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National technology policies and international friction: Theory, evidence, and policy options

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Kiel Institute of World Economics

HWWA-Institute for Economic
Research

National Technology Policies and International Friction: Theory, Evidence, and Policy Options

CONTENTS

- Economic theory and empirical evidence suggest that governments might usefully intervene in high-technology competition in two ways: First, they could act as a neutral agent that creates the necessary credibility, commitment and mutual trust among private companies so as to facilitate cooperation in high-risk, high-volume R&D. Second, if — in view of the externalities involved — an element of subsidization is to be added, this could be done in a nondiscriminatory fashion. A favourable tax treatment of R&D expenditures may be the most appropriate tool to achieve this task.
- In practice, governments do engage in targeted industrial and technology policies, whether justified on economic grounds or not. As a consequence, the string of trade conflicts in high-tech industries that began in the 1980s is unlikely to end in the near future, unless substantial reforms are undertaken in some crucial areas of the international trade order. Above all, appropriate reform steps should be made with a view to the regulations on (i) subsidies, (ii) structural impediments, and (iii) dumping and anti-dumping.
- To mitigate the frictions that arise from a subsidization of domestic firms, a new set of rules should be established. The rules should provide that all plans to grant or to alter existing subsidies are to be notified to and approved by the WTO. Moreover, all subsidies should be ranked according to their potential distortional effects on competition and trade. For each category, quantitative limits that constrain the provision of subsidies to a certain fraction of the subsidy base should be set. To facilitate further liberalization steps, a country should be allowed to exceed these limits, if a national subsidy program offers an open access to firms located in third markets.
- Besides restrictive business practices of private firms, government regulations and technical standards are the most important structural impediments to trade. Existing GATT Articles already offer a multilateral route to conflict resolution in cases of structural impediments. However, this route has not been used by complainants up to now. The so-called “non-violation” clause of Article 23 GATT provides access to a multilateral dispute settlement even if the defending country has not explicitly violated GATT rules. This route should be tested and, if necessary, improved.
- To reduce the potential for a protectionist abuse of existing anti-dumping regulations, explicit reference to the state of competition in the relevant exporting and importing country markets should be made in anti-dumping investigations. To meet specific anti-trust concerns in high-tech competition — notably with respect to network externalities, systems leverage, standardization, and innovation cartels — one might consider adopting the *Draft International Antitrust Code* (DIAC) that has recently been proposed by an international group of legal experts.

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The objective of the report is to discuss the economic rationale of national research and development policies in light of recent theoretical and empirical work on intraregional and interregional knowledge diffusion (Chapter I) and to present reform proposals for crucial areas of the international trade order (subsidies and public procurement; market access and structural impediments; dumping, anti-dumping, and competition policies) that aim at mitigating the frictions that are arising from national industrial policies (Chapter II).

The report was jointly produced by staff members of the HWWA-Institute for Economic Research and the Kiel Institute of World Economics (IfW). Chapter I and Section II.1 were written by Karl-Heinz Paqué, Jürgen Stehn, and Ernst-Jürgen Horn of the IfW, Sections II.2 and II.3 by Hans-Eckart Scharrer and Georg Koopmann of the HWWA-Institute, respectively.

I. The Economics of Technology Policies in Globalised Markets

1. Analytical Benchmarks

To a large extent, international frictions in markets for high-tech products are the consequence of some form of unilateral state intervention. Using a large variety of instruments, many governments grant support to specific branches of economic activity whose growth is deemed to be beneficial or even crucial for the long-term performance of the national economy. The policy toolbox ranges from overt protectionism and subsidisation to more covert barriers to market entry such as discrimination in public procurement, product standards and distributional networks. Whatever their specific shape may be, the instruments are usually part of a more or less coherent growth strategy that is well summed up under the terms "technology policy" or "industrial policy".¹

Many of the more popular arguments for technology policies in high-tech markets can easily be refuted with standard economic reasoning and are therefore no serious candidates for further scrutiny.² The more powerful case for technology policy — and the one that is most likely to dominate future debate on trade frictions in high-tech markets — comes from two modern strands of economic research that are both analytically important and politically relevant: endogenous growth theory and strategic trade theory.

a. Endogenous Growth Theory

Some strands of endogenous growth theory — notably the pioneering work by Grossman and Helpman (1991) and Rivera-Batiz and Romer (1991a, 1991b) —³ have focused on the link between international trade integration and the concomitant changes of sectoral specialisation patterns on the one hand and the long-run growth prospects of a country on the other. This work contains a vast array of rather complex analytical insights that may also be of interest for selected questions of economic policy. With some courageous simplifications, the policy gist of the work — as far as it is relevant for technology policy in advanced economies — may be summarised as follows.⁴

International trade patterns in (free) high-tech markets are determined by comparative advantages. More than in other markets, however, these comparative advantages may be affected by the resources that different economies devote to industrial research, i.e. to investment into the creation of new knowledge. But not each and every piece of new industrial knowledge does affect trade patterns; whether it does depends, most importantly, on the subsequent diffusion of this knowledge, i.e., in economists' jargon, on the degree of localisation of technological spillovers. In this respect, two polar cases deserve attention as conceptual benchmarks: knowledge as a global good and knowledge as a national good.

If the spillovers are essentially global, i.e. if competitors in all relevant countries have access to any addition to the (common) knowledge pool wherever it comes from, there will be no lasting effects of national research efforts on trade patterns, and one is back at standard explanations of trade in terms of national endowments with ordinary production factors, notably labour, human capital and physical capital. In these circumstances, national technology policy makes little economic sense because what it helps to create in terms of new knowledge will easily diffuse outside the country without giving domestic producers a viable and persistent advantage over foreign competitors.

If, on the other hand, knowledge spillovers remain geographically concentrated and thus essentially national in scope, then a cumulative process of what may be called "national learning" may set in and drive a widening competitive wedge between the respective national industry and the rest of the world: in the extreme, a country starting with a tiny and accidental technological lead may eventually dominate the relevant world market because it profits — alone and persistently — from its own knowledge creation, which allows it to lower costs, to raise quality levels and to introduce new products and production processes. In these circumstances, a national technology policy may well have a powerful rationale: if private producers do not make the socially optimal decisions — in economists' jargon: if there is a market failure — government may step in to initiate the virtuous high-tech growth circle.

Is the market likely to fail? Among the cases of potential market failure that have been identified in the literature, two stand out in importance, one focusing on positive externalities of private R&D spending, the other on negative ones. The argument on positive externalities recognises a tendency towards private *underinvestment* in R&D due to any positive spillover contributions to the (national) stock of knowledge that cannot be appropriated in a private calculus of profit maximisation. The government is then called upon to raise the level of research effort in the industry at hand.

The argument on negative externalities identifies a tendency towards *overinvestment* due to inefficient parallel research: with a limited common pool of potential discoveries and innovations at any point in time, a successful innovation is likely to reduce the prospective commercial value of research efforts by other firms, a form of negative (pecuniary) externality that is not properly taken into account by private agents.⁵ The government may then be called upon to reduce, or better: to bundle and focus the research efforts so as to ensure a maximum expected social rate of return and a minimum deadweight loss.

Which instruments of intervention should the government use? In the case of positive externalities, the modern theories of endogenous growth recommend public support directly of R&D activities rather than general protectionist measures for the respective industrial branch, say, in the form of production subsidies or tariffs. This is in line with the more traditional welfare analysis of externalities in trade theory,⁶ though the underlying rationale of the result is somewhat different: while traditional theory wants the government to avoid static allocative losses, the modern theory wants it to avoid a (growth-hindering) resource competition for skilled labour that may be used both in manufacturing and in research. For instance, production subsidies or tariff protection for the production of a high-tech good may induce highly qualified engineering personnel to move from research into production, thus increasing the cost of R&D and reducing the country's potential for growth.

A similar argument for direct intervention applies for the case of negative externalities, though it has not yet been spelled out in detail in the literature: if a "bundling" of R&D efforts is required to reduce inefficient parallel research, it should be done by allowing firms to cooperate so as to rationalise and co-ordinate some of their research investment, possibly under government auspices and encouragement.

b. Strategic Trade Theory

Some modern strands of trade theory — beginning with the pioneering work by Brander and Spencer (1983, 1985) and Dixit and Kyle (1985) — have focused on the international rivalry for monopoly rents in world markets that operate under conditions of highly imperfect competition, usually involving only very few producers from different countries. This rivalry can have the characteristic that possibly accidental initial advantages of one firm lead to high monopoly profits because potential competitors are deterred from market entry by high start-up costs and/or the narrowness of the prospective market.

Once again, the details of the relevant theoretical models are complex, but the case for government intervention in the form of so-called strategic trade policy is simple and straightforward: by granting a temporary subsidy to a newcomer, the government may turn potential competitors into actual ones, thus breaking up a (quasi-)monopolistic market position of the dominant foreign producer(s) and shifting at least some of the monopoly rents from one country to the other. If, in the end, national subsidy costs are lower than the gain in rents, then the active policy stance pays off from a national point of view.

Note that, in the technology policy debate, the case for a strategic trade policy does hardly come neatly separated from arguments based on endogenous growth theory. For instance, the case for the European Union's long-standing effort to break up the American quasi-monopoly in the world market for commercial aircraft has been consistently justified on two grounds: shifting rents across the Atlantic *and* laying the ground for the expansion of a high-tech industry that was regarded as greatly beneficial in terms of internal and external learning processes for future economic growth in Europe. In fact, the American lead in aircraft and related technologies was widely identified as being the consequence of a costly learning process that any prospective European competitor would still have to go through.

2. Empirical Evidence

What do we know about the prospects for a successful technology policy in actual reality? Or more specifically: What do we know about the extent to which there are cumulative processes of external learning that are geographically concentrated? And what do we know about the extent to which there are monopoly rents to be shifted around internationally? It may not come as a surprise that any serious economist can hardly avoid to answer all of these questions with: very little. Our current ignorance simply reflects the enormous problems of empirically isolating and measuring the relevant phenomena, not to speak of identifying causal relationships.

To be sure, there is a large literature of individual case studies, in which selected high tech branches or markets are picked to demonstrate the success or failure of particular government measures. In the context of the bilateral trade disputes between the United States and Japan, some of these studies have received considerable public attention, notably the book by Tyson (1992).⁷ These studies suffer from major methodological deficiencies: despite their wealth of information and interpretation, they offer neither a theory-based empirical account of the diffusion of knowledge or the shifting of rents nor a reasonably specified counterfactual scenario that would allow to pin down with some conceptual precision to what extent government intervention in fact altered the path of economic history.

The example of Japanese industrial policies is notorious in this respect.⁸ To qualify as a valuable piece of economic analysis, it is *not* sufficient to demonstrate that there was some intervention in some industrial branch and that producers in this branch were increasingly successful in world markets; it has rather to be shown that the relevant path of events was sufficiently different from what could have been expected on the basis of factor endowments and learning processes that went on anyway, independently of government action.

It is an a priori open question whether the remarkable world market penetration that Japanese industry achieved in the mass production of cameras, automobiles and semiconductors was the "natural

crop” of the specific engineering skills that the Japanese education and training system tends to provide (like, say, the German or the Swiss one) or whether it was the “artificial consequence” of smart technology policy initiatives, or part of both. To come closer to an answer, one would have to study carefully the dynamics of comparative advantages over time and across countries, testing for elements of path dependence and hysteresis in specialisation patterns of production and trade,⁹ and linking this to government interventions. Clearly, the case studies available so far fall well short of this standard.

Apart from the more descriptive case studies, however, there is a small but growing literature that makes a serious econometric attempt at identifying phenomena that are relevant for technology policy making. In the following paragraphs, we will provide a brief review of important recent pieces of empirical analysis — first of those concerning external learning effects and growth, and second of those concerning rent-shifting through strategic trade policy.¹⁰

a. External Learning and Growth

There has been a large number of studies over the last three decades which, in one way or another, try to measure and quantify spillover effects of R&D. While many of them are flawed and subject to a variety of reservations, they do on the whole support the view that R&D spillovers are positive and quantitatively important.¹¹ We shall strictly focus on those (relatively few and recent) studies that investigate the regional and sectoral incidence of learning effects and externalities, which is the core issue for the design of technology policies.

