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Summary. The role of government in fostering "Competitiveness" is a major issue in recent industrial public policy debates.[1] In fact, the increased politicization of international business represents one of the most significant changes in business-government relations over the last two decades.[2] During this same time period, we also observe an enormous increase among multinational enterprises in their useage of interfirm partnerships and cooperative strategies in core technologies. This paper evaluates the increasingly important role of government public policy and the interdependencies between governments, technological innovations and the theory of international production. The analysis is guided by the underlying theme of applying heuristically the economic theory of clubs to the theory of international production.

1. Introduction

This paper explores the increasingly important role of government public policy towards international business and the extent to which technological competitiveness depends upon the structure of the international industry and the strategies of multinational enterprises (MNEs). A range of issues are addressed which pertain directly to the interdependence between the theory of international production and the formation of technology clubs. This preliminary analysis is guided by the underlying theme of applying the economic theory of clubs to international production and technological innovation.

The world's leading multinational enterprises are a rather select group. Entry into this club is difficult, although not impossible as the emergence of the Japanese and Korean multinational enterprises has demonstrated. Large teams of researchers combined with well-established international marketing networks serve as barriers to entry. As a result, the list of the world's largest enterprises has changed only marginally in recent years. There has

[1] See especially the recent entertaining exchange of arguments put forth by the debate opened by Krugman (1994) in the March/April edition of Foreign Affairs and the respective replies in the July/August edition of the same journal. Further, confer Dunning (1990), Cantwell and Dunning (1991), Gugler and Dunning (1992), Porter (1990), Krugman (1987), Reich (1991), Sawyser (1992). For a discussion of the debate within the German language literature see Straubhaar (1994), Mieth (1995) and Vosgerau (1995).

[2] For a recent review of the literature concerning multinational-government relations see Brewer (1992).

been, however, a great deal of change in the relative standing of these major enterprises.

We begin with a discussion of free trade, competitiveness and the role of governments in international markets in fostering or hindering the pace of innovation in Section 2. A brief introduction on the basic lines of reasoning on economic club theory is then presented in Section 3, followed by an application to international production and technology clubs in Section 4. Section 5 then raises the important issue of the locus of regulatory authority as expressed in the debate on global federalism versus centralized decision making. Finally, some preliminary conclusions are drawn in Section 6.

2. Free Trade, Competitiveness and the Role of Governments in International Markets

The concept of worldwide free trade based upon competitive advantage is one of the oldest and most commonly acknowledged economic theorems (Broll (1993), Baldwin (1992), and Haberler (1990)). Unfortunately, however, the protectionism versus free trade and capital movements debate was won only, in principle, by free traders; in practice, the real winners may well be the protectionists. Although governments publicly commit themselves to free trade they continue to maintain or create new barriers to the movements of goods, people, capital, and technology (Behrman and Grosse (1990)). Consequently, protectionism adversely reigns. However, attempts to establish a level playing field through the international coordination of competitive public policies may well indeed serve to be a possible substitute for trade policy (Vosgerau (1993)).

The role of government in fostering "competitiveness" is still a major political issue in today's ongoing industrial public policy debates. Can and should governments attempt to assist in obtaining national competitive comparative advantage via industrial policies? In fact, the increased politicization of international business represents one of the most significant changes in business - government relations over the last two decades. Due to the high degree of mobility of international enterprise production, strong impacts upon relative competitive positions of nations are being perceived as a matter of great governmental concern. No nation wishes to lose the global technology race. Since the mid-1970s, there has been a rapid acceleration of two mutually reinforcing trends - the convergence in technical capabilities of industrialized nations and the global integration of formerly discrete national technical enterprises (Gugler and Dunning (1992)).

