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INDUSTRIAL POLLUTION CONTROL AND INTERNATIONAL TRADE

Note by the GATT Secretariat

Early this year, the Secretary-General of the UN Conference on the Human Environment, Mr. M. Strong, requested GATT's participation in the preparatory work for this Conference to be held in Stockholm in 1972. It was agreed that the GATT secretariat would survey certain issues that national anti-pollution measures might raise for international trade, having regard to the provisions and objectives of the General Agreement, and present the conclusions of such a survey in a paper to be included in the basic documentation for the Conference. The text of the paper, which has been prepared by the secretariat and which in no way commits contracting parties, has recently been sent to Mr. Strong. A copy of the paper is annexed. The Director-General believes that, in view of the importance of ensuring due consideration of national and international action towards pollution control in their relation to international trade, the paper would merit early discussion by the CONTRACTING PARTIES.

Annex

INDUSTRIAL POLLUTION CONTROL AND INTERNATIONAL TRADE

Man's natural environment is being degraded by (a) industrial products in their intended use (automobiles, DDT, detergents, etc.), (b) products after they have been used (waste and junk), and (c) noxious emissions and wastes from the processes by which some, perhaps most, of these goods are being produced. Although environmental damage of type (a) may be quantitatively the most significant, measures to be taken against it are not likely to present major new international problems. They will be another instance of the need, at least among highly developed and urbanized countries, for qualitative standards prescribed for products.¹ Unless their determination and application are governed by internationally agreed principles, such standards or their enforcement² may well cause distortions of, or discrimination in foreign trade but the problems will not be different in kind from those created by standards used to promote health and safety in general. General rules governing use of such measures and consultative procedures already exist in the GATT for dealing with problems that might arise from national and international product standards; and the continuing work on non-tariff barriers aims at elaborating principles and procedures specifically applicable to standards.

Since the problems posed by solid waste disposal are mainly local or national in character, this paper is concerned primarily with pollution of type (c), by processes of industrial production. The concern is justified by the fact that industrial production, although not perhaps the chief source of pollution, is a major one³, and will be perceptibly affected by the enforcement of more effective pollution controls.

¹Comparable to the existing safety regulations for automobiles, pure food laws, tests required before new pharmaceutical drugs are allowed to be marketed, ban on DDT, etc.

²Including procedures for testing and certifications.

³In the United States it is estimated that transportation (mainly the automobile) is responsible for 42 per cent of air pollution, other fuel combustion for 21, manufacturing for only 14, and miscellaneous sources for the remaining 23 per cent. For the pollution of water resources, however, manufacturing, together with households, bears the main responsibility.

The deterioration of the natural environment caused by industrial production processes is an instance of "social cost".¹ Since the economic concept of "cost" implies quantification, until recently pollution would be more fittingly described as an instance of "social disutility" - a vague largely psychological cost borne in some way by the community at large. The fact that the community now wants to do something about environment means that the cost which pollution represents must be made explicit, i.e., quantified and charged to someone.

The purpose of this analysis is neither to estimate the various elements of this cost, nor to explore in institutional detail the various possible ways of defraying it. Taking some rough estimates, and the basic alternatives of the social allocation of this cost, this paper will trace out in the most general terms the impact of various types of action that could be taken with respect to pollution control (henceforth abbreviated to P.C.) by the industrialized societies on the international competitive position of individual industries affected, and hence on future development of international trade. It will then explore the extent to which the 78 nations which are contracting parties to GATT are free to act in this area consistently with the obligations they have assumed with respect to promotion of international trade on a non-discriminatory basis.

The paper is in six sections. The first explains the main assumptions; the second discusses the available estimates with a view to establishing some orders of magnitude of the industrial P.C. costs to be expected; the third outlines the basic alternatives of allocating these costs and presents some implications for international trade of each; in the fourth, GATT considerations are explored; in the fifth some more concrete conditions and considerations are introduced into the analysis; and the sixth presents the conclusions.

I

In the vast and variegated ecological literature on pollution, a line of thought can be discerned on which there appears to be a broad, if not general agreement among experts. It is that a major problem appears only when a certain critical level of pollution is attained. Below that threshold, nature (often referred to as "the environment" or the "ecological system") can assimilate, i.e. chemically converts most of the noxious wastes emitted by the industrial process; as the rate of such effluence in any given environment increases, however, nature becomes progressively less able to cope and, in the ultimate, its assimilative powers may become overwhelmed and completely break down.

¹This notion, and the related one of "external diseconomies", goes back to the analysis by A.C. Pigou (The Economics of Welfare, first edition printed in 1920) distinguishing private and social net products, and classifying the instances in which the two may diverge. One such instance may be that "one person A, in the course of rendering some service, for which payment is made, to a second person B, incidentally also renders services or disservices to other persons...of such a sort that payment cannot be exacted from the benefited parties or compensation enforced on behalf of the injured parties". In this paper environment pollution is viewed in exactly these terms: as an unintended by-product of services which are in demand. The extensive literature which had grown on these foundations, particularly in the postwar period, was most recently reviewed by E.J. Misham in "The Postwar Literature on Externalities: An Interpretative Essay", Journal of Economics Literature, March 1971, (Vol. IX, No. 1), pp. 1-28.

This simple and highly plausible insight leads us to assume that the action required to establish satisfactory P.C. systems will differ between countries. Even if it were internationally agreed that a particular type of action is the most effective and desirable, the degree to which it would be pushed would differ internationally, since countries differ in the degree to which they have already polluted the natural environment of human activity. More specifically, it is to be expected that the most industrialized countries will establish (or strengthen the existing) norms specifying the maximum admissible levels of various polluting agents in industrial effluents. Such norms will differ in the degree of stringency between countries, depending on the urgency of the problem, i.e. the relative extent of the industrial¹ activities causing pollution and their spatial distribution within each country.

