Free Trade and Investment in the Fisheries Sector of the Asia-Pacific Region: An Economic Analysis of Tariffs

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Global Economics Ltd.

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I. INTRODUCTION

The Economic Leaders of APEC made a commitment to enhance and facilitate trade and investment flows in the region at their meeting in Seattle, November 1993 (APEC, 1993a; 1993b). In the Bogor Declaration of November 1994 (APEC, 1994), the Economic Leaders made a further commitment to the goal of achieving free and open trade and investment in the Asia-Pacific region by the year 2020. The industrialized members of APEC were called upon to remove barriers to trade and investment flows in the region by 2010 (APEC, 1994.) These two commitments marked the beginning of APEC's initiative to liberalize and facilitate trade and investment (TILF) in the Asia-Pacific.

The second stage in the development of the TILF Initiative occurred at the 1995 meeting of the Economic Leaders in Osaka, at which the Osaka Action Agenda was brought forth as the first step in implementing the Bogor Declaration (APEC, 1995). The Osaka Action Agenda (OAA) called upon APEC to develop action plans both on an individual member and on a collective basis, in fifteen specific areas. The first two of these areas were: Tariffs and Non-Tariff Measures (NTMs) (APEC, 1994).

The Early Voluntary Sector Liberalization (EVSL) program has its roots in the proposed Collective Actions in the Tariff and NTM areas that appears in the OAA. It resulted from an effort to:

> "identify industries in which the progressive reduction of tariffs may have a positive impact on trade and on economic growth in the region *or for which there is regional industry support for early liberalization*" (APEC, 1994).

Stage three in the TILF Initiative emerged at the 1996 Economic Leaders' meeting in Manila. At the meeting, the Manila Action Plan for APEC (MAPA) was introduced. MAPA built upon the Osaka Action Agenda by outlining the trade and investment liberalization measures to be implemented in pursuit of the goals laid down by the Bogor Declaration. MAPA brought together the individual economy plans, the collective action plans, and joint activities on economic and technical cooperation (APEC, 1996a).

At the Manila meeting in 1996, the Economic Leaders did, moreover, explicitly call upon their ministers to identify candidate sectors for Early Voluntary Liberalization (APEC, 1996b). The following year in Vancouver, the Economic Leaders endorsed fifteen sectors that had been selected for liberalization under EVSL (APEC, 1997a). For nine fast-track sectors, trade liberalization agreements were to be finalized for the approval of Trade

Ministers and Leaders at the November 1998 APEC meetings in Malaysia.

One of the fast-track sectors is fish and fish products. This study was commissioned to examine the economic impact of eliminating tariffs on fish and fish products in APEC economies. Chapter II provides a qualitative assessment of the impacts of liberalization of fisheries trade drawing on the available data and economic theory. Chapter III presents specific quantitative estimates of the impact on trade flows of fish and fish products using an econometrically estimated model of fisheries trade liberalization. Chapter IV summarizes the study's overall conclusions.

II. QUALITATIVE ASSESSMENT

INTRODUCTION

This section presents an overview of the growth of world trade in fisheries products, and the role of APEC in this trade, followed by a review of the state of world fishery resources and an assessment of the probable shifts in comparative advantage in fisheries trade. It then examines the basic underlying theory of the impact of tariffs and their removal, as applied to fisheries.

It commences, however, with a commentary on the impact upon trade flows in fisheries of the fishery resources themselves. The commentary is divided into two parts, the first being rather obvious, the second less so.

Somewhat similar to forestry and agriculture, the fishery resources of the APEC region consist of a myriad of species which vary by regional and climatic zones. Consequently, it is to be expected that two way trade in fisheries products among APEC members will be commonplace. Thus a temperate zone APEC member could be expected to be exporting products arising from temperate zone species, for example, pollock, salmon, while at the same time importing products arising from tropical zone species, for example: skipjack tuna.

Secondly, trade in fisheries products will be affected by constraints on supply and resource management practices. World fisheries can be divided into two broad categories, aquaculture and capture fisheries. In terms of volume of output, the division is roughly 15-20 per cent aquaculture; 80-85 per cent capture fisheries (FAO, 1997(a)). In aquaculture, or "fish farming", one would anticipate that supply of output can, as in agriculture or forestry, be increased through time by devoting more resources to aquaculture and through improvements in productivity.