Although the concept of "competitiveness" is a very elusive concept, current research on the determinants of international competitiveness (e.g. Porter (1990), Enderwick and Barber (1992, p. 269)) has brought about three main findings. First, in an era of global competition the nation state has become more, not less, important. Second, there is a growing recognition that

competitive advantage is most effective when it is created rather than based on natural comparative advantage. Competitive differences depend mainly on elements of technology leadership and product differentiation of MNEs rather than natural comparative advantage. "Technology is not a natural resource; it has to be created (Cantwell and Dunning (1991, p. 62))." This implies a strong role for governments to play in supporting the development of technological capacity. Governments need to reaccess their industrial and technological policies in the light of the actitivities of MNEs. Third, the main determinant of competitive advantage is skilled labor and investments in research and developement (for the U.K case see Webster and Gilroy (1995)).

The basic insight to a fuller understanding of the current situation is that "governments are not elected to turn major decisions over to private corporations and certainly not to foreigners. The continued urging that the world's governments should avoid interferences in international business simply misunderstands the nature and purpose of government - which is to promote and protect national interests (Behrman and Grosse (1990, p. 1)." This is commonly expressed by the fact that the goal of the majority of domestic competitive policies is usually the egoistic improvement of the sovereign national position at the cost of the foreign position (Vosgerau (1995, p. 106)).

Global integration of increasing production levels of multinational enterprises has brought forth intensive competition and efficiency gains among national economies and their emerging industrial structures. The difficult distributional question remains, however, how these benefits should be distributed in an interdependent world. Neo-mercantilistic pressures are on the rise. More than one third of world trade now occurs in regional trading arrangements such as the U.S. - Canada Free Trade Agreement and the EU internal market. Dividing the world into four trade zones - North America, the EU, Asia-Pacific and the Rest - trade between these zones amounted to $1.6 trillon in 1989, whereas trade between countries within the zones was $1.5 trillion (The Economist, Dec. 8, 1990, p. 15). Dunning (1990, p. 25) registers that approximately eighty percent of the activities of multinationals are currently within the three trading blocs - North America, Western Europe, and Japan. Further, he notes that multinational enterprises account for more than three-quarters of the world trade in goods and services. To a growing extent this is due to an increasing rise in the amount of intra-firm trade between related affiliates of MNEs (Gilroy (1989), (1992), Broll (1995)).

Parallel to the increasing politicization of the international production and government interface we observe an enormous increase among multinational enterprises in their useage of interfirm partnerships and cooperative strategies in core technologies. A "new" model of internalization based upon technology-oriented competition among nations has emerged, founded upon rapid growth of non-U.S. FDI and a proliferation of MNE alliances (Gilroy, (1993)). The blurring of enterprise nationalities and the lack of internationally accepted rules of behavior for MNEs and their home and host governments

have complicated matters. Basically, the present scenario may be fully integrated in a dynamic version of the eclectic paradigm of international production as recently put forth by Gugler and Dunning (1992) or Rugman and Verbeke (1992). To a large extent, the technical and economic vitality of today's nations now rests upon the ability of MNE operating within their boarders to harness and exploit globally dispersed resources and technical capabilities rapidly and effectively (Cantwell and Dunning (1991), Gugler and Dunning (1992)). The firm may be conceived as a portfolio of core competencies such that inter-firm competition is fundamentally concerned with the acquisition of skills. Global competition may thus be viewed simply as a relative reflection of an enterprise's core function, i.e. the pace, efficiency, and extent of knowledge accumulation (Hamel (1991, p. 83)). Put in the terminology of Dunning's Ownership, Location, Internalization (OLI) theory of international production "...the present global environment requires firms to develop dual sets of FSAs (firm specific assets). These are the non-location-bound FSAs, required to reap economies of integration, plus location-bound FSAs, required to successfully adapt to location-specific requirements (Rugman and Verbeke (1992, p. 198))." Also, it needs to be increasingly recognized that issues of technology adoption, adaptation, and diffusion are of equally critical importance to national economic growth and international competitiveness. There is a rising need for a stronger public role in support of generic technologies and the establishment of credible mechanisms for translating this commitment in principle into specific actions that result in the commercialization of such technologies.