This is not to say that all national norms are to be expected to differ. Where several countries share a pollutable resource - such as a river or a sea shore - international conventions may be elaborated providing for common norms. It is even possible to imagine economic sanctions being applied to an involved government reluctant to adhere to a norm which others deem necessary. Except for such regional norms, however, diversity should be expected. The developing countries in particular may have good reasons for refusing to accept the exacting norms required by the most industrialized countries. Protection of the environment represents a claim on economic resources; and as every economic choice, the determination of appropriate P.C. arrangements for a country involves a marginal comparison of the utility of the production increments foregone with that of the environmental improvements or safeguards gained in return. Especially if, as assumed above, pollution becomes a problem only at a certain critical level which the developed countries have apparently already attained, developing countries may find it rational to adopt less rigorous and costly P.C. standards for the immediate future in the expectation that in the longer run (a) technological progress will reduce the industrial P.C. costs and (b) continued growth of national income will make these costs much easier to bear.

Compliance with new anti-pollution norms will inevitably raise the average cost of industrial operations. On the whole (i.e. except for specific regional arrangements), such cost increases will differ between countries. It is important to note that the inter-country differentials in the actual cost increases resulting from the enforcement of P.C. norms will tend to be larger, possibly much larger, than the differences between the national norms themselves. As a result of several technical factors, even minor differences in the norm of "cleanliness" enforced are likely to result in a disproportionately wide variance in costs.

¹Indeed, it may be found efficient for such norms to differ from region to region of the same country, depending on the degree of industrial concentration. At this level of abstraction, this does not complicate the arguments which can be continued in terms of differences in national "average norms".

The main reason for this is that the cost of purifying the effluents tends, in general, to rise rapidly with the degree of purification already achieved. For the iron and steel industry, for example, the cost of "cleaning" to 99 per cent efficiency is double the cost of an installation attaining 90 per cent efficiency, and the cost doubles again to attain 99.9 per cent cleanliness.¹

Another reason is that the average cost of industrial P.C. for an economy will depend on the structure of its industrial production, rising with the relative importance in that structure of those industries which are the worst offenders: and, not unexpectedly, these industries are relatively most developed in countries showing the highest pollution levels. It is already possible approximately to identify the industries whose processes do the most damage to environment and for which compliance with a given purity standard would mean the largest additional cost. The appendix contains two tables shedding light on this problem. The first presents results of input-output calculations by Prof. Leontief of the price increases that would be occasioned in individual industries if all industries were forced to comply with a given standard (US Clean Air Act, 1967); the second presents the results of an inquiry, made in the framework of an annual survey of industrial investment plans, as to the proportion of expenditure on water and air P.C. in total expenditure on new industrial plant and equipment. The two are thus not wholly comparable (the latter ranking industries by the investment cost of water and air P.C., the former by additional total - i.e. capital and current - cost arising from air pollution control only). Nonetheless, they jointly indicate that certain sectors of energy production (thermo-generated electricity and petroleum refining) as well as iron and steel production are the leading polluters with the relatively largest cost increases in store for them, followed by a group of industries within which it is difficult to establish precise ranking and which includes non-ferrous metals, certain types of metal fabrication, basic chemicals, pulp and paper, leather tanning and cement.

Another factor influencing the relative costs of industrial P.C. is the age-structure of the existing industrial plant and equipment. Ceteris paribus, the P.C. cost will be higher in countries with ageing capital stock, for several reasons. Even assuming that the total cost of installing P.C. equipment did not differ from plant to plant in the same industry, the cost per unit of output would increase with the age of the plant, since the older units can be expected to be less productive. In addition, the total cost of P.C. installations would probably be higher in the older units which are likely to be less integrated and otherwise less suitable for installing modern P.C. equipment. Indeed, the installation of P.C. in the oldest plants which are comparatively inefficient may be ruled out for financial reasons. It is thus possible that an industry's effort to comply with new P.C. norms would accelerate the scrapping of obsolete plant and new investment, resulting in increased productivity.

¹J. Massignon, "Pollution atmosphérique et sidérurgique", Revue belge des ingénieurs et des industriels, quoted from UN, Problems of air and water pollution arising in the iron and steel industry.

In countries where the industry in question is relatively new and rapidly growing, its annual investments are large in relation to the existing stock, and the introduction of P.C. can be more easily accommodated financially in the normal process of expanding or modernizing the existing plants. In countries where the industry in question is a mature one, on the other hand, the proportion of older units maintained in operation is higher and annual investment smaller in relation to the stock; the cost of complying with a given P.C. standard would therefore be higher per unit of output. To take the steel industry as an example, it is easy to see that even under a uniform P.C. norm, the relative newcomers such as Italy and Japan would have an additional advantage over such long established producers as the United Kingdom and the United States.

II

As mentioned above, it is already possible to form a rough idea of the absolute and relative amounts of the additional cost involved in the establishment of satisfactory industrial P.C. systems in the more developed countries. In the United States, for example, according to one estimate, some \$1.7 billion a year is currently being spent by industry (mining, manufacturing and public utilities) on P.C. installation (see Table 2). On the basis of 1970 statistics, this corresponds to about 4 per cent of total annual gross expenditure on industrial plant and equipment, and 0.2 per cent of GNP.

The general plausibility of these figures is confirmed by reports from a few other countries where similar estimates have been made. In Sweden, the overall capital cost of P.C. for the next five years is expected to amount to approximately \$1.4 billion; the annual outlay would thus represent about 1 per cent of GNP. (This figure comprises the cost of controlling all sources of pollution; industrial P.C. alone accounts for about one quarter of the total amount.)

In Japan, surveys by the Ministry of International Trade and Industry indicate the share of corporate expenditure for P.C. in total plant and equipment outlays rose from 3.1 per cent in 1965 to 5.8 per cent in 1970.

The data for the United States is based on information obtained from a representative sample of industrial corporations, and is said to comprise outlays made in order to comply with the existing (relatively modest and, it is reported, only perfunctorily enforced) P.C. standards as well as outlays representing a voluntary effort at P.C. The former probably account for the bulk of the sum.