In capture fisheries, by way of contrast, nature will place an ultimate upper limit on sustainable harvests from the resources, even if the resources are superbly managed. There is evidence, which will be noted below, that the upper limit is clearly in sight.
In addition, capture fishery resources are characterized by management problems, not normally encountered in aquaculture, which can be expected to have an impact upon trade. Capture fishery resources within, and without, the APEC region have proven over time to be notoriously difficult to manage with full effectiveness in both economic and biological terms. The source of the difficulty lies in the fact that, due to the mobility of most fish, and the fact that fish are not readily visible prior to capture, it had in the past proven difficult to establish effective property rights to the resources. Ill-defined, or simply non-existent, property rights

result in the emergence of a set of perverse incentives confronting fishers, which leads in turn to the twin evils of over-exploitation of the resources and overcapitalization in both the harvesting and processing sectors (Munro, Bingham and Pikitch, 1998).

Resource management will obviously influence trade by having an impact upon the sustainable supplies of harvested fish emanating from capture fisheries. In addition, however, there is, as is being increasingly recognized, an interaction between resource management and international trade in fisheries (PECC, 1997). As shall be discussed at a later point, ineffective resource management can have a negative impact upon international trade. On the other hand, effective resource management and liberal international trade are mutually supportive.

THE ROLE OF APEC IN WORLD FISHERIES PRODUCTION AND TRADE

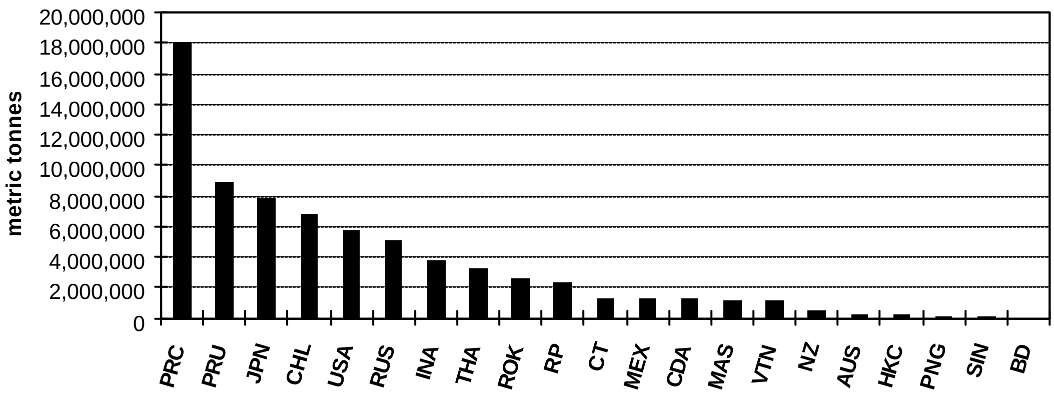
It is no exaggeration to state that the APEC members combined dominate world production of harvested fish. Over the most recent five year period for which complete data is available, 1991-1995, total world production of fish averaged just under 105 million metric tonnes. The twenty-one APEC members combined accounted for approximately 68 per cent of the total (on average) over the five year period (FAO, 1995; 1997b).

Figure 1 shows the annual fish production flows of the APEC members averaged over the period 1991-1995.

Six APEC members, Canada, Japan, Mexico, the Republic of Korea, the Russian Federation, and the United States have significant fish harvesting operations in the Atlantic. Two APEC members, Malaysia and Thailand, harvest fish in the Indian Ocean. If the APEC harvests in the Atlantic and Indian Oceans are excluded, the APEC member harvests in the Pacific are found to account for approximately 60 per cent of the world total production (FAO, 1995; 1997b).

FIGURE 1: FISHERIES PRODUCTION BY APEC MEMBERS 1991-1995*

*Average production over this period



Source: FAO Yearbook of Fishery Statistics

The Food and Agriculture Organization of the U.N. (FAO) divides world harvest of fish into five broad species categories. The relative importance of the five categories to world harvests, in volume terms, and APEC's share in each of the categories, is shown in Table 1. The APEC shares are based on total APEC harvests[1]:

TABLE 1: WORLD HARVESTS* OF FISH BY SPECIES CATEGORIES – 1991–1995 (PERCENTAGES)

Species Category	Percentage of Total World Harvests	Percentage of Harvests Accounted for by APEC
Freshwater:		
Finfish	14.37	64.23
Shellfish	0.60	93.55
Total Freshwater	15.07	65.38

[1] That is to say, including harvests by APEC members in the Atlantic and Indian Oceans.