Could it be that the observed increased useage of collaborative arrangements among the world's multinational enterprises serve to internalize the political distortions of todays multilateral trading system under the reigns of GATT and the WTO? Multinational enterprises are responding with "political" collaborative strategies in addition to their economic strategies of global expansion. Complementary to enterprise joint efforts, governments are becoming increasingly willing to support and promote such collaborations (outside of the existing multilateral trade arrangements) to create technology clubs as exemplified by the European technology initiatives JESSE, ESPRIT, RACE, BRITE, EUREKA or Airbus Industry. In America, similar consortia have emerged since the passage of the National Cooperation Research Act in 1984. The Microelectronics and Computer Technology (MCC) and Semiconductor Manufacturing Technology (SEMATECH), both based in Austin, Texas, are the two most publicized examples. MCC consists of 21 enterprises collaborating in areas of advanced computer technology, computer-aided design, semiconductor packaging/interconnect, software technology, and superconductivity based upon an annual research budget of $65 million (Gibbson and Rogers (1988), Auster (1990)). Founded in 1987, SEMATECH consists of 14 American enterprises in an attempt to gain back market shares from the Japanese in the dynamic random-access memory market. Both MCC and

SEMATECH are illustrative of the new industrial boundaries being created due to collective goal setting between governments and industry in pursuit of global market shares (Auster (1990)). As Dunning (1990, p. 26) noted, "the interesting thing, and apparent paradox about movement towards the globalization of production, is that it is occuring as economies converge in their industrial structures."[3]

To this statement may be added that as industrial structures converge internationally research parity will be increasingly observed, due largely to decreasing returns to scale of research and development: when you exert more effort (expressed through rising costs), the benefits derived become exceedingly smaller.

3. A Brief Primer On Club Theory

The beginnings of an economic theory of clubs can be traced back to the works of A.C. Pigou (1920) and Frank Knight (1924) in their analyses on tolls on congested roads. Modern analysis of club theory based upon cost-sharing rationale originates in Tiebout (1956) and Wiseman (1957). Tiebout's "voting with the feet" hypothesis illustrates how jurisdictional size of local governments could be determined by voluntary mobility (or membership) decisions. Wiseman (1957) demonstrates the club principle for sharing costs among users of a public utility. However, the two most influential works on club theory are Olson (1965) and Buchanan (1965). Olson suggested that clubs might originate to exploit economies of scale and to share public goods. According to Olson (1965, p. 37), club analysis could be applied to consider the determination of industry size since the entry of a firm into an industry causes a market thinning (congestion) effect in the form of reduced sales to other competitors. Buchanan derived the first analytical statement of the optimal marginal club provision and membership conditions for sharing impure public goods.

The optimal provision condition for the shared good indicates that for each club member the marginal rate of substitution between the club good and the private must be equated to the marginal rate of transformation between these two goods. Thus, for a club good, members equate their marginal benefit with their marginal costs. The novel aspect of club theory emerges in the membership condition (i.e. the form of the congestion function). For "within-club" optimality a representative member equates the marginal rate of substitution between group size and the private good, thereby achieving an equality between marginal benefits and marginal costs from having another club member. These marginal benefits are usually negative after some

[3] The question of convergence is now also at the center of the theoretical and empirical discussions of the endogeneous growth literature (compare e.g. Barro and Sala-I-Martin (1995)).

threshold due to crowding effects (thinning of the market), and the corresponding marginal costs are negative owing to cost reductions derived from cost sharing.

In the basic club theory model the provision and membership conditions must be simultaneously determined and utility (profit) is maximized for the representative member implying that average net benefits are maximized. Ignoring nonmembers, such a within-club viewpoint may result in pareto optimality given that the club is replicable and the entire population can be partitioned into a set of clubs without omitting anyone. When this occurs, maximizing average net benefits is the same as maximizing total net benefits of each and every club.