To attempt even a most approximate estimate of the growth of these expenditures over the next few years, it would be necessary to know whether the indicated amount represents the cost of P.C. installations in the new as well as in the pre-existing production facilities, or whether it stands for P.C. cost in the newly constructed plant only. It is possible that in response to a tightening enforcement of the existing norms, the corporations surveyed are reporting their expenditures on P.C. in both old and new establishments; in this case, a further tightening of enforcement, or of the norms themselves, would produce only an increase in their P.C. expenditures corresponding to the

cost progression described earlier for rising standards of "cleanliness".¹ It is also possible, however, that the responding corporations consider their existing plant to be in conformity with the enforced norms, and are reporting only their P.C. cost at the margin of expansion; in that case, a tightening of the norm would produce a still more disproportionate increase in their total P.C. expenditures, since the whole existing plant would have to be readapted. The survey itself does not make this distinction.

Reports forthcoming from individual industries on P.C. cost in new, optimum-sized plants agree, in orders of magnitude, with the corresponding indications of Table 2. If the survey data are interpreted as referring principally to P.C. cost at the margin of expansion, the following case, still largely hypothetical, might not be unrepresentative of the actual situation in a few years. Assume that within five years, the United States industry will have to comply with pollution norms which would add 5 per cent to the capital cost of newly built plants (or some \$2 billion in the same industries (excluding land)), the cost of introducing the required additional P.C. equipment onto existing plant could average \$4-5 billion a year during five years. A capital cost of \$6 billion would add some 15 per cent to the capital outlay of the industries concerned in the first year; if total investment continued to grow, the proportion of P.C. expenditures in it might slowly decline thereafter. Even though substantial from the viewpoint of the industries concerned, the amount of \$6 billion still represents less than 5 per cent of the current level of total gross fixed capital investment in the United States, and a little over $\frac{1}{2}$ per cent of GNP.

As it is likely that P.C. norms are, and will continue to be enforced more rigorously on newly constructed plant², this estimate is probably on the high side. It thus establishes a range - from the present 4 to as much as 15 per cent of total investment outlay - for the possible future cost of industrial P.C. If it seems that even at its maximum this cost is not exorbitant or unmanageable for the economy as a whole, it should be borne in mind that in a number of large industries its incidence would far exceed the average.

It should be noted that installation of P.C. equipment will represent only one part of each industry's total P.C. cost. There will be, in addition, some operating or at least maintenance (i.e. current) costs connected with the P.C. investment and, more important, the prices of some of the inputs bought by each industry may rise in consequence of additional P.C. costs in their production. The net effect of P.C. on industrial prices can thus be calculated only by the Leontief (input-output) method. Such a calculation could not be carried out in the preparation of this paper, but a careful look at Table 1 suggests that, although the average price increase necessary for industry as a whole to recoup its P.C. costs would not be more than a few percentage points, it would vary widely from industry to industry. In individual cases, prices might rise by as much as 10, or even more, per cent. Within these orders of magnitude, the international differentials in the additional cost for such an industry as iron and steel, for example, could amount to 3-5 per cent. It has been our experience that international trade responds fairly promptly to much smaller international price differentials.

¹See page 5

²Which after all, will be in operation for something like twenty years in which period all of the pre-existing stock will be scrapped.

III

In principle, the response of trade to international differentials in P.C. cost should depend entirely on the way in which individual countries choose to allocate it. In this respect, the basic alternatives are to let the polluting industry bear the full cost, or to charge this cost to the society at large. Under the first alternative (A), the cost would be borne by capital and/or labour (in the form of reduced profit and/or some lag of wage increases behind productivity growth), in proportions depending on the specific circumstances in each industry concerned. The second alternative leaves two real choices open: (B) a society can bear the P.C. cost either directly, by paying higher prices, or (C) indirectly, through the government budget. In the following, the theoretical repercussions of these three alternatives on foreign trade are explored.

A. The only way in which a polluting industry can be made to bear the full, or at least a substantial part of the P.C. cost is for the government to enact mandatory standards to which industry would have to conform, while maintaining intact the existing pattern of duties, taxes and other charges on imports, as well as the pattern of all other internal taxes, and not granting any public aid to alleviate the financial cost to industries of adherence to these P.C. standards. In this way, imports from countries with less exacting P.C. standards or from sources enjoying lower costs of P.C. (either because of use of different and less polluting processes or because they have received public assistance) would have a tendency to increase and would thus exert a pressure against a rise in the prices of the corresponding domestically produced goods. The most polluting industries¹ in the countries with the most exacting standards would thus become relatively less profitable, their expansion would slow down relatively to that of other industries, and there would be a tendency for these industries gradually to move out of countries with relatively heavy direct costs of pollution abatement and to expand in countries with a less acute pollution-control problem. If the re-allocation proceeded smoothly, without causing severe (cumulative) unemployment in the former and inflation in the latter countries, not only trade in the products in question would intensify; the whole pattern of international specialization would be gradually changing, bringing about corresponding intensification of trade also in the products of the non- or less-polluting industries.

B. If, on the other hand, a government, in response to its industry's demands, imposed an additional charge on imports, calculated to offset the difference between domestic and foreign P.C. expenditure per unit of output, the domestic price of the product in question would tend to rise by the amount necessary to maintain the profits and wages of the domestic industry after the additional capital outlay. This would have a profound influence on inter-industry relations within the country.

