

North-South Technology Transfer: Two Neglected Problems*

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I. Introduction

The Group of 77 representing the developing nations (the South) in the North-South dialogue has voiced several complaints with the practices of multinational corporations (MNCs) and of their developed parent-countries (the North). Two of the more important issues concern the cost and availability of technology to southern nations, and the degree of appropriateness of technology actually transferred to the ambient host-economy. Sections I and II seek to shed some new light on the two problems in the hope that the level of the dialogue can be raised at the same time that its stridency is reduced. Section III examines the broader implications of constraints upon the range of input mixes in some products for economic development.

II. Cost and Availability of Technology

The existence and exploitation of market imperfections is the essence of the Hymer explanation of multinational enterprise. A monopoly position in technological inputs was the most common and extreme type of imperfection. The automatic abhorrence of monopoly colored the perception of MNCs particularly in the

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South where the North was seen as having a collective monopoly even if the individual pieces of proprietary knowledge of some MNCs were close substitutes.¹ This coloration was enhanced by an important paper by Harry Johnson (1970) which identified knowledge as a public good in that no additional social resources would be used up if the knowledge were to be made freely available to everyone.² Maximization of global production required, therefore, that technological know-how, even though generated by private expenditures on research and development (R & D), should command a zero price. Technological know-how should be viewed as a public input. It is in the two arguments of Hymer and Johnson that the position of the Group of 77 finds its analytic base.

There is a major difference in the social value of an institution (or set of institutions) which exists in response to imperfections in product markets particularly when the institution works to create or maintain the imperfection and of an institution whose monopoly power derives from technology-creation. To lump the two kinds of imperfections together within a single rubric is to gloss over a strong distinction. Clearly, if an MNC exists because of membership in a number of oligopolistic product markets in different nations its net social contribution is far less than an MNC whose existence derives from the proprietary ownership of a piece of technology created by R & D expenditures by the MNC. The fact that the MNC has a monopoly in the proprietary knowledge is production-creating whereas an oligopoly is production-restricting. Consider the question of global output in terms of two curves (or surfaces): a production-possibility curve and a production-feasibility curve. The former is determined by global resources (including technology) and assumes perfect competition and information in all markets; the latter is determined by global resources and allows for the existing imperfections of competition in product and factor markets. The feasibility curve will always lie inside the equivalent possibility curve as long as one market is less than perfect. If an MNC establishes itself by reducing the degree of competition in national markets or globally within an industry,

¹ Frequently a local monopoly in the product market was a condition of having the piece of technology transferred to a developing host nation.

² This does not deny the existence of social expenditures in transferring the technology to a developing economy. See Teece.

the feasibility curve will shift inwards and the MNC is counter-productive. But when an MNC creates a new piece of technology by expenditure of private funds on R & D and the degree of competition in all markets (except for the new monopoly in the proprietary knowledge) remains the same, both the production curve and the feasibility curve will shift outward. It is true that the retention of the know-how in the hands of the MNC allows the feasibility curve to shift outward by a smaller amount than the possibility curve but the feasibility curve does move outward and the world benefits. As the proprietary knowledge slowly seeps into the public domain, the feasibility curve approaches the possibility curve. Dunning identifies this Jekyll and Hyde aspect of multinationals. The simple identification of monopoly does not distinguish sufficiently between the two phenomena. The two phenomena would be equivalent if MNCs used their profits to buy up and preclude the utilization of a piece of proprietary knowledge generated by another entity since that would amount to technological destruction.

The problem with Johnson's analysis (1970) and with the normative prescription of zero price deduced from it, is that the analysis is essentially static. No additional social resources are used up if proprietary knowledge is transformed into a public good commanding a zero price if (and only if) future R & D expenditures are not influenced by the private return on past expenditures. Any such relationship could be overcome by having the government intervene to buy the technology and to make it freely available but this is economic legerdemain implying the ability of economists accurately to value a piece of technology and to effect a transfer at zero cost. In the absence of exact government intervention, the transformation of private technology into a public good (or input) would have a social cost. To the extent that a firm experiences a reduction in its rate of return on technological innovation, it will reduce its R & D expenditures. Indeed if a zero rate of return is assured, a profit-seeking firm will reduce its R & D expenditures to zero. The social cost of making technology freely available to all is the difference between the social rate of return on private R & D (now eliminated) and the social rate of return on the alternative uses of the resources.