The above general principles of the basic club model have been extended to include mixed member clubs with members drawn from a heterogeneous population, to include the partitioning issue in more detail, and to include the issue of discrimination. The discriminatory club model suggests that utilization and membership conditions change as members consume a club package consisting of the shared good and the member's characteristics. Once again, a member utilizes the club until the individual marginal benefits derived from the club package are equivalent to to the corresponding marginal costs (or value) that the club experiences from the members utilization. Now different members will be required to contribute to the financing of the club according to their different attributes. The membership condition also now reflects aspects of the club package. Members with desireable traits may be rewarded to join, since they generate enough positive characteristics to offset any crowding caused by their presence.

Further justifications of club formation have relied upon a pure taste for association (Schelling (1969), McGuire (1974)), cost reductions from scale economies, cost reductions from team production (McGuire (1972)), the sharing of public goods, and the sharing of public factors (Hillman (1978)), club governments versus representative governments (Blankart (1994)). Basically, club theory was developed out of the need to explain the allocative efficiency of impure public goods.[4]

4. International Production and Technology Clubs

Most descriptions of multinational enterprise and international production implement some sort of market failure argument and the existence of knowledge-based firm-specific factor inputs such as superior production technology or management know-how (Dunning (1977) and (1981), Helpman (1984), Horstman and Markusen (1989)). Commonly, these inputs are viewed upon as being much like public goods within the firm in that they can be costlessly

[4] Surveys of the some two hundred articles on club theory can be found in Sandler and Tschirrhart (1980) and Cornes and Sandler (1986).

transmitted to foreign subsidiary plants without congestion. Multinational enterprises thus arise as an equilibrium production structure which supplies the services of these assets to foreign affiliates in return for repatriated earnings (royalties). Firm-specific assets display "public goods" characteristics, such inputs may be utilized at a declining marginal cost, yet be excluded at least temporarily from others' use (Atik, (1995)). As is well known, collective goods are characterized by important characteristics: nonexcludability and nonrivalry of benefits (and the size of the group affected by the good's benefits). Given that congestion problems are not present, the appropriability of marginal useage benefits do not lead to distribution conflicts. However, often a "free rider problem" exists, since it is not feasible to exclude non-payers or agents who practice task shirking from benefiting.

Efficient coordination of international business activities requires a complete set of intermediate product markets (Buckley and Casson (1991, chapter 2), McManus (1972) and Hennart (1982)). If intermediate product markets are imperfect, there is an incentive to bypass them by creating internal markets. Along these lines of thought, internalization of markets across national boundaries generates multinational enterprises. However, for a full understanding it is also necessary to examine alternative "externalizing" modes of mediating international transactions (equity and non-equity forms of internationalization) as well as the strategic scope of their application by multinational enterprises (Gilroy, (1993), Young and Hamill (1992)). It is at this point where our argument links into the economic theory of clubs.

We define a technology club as a united voluntary group deriving mutual benefit from sharing one or more of the following: production costs inclusive R & D expenditures, the member's characteristics (e.g. producer trade associations, issues concerning international standards and technological norms leading to network externalities) or a good characterized by excludable benefits. The focus of the analysis will be on the sharing of the last item, i.e. the club good input which is interpeted here to be some basic proprietary technology.

A number of aspects of the club definition as applied to multinational technology clubs should be mentioned (see further Cornes and Sandler (1986), Mueller (1989)). The first important characteristic of a club is that it is voluntary; multinational enterprises and governments form strategic (technical) alliance clubs because they perceive opportunities of higher expected profits. In other words, perceived joint profit maximization levels (or eqivalently, joint cost minimization levels) must exceed obtainable profit levels associated with nonmembership status. Due to the right to exit from the club, strong reputation mechanisms are in place which enforce fair playing field levels.

Second, clubs involve sharing which often ends in rivalry of benefits as congestion and crowding effects take hold as club membership increases. Increases in club membership size often involve increased congestion costs. At the same time, increases in membership provides benefits due to the sharing

of provision expense associated with the club good. Due to the congestion cost offset of increasing membership size clubs are characterized by finite membership.