It was shown in the first section of this paper that all the most polluting industries are producers of semi-manufactures and other inputs used in the manufacture of finished products. In the past decade finished manufactures have

¹Except those whose output cannot be traded internationally in significant volumes, e.g. electric power.

been the most rapidly expanding category in international trade and are now traded in volumes large enough to exert substantial influence on prices of the corresponding, domestically produced goods in most importing countries, particularly in the developed importing countries. If the changes introduced in the taxation of imports were exactly calculated to do nothing more than offset the international differential in P.C. cost per unit of output, the prices of domestically produced basic industrial materials (on which this charge is heavy) would rise relatively to the prices of domestically produced finished manufactures (on which this charge is light). The highly elastic supply of manufactured imports would prevent the prices of domestically produced finished manufactures from rising above the relatively small surcharge imposed to offset pollution control costs occurring at the finishing end of the manufacturing process. In effect, these changes would amount to a reduction of the effective protection that the finishing industries had enjoyed; the proportion of value added in the gross value of their (finished) product would decline, the proportion of inputs purchased from other industries would rise. Profits and investment incentives would be reduced. Thus a situation exactly opposite to alternative A would be produced: the P.C. cost would be borne principally by capital and labour engaged in the relatively non-polluting manufacture of finished products. This would be the least rational of all possible outcomes for in this way, countries already experiencing a severe pollution problem would be trying to preserve their less desirable industries at the cost of a relative contraction (and a movement abroad) of those industries which do not damage environment and should for that reason be fostered. In this alternative, for example, engineering and various finishing industries dependent on chemical inputs (such as pharmaceuticals) could be expected to find themselves among the most severely affected ones; and it is precisely in these two industrial groups that the export future of the highly developed, pollution-plagued countries seems to lie.

To permit the polluting industries to recoup their P.C. expenditure via higher prices without penalizing other industries, appropriate protection would have to be extended to all. The additional cost of P.C. would be borne by the whole of the society only if all domestic prices were allowed to adjust to it. The difficulties of assessing the degree of additional protection that would be required exactly to offset the cost of P.C., and the GATT implications of such a course, will be discussed in the following section.

C. From the viewpoint of foreign trade, the simplest way of paying for P.C. would be through government budgets. Norms would have to be set up with respect to the installation cost of P.C. equipment in individual industries. Those who equipped themselves might, as one possibility, be permitted to deduct such cost from their tax liabilities. This would leave the relative position of individual industries unchanged, at least initially that is, since the government, having paid the full cost of pollution control, would have to either increase other taxes or reduce its expenditures, these secondary changes exercising an influence on the level and pattern of both consumption and investment.

As in the hypothetical case of full internal price adjustments, the whole of the society would be bearing the cost, and international trade would not be unduly disturbed. In contrast to the preceding case, in which the cost would be "allocated" to individual households according to the pattern and level of their consumption, this allocation could be made to conform more closely to the prevailing social notion of distributive justice.

For the purpose of exposition, the three approaches were presented above as contrasting alternatives: it should be obvious, however, that for practical reasons, none can be chosen to the exclusion of the other two, and that, as always in matters of policy and politics, we should expect to have more or less of each.

As for alternative A, it is unlikely that each polluting industry would be let alone to bear the full cost of the damage which it causes to the environment and which is a by-effect of its productive contribution -- since it so happens that the damage is particularly severe in the basic industries to which all industrial countries attach particular importance. While not proclaiming it as a goal, governments of the developed countries seem to be guided in their commercial and industrial policies by the notion of a well-rounded, well-integrated industrial structure. They welcome the form which international specialization has taken in the post-war period, namely specialization within, rather than between, individual industries but it is difficult to imagine them taking, against strenuous opposition, measures whose ultimate (and predicted) effect could be a sharp contraction of one or more of the basic heavy industries whose labour force is usually large and well-organized. Nonetheless, while trying to cushion a disproportionately heavy impact of P.C. cost on individual industries, the governments of the more polluted countries will continue to be pressed by public opinion to adopt or maintain general policies under which the basic tendencies described under A could work themselves out in some attenuated form and over longer periods of time.

The difficulties confronting alternative B lie in calculating the protective surcharges required, in getting the trading partners to accept them, in administering such charges, and in containing the demands of import-competing industries not considered to merit additional protection on P.C. grounds. Such a system would also fail to provide incentives for further technological research into P.C. and for advance in P.C. beyond statutory requirements. It would also distribute aid with no more than a very approximate relationship to needs.

The most serious disadvantage from the standpoint of international trade may well be that all import-competing industries would vigorously demand protection -- by an argument analogous to their old complaint about "low-wage" imports -- against imports not manufactured in accordance with local P.C. standards. One can easily envisage a situation in which a government might

inadvertently - before it has thought out all other alternatives - get into a situation in which it would be committed to grant protection of this kind to certain or all domestic industries; and, faced with the insoluble problem of calculating the minimum necessary surcharge on imports from each individual source, could in the end be faced with a demand for a uniform import surcharge applying to imports from all sources. It is mainly in this area, of course, that contracting parties to GATT might become involved in action which would have a restrictive effect on international trade. The best way of preventing such an involvement is to give sufficient advance publicity to the difficulties, both internal and international, inherent in solutions of this kind. These problems are further discussed in IV below.

As for alternative C, the whole problem appears to be too large for any society to be able to finance entirely through the government budget. Selective assistance can and probably will be given to certain industries, such as electric power generation, where continued expansion of production (and, therefore, sufficient availability of investible funds) is vital and where price increases are particularly undesirable due to the pervasive influence they would have throughout the entire price structure.¹

Exploration and discussion of these problems in all their engineering, economic and political detail continues in and outside the governments. An intensive effort is being made to inform the public, not only of all forms of danger and damage to the environment, but also of the difficulties in the way of instituting satisfactory pollution control systems. It is true that most of the official pronouncements on the subject are still vague, ambiguous, sometimes conflicting,² but this may be a sign of the governments' awareness of the fact that progress can only be made in a piecemeal fashion, combining various elements and approaches as circumstances will allow. From the viewpoint of foreign trade, such a pragmatic approach might indeed be the most desirable one.

¹In some instances, such assistance could have the form of the government guaranteeing the industry's borrowing for P.C. purposes, or making tax-exempt the interest payable on such bonds. This would amount to shifting a part of the P.C. cost, via the capital market, onto other borrowers of long-term funds.

²As illustrated by the following two (consecutive) paragraphs in a recent official statement:

"Ethically and economically, it is right that the cost of cleaning the environment should be borne by the industries which polluted it. If an industrialist knows that he will have to, he will take action to develop a more efficient method of production."

