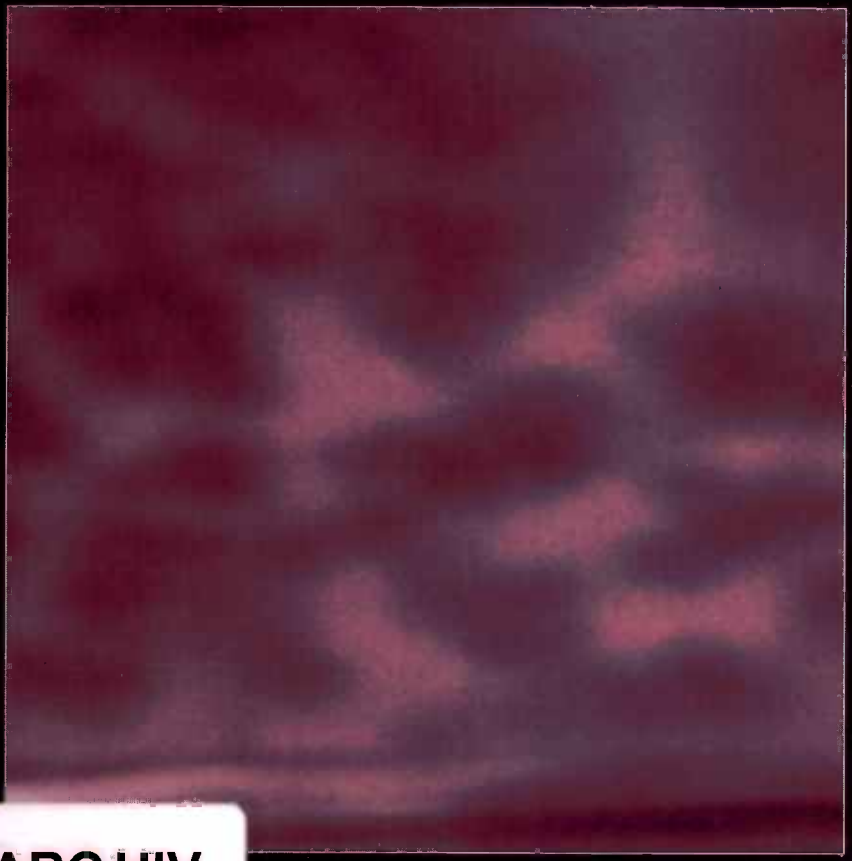
Edited by

A. S. Bhalla

GLOBALIZATION, GROWTH AND MARGINALIZATION



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UNEVEN DEVELOPMENT IN THE THIRD WORLD

Globalization, Growth and Marginalization

Edited by

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Jeffrey James[1]

Globalization is an undeniably real phenomenon defined in terms of increased flows of trade and investment between countries regardless of however meaningful it may or may not be according to various other definitions. Over the ten-year period from 1985 to 1994, for example, the ratio of world trade to GDP rose more than three times more rapidly than during the ten previous years, while the ratio of foreign investment to GDP doubled (World Bank, 1996b). In this sense globalization is just as meaningful a notion from the standpoint of developing countries as it is for the world economy as a whole. For not only did the overall ratio of trade to GDP in those countries increase by 1.2 per cent per annum over the decade, but they also registered a rising share of total foreign investment (to more than one third) (ibid.)

When they are disaggregated, however, these data indicate that developing countries are not participating equally in the process of global integration. On the contrary, a recent World Bank study depicts a disturbingly unequal pattern of integration (ibid.) For example the wide variance around the average increase in the ratio of trade to GDP for the developing world as a whole is reflected in the fact that that ratio actually fell in 44 of 93 developing countries, while of the total direct foreign investment going to those countries some two-thirds was concentrated among only eight of them (ibid.) The purpose of this chapter is to examine the role played by the new information technologies in these divergent global integration patterns, which, as the following section demonstrates, point firmly to the marginalization of a large number of developing countries.

PATTERNS OF GLOBAL INTEGRATION

The main finding of the World Bank (ibid) on the economic prospects of developing countries is that their integration into the global economy in recent years has been a highly uneven process. Table 2.1 shows the extent

of that unevenness. In particular it shows that some parts of the developing world – notably East Asia, South Asia and Latin America – have experienced substantial integration (as measured by the growth of exports and foreign direct investment), while other regions – the Middle East and Africa – are integrating much more slowly. Table 2.1 also reveals a clear correlation between degree of integration and rate of economic growth: that is, the regions that integrated most intensively grew the fastest, whereas the slowest integrating economies exhibited the least rapid rates of economic growth.

Other data from the World Bank report can be used to focus more closely on the process of global marginalization; that is, the process whereby some countries are experiencing a decline in the ratio of (1) trade and (2) foreign direct investment to GDP. With regard to the former ratio, the World Bank data indicate a decline in 44 of the 93 developing countries, 'representing more than one billion people, or 26 per cent of the sample population'(ibid., p. 21). The majority of those 44 countries are in the Middle East and Africa. Similarly, 'Over the past decade ratios of FDI to GDP fell in thirty-seven of the ninety-three countries studied' (ibid., p. 22). Of these, 20 were in Sub-Saharan Africa, nine were in Latin America and the Caribbean and seven were in the Middle East and North Africa.

Generally speaking, therefore, marginalization seems to be most pronounced on the African continent (see Chapter 6). Indeed the conclusion of one recent article on the subject is that 'Africa is currently more marginalized within the world economy than at any time in the past half century. Its shares of world trade, investment and output have declined to negligible proportions' (Collier, 1995, p. 556).