The Case of the Semiconductor Industry

In recent years, the semiconductor industry has been at centre stage of the technology policy debate, not least because it is widely regarded as a strategic industry in the sense that the production of semiconductors involves strong learning effects (and thus cost reductions) over time and that semiconductors are used as high-tech inputs in virtually all branches of any modern economy.¹² Irwin and Klenow (1994a) deliver the first serious econometric attempt to estimate the actual magnitude of internal and external learning effects as well as the geographic concentration of externalities for the semiconductor industry.

On the basis of a large set of quarterly data for the period 1974–92 and for roughly 30 semiconductor producers in the United States, Europe and East Asia (Japan and South Korea), the study provides estimates of how strongly the product price depends on past production of semiconductors (i) in the firm itself, (ii) in the country where the firm is located, and (iii) in the world as a whole. In the absence of cost data, the product price is taken as a proxy for “dynamic” marginal production cost,¹³ i.e. the marginal cost that takes into account the discounted value of all future cost reductions due to production experience; cumulative past production is taken as a proxy for the cumulative production experience and thus for the level of technical knowledge, i.e. the stage of the learning process. Also, an explicit distinction is made between cumulative experience within a production line — i.e., within the current generation of memory chips — and the experience with earlier production lines, i.e. with older memory chip generations.

The results of Irwin and Klenow (1994a) are remarkable and important. They find strong learning effects *within* each chip generation — on average a 20 per cent cost reduction with a doubling of output over time. However, they find no significant learning effects between chip generations: any new quality stage of technological development in the form of a new generation of memory chips begins with a level playing field. They also find rather powerful externalities: additional output (and thus additional experience) of other firms leads to a cost reduction of roughly one third of a corresponding output increase of the firm itself. What they do not find, however, is a significant difference between *international* and *intranational* externalities: knowledge spillovers — as far as they exist — appear to be un-

disturbed by national borders. Also, the authors of the study do *not* find any significant difference in the structural parameters of learning and external effects between Japanese and other firms.

All in all, these results cast serious doubt on whether the popular idea that there are powerful first-mover advantages for early market entrants is really compatible with the empirical record of the semiconductor industry. *Prima facie*, the simple observation that Japanese semiconductor producers — after a prolonged period of spectacular world market penetration — lost again world market shares to American competitors by the late 1980s, seems to point in the same direction. However, the interpretation of this fact is complicated by two major policy shifts that may have influenced the course of events, namely the conclusion of two US–Japanese semiconductor trade agreements, which brought some protectionist relief to American producers, and the establishing of SEMATECH, the joint industry-government research consortium in the American semiconductor industry.

With respect to the trade agreements, there is by now a broad consensus that they came too late — the first in 1986 — to prevent a fundamental restructuring of American industry away from the mass production of DRAMS¹⁴ to more profitable market segments (e.g., design intensive chips). With the benefit of hindsight, one can say that this turned out to be a blessing because of the rising tide of competitive pressures from South Korean producers that forcefully entered the DRAM market and undermined the dominating Japanese position.¹⁵

With respect to the economic impact of SEMATECH, there has been a first econometric attempt at estimation, again by Irwin and Klenow (1994b). Using data on American semiconductor firms, i.e. on those which were members of SEMATECH in the relevant period and those which were not (and which, statistically, form a control group), the authors estimate the effects of the consortium on the members' R&D spending, profitability, investment and productivity. Their results turn out to be conclusive only for the effect on R&D spending: they indicate that SEMATECH has *reduced* R&D spending by roughly \$300 million per year. In terms of the two alternative theoretical interpretations of technology policy presented above (see Section I.1.a), this supports the view that SEMATECH has served as an instrument to focus and bundle research, i.e. to reduce inefficient parallel efforts, rather than to expand the research scope into ranges that would otherwise not have been profitable to explore by private member firms.¹⁶

While SEMATECH may thus have helped firms to coordinate their research efforts efficiently, there is by now broad agreement that this piece of positive technology policy can hardly be made responsible for the bulk of the recovery of the American semiconductor industry.¹⁷ Instead, the timely restructuring of the industry appears to have done by itself the major part of the work. In view of the econometric evidence about the powerful international diffusion of technological knowledge in this high tech industry, one should not be surprised to see one country's producers recover quite successfully even from rather deep adjustment crises.¹⁸

Knowledge Diffusion: International and Interregional

Coe and Helpman (1993) attempt to quantify international knowledge spillovers between industrial economies.¹⁹ On the basis of annual data for the period 1971–1990 and 22 mostly OECD countries, they estimate how strongly total factor productivity in any country depends on the “research capital stock” (i) in this country itself and (ii) in all other countries. The domestic “research capital stock” is defined as total national R&D expenditure, accumulated over time using a certain rate of “knowledge depreciation”; the total foreign research capital is calculated as a weighted average of all other countries, with the weights being bilateral import quota, i.e. — roughly speaking — the degree of trade integration.

The authors find that total factor productivity in a country depends strongly on the domestic research capital: according to their estimates, a 1 per cent increase of the research capital stock leads to a 0.25 per cent productivity increase. They also find that foreign research capital matters as well, but that it matters comparatively more for smaller countries than for large ones. In fact, for small highly integrated

economies, research efforts in the main trading-partner countries appear to matter at least as much as corresponding efforts at home. Apparently, trade between advanced economies — and with it international capital movements — appear to be powerful channels for transmitting technological knowledge across borders, a result which tends to support the estimates and message of Irwin and Klenow (1994a) in the narrower context of the semiconductor industry.

On interregional knowledge spillovers, there are two major studies that are directly relevant for the policy questions at hand. Jaffe et al. (1993) exploit the geographic information contained in U.S. patent statistics to draw econometric inferences on the extent to which the diffusion of knowledge remains localised after an innovation has been made in some place of the country. The central piece of information on which they build their econometrics is the geographic pattern of patent citations to be found in new patent applications, which can serve as a kind of road map to track knowledge spillovers.

While the methodology is rich and complex in detail,²⁰ the results are rather clear-cut. First of all, they point towards quite strong localisation effects, with the degree of localisation being higher for patents of private firms than for those of universities, which is plausible because purely academic research results are likely to be circulated more openly than the knowledge created in private research laboratories. Second, for any patent, localisation tends to decline over time, but very slowly so: even a decade after a patent is granted, the geographic diffusion pattern remains little changed for all practical purposes. And third, the high degree of *geographic* localisation is *not* matched by a corresponding degree of *sectoral* localisation: whatever the grouping of patents into technological or industrial segments, there is always a remarkably high share of citations that refer to patents in very different fields. This casts some doubt on the common assumption that cumulative learning processes *within* a well-defined high-tech industry are a valid rationale for technology policy.

This last result has received independent support from another strand of research on interregional knowledge spillovers, which applies ideas of endogenous growth theory to the study of urban agglomerations. In a major contribution on the economic determinants of city growth, Glaeser et al. (1992) test two competing hypotheses, one identifying knowledge spillovers *within* an industry, the other one spillovers *between* industries as the driving force of output and employment growth. Using a large data set on the structure of industry for 170 metropolitan areas in the United States for the time 1956–1987, the authors estimate to what extent the long-term growth of a city industry was positively or negatively correlated with a number of characteristics of local industry structure, most importantly the degree of specialisation (i) of the respective industry and (ii) of the rest of the urban economy.

The results are again rather clearcut: other things being equal, an industry tends to grow faster in cities where it is still underrepresented and where the rest of the urban economy has a low degree of industrial specialisation. Hence, as in the research on patent knowledge diffusion, an empirical case can be made for inter-industrial rather than intra-industrial spillovers dominating the picture.²¹

b. Strategic Trade Policy: The Aircraft Industry

Rent-shifting in high-tech markets through deliberate government intervention has been an explicit aim of policy in one particular branch of economic activity: the aircraft industry. Naturally, it has been this industry and in particular the economics of the European launching of Airbus as a competitor of Boeing that was subjected to empirical analysis, notably by Baldwin and Krugman (1988) and Klepper (1990, 1994).²² For a number of reasons ranging from the duopolistic market structure to simple lack of data, all these empirical studies consist of model calibration and simulation rather than econometric estimation of theory-based parameters.²³ This is why all results must be interpreted with utmost caution because they depend crucially on the models' assumptions and imputed parameters.

The policy-relevant core of these studies consists in answering the following double question: to what extent and for what economic reason did the subsidised market entry of Airbus — and thus the transformation of the aircraft market from a (prospective) monopoly of Boeing into a transatlantic duo-

poly — lead to a redistribution of producer and consumer surplus in the United States, in Europe and in the rest of the world? Despite considerable methodological differences, the answers to these questions do not differ greatly between the relevant studies.

Briefly summarised, the answers read as follows. The market entry and continued market presence of Airbus has led or will lead to a loss of producer surplus in the United States due to the reduction of (monopoly) profits and a gain of consumer surplus all over the world due to lower aircraft prices. However, European consumers/taxpayers are likely to end up worse off because the additional tax burden may well overcompensate the gain in consumer surplus. Also, world welfare as a whole is likely to be reduced because the loss of producer surplus in the United States may well overcompensate the world-wide gains in consumer surplus (net of the tax burden), a result which reflects the enormous importance of economies of scale in the aircraft industry: given very sharp cost reductions through learning effects, the socially optimal outcome for the world as a whole may simply be a monopoly.

The central conclusion from these results is that, in economic terms, the European Airbus venture is better interpreted as a world-wide anti-monopoly policy rather than a transatlantic rent-shifting: European consumers/taxpayers foot the bill of breaking an American monopoly to the unambiguous advantage of consumers in the rest of the world.²⁴ Whether one likes this policy or not, it has very little to do with the idea of a genuine strategic trade policy that postulates a national interest in rent-shifting as the normative basis for government intervention, and not an altruistic policy stance vis-à-vis the rest of the world.

Needless to say that one may put forward other arguments for fostering a European aircraft industry as an important high-tech branch, but these usually lead into the realm of technological spillovers (see Section I.2.a). To our knowledge, there have been no systematic empirical assessments of the aircraft industry with respect to technological externalities. Casual observations — e.g. the apparent failure of Germany's Daimler-Benz to profit from so-called synergy effects between aircraft and motor car production²⁵ — suggest that these effects have been grossly overestimated in the past and have lured some firms into a path of diversification that turned out to be unprofitable in the longer run.

There is a more general conclusion to be drawn from the empirical studies on rent-shifting that goes well beyond the aircraft market. Obviously, the aircraft industry is almost a textbook case for an industry with strong economies of scale and, consequently, very few commercial players and fat monopoly margins: if even in this industry it is very hard to channel rents into the pockets of producers in the intervening country, how can one ever arrive at a powerful case for government intervention on these grounds in other industries that are much further away from the conditions of a natural monopoly? One may suspect that the chances to do so are small at best.

3. Technology Policy: Some Cautious Conclusions

Despite the vast uncharted territories that still await future research — notably in the field of econometrically scrutinising the various dimensions of knowledge diffusion — some preliminary conclusions may be drawn from the available evidence surveyed above:

(i) Knowledge spillovers appear to be a pervasive feature of modern economies that is likely to be of great importance for economic growth. There is still much less clarity about how the knowledge diffusion actually works, although there are some patches of relevant evidence: studies on the *interregional* diffusion process point to strong localisation effects in terms of geography, but not in terms of sectors of economic activity; in turn, studies on *international* diffusion point to powerful spillovers across national borders, be it on a macroeconomic level or for a selected important high-tech industry, namely semi-conductors. The apparent contradiction between the empirical results from interregional and international studies may have its cause in a genuine “globalisation” of knowledge flows: it is not im-

plausible to suspect that the leading high-tech centres in different countries may be better linked in terms of communication than the high-tech centres and the periphery in one single (large) country.

(ii) The aim of shifting monopoly rents between countries does not make by itself a case for government intervention. The one instant where it was obviously relevant — the aircraft industry — is history since Airbus is by now an established competitor of the former (quasi-)monopolist Boeing. Whether the launching of Airbus was a policy success depends on the criteria used. Be that as it may, no comparably structured high-tech branch, where fat monopoly profits accrue in just one country, is in sight in the near future.