The essentially-private aspects of technology are developed by Johnson in a later paper (1975):

"Technology is a capital good or investment good produced by the investment over time of material resources that yield their returns over further time, and (in contrast to 'basic scientific research') is typically invested in by private enterprises and also by governments in the expectation that the profits will justify the costs of the investment. This basic characteristic involves an economic logic being at work in the generation of technology and in the effects of such generation and diffusion of technological knowledge on international patterns of comparative advantages as reflected in changes in comparative advantage in particular categories of traded goods, which has best been expressed in Vernon's theory of the product cycle. This logic is ignored in discussions of technology in the context of international trade and economic development."

The distinction between the private and public characteristics of technology is at the root of the dissension between the Group of 77 and the bloc of manufacturing nations.³ The Group of 77 perceives technological know-how to be a part of "the universal human heritage" and contends that all countries have the *right* of access to known technology. The concept that technology will serve as an important ingredient in the process of economic development is fundamental. Costs of and constraints on the acquisition of technology are to be minimized and, in particular, governments of developed nations are to subsidize the acquisition by host developing nations of any capital and intermediate goods made necessary by the transfer of technology. It is also important that there shall be no commercial-policy impediment placed on the importation into the technology transferring nations of goods produced with the newly-acquired technology. In effect, the Group of 77 looks upon technology as a free good or as an asset that should be free and implies a responsibility on the part of the technologically-advanced nations not only to make the technology available but also to assist the recipient country in its absorption. The developed nations, in contrast, emphasize the need for an adequate return on existing technological inventions and innovations as a means of ensuring continued R & D expenditures. In this the developed nations express the views of the MNCs themselves: international law, not recipient country law shall provide the framework within which technology transfers take place; each transfer is an individual and unique transaction; and

³ For an excellent summary of the two positions, see Roffe.

technological know-how is a proprietary good so that transfers take place between enterprises or economic units.

It is the public good/private asset distinction, which is the key to the North-South disagreement. Costs incurred in the production of existing technological know-how are sunk. It is possible to regard the *stock* of technology as a collection of potential inputs which will enhance global output with small or zero marginal costs. Developing nations may be expected to reap large gains. This may be the concept of the Group of 77 preoccupied with the difference between the *stock* of technology employed and available in the developed world and the *stocks* in their own home countries. The developed world, on the other hand, is mainly concerned with the continued *flow* of technology and with the need for returns on the fruits of R & D being sufficient to ensure further R & D expenditures.⁴

The private aspects of technological know-how are necessary for continued technological advance unless governments can be relied upon for all research and development initiatives. Without denying the supportive role of government in many endeavors, the private aspects of technological know-how are likely to continue to dominate commercial innovation in a world in which the leading industrial nations rely on private enterprise. It is no accident that the larger part of what may be broadly termed "commercial technology" (as distinct from "weapons technology") has originated in the so-called western world. The freedoms of thought and individual action that characterize democratic, market-oriented economies constitute the most favorable climate for the advancement of knowledge (including economic innovation). This equation of the kind of intellectual and commercial climate which most encourages technological progress is important. If private ownership of technology and the probability of technological innovation are positively correlated, then the future flow of innovation would be drastically reduced if the public goods prescription were to dominate returns to technological innovation.