Table 2.1 Uneven integration of developing countries into the global economy (per cent)

Region	*Real GDP growth per capita, 1991–95*	*Export growth per capita, 1991–95*	*FDI inflows as a share of GDP, 1993–95*
East Asia	8.0	14.1	3.1
South Asia	2.2	8.4	0.3
Latin America and the Caribbean	1.1	7.2	1.1
Middle East and North Africa	−0.2	−0.4	−0.4
Sub-Saharan Africa	−1.5	−1.6	−0.9

Source: World Bank (1996b).

Alternative Explanations

There are undoubtedly many reasons for these divergent patterns of global integration, perhaps the most obvious of them being intercountry differences in macroeconomic, trade and industrial policies. It is often argued for example that the Asian newly industrializing economies have adopted far more outward-looking trade and industrial policies than other developing countries in general and those in Sub-Saharan Africa in particular. Another frequently heard explanation is that some regions are far more prone to political risk and uncertainty than others (with Africa again featuring prominently in the latter category). It is not our intention to minimise the importance of arguments such as these, rather that the influence of information technology has not yet received the attention it deserves in this context. There are, we will show, a variety of different mechanisms through which information technologies influence the process of globalization. And in each case the nature of this influence tends to correspond in a broad way to the patterns of globalization that have just been described. What will also become apparent is that these same influences also tend to *increase* the extent of globalization itself. Thus the relationship between information technology and globalization is one of mutual causation rather than unidirectionality.

THE INFLUENCE OF INFORMATION TECHNOLOGY ON PATTERNS OF GLOBAL INTEGRATION

Because we have defined globalization and marginalization in terms of foreign trade and investment flows, it is in relation to these same variables that the role played by the new information technologies needs to be examined. Let us therefore turn first to the foreign-trade-induced mechanisms of technological influence.

Trade-Induced Mechanisms of Technological Influence

Information technology influences not only the extent of international trade but also the degree to which different countries (and firms in those countries) benefit from the relationships thus induced. In turn these technological influences are exerted through two different mechanisms. One of them has to do with the adoption and diffusion of information technologies across countries and among firms in those countries. By reducing production or communication costs and improving product quality, these technologies tend to create new trade opportunities for adopting units;[2] non-adopters, however, may find themselves at a competitive disadvantage, which over time may result in their becoming increasingly marginalized. The second mechanism has more to do

with the *production* than the *adoption* of information technology. In particular the rapid growth in demand for electronic products affords valuable export opportunities to firms and countries that can sell those products on international markets.

Let us consider each of these mechanisms in turn, although before so doing we should take note of a possibly important connection between them, namely that the user skills required for successful adoption of the new technologies may also be necessary for the skills needed to produce them. The underlying argument is that technological capabilities tend to be sequentially acquired, beginning with the capability to use imported machinery efficiently, a stage that is usually followed by repair and maintenance capabilities and ultimately by the ability to produce and export the machinery itself. Thus user and producer capabilities can not be separated from new technology in general or information technology in particular. Indeed 'The experience of OECD countries suggests that intensive users of information technology (IT) often become competitive suppliers of information systems in their own industries, such as banking and airline services' (Hanna and Dugonjic, 1995, p. 38).

The Adoption of Information Technology and International Trade

We begin this section with telecommunications not just because this form of information technology influences the extent to which certain new industrial technologies can be adopted (for example in the garments and textiles industries) (Mody and Dahlman, 1992), but also because many observers initially saw in electronic switching technology an especially favourable opportunity for developing countries to engage in technological leapfrogging, that is, to assimilate that technology even more rapidly than the industrialized countries. By expanding their main telephone lines and reducing their comparative transport and communication costs, developing countries would be able to compete more effectively in international markets for goods and services. (Electronic or digital switching involves the use of microelectronics to connect terminals and coordinate the entire telecommunications network as opposed to the use of electromechanical parts. The former type of switching tends to be cheaper than the latter and it also requires less maintenance because it involves no moving parts.)

The Adoption of Advanced Telecommunications Technology

The possibility of leapfrogging by means of electronic switching technology arises because (1) this technology is cheaper and less complex to install from scratch than when it has to be added to an existing electromechanical network, and (2) it is developed rather than developing countries that tend to

have large existing networks of this kind. The latter countries 'thus had a remarkable opportunity to completely leapfrog the electromechanical technology, avoiding the expense of replacing obsolete (though young in age) capital stock and problems of technological cumulativity, and start their telecommunications infrastructure from scratch' (Antonelli, 1991, p. 71).

Not all developing countries, however, were well placed to take advantage of the opportunity thus presented, and while some were indeed able to assimilate the new switching technology more rapidly than the developed countries, others lagged far behind. Table 2.2 shows that most of the fastest adopting countries (as defined by the ratio of electronic lines to total switching capacity) were first- and second-tier newly industrializing countries in the Far East that enjoyed high rates of investment, technical skills and other attributes.

To the extent that these countries generally achieved more rapid rates of penetration than the developed countries, technological leapfrogging has indeed taken place (ibid.) On the other hand, many of the developing countries, especially but not only in Sub-Saharan Africa, that lack these features seem to have achieved very low or non-existent rates of adoption, a consideration that helps explain why the total number and quality of lines remains so low in that region compared with other parts of the developing world. 'For example, there are only 0.3 telephones per 100 people in Sub-Saharan Africa.

Table 2.2 Extent of adoption of electronic switching in developing countries, 1987

	Latin America	*Asia*	*Africa*
Leaders[1]		Singapore Thailand Malaysia Hong Kong Republic of Korea Sri Lanka	Morocco
Fast followers[2]	Chile Colombia Peru	Philippines	

Notes:
1. Countries whose ratio of electronic lines to total switching capacity was greater than 50 per cent in 1987.
2. Countries whose ratio of electronic lines to total switching capacity was 35–50 per cent in 1987.
Source: Antonelli (1991), p. 50.

