that companies that used to invest heavily in long-run research, now are drawing back. A number of American companies which, during the period 1950 to 1980, had significant basic research programs, have abandoned them, or have moved to make them more applied. While the case of AT&T is somewhat special, the shortening of time horizons and the associated erosion of basic research at Bell Labs may, over the long run, lead to a significant decline in the pace of major innovation in electronics. The collapse of RCA's basic laboratory and of Xerox Park are different in some respects, but part of the same story. IBM's troubles in taking advantage of what comes out of its Yorktown laboratories almost surely will lead to major changes in what is done in those laboratories, perhaps at major costs to the evolution of computer technology.

The combination of very strong competition and a diminished ability to prevent rivals from finding out what one is doing in research is a recipe for driving companies out of the basic research business. It clearly is happening in the United States. It seems to be happening in Europe. Knowledgeable observers suggest that, while Japanese firms now are increasing their investments in basic and long-run research, the same problems that occurred in American firms may soon make Japanese firms think twice about the matter.

At the same time, governments have tried to help out their high-technology firms and, as noted, a standard instrument is research support. For the most part, governments have not funded commercial product development, but the industry research they do support tends to focus on achieving particular technological capabilities in a relatively short period of time. In other words, precompetitive generic research is moving closer to the market phase of innovation. These new programs are not about basic and long-term research.

In the United States at least, government agencies that traditionally supported basic research at universities have been under strong pressure from Congress, and recently from the Executive, to shift their funding more toward fields and projects where relatively clear and short-run commercial benefits can be seen. And universities and government laboratories are being strongly encouraged to get closer to industry. While there is less information about Europe, it appears that the same trends may be ongoing there.

There seems to be a Gresham's law at work, in which all the present inducements are for firms, governments and universities to shift away from basic and long-run research, and toward research that is closer to commercialization and easier to appropriate. This problem has been most noticeable in electronics, and there are indications that the same problem is occurring in the chemical products industry.

The tendency of firms and nations, in the name of competition, to focus their R&D where commercial pay offs are clear and short run, is a strategy to minimize spillover, to keep the pay offs "internal." But if all firms and countries do it, the rate at which new understandings that open up broad new technological prospects are won may slow down. Very little analysis has been done on this problem which, over the long run, may be more serious than the two concerns that are so often looked at: the wastefulness that often occurs and the international conflicts which flare up.

This is a problem that calls for more co-ordination and co-operation among governments. Once again, the OECD should play a key role. First, the question should be put to member governments: is there evidence that corporations are shifting from basic and long-run research, which they finance themselves? Is this an inevitable and durable aspect of the broader competition in high-tech fields, because of the reduced ability of the companies that undertake and fund such work to take the lion's share of the benefits themselves? This hypothesis needs to be documented by the OECD in its survey work on S&T indicators. Further, are governments responding by shifting their research portfolios toward the applied and shorter run? If both these developments are widespread, then the consequences for global welfare should be spelled out. Finally, policy options should be explored including not only proposals for domestic S&T (*i.e.*, more emphasis on basic and long run) but also for international research projects in both basic science and technologies applicable to global problems such as the environment.

With respect to international projects, it would be useful to review recent experience. The Japanese have initiated two international projects, one in biological science (the Human Frontiers Science project) and the other in precompetitive research (the Intelligent Manufacturing System). Serious difficulties were encountered in the launch of both. This illustrates the need for new rules

governing international research issues such as sharing of costs and benefits, and intellectual property rights. And the new rules should also include guidelines for evaluation.

The rationale for a project on international research co-operation stems from the need to offset a probable negative externality of globalization. But the relative decline of basic research in S&T private and public expenditure is hardly a high-profile issue in industrialized countries. That is precisely why the project has been suggested. However, a different kind of negative externality of globalization — the alleged impacts of international competition from lower-wage NIEs and of technological change on wages and employment in the industrialized countries — has been the subject of rigorous debate in both the OECD and the Economic Summit forum. While the debate is by no means over, most analysts suggest that international factors played a less significant role in these labour market developments than did changing technology which favoured higher-skilled workers. In addition, different institutional arrangements in labour markets account for differences in the impact of skill-biased technological advance with respect to both unemployment and wage dispersion. (Basic underlying trends are widely observable in most OECD countries.)

Labour market proposals have been advanced to mitigate structural unemployment and offset the serious social consequences of sluggish real wages and widening income gaps. There is no need to repeat them here. Reducing structural rigidities and improving education and training are the two main themes which run through most of this analysis. Perhaps, it might also be wise for the OECD to consider other approaches based on the premise that if technology is the engine of innovation in the private sector, it might be an impetus in the public sector and enhance the effectiveness of both macro and micro policies by improving the capacity of governments to adapt to a rapidly changing global environment.