(iii) The actual record of government intervention in high-tech industries is very hard to evaluate because, usually, no sensible counterfactual scenario can be made available. However, there is one important case where such a scenario has been at least tentatively constructed: SEMATECH. The relevant analysis of SEMATECH indicates that the consortium helped to reduce — arguably inefficient — parallel research, thus pointing to a positive role of the government as an agent that bundles and focuses rather than expands research efforts.

Back to the basic question: Is there a theoretically sound and empirically supported rationale for government intervention in high-tech markets? Given the extent of our ignorance of the precise determinants and structure of knowledge flows, it is hard to avoid the conclusion that a government in an advanced economy has exactly the same information problem as the empirical economist in tracing the relevant knowledge flows. Hence a fine-structured industrial policy targeted at selected high-tech industries can hardly be recommended.²⁶ On the other hand, the observed regional localisation of knowledge spillovers may suggest that a “technology policy” aimed at generally supporting the (otherwise suboptimal) growth of high-tech agglomerations, can make economic sense. The problem is, of course, how this should be done with a minimum risk of incurring deadweight losses for taxpayers and consumers. Some reasonable guidelines may read as follows:

(1) In selecting instruments of government intervention, one should aim at supporting R&D itself and not output or trade because output subsidies and trade policies do invariably have undesirable allocative side effects, not to speak of the potential for political frictions that may come to the fore once countries engage in protectionist warfare in high-tech markets.

(2) When choosing R&D for government support, one should consider whether the apparent market failure cannot be corrected through what may be called “government coordination” rather than through subsidies. Finding an economically efficient level and structure of industry research by jointly launching particularly large and risky projects or by weeding out costly parallel research is eventually in the interest of all firms concerned; and at least in high-tech markets that are characterised by (not too wide) oligopolies, firms may be ready to cooperate in research. Hence the government may simply serve as a positively neutral agent that creates the necessary credibility, commitment and mutual trust among the private parties so as to make the joint venture possible at all. With the benefit of hindsight, SEMATEC may in fact be interpreted in this way, given its apparently successful record and its decision in 1994 to continue its operation into the second half of the 1990s, but to renounce on government money, which had previously made up about half of its funds.

Of course, even such a modest government role does create problems. First, it requires a precise definition in anti-trust law under which pre-competitive circumstances a R&D joint venture does not fall under the ban on collusions. In practice, any exemption clause will be abused to some extent so that the likely damage of abuse will have to be put onto the debit account of any (government-sponsored) co-operation. Second, it requires a decision to what extent foreign firms are permitted to participate. Again, there is a conflict: on one side, the very rationale of technology policy is to foster national high-tech agglomerations, and not the ones in other countries; on the other hand, the participation of foreign firms may be the only feasible way to tap a foreign stock of knowledge that may be crucial to obtain or preserve the competitive edge of domestic industry. Even if foreign firms were excluded from participating

in a government-sponsored cooperation, however, they may acquire the relevant knowledge by taking over a firm that does participate.²⁷ In practice, this can hardly be avoided unless a government is prepared to make very serious inroads into the freedom of capital movements.

(3) If an element of subsidisation is to be added to the package of government R&D support, it should be done in a non-discriminatory fashion. This means — roughly speaking — that any dollar or deutschmark spent on R&D should be subsidised at the same rate, no matter in which branch of economic activity it is invested. This of course means that high-tech branches with high ratios of R&D spending to value added receive a higher subsidy per unit of value added; but this “discrimination” is perfectly compatible with the externality-based logic of the subsidy because they are also the branches whose output is likely to be the furthest below the social optimum. In practice, a favourable tax treatment of R&D may be the most appropriate tool to achieve this task.

Of course, one may wonder whether most industrialised countries — including the United States and Germany — do not already have an implicit R&D subsidy implemented in their tax codes, though maybe for reasons that have nothing to do with a conscious and deliberate effort to support R&D. An implicit R&D subsidy can be recognised in two distinct elements of the tax code.²⁸ First, labour costs incurred in R&D can be deducted as current expenditure like labour costs incurred in production, although they are economically more like an investment in future knowledge creation and thus, in a neutral tax code, would have to be treated like an investment in physical capital, which can only be deducted over time according to some schedule of depreciation. Second, the value of the knowledge output that is not sold in the market for patents and licences but kept for exclusive use in the company, is not counted as an asset for tax purposes. This amounts to a positive discrimination of the knowledge stock vis-à-vis that part of the physical capital stock that is produced by the firm itself. While these tax rules may not be optimal from an economic perspective, they do constitute a considerable element of R&D support and maybe a starting-point for a “non-mercantilistic technology policy”.

II. Approaches to Conflict Resolution: Agenda for Action

1. Subsidies and Public Procurement

a. Towards an Open Subsidy Club²⁹

Subsidies are one of the most important instruments for the promotion of high-technology industries. The share of public funding in private R&D expenditures varies between 11 and 33 per cent in leading OECD countries, with the remarkable exception of Japan where public subsidies cover only 1.5 per cent of private R&D outlays (Bletschacher and Klodt 1992). What is more, R&D subsidies are directed towards very few high-technology industries — above all to the electronics and the aerospace industry — and often go along with investment and production subsidies, as the Airbus case demonstrates.³⁰

In the course of the Uruguay Round negotiations, the GATT signatories have made a new attempt to restrict the use of subsidies for industrial policy purposes. The Agreement on Subsidies and Countervailing Duties introduced a so-called “traffic lights” approach that divides subsidies in three categories: (i) prohibited; (ii) actionable (i.e., these subsidies can be countervailed); (iii) non-actionable. The “red light” group includes export subsidies and subsidies that can be roughly characterised as import substitution subsidies.³¹ These subsidies are actionable in any case, regardless of whether they are specific or not. The “green light” (non-actionable) category covers non-specific subsidies, R&D subsidies, regional subsidies, and environmental subsidies. A subsidy is considered as specific if it is granted only to a limited number of well-defined industries or enterprises. Although most R&D subsidies are

designed to promote specific industries, R&D subsidies are non-actionable as long as public funds cover not more than 75 per cent of the costs of industrial research and not more than 50 per cent of pre-competitive development research. To benefit from non-actionability, “green light” subsidies are to be notified to and approved by the WTO Committee on Subsidies and Countervailing Measures. All subsidies that fall neither into the “red light” nor into the “green light” category are defined as actionable (“yellow light” category).³²

Although the WTO Subsidies Agreement clarified some of the issues that caused frequent disputes (Schott 1995), it suffers from at least two major weaknesses that might give rise to further conflicts in international trade, especially with a view to high-technology competition. First, countervailing duties imposed by third countries are the only enforcement mechanism of both the WTO Subsidies Agreement and the Tokyo Round Subsidy Code. To initiate a countervailing duty investigation a signatory has to prove that subsidies of an offended trading partner violate existing WTO regulations and that the domestic industry is “experiencing injury” as a result of these subsidies. Thus, industries and enterprises suffering from subsidies abroad are the real supervisors of the WTO subsidy regulations. This “decentralized” supervision system has proved to be rather ineffective on several grounds:³³

(i) Many kinds of subsidies, especially investment subsidies and R&D subsidies, do not cause measurable competition distortion effects for several years. By the time the effects become obvious, the relevant subsidies have often been phased out, and it may become almost impossible to prove that the subsidies caused material injury.

(ii) The current subsidy regulations cannot prevent governments from granting subsidies that are distorting international competition because a proof of material injury is a first and indispensable step in a countervailing duty investigation. Hence, countervailing duties can only mitigate the competition distortions once they have occurred.

(iii) The countervailing duties approach poses the danger of retaliation, especially in high-technology industries, where the time lag between subsidies and the resulting competition distortion effects is usually quite long. Under these conditions, the imposition of a countervailing duty by a trading partner might be judged as arbitrary and unfair by the offended country.

(iv) Countervailing measures may be abused for protectionist purposes and — due to their price effects — may further distort international competition.

In view of these shortcomings, the WTO Subsidies Agreement should be reformed by (1) introducing a notification system aiming at an assessment of all planned subsidies *prior* to their implementation and (2) by defining quantitative thresholds for the provision of subsidies:

(1) With respect to the implementation of a multilateral notification system the aid supervision procedure of the European Union can serve as a reference system.³⁴ A multilateral subsidy supervision should stipulate that all plans to grant new or to alter existing subsidies are to be notified to and approved by the WTO Committee on Subsidies and Countervailing Measures (CSCM).³⁵ The CSCM should be entitled to examine the notified plans and to decide whether they are compatible with the WTO Subsidies Agreement. In the course of the investigation, the CSCM should take into account written comments by third signatories that might be affected by the notified subsidy. After the CSCM has made its decision, any signatory concerned should have the opportunity to initiate a panel procedure against the CSCM ruling in accordance with the WTO Dispute Settlement Mechanism. Given that a signatory grants a subsidy in violation of a final CSCM or WTO panel ruling, the CSCM should be empowered to require a repayment of the subsidy to the respective national government. The potential threat of a repayment may give an incentive to recipient firms and industries to ask their respective national governments to present an approval of the CSCM before granting the subsidy, and may, therefore, lead to some sort of a self-restraint. Only if a signatory does not react to any of the CSCM or WTO panel rulings within an appropriate time period (e.g., two months after the final decision), third

parties would be entitled — as a last resort — to initiate a countervailing duty procedure according to the regulations of the current WTO Subsidies Agreement.

To facilitate a multilateral aid supervision, the current traffic lights approach should be reformed by categorizing all subsidies in either prohibited subsidies or subsidies that are allowed under certain conditions. This can easily be done by just skipping the “yellow light” category. Although this category is defined by default, it is obvious from the definitions of the “red light” and “green light” subsidies that it covers all specific subsidies not being explicitly mentioned in the “green light” group. As a consequence, all non-specific subsidies except for the current “red light” group, i.e. export subsidies and import substitution subsidies, would be admissible. Thus, a workable and clear-cut definition of specificity is an important prerequisite for an effective subsidy supervision.

(2) The WTO Subsidies Agreement fails to provide unequivocal guidelines for measuring specificity. According to the agreement, the following factors should be considered in determining whether a subsidy programme is specific or not:

- “the use by a certain number of enterprises;
- the predominant use by certain enterprises;
- the grant of disproportionately large amounts of subsidy to certain enterprises; and
- the manner in which discretion is exercised by administering authorities” (Subsidy Agreement, Art. 2.1(c)).

Besides being obviously rather vague and ambiguous and thus giving rise to disputes in interpretation, these guidelines do not take sufficient account of the economic effects resulting from firm-specific or industry-specific subsidies. From an economic point of view, the main objective of specificity rules is to limit the competitive distortions due to subsidies that are mainly directed at a single industry or enterprise. It can be realistically assumed that the extent of competition distortions depends on the share of production, investment, or research and development costs that is covered by the public funding. Hence, the current rules could be considerably improved by defining quantitative thresholds that limit the provision of subsidies to a certain fraction — say, 5 per cent — of the respective subsidy base.

With a view to R&D subsidies, it is certainly by far too optimistic to expect that governments will agree on a 5 per cent threshold in the near future. The “safe harbour provision” (Schott 1995) for R&D subsidies which was agreed upon in the Uruguay Round negotiations rather points in the opposite direction. It is obvious that the current maximum, i.e. a public funding of up to 75 per cent of R&D costs, will give a recipient firm a considerable competitive edge and might thus lead to major conflicts in high-technology trade and competition. Under these conditions, the levelling-down of current thresholds seems to be a necessary and highly desirable policy goal.

As empirical research indicates, high-technology R&D can be expected to generate cross-border externalities (see Chapter I). Thus, new technological knowledge can be no longer assumed to be totally exclusive. If national governments were to take these international spillovers of domestic innovations into account, they should have strong incentives to cooperate internationally.³⁶ An efficient way of international cooperation might be the mutual opening up of national subsidy funds for high-technology development. This approach would allow firms located in third countries an open access to national subsidy funds if — and only if — third countries are ready to open access to their subsidy budgets on a reciprocal basis.