The figure is twice as great in Asia (excluding Japan), 16 times greater in Latin America, and 60 times higher in the industrialized countries of Europe' (Moussa and Schware, 1992, p. 1738). In addition,

> subscriber equipment is often out of service for long periods, in particular due to cable faults. Lines are noisy: new connections are limited, and long waiting lists exist: tariffs are high; new services are not readily provided, and what service is available is often limited to the larger urban areas. The international service is often better than the national service (Winsbury, 1995, pp. 233–4).[3]

Inasmuch as the differential rates of digital switching technology vary directly with per capita income levels, and because this technology has fostered additional trade and growth among the adopting countries, it seems to have exerted an inegalitarian influence on the global distribution of income. Moreover, according to some observers, the distributional impact may have been negative *within* the adopting countries themselves. For example in Table 2.2 the Philippines is listed as a 'fast follower' country, but the growth that took place there has apparently benefited foreign rather than locally-owned enterprises, urban rather than rural areas and those who make long-distance rather than local telephone calls (Sussman, 1991; see also O'Siochrú, 1993).

The Adoption of New Industrial Technology and International Trade

Although much more research needs to be done on the diffusion of new industrial technologies in developing countries (for example computer-aided design, CAD, and computer numerically controlled machine tools, CNCMTs), two broad tendencies are already apparent. One is that, because they are skill- and infrastructure-intensive and tend to be associated with sophisticated 'high-income' products, the new industrial technologies are being adopted primarily in the more industrialized of the developing countries (especially, but not exclusively, in Asia).[4] The second tendency is that, for similar reasons, these technologies tend to be adopted by relatively large-scale, export-oriented and often foreign-owned enterprises in the countries concerned.[5]

What is less clear, however, is how these differential patterns of adoption influence the competitive position of firms and countries *vis-à-vis* non-adopters. That is, to what extent is the competitive position of the latter being undermined – or marginalized – by the technological behaviour of the former? The problem in addressing this question is that within broad product categories, such as textiles and footwear, some goods are close substitutes for one another, while others are entirely non-competitive (as may be the case, for

example, with products embodying essential and luxury characteristics in very different proportions). Technical change that affects one product (when, say, it is produced by CNCMT) will thus tend to have a very different impact on the other products in a given category, depending on the closeness of the substitutes they represent. Consider in this regard the situation portrayed in Figure 2.1, where three different products, A, B and C, embody two characteristics in different proportions.

In the initial situation (prior to technical change) we assume that the prices of the goods and available income are such that the efficiency frontier is represented by *OPQ*. Depending on their preferences, consumers will choose a particular point on this frontier. For example where preference is represented by IC^2, a point between *O* and *P* will be selected, whereas the consumer with the indifference curve IC^1 will be best off consuming good C. One can usefully conceive of these two indifference maps as representing two different markets, one with a distinct preference for one combination of characteristics and the other with an equally distinct preference for an entirely different combination of characteristics. Assume now that technical change endows good A with more of both characteristics than before, so that the new efficiency frontier becomes, say, O^1PQ (with a given income, that is, the consumer derives more characteristics from the same product). As one would expect, the technical change thus specified improves the competitive position of the producer of good A;[6] the effects on the producers of goods B

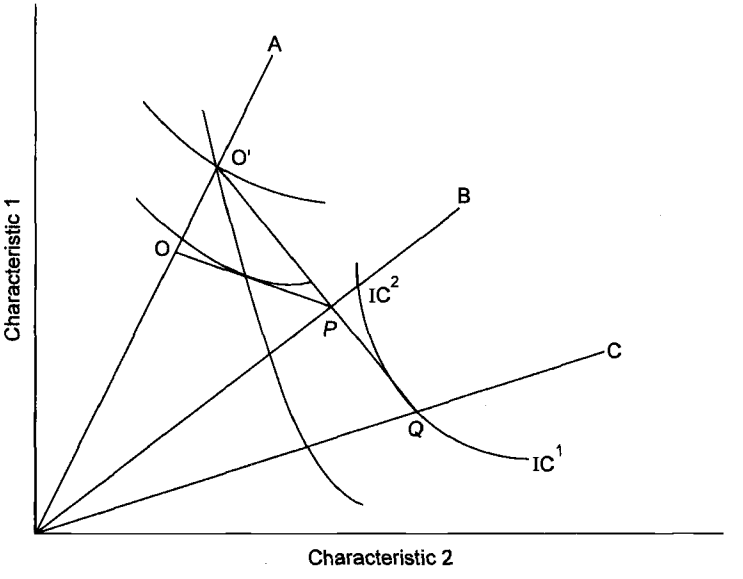

Figure 2.1 Adoption of new technology and product competitiveness

one would expect that the successful developing-country exporters are also among its most intensive (per capita) users.

Table 2.3 tends to confirm this expectation for it shows that, over a range of different subsectors of the electronics industry, exports are concentrated among a narrow group of newly industrializing countries, mainly but not exclusively in the East Asia region. Indeed for a number of these countries, these exports account for a sizeable proportion of manufactured exports as a whole, for example, 45 per cent and 50 per cent for Singapore and Malaysia respectively (UNCTAD, 1995a). At the other extreme, one can also see from Table 2.3 that the Africa region has barely participated in the international market for electronics products. This region's share of the total market is in fact even less than its export share of manufactures as a whole,[8] suggesting that it is more difficult to compete in electronics than in manufacturing more generally.