Marine:		
Groundfish	16.80	57.30
Pelagics	54.30	69.64
Shellfish	13.83	78.71
Total Marine	84.93	68.69
Grand Total	100.00	68.19

* In volume terms
Source: FAO, *Yearbook of Fishery Statistics*, selected issues

Another classification of world harvests of fish, employed by FAO and one which is becoming increasingly important through time, divides world harvests of fish between those arising from aquaculture and those arising from capture fisheries, both marine and freshwater. The percentage division of world harvests, for the period 1991–1995, on an aquaculture–capture fishery basis is shown in Table 2:

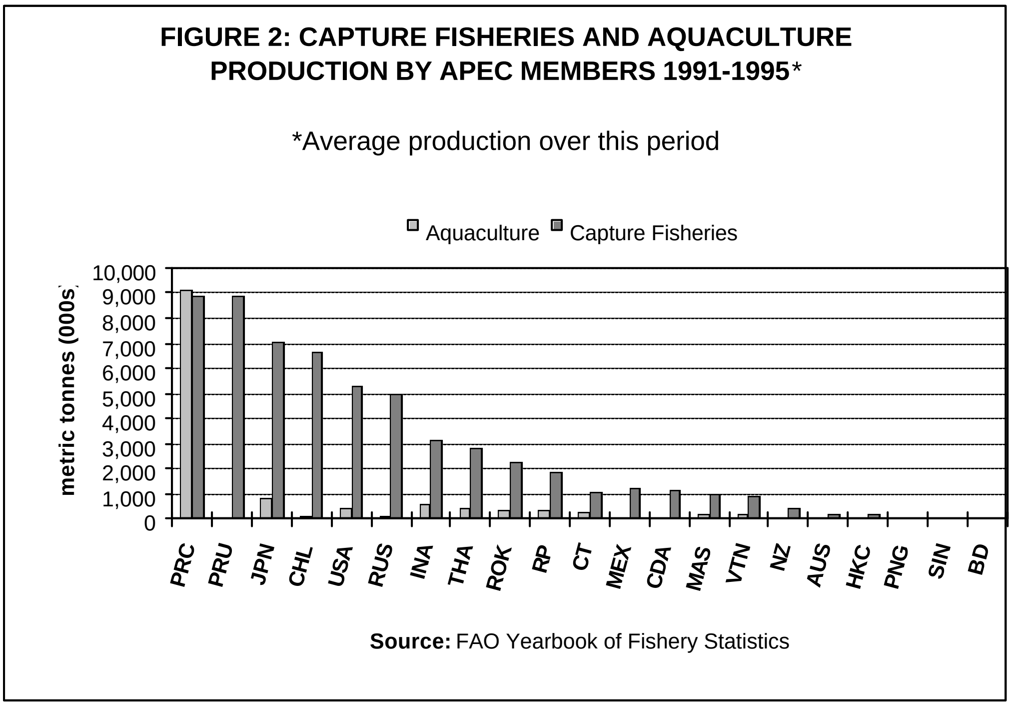
The dominance of APEC in harvests of aquaculture produced fish (in volume terms) is particularly striking. While aquaculture as a share of total world harvests (in volume terms) is modest, aquiculture harvests have been growing rapidly. As will be emphasized later, aquiculture is expected by the FAO to account for a large share of any future increases in world harvests of fish.