"The consumer may have to pay for the benefits of living in a cleaner environment. We cannot expect that someone else will pay for it. Our society will have to pay. The consumer has had the benefit of a cheaper product. It is time to pay the full price". ("The Guardian", London, 6 March 1971)

IV

Given the basic character of the industries causing the most pollution (production of power, steel, chemicals) and the pervasiveness of such products or their second-stage successor products in the whole range of goods which are traded internationally, the task of governments in dealing with pollution control will not end with estimating its costs, deciding upon priorities as to how much control can be afforded, setting standards and selecting domestic measures to allocate the expense in one way or another as between sectors of the national economy. Even internal adjustment by better regional planning and relocation of industry will not suffice. There will also be the problem of safeguarding national foreign trade interests, including the maintenance of export potential and avoidance of measures which harm other countries' trade interests and which would in that way threaten to generalize the use of similar measures by other countries.

In GATT, seventy-eight contracting parties accounting for over 80 per cent of world trade have agreed on a set of obligations designed to ensure the greatest possible freedom for international trade, consistent with the efficient use of resources, in the interest of maximizing real incomes and living standards. One basic principle is limitation of the protection offered to domestic production to that which is effected through the tariff and progressive reduction of such protection through successive rounds of exchange of tariff concessions. A second is the principle that equality of treatment should be afforded to imported goods, regardless of country provenance. Further, the use of subsidies is circumscribed, particularly where there may be significant international trade effects, and although there is no limitation on the power of taxation, there is an obligation that taxes shall apply to domestic goods and imports alike and not be applied so as to afford protection. Taken together, the principles apply to all possible measures of protection. And, although not formulated with specific reference to pollution control, they provide a frame of reference applicable to any measures which might be taken with effect on international trade, regardless of their purpose.

As regards pollutants, i.e., products which in their use or disposal are harmful to the environment, pollution control poses no problems unique or different in kind from those already familiar in relation to quality standards which may be maintained for other purposes, or other health measures. Very substantial trade barriers can and do arise from differences in national standards, even when no protection is intended, from variations in national procedures for ascertaining and certifying the qualities of materials offered in commerce, and from efforts to enforce national standards, but these are not peculiar to pollution control and are already covered in a general way in GATT, especially through exceptions in Article XX, permitting imposition of restrictions on goods harmful to public health and safety. Further specific obligations and procedures are under consideration as part of the work on non-tariff barriers undertaken by the CONTRACTING PARTIES to GATT.

When it comes to processes which cause pollution in the production of goods which are in themselves harmless in their use, the potential international trade difficulty is usually somewhat different. A shared resource, such as a lake or the atmosphere, which is being polluted by foreign producers may give rise to restrictions on trade in the product of that process justifiable on grounds of the public interest in the importing country of control over a process carried out in an adjacent or nearby country. But in the majority of cases in which a process pollutes, the interest in import restriction will stem not from concern to avoid pollution at the foreign producing site but from a desire to compensate domestic producers, or the domestic economy at large, for extra costs assumed in pollution control. Export aids might similarly be sought to compensate for pollution control costs borne by domestic producers heavier than those borne by foreign competitors.

But protection because of higher costs than those prevailing or believed to prevail elsewhere is precisely what GATT seeks to limit, in the interests of ensuring the most efficient use of resources on a worldwide basis. The fact that the new pollution control differences would result directly from governmental regulation would not make them unique: national standards concerning labour, social security, taxation and safety already have a varying impact on costs from one country to another which GATT does not recognize as grounds for protection. If the pollution control case is different, the peculiarity resides in the welfare aspect of the problem, its magnitude, its urgency for some countries (but not others), the disparity in prospective costs as between particular industries and the advantages of handling the matter by means of incentives rather than by mandatory regulation alone. These considerations make it urgent to seek ways in which governmental assistance may be afforded without conflict with the principles of GATT.

Possible governmental aids may be classified broadly as follows:

- (a) Restrictions, in the form of charges or quantitative limits, on imports alone.
- (b) Direct subsidies to industries which are subjected to pollution control costs, provided either out of general revenue or by special tax, to assist in meeting domestic conversion costs or to offset for exporters costs of meeting domestic standards.
- (c) Restrictions affecting both domestic production and imports, either in the form of charges (internal taxes) or quantitative restrictions.

A programme of assistance could, of course, combine elements from more than one class, and would presumably always be accompanied by technical standards to which production processes would be obliged to conform.

A. Import restrictions. Although in some ways attractive in their relative simplicity, and in avoiding the imposition of new domestic taxes or the granting of public assistance, import restrictions whether in the form of charges on imports of goods the production of which causes pollution or in the form of quantitative restrictions on such imports would cause the greatest conflict with GATT principles and the greatest disturbance to international trade of any of the major classes of measure listed above.

In the process of successive rounds of tariff negotiation, designed to reduce protection given to domestic protection, the major industrial countries which are contracting parties to GATT have bound their tariffs against increase on virtually the whole range of industrial products, and this binding likewise carries the commitment that no new import charges will be levied unless there is a parallel charge on like domestic products. The tariff bindings are not necessarily perpetual, and there is even specific provision for periodic revision, subject to the obligation to compensate for withdrawn concessions, at three-year intervals. Nevertheless, it is doubtful whether contracting parties would wish to contemplate the large-scale unbinding of tariffs which would be involved in placing major reliance on use of import charges for pollution control purposes. It is virtually certain that there is not adequate scope for compensation within the field of the tariff, and there would be widespread concern that this form of assistance would present irresistible temptations to over-compensate, i.e., to afford net additional protection to domestic industry.

It would indeed be impossible to select any single import charge which would exactly compensate, not only because the margin of protection required by different domestic producers of the same class of goods would vary, but also because the different foreign suppliers might already have borne, in their own production processes, varying amounts of cost for pollution control in their own countries.