To a large extent the export of electronics by developing countries has been generated by foreign direct investment, and hence one needs to look to the factors that determine the location of such investment in order to explain the

Table 2.3 Developing-country exports of selected electronics, 1993

Electronic micro-circuits		*Diodes, transistors, etc.*		*ADP peripherals**		*Digital computers*	
Major exporters	*% of world market*	*Major exporters*	*% of world market*	*Major exporters*	*% of world market*	*Major exporters*	*% of world market*
Rep. of Korea	9.5	Malaysia	8.6	Singapore	27.2	Singapore	24.0
Singapore	7.6	Hong Kong	6.3	Rep. of Korea	6.1	Mexico	3.2
Malaysia	7.5	Singapore	6.0	Malaysia	2.6	Rep. of Korea	3.1
Hong Kong	4.3	Rep. of Korea	4.7	China	1.5	Hong Kong	0.6
Thailand	1.6	Mexico	2.6	Hong Kong	1.4	Malaysia	0.4
Philippines	0.9	Philippines	2.1	Mexico	0.7	China	0.3
Total	31.4		30.3		39.5		31.6
Exports from Africa	0.0	Exports from Africa	0.4	Exports from Africa	0.0	Exports from Africa	0.0
Exports from N. Africa	0.0	Exports from N. Africa	0.4	Exports from N. Africa	0.0	Exports from N. Africa	0.0
Exports from Latin American Integration Association	0.5	Exports from Latin American Integration Association	2.7	Exports from Latin American Integration Association	0.9	Exports from Latin American Integration Association	3.3

* ADP stands for automatic data processing.
Source: UN (1993).

and C however are not at all the same, because while A and B are relatively close substitutes for one another, A and C are not. Thus in a market where A and B compete, the latter loses out to the former in the new situation because the consumer moves to point O^1. The consumer of good C, on the other hand, remains entirely unaffected by the technical change and remains in his or her initial position at Q (as might be the case in practice, for example, with the consumer of a highly standardized, price-sensitive item of clothing in the face of technical change at the more design-intensive end of the spectrum).

It follows from this analysis that the degree to which different developing countries are actually made worse off when new industrial technologies are adopted by developed and newly industrializing countries will need to be determined on a case-by-case basis using a considerable amount of highly disaggregated information about particular product categories. The current four-digit classification of trade data is far too aggregated to be useful in this regard.

The Adoption of Electronic Communication Technology and International Trade

In addition to the industrial technologies that have just been described, firms in developing countries may also adopt electronic communications technology such as the Internet and e-mail. These latter technologies may enhance the competitive standing of adopting firms by providing them, among other things, with information about prices and markets and by enabling them to place orders more rapidly. To the extent that installation and use of electronic communications technology is simpler and less expensive than the new industrial technologies, one could expect a more even diffusion of the former among firms of all sizes. As yet, however, there are no data that can be used to test this hypothesis.

The Production of New Technology and International Trade

As noted above, information technology affords developing countries the chance to become more actively involved in the international trading economy not only through the technology-adoption behaviour of firms, but also because of the opportunity to produce and export the new technologies. The latter is made all the more attractive by very rapid growth in the global demand for many of the products that together constitute the electronics sector.[7] Which developing countries, then, have best been able to meet this rapidly growing demand?

To the probably substantial extent that production and export capabilities presuppose the prior acquisition of user capabilities in information technology,

patterns summarized in Table 2.3. In the 1960s and 1970s overseas investors in semiconductor production, for example, were attracted not only by the availability of cheap unskilled labour in East Asia, but also by the political stability, open financial systems and excellent telecommunication facilities that that region generally offered (Henderson, 1989). Subsequently, as the production of electronics products became more automated, those same firms were attracted instead by the availability of low-cost skilled and semi-skilled labour in first- and second-tier newly industrializing countries in East Asia. Regions such as Sub-Saharan Africa, in contrast, tend to lack the factors that have just been cited and consequently they have failed to attract foreign investment in the electronics industry. One exception in the African context, however, is Mauritius which has managed to enter the export market for electronics partly on the basis of foreign investment (Moyo, 1996). This can be attributed in large measure to the fact that Mauritius has the only successful export-processing zone in the region.

Foreign-Investment-Induced Mechanisms of Technological Influence

The trade-induced mechanisms described above have implications for foreign investment behaviour in developing countries, and hence for the differing degrees of global integration exhibited by those countries. The reason is that trade tends to promote economic growth (recall the correlation between these variables, as shown in Table 2.1) and rapidly growing economies generally attract more foreign investment than economies that are not growing or growing relatively slowly. Because of agglomeration economies (Wheeler and Mody, 1988), moreover, the additional foreign investment that thus accrues tends to attract further foreign capital and so on, in a cycle of cumulative causation. Inasmuch as it helps to determine the patterns of international trade that give rise to this cumulative outcome, information technology may thus be said to exert an indirect influence on foreign investment behaviour. But there are also several *direct* mechanisms of technological influence, and it is to these that we now turn.

As it happens, these mechanisms exert two fundamentally opposing influences on the transnational corporation: whereas one of them induces the corporation to disperse its activities ever more widely across developing countries, the other has just the opposite effect of inducing a geographical concentration of foreign investment in a relatively narrow group of countries (OECD, 1993). The first of these tendencies is driven mainly by traditional supply or cost considerations, while the second has more to do with demand-side factors, especially those that are related to the so-called 'new competition' (see below). In both cases, though, it seems that once again the more advanced developing countries stand to benefit, rather than – or at the expense of – the least developed.