Bronowski attributed the movement of the intellectual leadership from Italy and the Mediterranean to northern Europe as a

⁴ Despite economists' concern with static analysis, it is doubtful if a free-enterprise system could function satisfactorily in the absence of invention and innovation.

direct consequence of the imposition of a set of beliefs as articles of faith and therefore as fact.⁵ But the kind of social and commercial climate may affect the climate for knowledge-creation differently for different kinds of knowledge. Provided that the state does not have a vested interest in scientific theories, research in the natural sciences could flourish as well in an autocratic system as in a democracy simply because the researchers will feel free to pursue truth as they interpret the evidence which they generate.⁶ But as the field of research moves away from analysis of physical and chemical relationships toward questions which bear on social dogma, government indifference to hypotheses grows smaller in autocratic states. Researchers then think only along approved lines. In a decentralized economy, the spur of commercial activity and competition and lust for revenues generate commercial, economic innovations. This is not to say that governmental support for large endeavors may not be vital in a decentralized system, simply because many undertakings require a sheer size of commitment that may exceed the R & D resources of even a giant multinational. The Japanese have recently recognized this need for combining the efforts of several large computer firms in research endeavors and the Ministry of International Trade and Industry both provides financial support and arranges the supervision of the inter-firm liaison. In several nations, such an approach is not feasible because of the restrictions against a combination of large firms embodied in anti-trust legislation. The Japanese approach is not without problems but it may offer an optimal combination of commercial and enterprise freedom with complementary research plans and with large-scale funding.

There exists, then, a fundamental conflict between the short-run interests of the developing nations and the long-run interests of the world (including those same developing nations). The short-run interests of the South would be served by the public good concept of technology: the long-run concerns must take into account the willingness of society to invest in R & D expenditures. From the evidence we have of the capacity for the development of commercial technology in centralized societies, it does not seem that the conflict between short and long-run interests can be

⁵ Also see Canterbury, Ch. 8.

⁶ It may well be that the ambience of a society affects the ability of even a professional researcher to think in original terms in his/her own field.

resolved by allotting to central governments the responsibility for R & D expenditures. Under existing conditions, the innovating MNC is the medium through which existing technology can be transferred.⁷ The inherent cost to the recipient country is likely to be small in comparison with the cost of indigenous generation of comparable technology. The stock flow or short-run/long-run distinction demonstrates the problems of Johnson's normative prescription (1970) and Hymer's failure to distinguish between kinds of monopoly. None of this suggests that MNCs do not fully exploit their advantages in product markets whenever possible nor that they release their proprietary know-how into the public domain quickly enough to meet a set of objectively-determined social criteria (if such a set could be constructed). The argument does suggest that the Group of 77 might use its leverage more profitably by devising ways in which the life of patent protection can be shortened and proprietary technology which has greater value in the South than to its owner, can be acquired by southern countries.

III. The Constraints on the Transfer of the Appropriate Technology⁸

There exist several possible reasons for the alleged failure of MNC subsidiaries to utilize in developing host countries, the technology which the host sees as appropriate. Many developing countries see the failure of MNCs to adopt a labor-intensive, low-technology production process as deriving from MNCs' overriding concerns with short-run profit maximization, and as evidence of MNCs' complete lack of empathy with southern economic developmental goals and aspirations.

MNCs' costs in the transfer of technology are reduced when previously-used (and presumably high-technology) processes are incorporated in the subsidiary plant (Teece). This precludes adaptation of the production process to meet local characteristics or serve social goals. MNCs also tend to develop more

⁷ On the effectiveness of actual transfer, see Cipolla, pp. 174-181.

⁸ The author is deeply indebted to Robert G. Hawkins who supplied the seminal idea of a given technology being dictated by conditions in the industry and not by the status of the producing country. Decanal duties precluded Hawkins' further involvement in the paper.

sophisticated technologies in that, according to Magee's appropriability theorem, the more sophisticated the technology, the more easily are the returns to the technological innovation obtained for the originating company. Finally, the use of previously tried and tested production methods (in other more advanced economies) eliminates fundamental production problems from the sizeable list of things that can go wrong in establishing a production subsidiary in a foreign country.