Third, technology clubs are distinguished by the presence of an exclusion mechanism which functions as a check on effort and permit the derivation of an "optimal", that is "effective" cost-sharing rule. Without such a monitoring device, e.g. the creation of a cooperative research center such as MCC or SEMATECH, there would be no incentives for members to join and pay dues and other fees.[5] As pointed out by Cornes and Sandler (1986, 25), the essential difference between club goods and pure public goods depends on the existence of such an exclusion mechanism, which establishes a pseudo-marketing device to overcome preference-relevation problems and opportunism. With technological advances, exclusion may be invented for some pure public goods, thus transforming them into club goods. The question may be then raised: Are advances in bargaining and control technologies of multinational enterprises responsible for the increased formation of international technology clubs as proprietary technology is being transformed from a pure public good to an impure public good?

Technology is central to any theory of international production (Cantwell (1989)). Commonly, however, we tend to focus attention on simple production technology. This state of affairs omits or at best greatly underemphasizes the importance of new bargaining- and transaction technologies and the cost of collecting information evolving through the extensive use of collaborative networks of strategic alliances (Dunning (1989) and (1990, p. 30), Casson (1995)). Recent research in industrial organization theory (Tirole (1989, p. 50)) suggests additionally that organizational behaviour is often best predicted by the analysis of group incentives as well as individual incentives. As multinational enterprises and governments increasingly collaborate, they have often successfully institutionalized what Buckley and Casson (1988, pp. 34–35) have termed the "principle of forbearance". Transactional coordination founded upon reciprocity evolves which allows involved parties to escape the "defect-defect" payoff cell in the transactional prisoner's dilemma game so that all refrain from cheating or free-riding behavior. Such behavior implies that the bargaining technology has succeeded in efficiently solving the distribution question regarding future profits. This may be a result of the fact that in a multiclub world safeguards against discrimination exist, since discriminated enterprises have the option of transferring between clubs.

A further important topic is the issue of power (Petrella (1989) and (1990)), Hamel (1991)) often expressed by the mere size of an enterprise or nation. Power structures can be included in a club model by allowing for a size parameter and modelling explicitly a non-symetric case of club membership.

[5] License fees may also be interpreted in analogy to optimal toll fees on congested highways. Here the question is simply, what is the optimal number of licenees given the congestive effect of thinning out the market and therefore respective profit shares.

The positional payoff from collaboration of a stronger partner consists of a net gain or loss in its relative capabilities and hence in its competitive industrial environment position. Given that partners improve their technological capablities but their relative positions stay the same, the positional payoff for both is zero. If, however, one partner secures a larger benefit from the collaboration than the other, it collects a positive positional payoff whereas its partner acquires a negative positional payoff (Tucker (1991)).

It must be recognized that the process of globalization will continue to involve a spatial redistribution of industrial and associated technical activities. The result being that some countries and enterprises will benefit more than others. Along with the greater efficiencies emerging worldwide through this spatial redistribution process, "competition" is being recast and intensified among enterprises and governments in the process.

There exists a natural tendency for technological know-how to flow from the stronger to the weaker partner. The weaker partner can commonly expect a larger positional payoff from collaboration. The creation of international technology clubs generates increasing returns to scale for partners with low levels of resources yet renders decreasing returns to scale for partners with high levels of resources (Ruggie (1972)). This to a large extent may explain the observed differences with regard to the national propensities to collaborate (Contractor and Lorange (1988), Harrigan and Newman (1990)).

Why then do multinational enterprises and governments attempt to form technology clubs? Basically, technology clubs are emerging as a response to environmental and technological parameters making it necessary to collaborate in order to spread and lower the fix development costs of high-risk, technology-intensive production, to obtain global economies of scale and scope in value-adding activities, to learn about a partner's technology and proprietary processes or to seek access to new distribution channels, to participate in shaping the evolution of competitive activity in the industry, and finally to collaborate in order to meet consumer demands for high variety and low cost. The above stated activities all consist of exchanges of club information and collective goal setting, while maintaining high levels of competition. As O'Brien and Tullis (1989, p. 13) have put forward, such club collaborations "...have something of the flavour of tennis doubles partnerships where each player is free to pursue a single career."