Dispersion

In so far as they reduce the costs of intrafirm communication, coordination and control,[9] the new technologies make it feasible and potentially attractive for the multinational corporation to engage in a more geographically dispersed pattern of economic activity. As applied to production, this 'distance shrinking' effect of information technology affords firms the opportunity to reduce costs in a number of different industries, especially those where production is based on distinct components and operations that can be physically separated (ibid.) In the clothing industry, for example,

> One vital contribution a [computer-aided design] CAD system interfaced with a modern telecommunications network can make is its ability to separate human capital-intensive activities from the locations where the purely labour-intensive production activities can take place, without sacrificing necessary information linkages.... Given that the labour-intensive core of the clothing manufacturing process has remained widely unaffected by the introduction of microelectronics, a microelectronic/telecommunications revolution can accelerate a migration of clothing industries to low labour cost areas by reducing natural (that is, communication) barriers to trade (Spinanger, 1992, p. 99).

Computer software is another industry where spatial production possibilities are being altered by information technology in a direction that favours certain developing countries. Already apparent, for example, is a tendency for routine data-processing activities to be relocated from the United States to the Caribbean, as advanced telecommunications facilities and a plentiful supply of skilled operators can be found at a relatively low cost in countries such as Barbados and Jamaica.[10]

When applied to research and development (R&D), information technology permits multinational corporations to undertake 'self-contained divisible activities that can take place in geographically separate locations, to be subsequently integrated, and they also allow, where needed, R&D activities that are undertaken on an integrated, on-line manner across borders' (UN, 1995, p.151). Texas Instruments, for example,

> has been able to perform geographically dispersed, but globally integrated, R&D activities because of information and communication technologies that allow the exchange of detailed integrated chip designs and scientific simulations across the world without a time delay. Texas Instruments (India) has the latest HP and Sun workstations and a variety of computers that are interconnected by a Local Area Network, which in turn is connected to Texas Instruments' worldwide data communications network.

> Texas Instruments (India) is connected to it on a 'real-time' basis through a dedicated 128 KB link, enabling the company to send and receive the latest support information, design technology and applications information for its products and services (ibid., p. 153).

Although it is difficult to assess the extent to which individual developing countries are currently involved in examples of this kind, early data for the period 1982–89 (Table 2.4) indicate that the increased R&D spending by US transnational corporations in the Third World is concentrated mainly in Asia, and especially in India and Hong Kong. Thus whereas R&D in direct product design and development tends to favour the first-tier newly industializing countries (NICs), which have a sophisticated technology base (accompanied by a relatively limited science base), R&D into generic and disembodied technology favours 'advanced' developing countries that are strong in science relative to technology (Reddy and Sigurdson, 1994). India in particular has become a prominent recipient of this type of R&D, offering as it does an especially large pool of skilled research personnel.

Although the degree to which it is taking place is as yet limited (ibid.), the emerging pattern of R&D dispersion across the developing world represents a fundamental departure from the traditional product cycle model of international investment behaviour. It will be recalled that, in the traditional model, foreign R&D activities are undertaken only when a new product or process has matured to the point where production is located abroad. Such overseas

Table 2.4 Research and development expenditure of US majority-owned affiliates as a percentage of sales, by developing regions and countries

Developing region/country	*1982*	*1989*
Latin America	0.20	0.20
Argentina	0.40	0.25
Brazil	0.40	0.30
Mexico	0.30	0.20
Africa	0.01	0.02
Asia and the Pacific	0.04	0.20
Hong Kong	n.a	0.10
India	0.50	0.60
Indonesia	0.02	0.03
Republic of Korea	n.a	0.30
Malaysia	n.a	0.10
Singapore	n.a	0.30
Thailand	0.03	0.02
Taiwan	0.30	0.40

Note: n.a = data not available.
Source: UN (1992).

R&D is 'mainly concerned with adapting the products (for example, to account for differences in consumer tastes) and the production processes (for example, to account for differences in the labour market) to suit the local market conditions' (Patel, 1995, p. 172). Inasmuch as it gives rise to products and processes that benefit the majority of the population, this adaptive type of research can be described as appropriate to developing-country circumstances.

The newly emerging forms of R&D, on the other hand, tend to be driven by very different considerations, with possibly important consequences for the nature of the resulting innovations and the distribution of the benefits of those innovations between and within countries. For one thing it is supply rather than demand-side factors that now dominate the location decision of transnational corporations.

> Thus firms are now assumed to assess a wide range of different geographic locations purely in terms of the strength of their science and technology base and the availability of adequately qualified scientists and engineers. In such a scenario the home country of the firm is assessed on the same basis as all other potential locations (ibid., p. 153).

A related distinction is that foreign R&D is now designed not so much to produce locally-oriented products and processes as to generate technologies that can be used internationally throughout the transnational corporation. In the previously cited case of the Texas Instruments Corporation, for example, all the innovations developed by the Indian affiliate are exported by satellite to the US parent firm for distribution throughout the corporation as a whole (UNCTAD, 1995a). By the same token, the Indian affiliate benefits from the information that flows from other R&D centres within the corporate communication network. 'In this respect', writes Cantwell (1995, p.172), 'innovation in the leading transnationals (TNCs) is now more genuinely international or, in the terminology used here, it has become "*globalised*".

However R&D is not the only mechanism through which the new information technologies are promoting the globalization of activities conducted by transnational corporations. On the contrary, an important line of recent research has revealed a wide variety of additional mechanisms such as joint research ventures, technological exchanges and unidirectional technology flows that are collectively referred to as international strategic technology alliances (Hagedoorn and Schakenraad, 1993). Indeed the growth of those alliances 'is considered by many observers as one of the major characteristics of economic globalisation' (Freeman and Hagedoorn, 1995, p. 41), and most of that growth, as shown in Table 2.5, has been concentrated in the new information technologies themselves.