To provide an incentive to open up national subsidy funds, one could also consider a provision that, as a general rule, lowers the threshold for high-technology subsidies to 30 and 15 per cent of the costs of basic and applied R&D respectively, but allows a higher public funding up to the current limits if a national research programme provides an open access for firms located in third countries. For practical purpose, this approach may require the implementation of the following general rules:

- (i) An R&D subsidy programme should only be regarded as open if at least two foreign firms are participating in the programme;
- (ii) the objectives of the open fund are formulated by the respective national government and must be met by both domestic and foreign firms;
- (iii) domestic and foreign firms should be treated equally with respect to patents and copyrights that emerge from the funded research;
- (iv) the open access to national funds should not be linked to a cooperation with a domestic firm.

To facilitate a multilateral subsidy supervision and an international cooperation in public funded R&D, the WTO should publish annual reports on recent developments in national subsidy schemes of leading OECD countries. A multilateral monitoring of current subsidization practices could also help to prevent international conflicts arising from a misinterpretation of the objectives and potential effects of national subsidy programmes (Ostry 1996).

b. Public Procurement: Conflict Resolution by National Courts

Public Procurement in advanced industrial economies covers a significant part of overall market demand. Non-defence public procurement in the member states of the European Union is estimated to represent about 7–10 per cent of gross domestic product.³⁷ It is therefore tempting for governments to use their demand for goods and services in order to achieve aims of technology and industrial policy.

The GATT procurement code of the Tokyo Round (in force since 1981) established for the first time internationally binding rules that secured foreign competitors open and undiscriminatory access to bidding procedures for public procurement of goods (though not yet of services).³⁸ It is based on the conditioned most-favoured-nation clause, i.e. it applies only to the relationships between those contracting parties of GATT that have actually signed the code.

The Tokyo Code which was at that time widely regarded as one of the most far-reaching achievements of the Tokyo Round Agreements (see Stern and Hoekman 1987) committed only central governments and directly related entities to internationally open tenders, (i.e. those surpassing certain threshold levels of tender value). The rather limited range of the Tokyo Code — covering less than ten per cent of non-defence public procurement in the United States and the European Community (see Messerlin 1994) — clearly constrained its impact from the outset and goes a long way to explain its actually very limited economic consequences. As a part of the Uruguay Round accord, the new Government Procurement Agreement (GPA) — in force from 1 January 1996 — extends the reach of the Tokyo code to potentially all kinds of non-defence procurement, i.e. to all non-defence goods and services.

The GPA is one of the three major agreements of the Uruguay Round that are not included in the so-called Single-Undertaking procedure. This means that these agreements apply only to their signatories, not to all contracting parties of the World Trade Organisation at large.³⁹ The potential value of contracts that will be covered by the GPA in signatory states is roughly estimated to about \$400 billion annually in current prices.⁴⁰

There are mainly two areas in which the GPA breaks new ground by the standard of its Tokyo Code predecessor. These concern (i) extensions of the coverage provided by the GPA, and (ii) disciplines imposed by the GPA on signatories:

(i) *Coverage of the GPA*: The principle of exchange of “trade concessions” that has governed all multilateral trade negotiations under the auspices of GATT means in the context of GPA that contracting parties concede

- “items” (i.e. certain groups of goods and services) to be opened to foreign competition in public tenders, and
- “entities” (public or semi-public bodies) designated to open their tenders for bids by foreign suppliers.

The new GPA extends the range with respect to both “entities” and “items” concerned. Under the new agreement (Article I), all tenders regarding rentals or leases of goods and the procurement of services shall be included.

These general extensions are, however, limited by exemptions listed in the Annex of the Agreement for each signatory state.⁴¹ Limits concerning goods are listed as exemptions, limits concerning services apply to all items that are not explicitly enumerated. This distinction is in accordance with the different philosophies of regulation in the GATT (for goods) and the GATS (for services). The institutional solutions chosen in service sectors are likely to favour bilateral deals of sectoral reciprocity, thus undermining attempts to arrive at a multilateral framework. A similar tendency prevails in the so-called exempted areas of public procurement of goods, notably of telecommunications equipment. As far as public or semi-public “entities” are concerned, the new GPA has in principle been extended to “sub-central” entities, i.e. basically regional and local government entities. However, those sub-central entities that are in fact obliged to open their tenders to foreign competition, are enumerated in the annex to the GPA.⁴²

There are two major problems involved in the definition of “public entities”. First, the power of the contracting party — the central government — to control the conduct of sub-central entities may be rather limited, e. g. in the case of federal member states. Second, previously “public firms”, once included in international arrangements on public procurement, may become privatized, thus leaving other contracting parties with a loss of “trade concessions” formerly granted to them.

(ii) *Disciplines Imposed by the GPA* (see Hoekman and Mavroides 1995b): According to the two basic principles embedded in the GPA, suppliers from other signatory states should benefit from the conditional MFN clause, and thus tendering procedures should not entail any discrimination between domestic suppliers and suppliers from other signatory states. In turn, discrimination against suppliers from third countries (i. e. non-members of the GPA) is still allowed, which is consistent with the philosophy of the WTO as an open club.

A core achievement of the new GPA is that foreign suppliers discriminated against in a national tendering process can use the so-called challenge procedure, i.e. they can submit their appeal directly to a ruling by the courts of the country that issued the respective tender, and these courts are then obliged to provide reasonably rapid proceedings.⁴³

Moreover, “offsets” (i.e. deviations from the GPA) are explicitly prohibited by Art. XVI, meaning that additional requirements attached to a bid on a national public tender (e.g. local content, counter-trade and the like) are to be considered illegal. Furthermore, the GPA does not contain any safeguard clause that could allow signatory states to refrain from or to circumvent their obligations under this agreement. On the other hand the GPA does not contain any provision against collusion among bidding domestic firms, which is left to the competence of domestic competition policy.

The regulations of the GPA, which by themselves appear to be quite strict ones,⁴⁴ may yet be undermined by regulations of the TRIPs Agreement (Agreement on Trade-Related Intellectual Property) of the Uruguay Round. This means in particular that a national government will still be allowed to specify the conditions of a tender, if “there is no sufficiently precise or intelligible way of describing the procurement requirements and provided that words such as “or equivalent” are included in the tender documentation” (Article VI.3 GPA).⁴⁵ This provision may give national governments enough leeway to limit international competition whenever they think it to be appropriate.

In practice, foreign firms affected by discrimination in public tendering procedures will weigh the possible advantages of a court ruling in their favour against the disadvantages of possibly foregoing the good will of the respective government. In the longer term, however, the opportunities established for foreign suppliers’ access to domestic court procedures should work in the direction that national governments will increasingly behave more strictly according to the rules laid down in the GPA.

Although, clearly, the GPA is a major step in the right direction, there remain also major problems unsolved:

- At present, WTO regulations still allow legal subsidies to R&D activities and subsidies on regional policy grounds. This opens the gate for abuse in national procurement: e.g. a national government may grant R&D subsidies and then define the terms of a later procurement tender on the basis of those specific R&D requirements that only a domestic firm can possibly meet. Bidders from the outside would quite obviously have little chance to succeed in such a procurement tender.
- Decisions of governments on matters of national security are exempted from WTO regulations. Obviously, clauses of this kind can also be misused, in particular with respect to the treatment of dual-use goods and services (i.e. goods and services that can be used for both military (security) and civilian purposes).
- The many national exemptions in the GPA with respect to public entities and items (or sectors) are likely to encourage bilateral bargaining, which is obviously not in the spirit of an international and multilateral framework of trade regulations.
- The question of what has to be considered as a public enterprise or as an enterprise under significant influence of government, can be hardly answered on the basis of common criteria across countries. As this definition is highly critical for the assessment of trade concessions in international trade negotiations, there is a strong need for further international agreements on this matter.

As the new GPA code entered into force by 1 January 1996, it remains to be seen, how effective this code will prove to be, and whether the problems enumerated above will in fact put into question the overall spirit of the whole venture.

2. Market Access and Structural Impediments

In addition to subsidies and public procurement practices, international competition in high-technology goods is distorted by a variety of other barriers to market access, including “structural” impediments to trade and investment. Trade and investment are in fact two major channels for the international diffusion of technology. In exporting countries the foreign trade outlet enables technology enterprises to exploit economies of scale in production and facilitates their recovering of R&D expenditures. In importing countries user industries benefit from access to the most advanced technology-intensive capital goods, components, and services at competitive prices, often a precondition for their own international competitiveness. Consumer welfare, too, is enhanced by the supply of high-tech consumer goods and services, again at competitive prices. From this one might infer that governments should be interested in open markets for technology goods and services.

In practice, however, barriers to market access prevail. Some barriers, like tariffs, certain anti-dumping practices, voluntary export restraint agreements, and safeguards, are deliberate attempts to shield domestic producers against competition from technologically superior, or simply less expensive, foreign suppliers, often with the intention of providing them a respite for catching-up. Others, like government regulatory measures and technical standards, are often the by-product of differences in national cultures, policy objectives, and technology practices which may be difficult to reconcile internationally. And still others, like barriers to access to private technology “clubs” or to national dealer networks, are the result of restrictive, though not necessarily illicit, business practices. All these practices are potential sources of economic and political friction.

a. Tariffs and Non-Tariff Barriers

Tariffs, traditionally the preferred instrument to restrict market access, have greatly lost importance in the course of repeated GATT rounds. The Uruguay Round resulted in a (further) lowering of import duties for industrial goods by 38 per cent in developed countries, from 6.3 to 3.9 per cent on average. 43 per cent (up from 20 per cent) of the total value of industrial products imported by developed countries are now entering duty-free, and only 5 per cent (down from 7 per cent) are subject to peak rates (GATT 1994). Equally important as the reduction of tariffs is that developed economies have now accepted a binding of virtually all their tariff lines on industrial products, thereby greatly improving the security of market access.⁴⁶ Technology products, among them electrical and non-electrical machinery, chemicals and pharmaceuticals, were also subject to the elimination or significant reduction of tariffs; on important electronics items, such as semiconductors, semiconductor manufacturing equipment and computer parts, tariff cuts of 50 per cent and above were achieved. Yet, for certain items, especially in the field of consumer electronics, substantial tariff barriers persist. Their reduction should be made part of a concerted multilateral effort to improve market access in which the European Union, the United States, and the major East Asian economies should take the lead.

With MFN tariffs rendered increasingly obsolete as measures of protection, at least in developed economies, non-tariff barriers to trade and market access have received growing attention. Among *border measures*, anti-dumping duties, countervailing duties, and safeguards are increasingly applied in high-technology trade. They are treated in the following chapter. The much criticized Voluntary Export Restraints (VER), a frequently applied substitute for these measures, shall be phased out as a result of the Uruguay Round. No less significant than border measures are the already mentioned structural impediments *inside the borders*: government regulatory practices, technical standards, and restrictive business practices. They may be deliberately designed in such way as to discriminate against imported products: luxury taxes on certain classes of automobiles, the U.S. corporate average fuel economy law (CAFE) (see Kleinfeld 1995), costly and time-consuming testing, certification and conformity assessment procedures for technology-intensive products, limitations to foreign ownership in business sectors deemed "strategic". Discriminatory measures are an offence against Article III of the GATT which establishes the principle of national treatment (non-discrimination) of imported products, a guiding principle of the multilateral trading system. Such measures are therefore challengeable under the GATT dispute settlement mechanism. Often, however, structural impediments simply reflect differences in national value systems, historic institutional settings, and grown systems of business culture (like the systems of corporate governance). While they may form effective barriers to foreign entry, the WTO recognizes the diversity of national business cultures, institutional settings, and policy approaches which are at the heart of comparative advantage (Ostry 1996: 159) and competition among which is indeed a condition for advancement. It is no wonder, then, that the Uruguay Round has made only limited progress in this difficult area. To be sure, the Agreement on Technical Barriers to Trade, concluded under the Tokyo Round, was revised and strengthened and Article XXIII of GATT was clarified. What is still missing is, among others, an agreed catalogue of government practices (including omissions) considered to be (challengeable) structural impediments as well as "objective" criteria for determining whether and to what extent a market is indeed "contestable" (Ostry 1996: 159) and if not, how this situation can be remedied.