Scaling the tax to costs actually borne abroad would be even less manageable, both in terms of verifying the facts and in terms of assigning a per unit of output equivalent to the costs borne. It would also raise a very serious question as to the meaning of "like" products. At one extreme, care must be taken not to extend this concept too far. Here, however, it would be implied that products identical in physical characteristics and use might be "unlike" if their costs of production were different, or differently composed. It has so far never been suggested that higher costs in the exporting country justified a lower import charge, and it is doubtful whether cost differences due to pollution control are essentially different in kind from many others. In reality, such a concept would seriously undermine the fundamental notion that costs differences should be allowed to play their part in promoting international trade. To permit one particular kind of production charge to be used to justify a lower level of protection would open the way to many more, to an enormous potential interference with the flow of trade and endless disputes. Ultimately, the most-favoured-nation commitment would be at stake. Obviously, action taken on the basis of an

intergovernmental agreement concerning maintenance of quality standards in a production process would be a different matter entirely, but it is hard to see how the CONTRACTING PARTIES to GATT could permit individual member governments to set import charges in relationship to costs of production, even if it were possible to determine these particular costs accurately.

Apart from these difficulties, any approach involving an import tax on goods which may have been produced by polluting processes would worsen the competitive position of domestic manufactures using the materials produced by polluting processes. Internally, improved pollution control and an import charge on such materials would inevitably have raised the costs to the users whether they obtained these materials from domestic or imported sources. Yet second-stage imported goods competitive with second-stage domestic goods would enter tax free and might well contain cheaper materials produced abroad by a lower-cost polluting process. To counter this, the importing country might consider a border tax adjustment in an amount equivalent to the tax content of the second-stage product. But again the same theoretical and practical difficulties would arise, the practical ones in even more acute form. This issue is really one of effective protection, and the main conclusion of the recent GATT conference on the theme has been that the concept of effective protection is not operational in the general equilibrium context - in simpler language, it is not possible to determine the extent of, or change in, effective protection afforded to any industry when the situation in all other industries has to be taken into account simultaneously.

It should be noted that apart from objections of an international character, the import charge is defective in terms of its efficiency, within the country imposing the charge, since it would not contribute toward selecting-out the most polluting units of production and would instead give windfall benefits to those least in need of aid.

Quantitative limitations on imports would have disadvantages similar to those of an import charge and a few more besides. Under GATT, as already mentioned, there are strict limits to the uses which may be made of such restrictions and these rules apply to all goods, whether or not tariff concessions have been granted on them by the contracting parties in question.

B. Subsidies

GATT's provisions on the use of subsidies to domestic industry, leaving aside for the moment the question of export subsidies, are relatively general and leave considerable scope to national governments. There is, first, a general undertaking in Article XVI:1 that any subsidy which operates directly or indirectly to increase exports or to reduce imports of a product shall be notified to the CONTRACTING PARTIES, joined with a further undertaking that if it is determined that serious prejudice is being caused or threatened to any other contracting party, the country granting the subsidy shall upon request discuss the possibility of limiting the subsidization with the other countries affected. In other words, a domestic subsidy, even if it had some incidental

effects on international trade, through a reduction in imports or an increase in exports, could be instituted and maintained with no GATT consequence other than an obligation to notify it to the CONTRACTING PARTIES and to stand ready to consult. A subsidy which would only meet a part, or even all, of the actual costs of pollution control, would be unlikely to cause international difficulty, especially if the industry in question were not a significant exporter.

Internally, a subsidy would offer good possibilities of incentives to progressively higher standards of "cleanliness" in production methods, as it could easily be scaled to the matching effort made by the industry in question. Prices, both of the products of the subsidized industry and of further manufactures containing or using the product, should not be affected by subsidized costs. There would also be possibility of phasing out particularly undesirable production processes in favour of substitute products or processes. Budgetary considerations would presumably operate to ensure that industry bore a share of the cost so that pressure would be maintained for continued research into more effective pollution control methods. There would of course also be a risk that, within the country granting the subsidy, the legislative authorities might, in their efforts to reduce governmental budgets, seek to shift the burden away from the budget and over to foreign suppliers by reducing the subsidy and substituting restrictions applicable only to imports and therefore directly inconsistent with GATT's provisions on the use of quantitative restrictions.

To the extent that the industries in question were or might become capable of exporting, use of subsidies would need to take account of GATT provisions which, for major industrialized contracting parties, are much more severe as regards subsidies on the export of manufactured products than with respect to domestic subsidies. All important industrialized countries have, in fact, agreed under a Declaration giving effect to Article XVI:4 not to grant subsidies on the export of non-primary products, and no exception¹ is made for a country having higher costs than others for any particular reason. Subsidization of producers who sold a part of their output on world markets, could be taken by producers of another country having equivalent standards but less generous subsidy systems (or none) as a direct violation of this undertaking.

C. Internal taxes or restrictions

Since internal measures - charges or restrictions - if applicable indifferently to domestic and imported goods, do not in general threaten to create any unwarranted interference with international trade, GATT provisions

¹The terms of Article XVI:4 regarding two-price effects would need consideration here, and it is arguable that a subsidy to domestic producers would not qualify as a subsidy "on the export" of a product in the terms of that provision, even though it might prejudice the "interests of other contracting parties" and hence fall within the terms of paragraph 1.

with regard to such taxes and restrictions are mainly designed to ensure that any new taxes apply no more heavily to imports than to the like domestic products. In the more general language of Article III, paragraph 1, such charges and any domestic quantitative regulations:

"should not be applied to imported or domestic products so as to afford protection to domestic production".

This rule holds whether a charge or requirement is applied to an import at the point of importation or at some other time or place.

With reference to products considered to be pollutants, it seems clear that these provisions would permit either penalty taxes on the sale or use of particular products or outright prohibitions on their distribution and use.