As can also be seen from Table 2.5, however, apart from the NICs, developing countries have been almost entirely excluded from such arrangements,

Table 2.5 International distribution of strategic technology alliances in information technology, 1980–9

	No. of alliances	*% for developed economies*	*% for triad*	*% for triad/ NICs*	*% for triad/ LDCs*	*Other*
Computers	199	98.0	96.0	1.5	0.5	–
Industrial automation	281	96.1	95.0	2.1	1.8	–
Microelectronics	387	95.9	95.1	3.6	–	0.5
Software	346	99.1	96.2	0.6	0.3	–
Telecommunications	368	97.5	92.1	1.6	0.3	0.5
Misc. IT	148	93.3	92.6	5.4	0.7	0.7
Heavy electronics	141	96.5	92.2	1.4	2.1	–

Source: Freeman and Hagedoorn (1995), p. 44.

which are overwhelmingly concluded between firms from the 'Triad' region (Europe, Japan and the United States). When it is combined with the evidence shown in Table 2.4 concerning the emerging distribution of global R&D investment, this pattern of technological relationship only seems to underline what some authors rightly refer to as a 'divergence of technological development on a world scale' (ibid., p. 55).

Concentration

Whereas the supply-side mechanisms described in the previous section facilitate the dispersion of economic activities by transnational corporations, the demand-side aspects of information technology give rise to just the opposite tendency. That is, when they are broadly defined to include organizational changes, those technologies offer firms the opportunity to engage in what Best (1990 p. 144) refers to as 'the new competition'. By this he means that a new competitive paradigm is emerging that 'is not about maximizing profits for a given material, product, process, and organizational method, but about seeking a competitive advantage by continuously upgrading product, process and organization'.

In this emerging competitive process, success depends not on being the lowest-cost producer (as in the supply-side type of situation described in the previous section), but rather 'upon the minimization of product development and product changeover times' (ibid., p. 14).

A key element of this 'new competition' is the use of new organizational practices – often in combination with information technology – that are variously referred to as 'post-Fordist', 'lean' or 'flexible' production systems. By means of techniques such as 'just-in-time production' and 'quality circles', firms that adopt the new organizational practices tend to be better able to compete successfully in the 'new competition', mainly because they can

usually respond more flexibly than non-adopting firms to changes in demand. The spatial implication of the new technology in this case, however, is concentration rather than dispersion. In particular, transnational firms that are engaged in this form of non-price competition on the basis of flexible production systems are likely to concentrate their investment activities in developing (and developed) countries that are physically close to their major markets. Such proximity matters

> because one of the keys to the competitive strength of post-Fordist production is its flexibility and continuous innovation, which depend heavily on close 'synergistic' relations between firms and their suppliers, and the just-in-time system. Proximity to customers is also important for establishing the continuous two-way information flows that allow producers to adapt quickly to changing market demands and consumer preferences.... The importance of proximity, for a given production unit, in turn militates against global sourcing, that is, against the use of suppliers scattered around the globe.... It militates in favour of the constitution of production networks in each of the world's major markets: Europe, North America, and Pacific Asia (Oman, 1994, p. 90).

Textiles and cars are two sectors that are especially subject to the 'new competition', and for the reasons just mentioned one does indeed find that foreign investment tends to be concentrated near the largest markets for those products (UNCTAD, 1995a). In the case of the United States for example, Mexico and the Caribbean are major recipients of foreign investment in cars and textiles respectively, while the recent decision by General Motors to establish a full-scale assembly plant in Thailand or the Philippines attests to the growing importance of the Asian market for cars (*The International Herald Tribune*, 29 May 1996).

Summary of the Technological Influences on Patterns of Globalization

It is useful at this point to summarize the numerous trade and foreign investment-induced mechanisms of technological influence as they involve different forms of information technology and benefit different groups of developing countries (Table 2.6). In fact, our analysis has identified four separate groups of developing countries that benefit from at least one of the mechanisms shown in Table 2.6, namely the first-tier NICs (such as Korea and Taiwan), the second-tier NICs (such as Malaysia and the Philippines), large developing countries with an advanced scientific or technological base (such as India and Brazil) and countries in close proximity to major markets, which by virtue of their particular competencies are able to participate in the 'new competition'. Some of these country groups, particularly the first-tier

NICs, tend to benefit from almost all the mechanisms while other groups benefit from only a few of them. If one looks at the country groups least likely to benefit from the mechanisms described in Table 2.6, Sub-Saharan Africa is the obvious choice because the necessary technological capabilities are conspicuously absent. Indeed the absence of such capabilities means that African countries may even have become worse off as a result of the adoption elsewhere of information technologies in the manner described earlier in relation to Figure 2.1 (see also 'Implications for Research and Policy Formulation' below).

Our conclusion is thus that the unequal patterns of global integration shown in Table 2.1 – and especially the extreme experiences of East Asia on the one hand and Sub-Saharan Africa on the other – are to some extent an outcome of the influence exerted by information technology.[11] Some of the entries in Table 2.6, moreover, suggest that a parallel type of influence may be at work *within* countries, where the gainers tend to be large-scale, foreign-owned, urban-based firms, rather than – or at the expense of – small-scale rural enterprises. In this respect information technology may also have contributed to income inequality within the developing countries themselves. One should note, however, that the relationship between *firms* is only one component of the total effect that technical change has on inequality within a country. What also needs to be considered is the question of how new technology influences the dispersion of wages within that country. This question mainly relates to the skill intensity of technical change, and in particular whether that change primarily concerns skilled or unskilled labour. If, as is widely believed, information technology tends to increase the relative demand for skilled labour, then the wages of this group will rise relative to those of workers in the unskilled category. Indeed one comprehensive study of wage dispersion trends in the United States 'points toward skill-biased technical change as the major driving force behind rising wage inequality' (Davis and Haltiwanger, 1991, p. 174).