In the field of high technology, market presence through foreign direct investment is no less important than market access through trade. Domestic presence is often critical to success in following market trends, gaining access to the R&D infrastructure, marketing research-intensive products with short product cycles and high sunk costs, and responding to marketing needs. At the same time, foreign investment is an important channel for the international diffusion of technology, including skills. In spite of these microeconomic and macroeconomic benefits, the notion of national treatment, while being accepted in principle, is not yet fully applied to investment.

Governments seek to attract greenfield investment from foreign high-technology enterprises through a great variety of financial incentives and/or through trade pressure. At the same time they often restrict market presence in business sectors deemed "strategic", they oppose the acquisition of domestic technology firms by foreign investors, or they restrain access to national technology programmes. True, with the world-wide process of deregulation and privatisation now underway, an opening of the respective sectors to foreign investment often goes hand in hand. For instance, in telecommunications, a high-technology service sector, deregulation in Europe has promoted foreign entry as well as the formation of international strategic alliances with non-European partners. Still, in all countries of the triad and even more so in emerging and developing economies obstacles and market distortions persist, as foreign investors are denied effective market presence.

The Uruguay Round Agreement on Trade-Related Investment Measures (TRIMs) is but a first step to a multilateral investment agreement. The Agreement is narrow in its focus, being limited to the trade-related aspects of investment, and here in particular to local-content and trade-balancing requirements which are expressly prohibited. This prohibition applies whether the measures are mandatory or are required in return for an incentive or advantage. The TRIMs Agreement had a poor start: Under the U.S.-Japan Auto Agreement of 1995, the Japanese car manufacturers entered into a "voluntary" commitment to raise the U.S. content of their transplants in the United States and to meet NAFTA local content standards by 1998 "in order to boost U.S. and North American content in their vehicles." (USIS 1995b: 11). This commitment, like the other commitments under the Agreement, will be monitored by "a new, effective monitoring system jointly developed by the U.S. industry working closely with the U.S. government" (USIS 1995b). It remains to be seen whether the auto agreement will serve as a model for circumventing the TRIMs Agreement by "voluntary" commitments or whether it remains a one-time transgression.

What is needed beyond the TRIMs Agreement is a General Agreement on Investment (GAI) the scope of which is not limited to trade-distorting measures. This agreement should guarantee the right of establishment and full national treatment (Lawrence 1996: 29), subject only to exceptions which are clearly and narrowly defined (e.g., national security) and open to judicial review.⁴⁷ Among the issues to be addressed under a GAI should be: Access to government technology-support programmes; state-sanctioned monopolies and other sector-specific reservations; most-favoured nation (MFN) treatment; transparency; barriers to foreign takeovers; performance requirements; investment incentives; restrictive business practices and competition policy; investment protection; access to technology; payments and transfers; movement of key personnel and data; and a dispute settlement mechanism for resolving conflicts not only between governments, but between governments and investors (Graham 1996; Price 1996; Aaron 1995).

Work for a Multilateral Agreement on Investment (MAI) is currently under way in the OECD. This takes account of the fact that most of the issues at stake are less controversial among industrialized countries than with emerging and developing economies. Nevertheless, the aim must be for an agreement under the WTO to complement the GATT and GATS Agreements and covering these countries as well, though initially a WTO agreement may be less far-reaching in scope and commitments than a MAI under the OECD:

In the face of what has been perceived "as inadequate" access to markets due to structural impediments, *effective market access* has become the catchword for triggering (and/or rationalizing) unilateral trade measures aimed at forcing open foreign markets and securing targeted market shares for imported (technology) products, thus circumventing the laborious procedure of negotiating away specific obstacles. This was especially the U.S. approach towards Japan under (the threat of) Section 301 in the cases of semiconductors, flat glass, telecom equipment, medical equipment and, recently, autos and auto parts. The European Community has as yet made little use of its New Commercial Policy Instrument (NCPI) introduced in 1984 and its successor, the Trade Barriers Regulation (TBR). Between 1984 and 1994 only four examination procedures were opened. In one case the EU obtained a favourable GATT

decision, in the three other cases the disputed practices were discontinued without the EU taking retaliatory measures (Beekmann 1995: 59 f.). With access of firms to the new TBR "liberalized" relative to the old NCPI, "it is likely that the use of the instrument will be more frequent in the future" (Beekmann 1995: 75). In the face of effectively closed markets, with no clearly identifiable — and yet quite effective — barriers to entry, taking recourse to market opening instruments such as Section 301 or the Trade Barriers Regulation appears at first sight an appropriate way of approaching the obstacles. The temptation of a unilateral approach is all the greater since experience in the semiconductor and automobile cases, and in cases which were resolved with less publicity under the threat of these instruments, may well lead to the conclusion that this is indeed a successful means of enforcing market access.

Yet there are serious arguments against a "managed trade" approach, especially if applied unilaterally. First, unilateral action undermines the multilateral trading system which is an international public good. Secondly, a unilateral approach lends itself only to countries or trading blocs with a high bargaining leverage, such as the United States and the European Union, with the rest of the world put at a clear disadvantage. It is therefore liable to misuse as an instrument of power politics. Thirdly, because of this there is a strong presumption that any concession achieved will be at the expense of third parties. This is even true if the claimant pretends not to seek preferred treatment over other foreign supplier countries, since the defendant country may not be prepared to open its market for imports generally and may well curtail existing market shares of third parties in favour of the economic superpower involved. Moreover, follow-up measures are discussed bilaterally without the participation of third parties (Zeidler 1995). Fourthly, lack of market access is often due to insufficient own marketing effort. Third-country suppliers which undertook such effort at high cost will find their investment depreciated by the easy access offered to their foreign competitors as a result of government pressure.⁴⁸ Fifthly, more often than not quantitative import targets can only be met through active involvement and commitment of domestic suppliers in the country concerned. This encourages collusive agreements among these firms and furthers the cartelization of the respective market, a result which is counterproductive to economic efficiency.

With the dispute settlement procedure greatly improved as a result of the Uruguay Round, there is therefore a strong case for taking resort to multilateral rather than unilateral action. Article XXIII:1(b), while not yet tested in practice, may offer access to the GATT dispute settlement procedure in cases where a contracting party finds that "any benefit accruing to it directly or indirectly under this Agreement is being nullified or impaired or that the attainment of any objective of the Agreement is being impeded as the result of the application by another contracting party of *any measure, whether or not it conflicts with the provisions of this Agreement*" [own emphasis] ("non-violation clause"). The Articles of Agreement of GATT thus seem to offer a multilateral route to dispute settlement even in cases of "structural" impediments, including private restraints of trade (Ostry 1996: 160 f.). This route should be tested and, if found inadequate, be improved.⁴⁹

b. Technical Norms and Standards

A major issue concerning market access are technical norms and standards. Generally speaking, standards, whether aimed at social objectives like human health and safety (regulatory standards) or at reducing transaction and information costs (compatibility standards), can be considered as welfare enhancing (Hoekman and Mavroides 1995a: 10 f.). Yet, they may also serve as instruments to promote the international competitiveness of national industries, and they may act as barriers to trade and market access. In both cases they give rise to friction. In consideration thereof, in the Tokyo Round the Agreement on Technical Barriers to Trade (TBT) was concluded. In the Uruguay Round this Agreement was revised and strengthened in several respects. The Agreement now applies to all member countries of the WTO rather than to a limited number of signatories only, and it now covers not only the central government bodies but, though with major reservations, local government and non-governmental bodies, too.

In the latter cases the member countries “shall take such reasonable measures as may be available to them to ensure compliance” with the provisions of the Agreement.

The Agreement establishes national treatment and MFN status as the guiding principles. It obliges the member countries to ensure that technical regulations as well as conformity assessment procedures are not prepared, adopted or applied with a view to or with the effect of creating *unnecessary obstacles* to international trade. The key concept of unnecessary obstacles has been clarified to the effect that regulations and procedures shall not be more trade-restrictive than necessary to fulfil a *legitimate objective*, taking account of the risks non-fulfilment would create. Among such legitimate objectives are national security requirements, the prevention of deceptive practices, protection of human health or safety; animal or plant life or health; or the environment. Where relevant international standards exist they shall be used as a basis for national technical regulations, except if this would be ineffective or inappropriate because of “fundamental” climatic, geographical or technological factors. Wherever appropriate, member countries shall specify technical regulations in terms of performance rather than design requirements. The Agreement sets forth provisions for the ex ante and ex post information on technical regulations (“transparency”); equitable procedures for conformity assessment, testing and certification including information requirements, the respectance of confidentiality of information about products; equitable fees; recognition of conformity assessment in other member countries; and consultation and dispute settlement according to the rules of the WTO Understanding.

Standards are set by the government, private standards organisations, and individual enterprises or alliances. There are no clear-cut boundary lines between the three: The — now dropped — European HDTV norm was agreed between the European Community and leading European manufacturers. As major, and sometimes sole, buyers of specific technology products, large state enterprises or monopolies, like railroads, post and telecommunications, and other public utilities, take a decisive influence on the relevant technical standards. Most of the standards are set by the industrial standards organisations. In Europe, eighteen national organisations like DIN in Germany, with about 25,700 standards (1986), Afnor in France (13,400), or BSI in the United Kingdom (9,400) (U.S. Congress 1992: 63), work together in CEN, the Comité Européen de Normalisation, CENELEC, the Comité Européen de Normalisation Electrotechnique, and ETSI, the European Telecommunications Standards Institute, reaching even beyond the European Union. Standard decisions are taken by qualified majority under a system of weighted votes (U.S. Congress 1992: 70). In the United States, the process is more complicated. Approximately 400 organizations, working independently of one another and only part of them coordinating their activities in ANSI, the American National Standards Institute, are involved in standards development (U.S. Congress 1992: 49 ff.). This puts obvious limits to any attempt to arrive at a binding plurilateral standards setting procedure following the European model. On the international level, only seventeen out of 89,000 standards used by the United States in 1989 were adopted from ISO standards; a shortcoming which has been criticized as violating the GATT Standards Code (Dhar 1992: 149 ff.).

In standards enforcement, there are even as many as 44,000 jurisdictions in the United States, resulting in “overlapping responsibility and redundant standards and regulations. In some cases, the products are regulated directly through inspection or testing programmes, or both. In other cases, an approval body may have to certify that products meet standards set by a particular state or municipal government. This becomes a technical barrier in cases where states and municipalities have regulations that apply different standards, or where certification requirements differ.”⁵⁰ When testing organizations even within the U.S. need multiple state and local accreditation, is it conceivable that the principle of home country control be applied in trans-Atlantic (and/or trans-Pacific) trade? In the European Community, this principle (“country-of-origin” principle; mutual recognition of standards and procedures) is a cornerstone of the so-called New Approach to standardisation adopted as part of the Single Market programme. It is coupled, though, with minimal harmonisation of performance requirements and even, where necessary to ensure compatibility and interconnection, of design requirements as well as of testing

and certification procedures. Under the New Transatlantic Marketplace, a key component of the New Transatlantic Agenda endorsed at the U.S.–EU Summit in Madrid on December 3, 1995, the United States and the European Union undertake to work towards agreements recognizing each other's testing and certification of products in a number of sectors, such as computers, telecommunications and business equipment (USIS 1995a: 9; USIS 1995c: 16). This is a first step into the same direction.

In new areas of high-technology, the problem of an international harmonisation of compatibility standards is increasingly being "solved" by standard-setting of leading firms or strategic international alliances which seek to promote their own standards internationally, often in competition with rival groups, by-passing the traditional standards organisations. Among the examples are DOS vs. Apple and OS/2; VHS vs. Betamax and Video 2000; Hi-8 vs. S-VHS; GSM vs. CDMA and PDC (the respective standards for mobile phones in Europe, the U.S. and Japan); etc. While the problem of international compatibility is solved to the extent that a *firm* standard is able to succeed as a new *industry* standard, issues of market power and collusive behaviour, including "fair" access to the "club" for competing firms, may arise. This poses problems for international competition policy.