TABLE 2: WORLD HARVESTS* OF FISH, 1991-1995
AQUACULTURE VS. CAPTURE FISHERIES

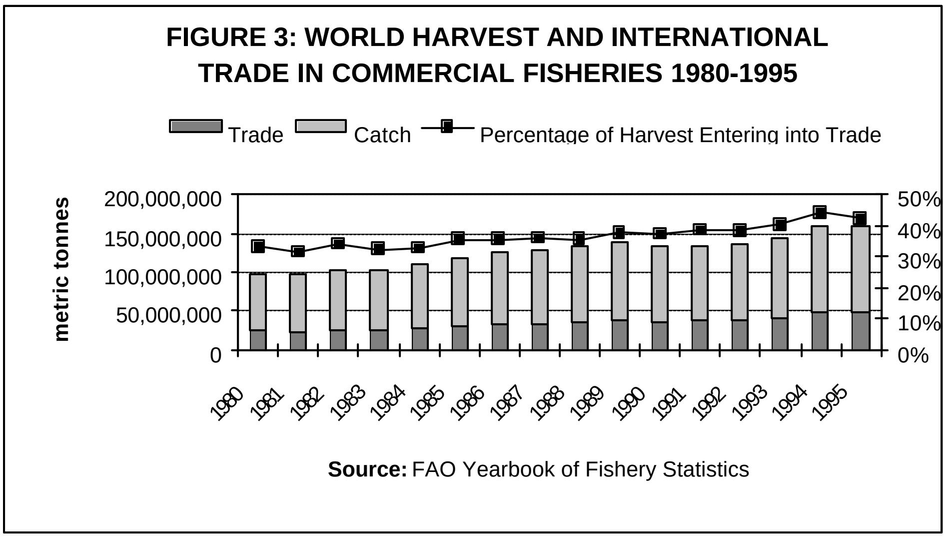
Source of Harvests	Percentage of Total World Harvests	Percentage of Harvests Accounted for by APEC
Aquaculture	16.09	78.06
Capture Fisheries	83.91	66.30
Grand Total	100.00	68.19

* Volume
Source: FAO, Yearbook of Fishery Statistics, selected issues

Of the APEC producers of aquaculture fish, one economy is dominant - China, as is apparent in Figure 2, which shows the breakdown between aquaculture and capture fishery production of APEC members. Indeed, over the period 1991-1995, China alone accounted for 50 per cent of the world aquaculture production (in volume terms (FAO, 1997b).



In turning now to world trade in fishery products, it is found that the FAO provides an estimate of the volume of harvested fish entering into international trade. Since 1980, the volume of harvested fish entering into trade has steadily trended upward from 30-35 per cent of total production to 40-45 per cent. Consider Figure 3.



Anderson (1997) and others have argued that the upward trend reflects, to some degree, the impact of the United Nations Third Conference on the Law of the Sea and the Exclusive Economic Zone (EEZ) regime. As a consequence of the advent of the EEZ regime, major distant water fishing nations have found their access to fisheries restricted and have had to rely more heavily upon international markets for supplies of fishery products.

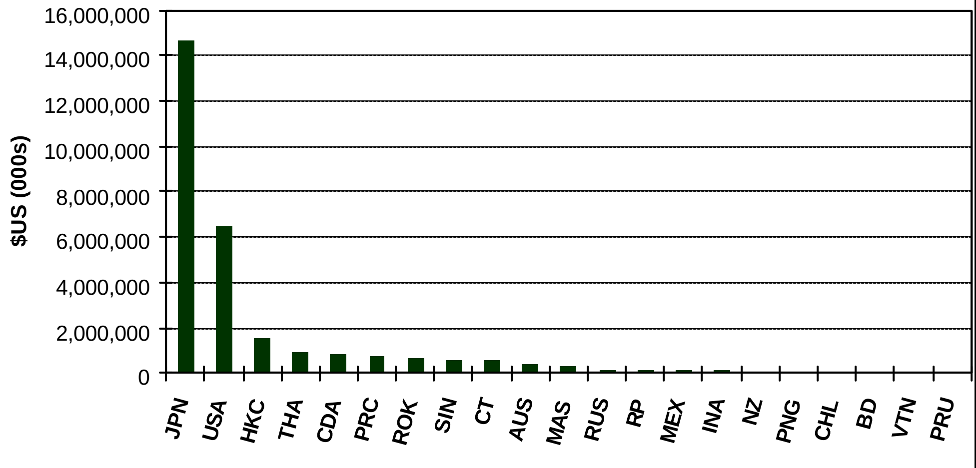
World trade in fish products in value terms approached U.S. $56 billion in 1995 (FAO, 1997b). The APEC members' share of the trade (in volume terms) is approximately 55 per cent of exports and 58 per cent of imports (FAO, *ibid*.) Not surprisingly, the APEC members are seen to dominate world trade in, as well as world production of, fishery products.