Other reasons for the failure of MNCs to install technology that is appropriate to the host economy can derive from "wishful thinking" on the part of host country politicians. These politicians are frequently mesmerized by the huge surplus of unskilled labor in their country. In countries in which population growth rates are high and in which education has been a lagging sector (in terms of population growth), the apparently unskilled workers are not employable in modern sector jobs. The workers are not so much 'unskilled' as 'raw' labor. 'Raw' labor lacks a familiarity with the concepts of work in the modern sector such as the discipline and cohesiveness required by factory working conditions and may be illiterate as well. What matters to the MNC subsidiary is the potential availability of labor with some minimum degree of human capital or capable of acquiring the needed capabilities with modest training costs. Politicians may have mistaken ideas about the feasible range of substitutability between technologically-advanced inputs and low-skilled inputs.⁹ Host-country politicians may also fail to recognize the constraint imposed upon MNC production practices by the lack of experience of production engineers and managers in MNCs in controlling and organizing large numbers of low-skilled workers. There would be communication problems between these workers, their indigenous supervisors and MNC production executives.

There is another level to the problem. There exists a group of industries whose corporate executives argue that *no* departure from the technology used in advanced countries is possible. They assert that any production units located in the developed or the developing world will need to use the same means of production regardless of whether they are owned by national (indigenous)

⁹ The 'range of substitutability' is defined as the distance between the ridge lines.

corporations or by MNCs.¹⁰ These industries may be described as 'inflexible'. Some of them are: basic steel; shipbuilding; office-equipment; computers; aircraft; chemicals; pharmaceuticals; oil-refining; synthetic textiles and non-ferrous metals smelting. Some consumer goods can also fall with general category of inflexible industries.

The concept of a production process which is insensitive to relative factor prices and the conditions of the ambient economy can best be portrayed by a production function with fixed coefficients. The mix of inputs to be used in the production of a final or intermediate product, X , is predetermined and places heavy emphasis on the use of technologically-advanced inputs. The latter comprise heavy use of physical capital with embodied technology and a matching emphasis on highly skilled labor. The role of unskilled labor is likely to be quite small. The advanced technology embodied in the physical capital requires even more technologically-advanced physical capital for its production so that the capital equipment to produce X has to be imported from a developed nation. In terms of a traditional diagram of a two-input production function with technologically-advanced inputs on the vertical axis and low-technology inputs on the horizontal axis, the output expansion path will be very steeply sloped through a series of right-angled isoquants.¹¹

In contradistinction, most manufactured goods will be perceived by host governments as having production functions with smooth, continuously-differentiable isoquants with fairly large elasticities of substitution. It is the gap between actual inflexibility and perceived flexibility that is likely to cause strained relations. There are two possible explanations of the fixed-coefficients production function: (i) the speeds of product and production development are so fast as to preclude any thought being given to alternative, less-technologically-intensive means of

10 As will be discussed below, it will be possible to adapt the means of production to suit the host economy if the host nation is prepared fully to shelter the domestic market for the product from world competition and fully to renounce any expectation that the industry itself (or downstream industries in some cases) will be able to export its product.

11 Reference in the text to right-angled isoquants and perfectly fixed coefficients is made solely for purposes of exposition. Some minimal substitutability may exist. For ancillary production activities such as materials handling in warehouses, security, cleaning, etc., substantial substitutability between high- and low-technology inputs may be possible.

production; and (ii) that the quality of the product is not independent of the input mix and that sales are constrained by minimum quality.¹² (i) New technology can be divided into path-breaking or original discoveries and derivative, developmental innovations (Klein). In technologically-advanced industries, the proprietary owners of new path-breaking knowledge are involved in the adaptation and commercialization of the basic knowledge. The process is a dynamic one by which a firm will attempt to develop a competitive edge over its rivals by exploiting the basic knowledge, by developing the knowledge into a usable product, by developing the usable product to new stages of practicality, and by acquiring "information capital" with its experience with the new product.¹³ Unless the basic knowledge is unique, competition among rival firms will be intense and devoted to firm-specific and appropriable developments of the product and of its means of production. Under these conditions, the idea of reducing the level of technological inputs used in the production process is quite foreign to the firm's way of thinking. If competition within the industry is intense, the direction of developmental thrust is nearly always toward greater technological intensity in the production process. This is the safe route to appropriability. The idea of a reduction in the technological input is not contemplated.