3. Dumping, Anti-Dumping and Competition Policies

a. Private versus Public Conduct in Trade and Competition

Apart from public obstacles to, and distortions of, high-technology trade and competition, trade-related barriers to market entry raised by private companies become increasingly important. This also means a greater role for competition policies and their international coordination. Existing international trading rules cover private business conduct to the extent that dumping practices are involved. An issue of particular interest in this context is the question as to whether anti-dumping policies should — and could — in future be replaced by genuine competition policies. Competition policy will also have to deal with private business practices which so far are not subject to international disciplines but may equally disrupt international trade and competition. These include various forms of international technological cooperation.

The dumping practices of companies and the anti-dumping policies of governments both lead to conflicts between countries as well as inside the borders. The international conflicts mainly concern producer interests. Foreign dumping causes friction if it hurts domestic industries. However, the policies applied in response to dumping are no less contentious among trading partners if weak domestic industries are protected against efficient foreign competitors. In the national context, friction arises if anti-dumping policies work to the detriment of consumers and user industries.

Defined as selling abroad at prices below "normal value", dumping is assumed to be unfair *per se*, regardless of its overall welfare impact. For protection measures to ensue, it is normally sufficient that dumping is shown to cause "injury" (e.g. sales, employment or profit losses), or threaten to do so, to a domestic industry or retard its establishment. Anti-dumping therefore has become the instrument of choice for industries seeking to reduce competition from imports. In many cases, it is "just ordinary protection with a good public relations programme" (Finger 1995: 29).

In contrast to its actual "capture" by special interests, the economic rationale of anti-dumping policy (and indeed its original design in the United States in 1916 as an international extension of competition law to deal with cross-border violations of anti-trust standards) is based on the existence of protected monopolistic market structures in foreign countries facilitating "predatory" pricing strategies which finally lead to a dominant position of exporting countries on the importer's market. For predatory dumping to take place, the foreign monopolist (or cartel) must not only eliminate existing competition in the importing country, but also be able to prohibit entry by new (domestic and foreign) competitors. He must either establish a global dominance or convince the host government to pursue a policy that

tolerates or supports entry restrictions (Hoekman and Mavroides 1994a). However, even the logical foundation of the argument appears weak. It seems more reasonable to argue that both the predator and the would-be victim would be better off by colluding with one another or by the takeover of the latter by the former rather than going through the evidently expensive procedure of dumping (Tharakan 1994).

In actual fact, cases of successful predatory dumping remain largely undocumented. A recent study for the OECD concludes that "in the overwhelming majority of anti-dumping cases, there was little or no threat to competition in the domestic market" (OECD 1995: 7). This was true in more than 90 per cent of the cases in which the US and EU imposed anti-dumping duties in the 1980s and especially so with high-technology products like semiconductors, compact disc players and plain-paper copiers. In particular, no clear evidence was found that Japanese producers of electronic products applied "monopolising" dumping designed to cripple foreign competitors.

Therefore, international dumping, as defined in anti-dumping regulations, largely appears to be normal competitive business behaviour aimed at expanding foreign market shares or offsetting a sudden fall in demand and exploit economies of scale. It is international price differentiation or "penetration" pricing below average cost (and even below short-run "static" marginal cost, which can be significantly higher than long-run "dynamic" marginal cost) that is consistent with free trade as it boosts competition to the benefit of the domestic economy as a whole. In consequence, the policies to curb "dumping" frequently harm the whole economy, as they pit the interests of a few, if powerful, domestic producers against those of the domestic "many" and foreign competitors. A recent study by the U.S. International Trade Commission (1995) counts the net welfare loss for the United States of the 279 anti-dumping (and countervailing) duties that were in place in 1991 at roughly \$1.6 billion.

Apart from the standard static welfare losses, anti-dumping measures have important dynamic consequences. Other than patent policies which lower static welfare, but do so by increasing the long-run rate of growth, anti-dumping action, by isolating national markets, tends to slow the pace of innovation (and with it growth). It may induce industrial users of the protected product to relocate plants out of the domestic territory, in order to avoid the duty, and in effect widen rather than close existing efficiency gaps between foreign and domestic companies. By indirectly increasing state interference with markets also in the exporting countries, policies may effectively bring about what they are supposed to fight: public protection of a dumper's home market.

Anti-dumping policies are also closely intertwined with other trade-protective measures such as export-restraint arrangements which impair economic welfare as well. Actually, the two forms of intervention have proved to be effective complements, as many anti-dumping cases were superseded by "voluntary" export restraints (VER). The threat of formal action under the antidumping law was the lever to force an exporter to accept a VER. It has also been shown, e.g. in the U.S.-Japan DRAMs case, that anti-dumping measures originally targeted at a limited number of product variants finally extended into an agreement covering the whole range of the respective product group.⁵¹

b. Dumping and Anti-Dumping in High Technology

In high technology, the two basic forms of "dumping", i.e. regional price differentiation and (temporary) pricing below cost, seem to be wide-spread business practices reflecting central characteristics of the sector such as market segmentation, high fixed costs (especially up-front R&D expenditures), decreasing variable costs over time due to learning by doing, first-mover advantages, etc. All this should make high-technology producers particularly vulnerable to anti-dumping measures, and especially so in the early stages of production.

Competition on high-technology markets has also been described as demand-driven product differentiation where the ability of suppliers to accurately forecast consumers' tastes (thereby creating temporary market access barriers subject to quick erosion) counts more than lasting entry deterrence based on an exclusive mastery of the technology at hand.⁵² This proposition is consistent with the

empirical finding of relatively low degrees of supplier concentration on many high-technology markets in the exporting countries pointing towards little leeway for predatory pricing. On balance, there are even more possibilities — and stronger incentives — for a protectionist use of the anti-dumping instrument in high technology than in “ordinary” business. In many cases, calculated dumping margins, and actual duties imposed, are indeed extraordinarily high for high-technology products.⁵³

Even though, in terms of numbers of cases, high-technology products have not been the main target of anti-dumping policies, their incidence is high if measured by product (wide coverage of affected product groups), market (high volumes of sales and trade) and supplier (broad representation of major producers) characteristics. The largest case in the whole EC anti-dumping history, for instance, concerns plain-paper copiers, with imports of \$3.5 billion in 1992. In this case, 20 per cent duties on Japanese photocopiers, originally introduced in 1987, were reimposed (and extended to larger models) in October 1995 for three more years. The decision was reached with a close (8–7) majority in the Council of Ministers which was sufficient only after voting rules were changed (from qualified to simple majority) in March 1994. European imports of Japanese photocopiers have dropped sharply since the introduction of anti-dumping duties, but the market share of Japanese producers has nonetheless increased as many of them have moved production inside the European Union.⁵⁴

Empirical analysis for a number of electronic products (color television sets, compact disc players and plain paper photocopiers) from Japan on which anti-dumping duties were imposed by the United States and the European Community reveals a strong tendency of anti-dumping policies in this sector to protect domestic competitors rather than preserve competition in the long run (see Messerlin and Noguchi 1995). The case studies investigate certain structural characteristics of the respective markets and industries — entry barriers, relative home-market size, concentration ratios, market shares, static and dynamic economies of scale, etc. — that are potentially conducive to predatory or strategic dumping.⁵⁵

Three results of the studies stand out:

First, declining government protection by tariff and non-tariff barriers as well as subsidies contrasts with persisting low import penetration of the examined Japanese markets. Available evidence on private restrictions against import competition, such as incompatible product standards agreed by domestic companies or entry-detering horizontal collusion among suppliers and vertical restraints through exclusive distribution channels etc., is unable to explain the phenomenon. In fact, low degrees of supplier concentration on the respective markets in Japan rather indicate that private entry barriers are moderate. Moreover, a limited number of domestic newcomers and foreign investors have successfully entered the markets considered in the analysis, the existence of interlocking “keiretsu” systems notwithstanding.

Second, factual exclusion of American and European exporters from the investigated Japanese markets has not evidently disadvantaged these companies in international competition. In particular, it has not prevented them from exploiting scale economies in production nor discouraged R&D efforts which for their profitability hinge on the number of units produced. Reliance on OEM (Original Equipment Manufacturing) agreements, for instance, by which firms are allowed to sell products of other companies under their own brand name, permits segment-specific economies of scale to be utilized without constraining the product range of each supplier.

Third, the case studies demonstrate that the recoupment of initial losses (and harvesting of some additional gain) on which the success of any predatory scheme crucially depends is unlikely to happen. An important factor here is (actual or potential) market entry by third-country suppliers, e.g. European firms in the United States, challenging possible dominant positions of potential predators. It is also shown that access to the basic technologies needed is relatively easy, which increases the contestability of the markets in question.

In sum, little evidence on the possible existence of predatory or strategic dumping practices has been found in empirical analysis.

c. The Uruguay Round Approach to Anti-Dumping

The degeneration of anti-dumping measures into protective, selective, anti-competitive and strategic trade policy devices has not been effectively contained in the Uruguay Round. The agreed changes will hardly transform anti-dumping action into competition policy. An attempt was made to correct some of the biases embodied in national anti-dumping regulations and remove the inconsistencies in the procedures used where rules often changed between cases and even methods within cases. However, no standards of competition law were adopted, and a number of highly questionable practices were allowed to continue if they are "appropriately" explained. Of particular relevance for high-technology products in this context are the modifications regarding averaging methods in price comparisons and the treatment of start-up costs.

In certain circumstances, and if appropriately explained, the new anti-dumping agreement allows the national authorities to deviate from the general method of comparing average home prices with average export prices or individual domestic transactions with corresponding individual transactions abroad. Instead, dumping investigators may compare a weighted *average* of domestic prices (omitting, if necessary, low-priced sales outside the "ordinary course of trade") to *individual* export prices if the latter vary significantly among different purchasers, regions or time periods. As this allows high-priced exports to be disregarded in the calculations, it is a sure way of finding dumping in almost every case and particularly so in cases where prices (and models) are as diverse and change as quickly as in high-technology products.

It may be an easy task for policymakers to offer plausible explanations for the chosen calculation method that stand any possible challenge by the affected trading partners with relative ease. Past dispute settlement panels in anti-dumping cases in general used to treat lack of explanation as reason to recommend that an anti-dumping duty be revised, not as reason for it to be removed. With the new general ("integrated") dispute settlement mechanism in place, this could possibly change in future, as panel decisions no longer need the consent of the defending country. However, the specific dispute settlement section of the anti-dumping agreement gives the national determination of dumping margins the benefit of the doubt. It is explicitly recognized that the provisions of the agreement admit more than one permissible interpretation. The panel is only to ask whether the anti-dumping authorities reached their conclusion without explicit error of fact or reasoning. This will make it very difficult for it to reject an explanation that has even the slightest plausibility (see Hindley 1994: 27).

The provisions of the agreement concerning start-up costs or sales below total unit costs (including a "reasonable" profit margin) are equally ambiguous. On the one hand, below-cost sales in the exporter's market have to be eliminated in the determination of the "normal value" if certain conditions are given.⁵⁶ This *raises* the "normal value" and so tends to make the finding of dumping even more likely than before (when elimination was a mere possibility). On the other hand, the agreement for the first time requires non-recurring items of cost (like R&D expenditures), which benefit future production, to be allocated over a longer period of time. In the case of start-up operations the costs at the end of the start-up period are relevant. This should *lower* the calculated normal value and hence *constrain* the finding of dumping. It could be particularly important in cases where in face of low home-country sales (less than 5 per cent of the disputed export sales) constructed values instead of direct price comparisons are used in the determination of dumping margins.

Other modifications of anti-dumping rules agreed in the Uruguay Round are a mixed blessing as well. The 5-year sunset clause according to which anti-dumping measures automatically expire after five years was adopted from existing EU legislation. However, its value appears to be limited: (1) not only is it possible to extend the limit (and this is actually happening as recently shown in the EU-Japan copier case noted above) but (2) the limit has also apparently not prevented European anti-dumping enforcement to be as biased as U.S. practices. For similar reasons, the new "de minimis" provision which requires the immediate termination of an anti-dumping investigation when the margin of dumping is less

than 2 per cent of the export price, or the volume of dumped imports less than 3 per cent of the respective total imports, seems unlikely to contain harassment of exporters in an effective way.