Competition in global markets is largely a result of research-based product development. A high research productivity, or innovative capacity, is thus a major determinant of an enterprise's competitive position. The pharmaceutical industry, for example, is illustrative of the substantial amount of resources involved. American enterprises were devoting approximately a fifth of all their revenues to research in 1989, up from 15 per cent in 1975. Similar patterns may be found elsewhere. United Kingdom research expenditures were 5.7 per cent of gross output in 1970 but had risen to 13.3 per cent by 1988. Recent

estimates for other European countries are even larger (Ballance, Pogàny and Forstner (1992, p. 90)).

Expenditures of the above magnitudes are large in comparison to the rate of turnover in the pharmaceutical industry. They underestimate, however, the total amount spent on research because public funding is omitted. For example, government funding for biomedical research exceeds enterprise-financed expenditures in all but a few industrialized countries (the exceptions where private spending exceeds public spending being Ireland, Japan, Switzerland and the United Kingdom). Government biomedical research expenditures for the United States reached the $7.7 billion mark in 1988, a sum much greater than total enterprise-financed spending. All the same, as governments increasingly spend more and more on research and development, multinational enterprises have also consistently increased their research and development investments. Enterprises are experiencing rising costs of research. They are facing the dilemma that global competition compels them to come up with new products with shortened product life cycles at a time when many enterprise research centers are experiencing a decline in their research productivity (law of diminishing R & D investment returns). The decision of an enterprise whether or not to adopt a particular technology further generates benefits or costs for other enterprises, and an enterprise's optimal choice depends in turn on what it expects others to do. Network externalities exist characterized by complementarity in consumption and production. The video-recorder industry is a recent example of this point. Producers of video-recorders had to decide which of the VHS and the Beta technologies to adapt. As experience in this industry has shown, it is expensive to adapt the technology that proves unpopular with other producers.[6]

5. Global Federalism versus Centralized Decision Making

In general, it must be remembered that the relations of governments to international business are at three levels: local, national, and international. Local incentive structures are offered by most cities and states in their desire to attract foreign capital in order to gain a larger employment and tax base. In this regard the pattern has been commonly observed that local governments often lose by offering more than necessary to support the project. At the national level, governments also set incentives and constraints for the conduct of enterprises in their countries and sometimes for the conduct of locally based enterprises when operating abroad. Finally, at the international

[6] Palfrey and Rosenthal (1984) is an example of such a game theoretical binary choice model. Further compare McMillan (1986) who examines countries as coalitions applying game theory. For reference to the game theoretical literature on club theory see chapter 13 of Cornes and Sandler (1986).

level, intergovernmental arrangements are commonly founded upon some international or regional organization. Efforts are still in progress to create a common body of rules for the world economy, as of yet, however, no single set of accepted rules exists towards a general treatment of international production (Behrman and Grosse (1990)).

Consequently, in any consideration of international production, technology clubs and governments the important issue of the locus of regulatory authority or political power structures arises. Industrial policy has traditionally been viewed as the preserve of central government. The critical point is that policy areas that are viewed traditionally to be purely discrete domestic policy areas are now internationally overlapping policy concerns for those seeking to reap the synergy gains of globalism. This will force governments to pay greater attention to the technological dimensions of international trade, investment, competition, and other critical issues not traditionally associated with science and technology concerns. Governments must intensify their cultivation of technical expertise in agencies responsible for domestic and international economic policy, and improve interagency communication and coordination of policy.