This approach is, of course, dynamic. It suggests that it may ultimately be possible to reduce the technology content of the input mix when the pressures of product development have eased. But this ultimate, relatively static set of conditions is seen as far off in time. Attention will be focused on dynamic rather than static production processes because relatively static processes may not be adaptable as the product evolves, however, slowly. Any production process which is not technologically-intensive would not be viable in the long or medium runs. It might even be true that the time and engineering effort consumed in attempting to adapt current technology to a less technologically-intensive state would be sufficiently great that the resultant production process would be outdated before it was fully operational. The opportunity costs of the engineering inputs in developing such a means

¹² The second argument will amend the standard concept of the production function slightly.

¹³ In this context "information capital" includes the fruits of experience with the new product — learning-by-doing.

of production might be very high in terms of the need for their services in seizing an advantage from competitors in advanced countries.

This aspect of the problem can be expressed in terms of a dynamic product-cycle model. It is not clear in Vernon's original essay, how many innovations are to be incorporated within a single product cycle. Tsurumi leaves the problem undefined but implies an ongoing *series* of innovations so that the product family can evolve to new and higher stages of development even as the original concept of the product is capable of being standardized. It is certainly possible for a product to evolve through different generations so that the original version would have reached stage two or stage three of Vernon's product cycle while the next generation is barely entering the first stage. If the product family is capable of several generations of design and evolution, then the product-cycle can continue for many years and the thrust toward adaptable production (high-technology) techniques viable in the long run will also continue on for many years. Within the small range permitted by both the basic and the derivative proprietary knowledge, the technology employed in such an industry is worldwide. If competitors are also emphasizing product development, considerations of cost reductions in consequence of changes in the input-mix are ignored.¹⁴ Any lower-cost production process which relies less on technologically-advanced inputs will be less flexible and adaptable as new features of the product come "on stream". The transfer of production to a developing country at an early stage of the product's development seems unlikely and the resistance to reductions in the level of reliance on technological inputs will continue even when the production of the current generation of the product has begun to standardize.

The argument of this subsection is that there exist families of technologically-advanced products which, because of their *rate* of development, command highly technological input-mixes. Production of these products in developing countries is not possible unless the host nations are prepared to tolerate the introduction of high-technology production subsidiaries in what may amount to

¹⁴ Differences in absolute factor costs will lead to production abroad: particularly when capital is mobile and can be transferred at its opportunity cost in developed countries and combined with low-cost labor in the developing country, see Gray (1982).

MNC enclave industries with minimal positive spread effects. If the subsidiary is likely to serve world markets, it will do so through production sharing — the integration of production units of an MNC in several countries according to each country's comparative cost advantage (Drucker). Under production sharing, the developing host nation has a production unit that is merely a cog in a complex global production organization and its product is destined to be combined with the product of other nations to produce a final good in another country. This scenario may have little appeal for developing nations which feel that it increases the dependence of their manufacturing sectors on the decisions (or whims) of MNCs as well as failing to provide a technology suitable to their resource base. (ii) Quality requirements can also limit the ability of the MNC (and the host government) to vary the mix of inputs used in a production process independently of production-sharing. Quality requirements can also be imposed on final goods sold either at arm's length or on an intra-firm basis. Goods for which foreign quality requirements limit the acceptable range of the input mix are likely to be standardized goods and therefore more important for developing countries than high-technology, rapidly-developing goods. Standardized goods will be basic goods which developing countries need to develop for their own as well as for foreign markets and the limitations placed on their quality can be direct (from foreign buyers) or indirect from domestic "downstream industries" (which, in turn, serve foreign buyers).