At the same time, the more elaborate requirements for an anti-dumping investigation to be initiated after application may effectively lengthen the period of uncertainty about trading conditions, and thus discourage imports, since there is no time limit in the pre-initiation phase as compared to the subsequent stages. With regard to the determination of injury and the causal link between dumping and injury, the new agreement provides little change over the preceding anti-dumping code of the Tokyo Round and so allows considerable scope for arbitrary decision making (e.g. in the definition of "injured" domestic industries which may *include* or *exclude* foreign subsidiaries) to continue.

By and large, the substantive and procedural conditions imposed by the new anti-dumping agreement on policies in this area appear in themselves unable to effect substantial change. Part of the improvements reached have also been eroded in national implementation legislation reflecting the political power of protection-seeking interests. Apparently, even the smallest content of ambiguity of any word has been intensely exploited, so amending anti-dumping procedures has been depicted as an activity with a productivity close to Sisyphus's, as new provisions seem to be deviated from their initial purpose at a more rapid pace than they were introduced (Messerlin 1995: 12). However, anti-dumping rules and practices remain far removed from the standards of sound competition policy which they were originally supposed to supplement at the international level. Disciplining anti-dumping policies should therefore rank high among the market access issues on the post-Uruguay Round trade agenda.

d. Reforming Anti-Dumping Policy

The first-best solution, from an intervention-theoretic point of view, would be to substitute competition rules and procedures, either harmonized and coordinated among nation-states or truly globalized, for existing anti-dumping laws. This would allow the removal of distortions, such as abuse of a dominant market position in the exporting country, at the source rather than merely compensating for them. However, this is a long-term perspective at best, unlikely to materialize in the near future. It sharply contrasts with political realities which are characterized by a proliferation of anti-dumping regulations and unwillingness of the most prominent user countries and regions (the United States and the European Union) to dispense with an expedient instrument of trade policy. Protection-seeking interests would have to be accommodated in one form or another anyway which would leave little net value of abolishing anti-dumping measures.

The prevailing political view is of raising international standards in the area of competition law, thus reducing the need to invoke the anti-dumping law, i.e. competition laws working effectively alongside the anti-dumping law without substituting for it. In fact, there have been only a few cases of anti-dumping policies superseded by competition policies. Apart from the European Union, these are the European Economic Area and, to a lesser extent, the Australian–New Zealand Closer Economic Relations Trade Agreement.

In face of the widely perceived political need to retain the anti-dumping option in trade policy, reforming policy in this area could proceed on four tracks:

- Removal of trade and investment barriers in the exporting (and importing) countries.
- Ad hoc review of the state of competition (actual and potential) on the exporting-country markets and of existing public barriers to entry (and presence) by foreign competitors.
- "Importing" competition-policy standards into anti-dumping legislation and raising the legal standing of consumer and industrial-user interests in the investigations.
- Developing international competition rules.

The *first* track involves ongoing liberalization of trade on a reciprocal basis, including the removal of remaining tariff, non-tariff and regulatory barriers to market access raised by governments, as well as

the negotiation of an international investment agreement that guarantees foreign companies freedom of establishment and national treatment in host countries. This will significantly change the environment for predatory behaviour and make it even less likely to happen. By the same token, it weakens the legitimization bases of anti-dumping policies. However, as international negotiations on broadly based liberalization and deregulation take time, no quick impact on dumping practices and anti-dumping measures can be expected.

A more immediate impact would have a multilateral agreement, as proposed by Hoekman and Mavroides (1994a), providing for an examination (preferably by competition authorities) of market characteristics (including private and public entry barriers) in the exporting country to precede any anti-dumping investigation. The policy objective in this *second* track would be to establish whether the structural preconditions for economically harmful (i.e. reducing the importing country's welfare) dumping strategies are given or not. An anti-dumping petition would consequently have to be turned down from the outset, irrespective of the existence of dumping, if (1) the competition agency in the exporting country should find the accused firms neither engaged in anti-competitive practices nor benefitting from government-created or supported market access barriers against foreign companies, and (2) the corresponding authorities of the importing country agree with the finding.

In the *third* track competition aspects are considered after an anti-dumping investigation has been launched. The focus now shifts from the exporting to the importing country market where the quality of the injury inflicted on domestic industries through foreign dumping apparently varies depending on the state of competition. On highly concentrated markets with high entry barriers, for instance, "injury" often means a reduction of non-competitive excess returns. "Dumping" would correspondingly work to "disrupt" monopolistic market structures to the benefit of other domestic agents and enhance general welfare.⁵⁷ The injury test in anti-dumping laws should accordingly be redesigned and expanded so as to more comprehensively include the interests of consumers and industrial users and review the state of competition on the domestic markets concerned. It could possibly also include an examination of whether anti-dumping duties would help domestic industries to compete more effectively.

A more competition-oriented approach to anti-dumping cases could involve the adoption of competition policy concepts like the "relevant market" and "critical degrees of concentration" in anti-dumping investigations, in order to correct the biases inherent in current anti-dumping concepts such as "like product" and "major proportion of the domestic industry". Defining quantified "thresholds" (comparable to the "tariffication" process in the Uruguay Round) would facilitate multilateral negotiations in this area. In addition to these re-interpretations of existing anti-dumping provisions, the appeals system in anti-dumping cases could be substantially improved. As proposed by Messerlin (1995: 13), an anti-dumping case could have to be passed from anti-dumping authorities to anti-trust agencies, e.g. from DG I to DG IV in the European Commission or to the cartel offices in individual EU member states, should a court ruling repeal the case for the formers' neglect of competition aspects. In sum, to the three elements of an anti-dumping investigation (unfair trade, injury and causal link between the two) a fourth element — competition analysis — would be added (see also Vandenbussche 1995). It would be a logical complement to the pre-test of competition on the exporting-country market noted above.

The *fourth* track entails the codification of international competition rules. This would contribute importantly to an eventual elimination of anti-dumping policies. Their final replacement by competition policies is feasible, though, only with a high standard of integration between countries. This would require realization of the "four freedoms" (i.e. complete liberalization of trade in goods, services, labour and capital) plus agreement on common disciplines for, or mutual recognition of, certain policies and regulations regarding in particular subsidies, government procurement, technical standardization, services and, for that matter, competition. Removing the anti-dumping instrument accordingly seems to be possible in the foreseeable future only for limited numbers of countries and typically in a regional context. This, again, bears chances as well as risks, since increased competition — and related adjustment pressures — inside the "club" might provoke compensatory anti-dumping action against outsiders.

e. Towards Multilateral Competition Rules

International coordination, or harmonisation, of competition policies may not only help to contain dumping practices, and counter-productive anti-dumping policies, but also prevent anti-competitive business conduct in international trade in general. This may essentially take three forms:

- Exclusion of foreign suppliers from domestic markets by the exercise of horizontal market power through collusive behaviour or vertical restraints of competition such as exclusive dealerships between companies of one country. This may effectively — and asymmetrically — thwart the liberalization of trade negotiated by governments.
- Formation of export cartels among a country's firms and similar action to inhibit foreign competitors on international markets with the ultimate effect of significantly raising international prices. With asymmetric incidence of private trade barriers between countries, trading partners may even suffer net losses from "public" liberalization in this case.
- Restraint of competition between companies from different countries in the form of strategic alliances (frequently of a technological nature), cartels, mergers and acquisitions in particular. Again, this could impair the benefits of liberalization. However, in the majority of cases, international cooperation among firms seems to stimulate rather than reduce competition on national markets as these become increasingly global in the course of trade liberalization.

Against this background, international policy-making in the field of competition faces two major challenges:

- (1) Adjusting existing rules and procedures in national competition policies — or building them from scratch — and monitor their implementation, so as to remove — and prevent — trade-restrictive and mercantilistic biases in competition policy. In particular, strict enforcement of the agreed provisions would have to be guaranteed and export cartels prohibited if they go beyond a mere sharing of expertise and services in supplying foreign markets. Export cartels may also be conducive to collusive behaviour on domestic markets.
- (2) Devising principles — and practical guidelines — for the international cooperation among national agencies responsible for competition policy in order to resolve conflicts that may arise when private restraints of competition simultaneously affect a number of national markets. Such conflicts are likely to occur also if competition laws — and the weight given to competition as compared to other policy aims — are largely identical between the countries concerned. This is so because in many cases the impact of the anti-competitive practices will vary from country to country.⁵⁸ In the final analysis, international action may require a supranational authority to coordinate the collection of information, and to apply any sanctions to the firm or firms involved (see Hay 1995).

In general, greater market interpenetration due to the integration of national markets has resulted in the need for competition policies to adjust to different circumstances of international competition (see Lloyd and Sampson 1995: 686). More specifically, and with particular relevance to high-technology, an important rationale, denoted by Soete (1995: 15), for international competition policy aimed at counter-acting the emergence of world-wide cartels between global firms could be to challenge national strategic policies based on arguments of dependence on "foreign" monopoly pricing. Other reasons for specific (national as well as international) anti-trust concerns in high-technology refer to (1) *network externalities* (e.g. in computer software) which could bias industries towards monopoly as the value placed on network membership by a consumer rises with the number of other people on the network; (2) *systems leverage* by which a firm that controls one part of a system may spread its monopoly into others through, e.g., cross-subsidization;⁵⁹ (3) *standardization* which may lend individual firms, and groups of companies, considerable market power as consumers and user firms get "locked in" into the

system and entry barriers, through costs of “switching” systems, are raised; and (4) *innovation cartels* inhibiting the innovation process proper (by reducing the number of innovative efforts) and possibly “spilling over” into other fields of activities such as production and marketing.⁶⁰

The actual development of international competition rules is still in its infancy. It could be advanced through “case law” built into dispute settlement procedures based on existing GATT provisions. Of particular interest in this context is the *non-violation* clause of GATT Article XXIII:1(b) designed to address the concern of GATT members relating to a modification of negotiated concessions through subsequent government action in areas that were either not addressed by the GATT or did not violate a GATT obligation. An example could be an exemption by the competent anti-trust authorities granted to private enterprises that effectively reduces market access opportunities for products of third countries by establishing difficult-to-penetrate distribution channels.⁶¹ In conjunction with a significantly strengthened dispute settlement procedure, non-violation complaints could therefore lead to the opening of foreign markets closed by private restrictive practices. However, the wording of the clause is too general, and its reach too limited, for it to serve as a solid base for an effective international competition policy. Its “structural” weakness is, by definition, not based on explicit provisions concerning anti-competitive business conduct in international trade (with the exception of dumping).

This is different with the *Draft International Antitrust Code (DIAC)* proposed by an international group of legal experts.⁶² The Draft Code provides for minimum standards to be observed by the anti-trust authorities in the participating countries (which must not include all WTO members as the DIAC is designed as a *plurilateral* GATT-WTO agreement) in dealing with private restraints of competition that affect international trade flows. The practices covered range from the formation of international cartels to the abuse of dominant market positions and from horizontal to vertical restraint. An international competition agency, equipped with the right of an *International Procedural Initiative*, would be entrusted to safeguard the application of the national law in cases where an inactive member state would not take its own initiative; if necessary, it could sue in the national courts to ensure application. Conflicts arising from impacts in one country of competitive restraints originating in an other would be addressed taking advantage of the new WTO dispute settlement procedure. Even though this proposal as a whole is fraught with a number of difficulties regarding its practical implementation and enforcement as well as inevitable losses of national sovereignty,⁶³ it seems in principle to be well suited to meet the challenges noted above, including the specific anti-trust issues related to high technology. It could effectively flank the international trading order with an international competition regime.