As the impact of regionalism on the world economy continues to gain momentum, however, the issue of the appropriate tier of government to deal with industrial policy arises (Sawsyer (1992)). Is centralized decision making or global federalism the more promising route of obtaining economic efficiency? In the context of the EU "Single Market", for example, it must be asked what aspects of industrial policy should lie within the province of the European Commission, which aspects with national governments and which aspects with regional government. In addition to the impact of the tendencies for regionalism on the world economy as a whole, its impact on nonparticipating countries in particular needs to be examined.

Much of the relevant logic and lines of argumentation necessary to examine these dimensions may be found in the literature on fiscal federalism under the title of "tax competition" or environmental economics in which the fear is expressed that competition among decentralized jurisdictions for jobs and income result in environmental exploitation. Further, perhaps the analogy to the theory of customs unions given trade diversion and trade benefit effects may give some helpful insights. It is, for example, well known from this last literature that integration (read club formation) may benefit member countries while harming third countries depending upon the terms-of-trade effect of integration. If the terms of trade of countries integrating their economies are improved, their share of the gain from trade with the outside world is increased at the expense of the latter. That some third countries may lose from the trade-diverting and/or terms of trade effects of regional integration is a theoretical possibility.

Oates and Schwab (1988a, 1988b) have modelled competition in which "local" jurisdictions may be interpreted as local clubs that compete for a

mobile national stock of capital using both tax and environmental policy instruments. Given neoclassical production functions, they demonstrate that an increase in a jurisdictions capital stock raises the level of wages through an associated increase in the capital-labor ratio. In their model local policy makers simultaneously apply two policy tools to attract capital: a tax rate on capital itself which can be lowered or even set negative (a subsidy) to raise the return to capital in the jurisdiction, and a level of allowable pollutant emissions (or, alternatively, an effluent fee; one analogy to the multinational enterprise could be e.g. local content value-added of production). By increasing the level of permissible waste discharges either directly or by lowering the fees on emissions, the local authority increases the marginal product of capital and thereby encourages a further inflow of capital. The model thus involves two straightforward tradeoffs: one between wage income and tax revenues, and the other between wage income and local environmental quality. The model reveals then that in a setting of homogeneous worker-residents making choices by simple majority rule, jurisdictions select the socially optimal levels of these two policy instruments. The tax rate on capital is set equal to zero, and the level of environmental quality is chosen so that the willingness to pay for a cleaner environment is equal to marginal abatement cost. The analysis thus supports the case for environmental federalism. Decentralized policy making is efficent in the model. Although their model is originally not conceived for our purposes, it does demonstrate a potential viable structure to apply in future research on the creation of technology clubs and the emerging externalities involved.

At a more practical level of analysis, McDermott (1992, p. 231), for example, has recently strongly argued the following: For Europe's policy makers it should be clear that the large EU market is sufficiently attractive to multinational enterprises, irrespective of nationality, for inward investment to occur, with or without financial incentives. For McDermott, such handouts appear ludicrously contradictory to the EU's objective of safeguarding the remains of Europe's industries. Enormous funding is being allocated to subsidize research and development initiatives of European manufacturers, while at the same time generous grants are given to non-EU competitors willing to invest in the EU. A recent example being the Commission's acceptance of IBM as the first non-European enterprise to become a member of the $4.0bn Joint Submicron Silicon Initiative (JESSI). In essence, EU member governments are subsidizing non-EU enterprises in their efforts to defeat European enterprises. As he suggests, "EC member countries will continue to bid against each other for inward investment projects from non-EC companies. In the process they will accelerate the loss of competitiveness of the very European firms they are struggling to protect (McDermott (1992, p. 231))."