Use of internal measures for pollution control with regard to processes might theoretically take either of two forms: either a control aimed only at domestic and foreign goods actually produced by sub-standard processes or control of all goods the product of industries whose processes sometimes pollute, irrespective of how actually produced. The former possibility would have to be rejected for all the reasons set out with regard to an import charge which aimed to afford protection exclusively against goods not having borne pollution control costs in their foreign manufacture equal to those borne by domestic goods. Differentiating between goods alike in their physical characteristics and use only on grounds of different costs of production would almost certainly contravene the most-favoured-nation principle, and would in addition offer insurmountable practical difficulties, as explained in connexion with import charges (pages 14-15).

It would, on the other hand, be possible, and consistent with GATT, to tax all products of industries which sometimes cause pollution, including both those produced domestically and imports. The problem here would, however, be to devise a means whereby such a tax, or even a general environmental tax on all goods, could afford either an incentive to pollution control or help industries defray costs incurred in the process of conforming to mandatory national standards. To solve this problem, it would be necessary to channel tax proceeds back to the industries to be assisted, in other words to combine the tax with a system of subsidy. Even this would appear to be consistent with Article III:8(b), which envisages the possibility of payment of subsidies exclusively to domestic producers from the proceeds of internal taxes applied consistently with Article III. The limitations of the resulting combined tax-subsidy system, with respect to its international effects, especially on manufactured exports from developed countries, would however remain.

V

Both statistical and engineering information on pollution control costs is still very scarce. In the preceding pages, such fragmentary data as were available were fitted into a largely theoretical analysis the main purpose of which was to estimate the maximum international cost differentials that could

arise from the enforcement of different national pollution control norms. The conclusions implied that pollution control cost, as a proportion of investment outlay and percent of output, would be inversely related to the length of time in which compliance were to be achieved, but time itself was not explicitly included in the analysis. Yet it has to be realized that the establishment of a satisfactory pollution control system in any country is not a change to be effected from one year to the next but is, in fact, only a continuation and a gradual intensification of a process reaching back to the beginning of the century. A more pragmatic consideration of pollution control as a process in time suggests, on several counts, that the cost differentials actually occurring may not be so large as to require the imposition of offset surcharges on goods in international trade.

First, the cost estimates presently being made are based on existing pollution control technology. The present concern about pollution, and the gradually tightening enforcement of pollution control, have led to a rapid expansion of industries producing pollution control equipment. These are "science-based" industries, par excellence, and their further expansion implies, above all, a rapid growth of research and development effort which will tend to reduce the pollution control costs in the years to come. Governments can, and no doubt will, stimulate further research and development in this area by various means at their disposal.

Second, it can be expected that when any new pollution control standards are proclaimed, the national industry will be given a period of time to achieve full compliance with them. This period may vary from country to country but could hardly be less than three years. The cost of pollution control would thus become only one element among all other conditions of price formation in the long run, and could be possibly offset against other elements (technology change, productivity growth) tending at the same time to improve the profit position of the industries in question. The gradual implementation of pollution control would primarily facilitate the absorption of pollution control costs, having only minor effects on their level. However, even these secondary effects would be cost-reducing: (a) a period of three to five years would give the firms concerned an opportunity to adopt the latest pollution control technologies and (b) the oldest plant, on which the pollution control cost burden would be disproportionately heavy, could be written off in the meantime.

The possibility of varying the "period of compliance" in itself represents an effective means of avoiding or preventing the emergence of significant pollution control cost differentials between countries. It is in this respect that international co-ordination of national pollution control plans would be most useful. It need not involve any negotiations: simply knowing what countries with a lesser pollution problem intend to do, countries with an acute problem could adjust the time-scale of their own plans so as to minimize any possible cost differential.

Finally, there is little doubt that fairly extensive government intervention and assistance to selected industries will be necessary. Governments of virtually all developed countries possess the required instruments for such an intervention in the form of various public industrial credit institutions. Let us note that in those countries which have accepted the principle, these are also the institutions administering import adjustment assistance. Indeed, public assistance to industries with a particularly heavy burden of pollution control cost would only be a special instance of import adjustment assistance. Thus, if the present concern with industrial pollution results in a more widespread use of public credit institutions to assist structural adjustments in industry, and in a more general recognition that such an assistance represents a legitimate exercise of public powers, the whole issue may, in the end, turn out to have facilitated a rational conduct of commercial policy.

VI

CONCLUSIONS

1. National measures to control environment pollution caused by products will in most cases assume the form of product standards. As such, they will constitute an aspect of an important international problem which is already under active consideration by contracting parties in GATT and elsewhere. Any conflicts of trade interests arising from variations in national standards, or from testing and certification problems in their enforcement may be resolved through existing and evolving arrangements and procedures relative to problems posed by standards in general.
2. Increased pollution control costs in certain industrial processes could open significant international cost-price differentials and thus create pressure for increased protection either in a generalized form or against specific products not manufactured according to an individual country's standards. Since, however, the emergence of such differentials can be phased over a period of time, i.e. the industrial adjustment will be a gradual one, it should be possible for governments to avoid situations in which the institution of national pollution control systems would interfere with the continued expansion of international trade. Such outcome presupposes a careful choice of national policies with respect to both the pollution control norms and the industrial adjustment to them, and an international co-ordination of such policies.
3. The method chosen for allocating or defraying the additional costs of pollution control could significantly influence the pattern of investment in individual countries and, consequently, international trade and capital flows.
4. One possible result of national responses to the environmental problem could be an accelerated transfer of industries or processes causing the most pollution to countries facing a less urgent pollution problem. The transferring

country would thereby assist the industrialization efforts of the receiving country while at the same time ensuring that imports from this source would not be inflated by anti-pollution costs.

5. An important point to be considered in this respect is whether the developing countries, having not yet generally attained critical pollution levels and expecting technological progress to reduce pollution control costs in the future, need to adopt the same pollution control norms as the more advanced countries. In general, it would not seem desirable for any country to adopt measures designed to stem such flows of investment and trade as might result from international differences in pollution control norms.

6. It is to be expected that the most polluting industries in each country will be forced to bear a considerable part of the cost of improving the environment. However, whenever such industries occupy a key or strategic position in the economy and face exceptionally heavy pollution control costs, governments may find it necessary to assist them in their adjustment to the new situation.