Endnotes

- 1 We use these terms interchangeably in the following paragraphs, with both terms describing a government policy that grants support to a (specific) high-tech industry.
- 2 A standard undergraduate textbook on international trade — Krugman and Obstfeld (1994: 278–281) — does an excellent job in refuting some common errors and misapprehensions.
- 3 For a summary evaluation of the policy relevance of the new growth theories, see also Rivera-Batiz (1996), Baldwin (1996), and Soete (1995).
- 4 A detailed survey of results is given by Stolpe (1995: 41–47).
- 5 This (pecuniary) externality is a typical result of models of (Schumpeterian) creative destruction as pioneered by Aghion and Howitt (1992: 323–351).
- 6 See, e.g., the classical statement by Corden (1974: 257–264).
- 7 See also, most recently, Cohen and Chin (1995).
- 8 On Japanese industrial policies in the relevant periods, see Yamamura (1986).
- 9 An econometric step in this direction has been made by Stolpe (1995: Chapters D and E).
- 10 For a more extensive survey, see Paqué (1995).
- 11 This is also the conclusion of the most comprehensive survey of this literature to date (see Griliches 1992).
- 12 See Bresnahan and Trajtenberg (1992) and Helpman and Trajtenberg (1994), who provide a rigorous analysis of the link between economic growth and the expansion of what they call “general purpose technologies”, i.e. technologies that are “extremely pervasive” in the sense of being used as inputs by a wide range of sectors of an economy.
- 13 Strictly speaking, it is an “adjusted” product price that is used: Irwin and Klenow (1994a: 1212–1213) assume Cournot-competition and adjust the price accordingly, thus taking account of changing monopolistic mark-ups over the product cycle.
- 14 Dynamic Random Access Memory Chips.
- 15 On the genesis and the details of the American–Japanese semiconductor agreement, see Irwin (1994: 69–71), for a summary of opinions, Maitland (1995: 88–89).
- 16 Irwin and Klenow (1994b) speak of support for the “sharing hypothesis” against the “commitment hypothesis”.
- 17 See, i.a., the assessment in *The Economist* of April 2nd 1994, “Uncle Sam’s Helping Hand” (pp. 91–93).
- 18 It is most unfortunate that no methodologically comparable studies are available for evaluating specific technology policies of other countries, notably those of Japan and the European Union. This is so because, to our knowledge, no data are available that would allow to set up control groups of firms that are not covered by the relevant policy and to quantify the effect of government intervention against this background. Thus the many available accounts of European technology policy — e.g. Klodt (1987), Klodt et al. (1988) and, more recently, Klodt and Stehn et al. (1992: 98–114, 152–160) — have to remain largely descriptive and interpretative.
- 19 A methodologically comparable study that focuses, however, on spillovers from rich to poor countries is Coe et al. (1995).
- 20 See Jaffe et al. (1993: 580–585). The main methodological problem is to separate genuine spillovers from correlations that are due to a pre-existing pattern of geographic concentration of technology-relevant activities.
- 21 Note, however, that — by not specifying any proxy variable for the state of “knowledge” — the methodology used by Glaeser et al. (1992) may be subject to the criticism that it does not allow to discriminate between technological externalities and mere pecuniary externalities, which work through the price mechanism and do less easily qualify as a rationale for technology policy. — The same problem plagues another strand of research which tries to identify intersectoral external effects by examining the input-output relationships between industries and estimating to what extent the productivity in one industry is affected by output changes in other industries. By this token, Caballero and Lyons (1992) find sizeable externalities, but it remains unclear of what kind. — On these methodological problems in detail, see Stolpe (1995: 51–54).
- 22 A methodologically comparable analysis of the market for small-sized aircraft is provided by Baldwin and Flam (1989).
- 23 On the specific methodological problems in this field of empirical research, see Krugman’s Introduction in Krugman and Smith (1994: 4–5).
- 24 Note, however, that this result holds only if Boeing had in fact become a monopoly without the subsidised market entry of Airbus. Yet this is an open question because Boeing’s inner-American competitor McDonnell Douglas might have remained in the market in this case. A model calibration by Klepper (1990, 1994), which explicitly puts the actual Airbus entry against a duopoly with equal market shares of Boeing and McDonnell Douglas, yields the counterintuitive result that a duopoly Boeing/Airbus leaves Boeing with *higher* profits than the duopoly Boeing/McDonnell Douglas because the latter involves more equal market shares and thus forces Boeing further up the average cost curve. Whatever one may think of this peculiar result — it depends crucially on the imputed market share of McDonnell Douglas, which is purely speculative — the Airbus venture does lose its anti-monopoly rationale once it is assumed that there is no monopoly in the counterfactual scenario anyway.

- 25 See, e.g., *The Economist* of May 20th, 1995, "Schrempp Cocktail" (p. 70), and of November 18th, 1995, "A Tale of Two Conglomerates" (p. 20) and "Dismantling Daimler" (p. 79).
- 26 This is an almost commonplace conclusion among economists. See, e.g., the policy conclusions by one of the main advocates of endogenous growth theory: Grossman (1990: 117–119).
- 27 The history of SEMATEC is telling in this respect. See *The Economist* of April 2nd, 1994, "Uncle Sam's Helping Hand" (p. 93).
- 28 For details, see Stolpe (1993: 369–370).
- 29 This chapter is based on Stehn (1996).
- 30 It has been calculated that almost 1/3 of all subsidies to Airbus industries can be characterized as production subsidies. See Bletschacher and Klodt (1992: 64–66).
- 31 "... subsidies contingent, whether solely or as one of several other conditions, upon the use of domestic over imported goods." (WTO Subsidies Agreement, Article 3.1.).
- 32 According to the WTO Subsidies Agreement, both "yellow light" and "red light" subsidies are actionable. The main difference between these two groups is that "red light" subsidies can — as a general rule — be countervailed by a foreign government without a proof of material injury.
- 33 See Tyson (1992: 280–286) for a detailed evaluation of the Tokyo Round subsidy regulations.
- 34 See Stehn (1993: 43–60) for an evaluation of the European aid supervision system.
- 35 Currently, only "green light" subsidies have to be notified to the CSCM.
- 36 In an extreme case, this could lead to a free-rider problem in promoting private R&D. However, with a view to the fact that the number of players in the high-tech game is rather small, this seems to be very unlikely.
- 37 See Messerlin (1994). Figures of this kind do of course depend on the underlying definition of what is considered as public sector procurement. This concerns in particular the procurement policy of government owned firms and the procurement policy of firms operating in markets that are heavily regulated by government (such as utilities).
- 38 Government procurement had been previously exempted from GATT regulations (Art. III (8) GATT).
- 39 The other two agreements are the Arrangement Regarding Bovine Meat and the International Dairy Arrangement. A fourth plurilateral agreement under the umbrella of the WTO, the agreement on Trade in Civil Aircraft, was not changed at the end of the Uruguay Round and remained open to signature only in its already existing form. Parties of the GPA are at present Canada, the fifteen member states of the European Union, Norway, Switzerland, Japan, the United States, Israel and South Korea. Singapore was a signatory of the Tokyo Code, but opted out this time. In turn, South Korea entered the club as a new member.
- 40 See Schott (1994), OECD (1994) and Ostry and Nelson (1995).
- 41 Note that the public procurement regulation of the European Union which in many instances seems to have served as an example for the WTO procurement regulation, does not contain exemptions by "public entities" or "items" except for the general exemption of defence procurement.
- 42 For instance, in the case of the United States, many of the obligations under this treaty are limited to a rather small number of states.
- 43 In addition, the WTO dispute settlement procedures are open to such cases and can also be used. There are, however, significant differences between these two routes of appeal against discriminatory treatment by particular national "public entities". To be successful in a WTO dispute settlement procedure, the claimant (the government of the affected firm) must provide evidence that its previously granted trade concessions were impeded in the case in question.
- 44 Here are selected articles of the GPA with some relevance to the issue of maintaining club discipline: Art. VI defines rules for technical specifications of the items included in a tender; Art. VII regulates the choice among possible tendering procedures; Art. VIII is concerned with qualification requirements for tenderers; the invitation procedures to participate in a tender are circumscribed in Art. IX; the selection procedure is outlined in Art. X; prescriptions on time schedules are given in Art. XI, on necessary documentations in Art. XII; submission procedures are regulated in Art. XIII; Article XIV to XVIII are primarily concerned with other technicalities of the tendering process; finally, Art. XIX requires that the parties concerned have to collect annual statistics and to provide these statistics to the Committee on Government Procurement at the WTO — which by the way can be considered as the "nucleus" of a future supervision board in this area the creation of which is considered necessary by many experts (see Ostry 1996).
- 45 See also Laffont and Tirole (1991).
- 46 The percentage of tariff lines bound has been increased from 78 to 99 per cent in developed economies, and from 22 to 72 per cent in developing economies (GATT 1994).
- 47 See Graham (1996). The authority granted to the U.S. president under the Exxon-Florio amendment to block the takeover of a U.S. enterprise by a foreign investor in the case of an "Impairment of national security" is much too general, and it is not subject to court challenges.
- 48 For instance, U.S. car manufacturers "estimate" that under the U.S.–Japan Auto Agreement of 1995 Japan will increase its imports of Big Three U.S.-made vehicles from 45,000 in 1994 to 160,000 by 1998. This "estimate" is the basis for the monitoring of the Agreement. A similar "goal" is the establishment of 200 new dealerships in Japan by

- 1996 and 1,000 by the year 2000 which is based on access to dealership networks of Japanese auto manufacturers (USIS 1995b: 11).
- 49 As Ostry (1996: 161) remarks, "The 1995 auto dispute between the United States and Japan was a lost opportunity to launch that process."
 - 50 Department of Foreign Affairs and International Trade (1994: 11 f.) quoted in Ostry and Nelson (1995: 94, footnote 15).
 - 51 In fact, the DRAMs under anti-dumping measures represented only 7 per cent of the whole semiconductor sector. See Messerlin (1995: 7–8).
 - 52 Messerlin points to the general availability of basic technologies which is in most cases also suggested by the fact that many complainants in U.S. and EC anti-dumping cases involving high-technology products were the technological leaders of the product a couple of years before lodging the complaints. See Messerlin (1995: 4).
 - 53 For instance, in the U.S. EPROMs case, the calculated dumping margins ranged from 60 to 188 per cent, in the EC DRAMs case from 8 to 378 per cent. See Messerlin (1995: 9).
 - 54 See *Financial Times*, October 19, 1995 (Jonquières, G. de, E. Tucker, "Pressure Grows for EU to Overhaul Dumping Policy") and September 15 (Tucker, E., "EU Split over Dumping Duties on Japanese Copiers").
 - 55 Predatory dumping refers to low-priced exporting with the intention of driving rivals out of business in order to obtain monopoly power in the importing market, whereas strategic dumping describes exporting that injures domestic rivals through an overall strategy or general circumstances of the exporting nation that encompasses both the pricing of the exports as well as restraints protecting the exporters' home market. See Willig (1995: 6 f.).
 - 56 Below-cost sales must occur over an extended period of time (normally one year), in substantial quantities (at least 20 per cent of the total sales under consideration) and "at prices which do not provide for the recovery of all costs within a reasonable period of time" (Article 2 of the Agreement on Implementation of Article VI of GATT 1994).
 - 57 For example, Tharakan finds most of the EU anti-dumping impositions to have taken place in favour of industries which have a high degree of concentration in the European Union. He concludes that the lobbying power of oligopolistic industries is effectively used by them to obtain protection from import competition through anti-dumping measures. See Tharakan (1994: 565).
 - 58 With markets becoming increasingly global, international anti-trust frictions of this kind should, however, tend to diminish. See Jungnickel and Koopmann (1993: 44–45).
 - 59 For instance, Microsoft, the leading computer-software firm, has been accused of using profits from the operating-system market to subsidize applications programmes. See "Thoroughly Modern Monopoly" in *The Economist*, July 8, 1995, p. 92.
 - 60 However, empirical evidence on competitive restraints involved in, and flowing from, technological cooperation is scarce. A possible loss of variety seems to be more than compensated for by substantial economies of scale and gains in efficiency. For an overview of trends in (national and international) technological partnering see Hagedoorn (1996: 173 ff.).
 - 61 See Hoekman and Mavroides (1994a: 20). A comprehensive discussion of non-violation in the competition context is given in Hoekman and Mavroides (1994b).
 - 62 For the text and a detailed explication see Fikentscher (1994).
 - 63 Klodt, regarding the proposed *minimum* standards rather as *maximum* standards, points to the particular problems of establishing an international merger control as well as rules for the control of an abuse of market power. See Klodt (1995: 560).

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