To understand the reasons for the inflexibility of this second group of (standardized) goods, it is necessary to revise slightly some of the time-honored assumptions of neoclassical production theory. Neoclassical production theory does not allow for variations in the quality of a single good to be inherent in a single production function and to be affected by the input mix used. Consider the possibility that it is possible produce several different varieties of what, in terms of end-use, amounts to the same good except that each variety will differ in terms of quality. Differences in quality are directly related to the intensity of use of high-technology inputs. In a world in which host governments perceive different input-mixes to have different intrinsic desirabilities, it is useful to consider the problem of the choice of technology in terms of a single production function for the range of qualities of the good and allowing the quality to vary according to the input mix. (The standard neoclassical alternative would be to identify a

separate production function for each quality of the product.)

Define quality in terms of reliability of product. This definition can, in turn, be translated into smaller variability of product. For machine-made parts, smaller variability implies closer engineering tolerances and a smaller variation of tolerances within the range allowed. For non-metallic products, smaller variability implies consistency in the features that affect the input's ability to combine with co-operating factors of production. A very precise capital good will require a material input which is consistent if it is to produce goods with small tolerances. The quality of a product will vary directly with the technological intensity of the factors of production, and the quality of the material inputs.

It is useful in the development of this concept of the relationship of the quality of the end-product and the technological intensity of the production process to borrow from Lancaster's theory of consumer demand (Lancaster).¹⁵ Lancaster distinguishes among products according to their characteristics — the features of the individual products. Products with identical characteristics are the same 'good' and groups of products with similar but not identical characteristics that fulfill the same end use constitute a Lancasterian 'commodity'. Within a commodity group, goods are highly substitutable and, *ceteris paribus*, the demand for a good is very sensitive to its price relative to the price of competing goods. Lancaster's emphasis is on final goods and he has provided a more precise description of the phenomenon of product differentiation than Chamberlin although it is still not possible to delimit membership in a commodity group except by some arbitrary demarcation. When the concepts of Lancasterian goods and commodities are applied to intermediate goods serving the same end-use and with differing degrees of variability the potential interdependence of the characteristics of the inputs and outputs become clear. Define an 'intermediate commodity' as a group of substitute 'intermediate goods.' The quality of the intermediate good to be used in the (next) stage of production derives directly from the quality required in the finished product as well as upon the quality required by its co-operating inputs (including the

¹⁵ This application of Lancaster's model to inputs was first made by Laura Tandy in a study of the decline of the jute industry in Bangladesh. Her study was directly concerned with the quality differences between jute and its synthetic substitutes.

capital goods). It is possible, to conceive of a production function for an intermediate commodity specified in terms of high- and low-technology inputs. As the ray from the origin moves from intensive use of high-technology inputs to increased use of low-technology inputs, the quality of the intermediate good decreases.¹⁶

If foreign demand delimits the range of quality of an intermediate commodity which is acceptable, it directly limits the range of technologies which can be used to produce the commodity. If host country governments identify a range of technological intensity which is acceptable to them and the quality requirements of foreign (and domestic downstream) markets allows for a range of technological intensity of the production process, the two ranges need not overlap. Even though there are goods within the commodity group which can be produced by an input-mix acceptable to the host, buyer requirements make that mix infeasible. This can constitute a basis for the acrimony in the North South dialogue.

Goods which have quality standards imposed upon them by virtue of the requirements of the production processes in which they will feature or by consumer standards, must be produced with a minimum high-technology intensity. These standards dominate differences in costs of production among the goods within a commodity and therefore dominate the importance of differences in relative factor prices. It matters not where the goods are produced nor whether they are produced by an MNC or by an indigenous producer in a developing country, the technology is worldwide and is imposed upon the production unit. Industries which meet conditions of this kind are numerous. They include goods which have safety standards set for them by international bodies or by national bodies in the country of ultimate use. These requirements may refer to tolerances in the purely engineering sense, to conditions of production as well as to limits in the variability of ingredients for pharmaceuticals, and to sanitary

¹⁶ Note that the neoclassical theory of production has been bastardized rather than refuted. Separate production functions for goods within a commodity group do not lend themselves to the analysis of the links among the technological intensity of the production process, the quality of the intermediate good and the high degree of substitutability of the competing goods.

conditions of preparation as well as to the prohibition of certain ingredients in food products.