7. Government assistance can assume many forms, including direct import limiting measures. In the latter form however, it would be likely also to give rise to international commercial policy disputes. Appropriate procedures for advance notification, possible consultation and co-ordination concerning proposed national pollution control measures will be needed to avoid adverse effects on international trade and to maintain consistency with the rights and obligations countries have assumed in GATT. As a first step, it seems essential to draw attention to the important implications of pollution control for international trade and to the kind of repercussions which may arise through inclusion of an appropriate passage in the proposed Declaration on Human Environment.

8. This paper analyzed essentially short or medium-term implications of pollution control for international trade and investment. Over the long term (i.e. more than three to five years), the economic consequences of more effective industrial pollution control will be inextricably bound with as yet unpredictable technological developments, both in the area of pollution control technology and in that of production proper. In both areas, the productivity improvements stimulated by the new concern could be considerable. It is therefore important for governments which will be called upon to assist in certain pollution control financing difficulties, to resist being rushed into short-term expedients the effects of which could disturb the flow of international trade and thus, in the long run, hamper the advance of a more effective, environment oriented technology.

Table 1

Price Increases of all Goods and Services Resulting from
Compliance with Certain Anti-pollution Measures in Percent

Industrial sector ^{1/}	Price increase if major air-polluting industries met the standards of the US Clean Air Act, 1967 ^{2/}	Price increases resulting from an overall substitution of low sulphur fuels for high sulphur fuels ^{3/}
2 Electric utilities	7.3	2.9
87 Gas utilities	0.1	1.1
4 Iron and steel foundries	3.5	2.9
5 Primary steel	2.2	1.5
22 Iron and ferro-alloy mining	0.4	2.3
13 Coal mining	0.5	6.1
26 Chemical and ferrous mineral mining	0.4	1.9
52 Iron and steel forgings	1.9	2.4
3 Pulp mills	0.7	3.2
40 Paper and allied products	0.4	2.8
41 Paper containers	0.3	2.5
6 Primary non-ferrous metals	16.8	3.4
17 Secondary non-ferrous metals	3.0	1.9
23 Non-ferrous metal ore mining	0.5	1.8
53 Misc. non-ferrous metals	6.0	2.1
9 Petroleum refining	0.2	8.3
24 Crude petrol and natural gas	0.2	1.2
7 Industrial chemicals	0.6	10.3
44 Plastics and synthetic materials	0.4	6.2
8 Fertilizers	0.8	4.7
54 Metal containers	1.6	2.0
57 Other fabricated metal products	1.4	1.7

Table 1 (cont'd)

Industrial sector ^{1/}	Price increase if major air-polluting industries met the standards of the US Clean Air Act, 1967 ^{2/}	Price increases resulting from an overall substitution of low sulphur fuels for high sulphur fuels ^{3/}
61 Metal handling machinery and equipment	0.8	1.5
62 Metal working machinery and equipment	0.7	1.3
63 Specific including machinery and equipment	0.8	1.7
64 General including machinery and equipment	0.8	1.6
65 Machine shop products	0.8	1.1
68 Electric including equipment and appliances	0.9	1.6
73 Electric machinery and equipment	1.6	1.4
58 Engines and turbines	0.9	1.5

^{1/} Industry groupings aggregated from OBE 370-order matrix for 1963 published in "Input-Output Structure of the US Economy: 1963, Vol. 1 - Detailed Transactions", Washington, 1969.

^{2/} This column shows by how much all prices would have to increase if the 20 industries mainly responsible for generating the four principal pollutants (particulars, SO₂, hydrocarbons and CO) actually complied with the standards of the US Clean Air Act, 1967.

^{3/} This column shows by how much the prices of all goods and services would have to increase if, in industries as well as in domestic uses, high sulphur content fuels were replaced by low sulphur content fuels.

Source: Extracted from Table 7 in "Air Pollution and the Economic Structure: Empirical Results of Input-Output Computations" by Leontief and Ford.

Table 2

EXPENDITURE FOR NEW PLANT AND EQUIPMENT BY UNITED STATES BUSINESS AND INVESTMENTS
FOR AIR AND WATER POLLUTION CONTROL

	(1)	(2)	(3)
	Total expenditure for new plant and equipment (billion dollars)	of which: for air and pollution control (million dollars)	(2) (1) %
Iron and steel	1.83	179	9.8
Non-ferrous metals	1.10	41	3.7
electrical machinery	2.03	32	1.6
Other machinery	3.44	51	1.5
Motor vehicles	1.65	55	3.3
Aerospace	1.11	22	3.3
Other transportation		15	
Stone, clay, glass	1.07	63	5.9
Fabricated metals	3.74	44	4.6
Instruments		25	
Other durables		103	
<u>Total durables</u>	<u>15.96</u>	<u>630</u>	<u>3.9</u>
Chemicals	3.10	140	4.5
Paper and pulp	1.58	143	9.1
Rubber	1.09	9	0.1
Petroleum	5.63	280	4.6
Food and beverages	2.59	58	2.2
Textiles	0.63	10	1.6
Other non-durables	1.10	31	2.8
<u>Total non-durables</u>	<u>15.72</u>	<u>651</u>	<u>4.1</u>
<u>All manufacturing</u>	<u>31.68</u>	<u>1,281</u>	<u>4.0</u>
Mining	1.86	105	5.6
Electric utilities	8.94	155	1.7
Gas utilities	2.67	130	4.9
All other	30.40	presumably nil	-
<u>All industries</u>	<u>75.56</u>	<u>1,671</u>	<u>2.2</u>

Sources: a/ Survey of Current Business (September 1970, p.18)

b/ 23rd Annual McGraw Hill Survey of Business Plans for New Plant and Equipment, cited in Hearings before the Subcommittee on Air and Water Pollution, Committee on Public Works, U.S.Senate, 91st Congress, Second Session (pages 390-391)