This particular feature of information technology may also help explain the sharp rise in wage inequality in certain Latin American countries, for example Mexico and Chile (World Bank, 1995a), though reliable empirical evidence of this has yet to be gathered. Research is also lacking on yet another way in which information technology may affect inequality within a developing country. Apart from its influence on firms and workers, this technology also affects those consumers who are able to benefit from product improvements (with regard to say durability) and price reductions. What one needs to know in this regard is whether the beneficiaries are based in rural or urban areas and whether they have relatively high or low incomes.

So far our conclusions have been based on a consideration of each of the separate mechanisms shown in Table 2.6. These conclusions are reinforced if one also looks at the relations *between* the mechanisms rather than just at

Table 2.6 Summary of trade and foreign-investment-induced mechanisms of technological influence on globalization

Form of information technology	*Mechanism of influence*	*Developing countries and firms most likely to benefit*	*Developing countries and firms least likely to benefit (or to be made worse off)*
Telecommunications	Technological leapfrogging via digital switching	Countries with high rates of investment, skills and transnationals located in urban areas (e.g. Asian NICs)	Countries with low rates of investment, inadequate skills and small-scale firms in rural areas
Industrial technologies (e.g. CAD, CNCMTs)	Adoption enhances competitive advantage of adopting firms and countries at expense of non-adopters	Countries with large-scale firms competing in 'high-income' markets (e.g. more industrialized LDCs)	Countries with small-scale firms competing in price-sensitive markets
Electronics (e.g. diodes, peripherals, computers)	Exports of electronics to world markets	Countries and firms with advanced production capabilities (e.g. Asian NICs)	Countries and firms lacking advanced production capabilities
Communications technology (telecommunications and computers)	Information technology promotes global dispersion of production and R&D by transnationals	Countries with an abundance of low-cost skilled labour (e.g. Caribbean region for data processing). Countries / regions with advanced base of science or technology (e.g. India, Hong Kong)	Countries lacking skilled labour or with relatively high labour costs. Countries lacking either an advanced science or technology base
Organizational technology combined with information technology	Promotes concentration of investment by transnationals near major markets	Countries near major markets that are able to participate in "post-Fordist" production systems (e.g. Mexico)	Countries far from major markets
Information technology in general	International strategic alliances in information technology promote globalization (e.g. NICs)	Countries with innovation capabilities in information technology or advanced research capabilities in those technologies (e.g. NICs)	Countries lacking innovation capabilities or advanced research capabilities in information technology

each individual mechanism on its own. The reason is that there is considerable degree of *cumulativeness* in the technological processes that underlie the integration of developing countries into the global economy. This is partly a question of the synergy between the various information technologies themselves, as is the case for example with the integration of computers, telecommunications and office automation into an integrated services digital network (ISDN). But it also has a great deal to do with the Myrdalian notion of cumulative causation, which envisages a widening rather than a narrowing of the initial gap between competitors of unequal strength. We have already suggested, for example, that foreign investment is more likely to accrue to rapidly growing than to slowly growing economies, and it is also more likely to flow in the direction of those developing countries whose initial conditions include a well-developed telecommunications infrastructure. Or again, those countries or firms that at a given point in time are capable of using information technology effectively are also more likely to benefit from the production and export opportunities afforded by such technology.

IMPLICATIONS FOR RESEARCH AND POLICY FORMULATION

The implications for further research revolve around the mechanisms of technological influence on recent patterns of globalization that have formed the main part of this chapter and were presented in summary form in Table 2.6. First of all, we feel that there is a need for a better understanding of some of those mechanisms. For example we have suggested that the manner in which information technology influences the pattern of gains and losses is more complex than is usually thought. In particular we have argued that the effect that the adoption of certain information technologies has on non-adopting firms and countries depends crucially on the characteristics of the products made by the competing units. These demand-side relationships need to be examined empirically on the basis of far more disaggregated data than is now available in international trade statistics. Some of the other mechanisms require further research because they have only begun to emerge relatively recently. We are referring here especially to the way in which information technology is enabling transnational corporations to disperse their economic activities more widely than has hitherto been possible. Among the issues that need to be researched in connection with this emerging phenomenon, is the question of how it will alter the nature of innovations generated by transnationals in developing countries. For whereas at least part of that investment used to be undertaken for the purpose of adapting products and processes to host-country conditions, the R&D that is now being undertaken in developing countries on the basis of advanced information technologies appears to be directed towards more 'global' products that can be used throughout the

corporation, rather than towards local adaptations. To the extent that this switch in the focus of R&D does occur, it raises the disturbing possibility that the technical changes arising out of direct foreign investment will be even less appropriate to the needs of the majority of those living in the Third World than is currently the case. This possibility deserves to be investigated theoretically as well as empirically, and the research could perhaps best be set in the broader context of finding alternatives to the product cycle as a model of foreign investment in the era of information technology.[12]

The second main area where further research is needed has to do with the role of government policy in the process by which information technology causes some developing countries to become increasingly marginalized over time. For while it is true that these technologies possess characteristics – such as skill intensity and a tendency to be associated with sophisticated high-income products – that make them more accessible to relatively advanced developing countries, it is also true that accessibility is influenced to an important extent by government policy. We know, for example, that OECD countries have used a variety of national policies to maximize the diffusion of information technology and it is more than likely that those policies have improved the ability of OECD countries to compete effectively on world markets.[13] We also know a good deal about the policies towards information technology that have been pursued in the NICs and in large industrially advanced developing countries such as India, Brazil and China.[14] We know very much less, however, about policies in those countries that have integrated least successfully into the global economy in the past decade. It is therefore difficult to assess the extent to which that lack of integration can be ascribed to the governments of those countries, important though this issue obviously is.