If the developing country is willing completely to shield its home market from foreign competition — including competition from other developing nations that adopt the technology-intensive techniques — it may be possible for the country to use a low-technology mix. Under these circumstances the developing nations can forego playing host to MNC subsidiaries with possible ideological benefits and obvious technological costs. It is not clear that the renounced technology may be available through licensing arrangements. The short-run gains of sheltering a labor-intensive industry are that additional employment in the industrial sector can be 'manufactured'. The costs are that having the low-quality product pervade the economy will generate negative spread effects. The negative spread effects will be particularly apparent when the sheltered industry produces intermediate goods which will retard the technological development of downstream industries. However, a developing nation may rationally be more willing to renounce ultra-strict quality control on food and drug products. Finally, the renunciation of modern technology denies the possibility of allowing a home industry to use the export market as a vent for surplus.

IV. Implications of the Constraints on Low-Technology Production

The possibility that a substantial number of basic industries does not allow developing nations to utilize low-technology (labor-intensive) production techniques, will have important implications for development strategies. Four aspects of this possibility can be considered briefly here.

The inability to absorb excess population in some industries makes the burden of excess population more intractable and rapid population growth becomes a matter of even greater concern than many currently believe it to be. The comfortable idea that a nation can create useful employment for (virtually) all of its population of working age by expanding its secondary (and tertiary) sector(s) is seriously damaged. What is likely to happen is that the growth of those industries which do lend themselves to

labor-intensive techniques without adverse effects on the quality of production will be emphasized in many developing nations and the export markets sought for the products. These exports are unlikely to materialize for two reasons: very severe competition will exist among many developing nations; and developed nations will be suffering from similar labor-supply problems and will place severe limits upon imports of these goods (Gray, 1980). Some manifestation of this problem has already been seen in the creation of so-called 'voluntary export restraints' and in the exclusions applied to the Generalized System of Preferences (Rom).

Those favored few who obtain work in the high-technology sector will earn substantial incomes and their salaries will tend to aggravate the inevitably stark inequalities in income distribution in the developing nation. This dual labor market is already a cause of some political concern in developing countries. Under these conditions, the high-technology sector, particularly to the extent that it comprises MNC subsidiaries, becomes a convenient political target for the gamut of opposition parties. These political strains can lead to the emergence of a strong, autocratic government.

When modern production techniques require very large-scale operations, small countries could find themselves unable to construct suitable production units in all basic industries, even with the co-operation of MNCs. Small countries will be doomed to specialization in basic industries and forced to rely upon international trade for the provision of products not made domestically. Those high-technology industries which they do have will be very reliant upon export markets for their products and will be vulnerable to commercial policy measures in foreign nations. Neither of these attributes is inherently desirable. Dependence upon foreign suppliers for basic materials exposes a nation to any changes in world conditions including production interruptions in foreign supplier nations. Dependence on exports for efficient utilization of a large proportion of the secondary sector also makes the economy vulnerable to foreign actions and conditions. These conditions argue strongly in favor of economic integration among blocs of small developing nations so that the economies of high-technology output can be shared among the community.

When the production plant is an MNC subsidiary and is integrated in an international production system, the host country,

irrespective of size, is again vulnerable to shifts in international conditions and to the whims and caprices of the MNC. The specialization of an MNC subsidiary in the production of an intermediate good or in a single process in a complex production chain, makes the host country vulnerable to international conditions in the sense that its productive equipment cannot produce a complete good which could be adapted for the home market in the event of a major disruption in the international economy. The fear of capricious behavior on the part of the MNC is less of a problem since the MNC will be unwilling, except in the most unusual circumstances, unnecessarily to alienate a host government and to waste valuable capacity. When the product produced by the MNC subsidiary is a differentiated consumer good, the production in the developing country is directly dependent upon the parent corporation's marketing plans and effectiveness even when the complete product is produced within the host's boundaries. It is arguable that if developing nations are to continue to expand their manufacturing sectors, they will need to produce manufactures for export. These additional exports are likely to comprise differentiated consumer durables to an increasing degree as the market in developed nations for standardized products becomes satiated. Under these circumstances the host does not have the option of developing an export market without the aid of an MNC because this type of product requires a sophisticated marketing organization in the country of sale. Developing nations have a comparative disadvantage in such endeavors and would be likely to be frustrated by MNCs which control the established marketing organizations.