6. Conclusions

A fundamental problem arises in any analysis of economic policy of this sort, namely, the fact that government policy makers do not initially know the tastes or preferences of the individual economic agents whose welfare levels are ingrediants of any social welfare function (Cornes and Sandler (1986, 92)). Consequently, government policy makers are faced with the dilemma of attempting to secure socially desireable outcomes through the design and implementation of mechanisms that do not presuppose their possession of information concerning the technology and preferences of individual members of society. Even the standard private goods economy may be characterized by inefficiencies arising from individuals misrepresenting their tastes, as Hurwicz (1972) has shown. Unless there is strictly a continuum of consumers, the typical individual can influence the equilibrium relative prices in his or her favor by sending false signals to the Walrasian auctioneer. The government policy maker of neoclassical economic theory is a Pareto-optimist who is concerned with determining the optimal value of supply Q^*, and not so much with determining the shares θ^h. By contrast, each potential contributor is directly affected by his or her own share. Consequently, the response of each will reflect this concern, and attempts by all to increase their share of the benefits while minimizing their costs results in a set of distorted messages being fed into the mechanism that determines Q. In short, the allocation decision is contaminated by distributional conflict. If, somehow, a mechanism could be developed that makes an individual's share independent of his or her own actions, while making the overall level of output sensitive to the response of each, this would provide a global solution (Cornes and Sandler (1986, 104).) However, the literature on public goods and the problem of designing incentive-compatible mechanisms for determining the optimal supply of public goods and individual contributions is not at all straightforward. Indeed, it turns out that it is impossible to design a mechanism that simultaneously possesses all the properties considered desireable, and difficult tradeoffs seem unavoidable. The problem of equitable distribution of benefits and costs will therefore remain at the center of any debate regarding international business/government relations (Behrman and Grosse (1990, p. 25)).

Optimal economic policy of sovereign states entails establishing a policy instrument mix that relates directly to multinational enterprise's allocations. The traditional goal of public policy from a national perspective is to maximize real national income. Unfortunately, an inborn assignment dilemma exists since the policies that maximize the incomes of source countries, host countries, and the world as a whole are not interchangeable. Situations of conflict are predestined to arise in policy areas of national and international welfare and the business-government interface of the multinational enterprise. Furthermore, as is well-known governments may be more interested in pleasing constituents with large political influence than in setting up an efficient

club. As so often the case in economics, individual economic rationality constraints and aggregate rationality constraints do not coincide.

In conclusion, this short examination of international competitiveness, MNE technology clubs and the government interface suggests the following salient feature of global markets: Neither the nation-state nor multinational enterprise have superseded the other. Rather as technology has evolved, the fortunes and misfortunes of governments, producers and consumers worldwide have become ever more closely linked. A closer look at the economic theory of clubs as applied to international production and government policies offers a fruitful framework in which many of the present day aspects of technology development are reflected in a variety of complex competitive and cooperative institutional structures culminating in the formation of "technology clubs".

Rapid acceleration of technological change and the vital role that flexible adjustment has played in the expansion of knowledge-intensive multinational enterprise has raised both the costs and risks of knowledge production itself (Mytelka (1987, p. 50)). With shortened product-and industry life cycles, enterprises need to spend increasing amounts on research and development to remain at the frontier of technological change in their industry. Where technological, financial, and economic know-how and know-why replace embodied technology as the primary source of an enterprise's competitive advantage, and where new product life cycles barely cover the duration of effective patent protection due to the costs of governmental regulations in many areas of product commercialization, the ability to capture technological proprietary rents through patenting diminishes and the importance of directly appropriating research and development results grows. Such tendencies promote not only foreign direct investment but most recently the increasing occurence of technology clubs which may be interpreted as a preemptive strategy among governments and multinational enterprises to excel in global market shares. The establishment of technology clubs has the unique function of creating networks that enhance the profitabilty of the global R & D system. The key to competitive success in global markets is not simply the sharing of resources but the access to resources. You have to belong to the right club to be a winner! It must, however, be emphasized that the above statement is not to be misunderstood as an argument for protectionistic tendencies! Rather governments must more agressively than ever attempt to forge multilateral consensus on the mutual obligations of MNE and their home and host governments through coordination of competitive public policies. Only through a world characterised by free trade and factor mobility will the cumulative causation of technology processes be able to develop to their full potential.

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