Then there is the closely related normative question of how the marginalized countries (located mainly but not exclusively in Sub-Saharan Africa), could make better use of information technology in their relations with other countries. What seems most crucial in this regard is the formulation of a national information technology strategy

> to address the systemic constraints to the effective use and wide diffusion of IT. This involves organizational adjustments and coordinated actions at the firm, industry and national levels, with investments in management skills and restructuring. A long-term perspective and a coherent framework are needed to identify economy-wide information and communication needs, to target large-scale application areas for strategic impact and demonstration effects, and to create the funding mechanisms, policy environment and common services necessary to support a combination of top-down/bottom-up initiatives and pilot projects, accelerate learning and meet the needs of smaller organizations (Hanna and Dugonjic, 1995, p. 36).

Such a framework seems particularly necessary for small and low-income countries (for example in Sub-Saharan Africa) that depend heavily on foreign donors for information technology. The problem is that these interventions are frequently uncoordinated and are made in response to events rather than conforming to a coherent policy framework.

By no means the least important purpose of a national information technology strategy is the setting of certain policy priorities, since it is unrealistic to conceive of progress being made simultaneously along all the technological dimensions that influence a country's degree of integration into the global economy (unfortunately much of the policy advice that is given to developing countries in this as in other areas fails to recognize this need). What probably warrants particular attention in this regard is the telecommunications infrastructure because, among other reasons, of the powerful influence this variable exerts on not just one, but on several of the other mechanisms that are summarized in Table 2.6 above. Not only does it affect trade-induced mechanisms of technological influence (via, for example, an enhanced capability to adopt industrial information technologies), but also the mechanisms that operate through foreign investment (through, for example, an enhanced capacity to attract dispersed data-processing activities).

Two types of electronic communication systems appear especially promising in the context of Sub-Saharan Africa and other marginalized regions of the Third World. One of them, called 'FidoNet',

> is a low-cost method of linking together computer bulletin board systems through ordinary phone lines. Its virtue – and its usefulness in developing countries – lies in its ability to overcome the limitations of inadequate phone systems. FidoNet systems automatically contact each other at night – when phone rates are low – to exchange conference postings and electronic mail messages. They keep dialing until they make a connection, and do not stop transmitting until assured by the machine at the other end that all messages have been received free of errors. Regular connections, called gateways, between FidoNet computers and other systems such as the Internet and the Association for Progressive Communications (APC) networks, allow FidoNet users to communicate with virtually anyone with an electronic mail address, with most messages reaching their destination within 24 hours (Young, 1993, p. 33).

FidoNet computers are able to operate even without a telephone system by means of so-called 'packet radio' sets, which are small devices attached to computers in much the same way as a modem and allow e-mail and other data to be exchanged automatically.

The second type of communications system that seems especially well suited to African conditions makes use of (relatively inexpensive) low-Earth-orbit

satellite technology rather than the telephone network. While in orbit the satellite passes every point on Earth at least twice a day and during each 'pass' data can be up- or downloaded to other parts of the world using packet radio technology. One low-Earth satellite already forms the basis of an important medical network in Africa. It serves thousands of physicians and health-care workers by enabling them to communicate with colleagues elsewhere in the world and by providing them with recent medical information in electronic form (*The New York Times*, 22 January, 1996).

Notes

1. I am indebted to Ajit Bhalla, Paul Streeten and the IDRC for comments on an earlier draft of this chapter.
2. For a detailed description of these changes see James (1985).
3. Winsbury (1995, p. 234) reports that 'low income countries still have less than a 5 per cent share of global telephone main lines although they have 55 per cent of the world's population'.
4. According to Watanabe (1995, p. 345), for example, 'The use of microelectronic industrial machinery in the Third World is heavily concentrated in a small number of economies. Most of them have already been classified as "high income economies" by the World Bank (Singapore and Hong Kong), or are preparing to join the "rich men's club" (The Republic of Korea and Taiwan Province of China). Apart from these, ... the diffusion of the new technology is marginal.'
5. Bhalla (1996) provides some evidence in support of this assertion.
6. Evidence that the adoption of information technology enhances international competitiveness takes different forms. On the one hand there are econometric estimates of the relationship between country export performance and rates of technological diffusion. Antonelli *et al.* (1992), for example, find that international competitiveness in the market for cotton fabrics is 'strongly and positively influenced' by the rate of adoption of shuttleless looms. On the other hand there is case study evidence based on surveys of individual firms. See, for example the series of country case studies conducted by the International Labour Office (ILO) referred to in James (1994).
7. The value of world trade in electronic microcircuits, for example, grew by almost 7 per cent between 1989 and 1993. Diodes and transistors recorded a similar rate of growth over this period (see UN, 1993). The rapid growth in world demand for electronics and the central role played in that growth by the East Asian NICs is emphasized by Freeman *et al.* (1995).
8. Africa's share of world manufactured exports during the period from 1970–90 was 0.4 per cent (see UNCTAD, 1995b).
9. UN (1992) notes that 'recent developments in information technologies tend to increase the internationalisation advantages of Transnational Corporations'.
10. For details see Howland (1995) and Schware and Hume (1995).
11. A similar conclusion was reached by Castells and Tyson (1988) for the period before the 1980s and 1990s.

12. Recent literature on the changing relevance of the product cycle model includes Patel (1995) and Cantwell (1995).
13. See, for example, Hanna *et al.* (1995).
14. See the studies on these countries reviewed in James (1994) and the various chapters in Brundenius and Goransson (1993).