V. Conclusion

Strains in the North-South dialogue on the matter of technology transfer to the South through MNCs can be reduced by explicit recognition of (i) the concerns of northern economies for the continued flow of R & D expenditures and (ii) of the operational constraints limiting the use of low-technology production. Recognition of these factors suggests that the Group of 77 might usefully take aim at less ambitious targets than those to which they originally aspired. Unfortunately, the implications of the constraints on the behavior of the North and the MNCs both

imply even greater difficulties in development than are generally allowed. The corollary of this fact is the need for even greater co-operative efforts on the part of the North to achieve the feasible set of development-promoting policies.

References

- Bronowski, J., *The Ascent of Man*, Little Brown, Boston, 1973.
- Canterbery, E.R., *The Making of Economics*, Wadworth Pub., Belmont, California, 1976.
- Chamberlin, E.H., *The Theory of Monopolistic Competition*, 6th ed., Harvard Univ., Cambridge, Mass., 1948.
- Cipolla, C.M., *Before the Industrial Revolution*, W.W. Norton, New York, 1976.
- Drucker, P.F., "The Rise of Production Sharing," *Wall Street Journal*, 15, March 1977.
- Dunning, J.H., "Trade, Location of Economic Activity and the MNE: A Search for an Eclectic Approach," Ohlin, B., et al., eds., *The International Allocation of Economic Activity*, MacMillan Press, London, 1977.
- Gray, H.P., "Structural Consequences of Changing International Trade Patterns and Possible Alternative Policies," Leveson, I. and J.W. Wheeler, eds., *Western Economics in Transition*, Westview Press, Boulder, Colorado, 1980.
- , "Towards a Unified Theory of International Trade, International Production and Foreign Direct Investment," Black, J.S. and J.H. Dunning, eds., *International Capital Movements*, MacMillan Pub., London, 1982, 58-83.
- Hymner, S., *The International Operations of National Firms: A Study of Direct Investment*, MIT Press, Cambridge, Mass., 1976.
- Johnson, H.G., "The Efficiency and Welfare Implications of the International Corporation," Kindleberger, C.P., ed., *The International Corporation*, MIT Press, Cambridge, Mass., 1970.
- , "Technological Change and Comparative Advantage: An Advanced Country's Viewpoint," *Journal of World Trade Law*, 9, Jan.-Feb. 1975, 1-14.
- Klein, R.W., "A Dynamic Theory of Comparative Advantage," *American Economic Review* 63, Mar. 1973, 173-184.
- Lancaster, K., *Consumer Demand: New Approach*, Columbia Univ., New York, 1971.

- Magee, S.P., "Technology and the Appropriability Theory of the Multinational Corporation," Bhagwati, J.H., ed., *The New International Economic Order*, MIT Press, Cambridge, Mass., 1977.
- Roffe, P., "International Code of Conduct on Transfer of Technology," *Journal of World Trade Law*, 11, Mar.-Apr. 1977, 186-191.
- Rom, M.J., *The Role of Tariff Quotas in Commercial Policy*, Holmes and Meier, New York, 1979.
- Teece, D.J., "Technology Transfer by Multinational Firms: The Resource Cost of Transferring Technological Know-how," *Economic Journal*, 87, June 1977, 242-261.
- Tsurumi, Y., *Multinational Management: Business Strategy and Government Policy*, Ballinger Pub., Cambridge, Mass.
- Vernon, R.E., "International Investment and International Trade in the Product Cycle," *Quarterly Journal of Economics*, 80, May 1966, 190-207.