## CONCLUSIONS

This paper has stressed the importance of the globalization or deeper integration of the world economy as a prime force in shaping the policy agenda of postwar institutions. The focus of the discussion was on the GATT and the new WTO although, arguably, the need for change is even greater in the Bretton Woods arena. As is usually the case, institutional reform lags behind the "real world" transformation, and this is especially true in a period of accelerating change in the international economy and in the world polity with the end of the Cold War.

One new and significant feature of deeper integration has been to raise the profile of technological change as a prime engine of economic growth. This has generated an ongoing debate in the discipline of economics and, as a consequence, prompted a rethinking of domestic innovation policies. But there has been surprisingly little response in the international policy sphere. The purpose of this analysis, then, has been to highlight some of the policy issues stemming from the ongoing transformation of the global economy which is, to a considerable degree, fed and led by technological change and, especially, by the revolution in information and communication technology.

A number of features of the globalization process, especially the deeper integration engendered by the surge of foreign direct investment in the 1980s, are creating a new international policy template increasingly focused on high-tech matters. The significant change in the sectoral composition of trade toward technology-intensive manufacturing and services, and the growing importance of intra-industry and intra-firm trade in these technologically sophisticated sectors have heightened the international rivalry among the MNEs which dominate these industries. This rivalry, which has generated high-tech friction, reflects also the increasing ubiquitousness of the MNE as a global actor. Indeed, the MNE is the main agent of deeper integration and the main channel for the three engines of world growth: trade, investment and technology. Thus, one key aspect of the new policy template of deeper integration involves accepting the intertwining of trade, investment and technology: trade and investment are complementary features of effective market access and both involve two-way flows of technology.

A second, related feature of the new policy template is a growing shift from a focus on border barriers to "domestic" systems structural impediments. In a world of deepening integration, there is latent pressure for harmonization of domestic market systems — a source of increasing "system friction."

It is argued in this paper that a policy response to deeper integration is urgent to ensure that the fruits of the Uruguay Round and other liberalizing trade initiatives are not dissipated. No new institution is required. In any case, grand designs for institutional reform are not on the "political radar screen" of any of today's heads of government. Inaction is not an alternative. A number of specific and feasible policy initiatives are necessary in the OECD and the WTO to stave off increasing friction and to begin an ongoing process of incremental change to achieve a new world trading system that fully matches the new world of deeper integration.

These policy initiatives cover *trade policy* issues such as R&D subsidies, government procurement, intellectual property rights and strategic dumping in high-tech sectors. On the *investment policy* side, a proposal is made with respect to R&D consortia. And, finally, the fundamental issue of international co-operation in basic research is highlighted as an urgent policy need to enhance long-term global growth, the most basic and pervasive of international public goods.

## ENDNOTES

1. See, for example, Bretton Woods Commission, *Bretton Woods: Looking to the Future,*Commission Report and Conference Proceedings, Washington, D.C., July 20 to 22, 1994.

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3. *Ibid*., pp. 16-19.

4. UN, *World Investment Report,* 1994, p. 20.

5. Ostry and Nelson, *op. cit*., p. 24.

6. *Ibid.,* Chapter 3 and references cited therein.

7. See Thomas O. Bayard and Kimberly Ann Elliott, *Reciprocity and Retaliation in U.S. Trade Policy*, Institute for International Economics, Washington, D.C., September 1994. The SII was, in point of fact, a substitute for Super 301. See Sylvia Ostry, *Who's on First: The World Trading System in the 21st Century*, Twentieth Century Fund (forthcoming).

8. Jagdish Bhagwati, "Trade and Wages: Choosing among Alternative Explanations," *Economic Policy Review*, Federal Reserve Bank of New York, January 1995, pp. 44-45.

9. For a review see OECD, TEP, *Technology in a Changing World,* Paris, 1991.

10. Agreement on Subsidies and Countervailing Measures, Final Act of Uruguay Round Negotiations, Geneva, Part IV, December 15, 1995.

11. The *Frascati Manual,* developed by the OECD Directorate for Science, Technology and Industry.

12. Peter Grindley, David Mowery and Brian Silverman, "Sematech and Collaborative Research: Lessons in the Design of High-Technology Consortia," *Journal of Policy Analysis and Management*, 13, Fall 1994, pp. 723-758.

13. Fair Practice Not Protectionism," *Financial Times*, November 21, 1988, p. 29.

14. F.M. Scherer, *International High-Technology Competition,* Harvard University Press, 1992, pp. 54-57.

15. Ostry and Nelson, *op. cit*., p. 98.

16. In October 1994, the U.S. Justice Department and the Federal Trade Commission issued draft guidelines on enforcing U.S. antitrust laws internationally in cases where "anti-competitive conduct" by foreign firms affected U.S. trade. See *International Trade Reporter*, Washington, D.C., October 19, 1994, p. 1609.

17. For a comprehensive review of these and other policies, see Richard R. Nelson (ed.), *National Innovation Systems*, New York, 1993.

18. Office of Technology Assessment (OTA), *Multinationals and the U.S. Technology Base*, Congress of the United States, Washington, D.C., 1994, pp. 32-39.