What is also not surprising is the fact that much of the fisheries product trade of APEC members is intra-APEC region trade. It is estimated that over 85 per cent of APEC member exports of fishery products are destined for other APEC economies. It is estimated further that 65 per cent of APEC member imports of fishery products are supplied by other APEC members (Graham, Klijn, Cox, Stokes and Hartman, 1998).

Figures 4 and 5 show annual fish import and export flows (in value terms) averaged over the 1991-1995 period. Figure 4 is particularly striking. Two import nations, Japan and the United States, are of almost overwhelming importance. Japan and the United States are not just leading fish importers within APEC. They have for many years been consistently the two leading fish importing nations for the world at large (FAO, 1997b). Over the 1991-1995 period, Japan alone accounted for in excess of 30 per cent of the world's imports of fish and fish products (in value terms). Japan and the United States combined accounted for almost 44 per cent of fish/fish products imports during that period (FAO, *ibid*.).

FIGURE 4: IMPORTS OF FISHERIES PRODUCTS BY APEC MEMBERS 1991-1995*

*Average imports over this period

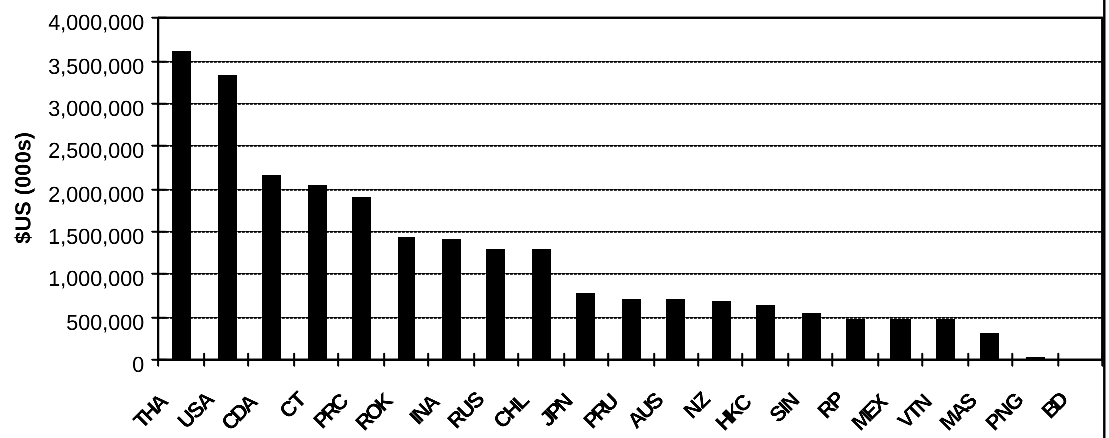


Source: FAO Yearbook of Fishery Statistics

The APEC pattern for exports is not as heavily dominated by a few economies, as is the import pattern. It is worth noting, however, that the two leading APEC export nations, Thailand and the United States alone lead the world (FAO, *ibid*.).

FIGURE 5: EXPORTS OF FISHERIES PRODUCTS BY APEC MEMBERS 1991-1995*

*Average exports over this period



Source: FAO Yearbook of Fishery Statistics

It was observed above that, given the wide diversity of fish species, one could anticipate that many APEC members could be expected to have extensive two way trade flows in fishery products. The two way flows could be expected to have policy implications. A net fish importing nation having significant export flows of fishery products could be expected to be less resistant to a reduction of trade barriers. The temporary adjustment difficulties to be encountered on the import side would likely be offset, in part, by the immediate gains on the export side.

Hence, it is appropriate, and of value, to obtain a measure of the two way trade flows in fishery products of the APEC members. There is, in fact, a simple measure of such two way trade flows commonly used by economists studying sectoral trade issues.[2]
Denote exports (in value terms, per period of time) as *X*. Denote imports (in value terms, per period of time) as *M*, and denote the Net Export Ratio as *NXR*:

$NXR=(X-M)/(X+M)$

[2]See for example: Australian Pacific Economic Cooperation Committee (1997a; 1997b).

The *NXR* can clearly vary from +1.0 to -1.0. At either extreme, trade is strictly one way. If, for example, *NXR* = +1.0, the economy exports fishery products and imports nothing. By way of contrast, if *NXR* = 0, then we would have a case of perfect two way trade. The economy's exports of fish would prove to be equally balanced by imports.

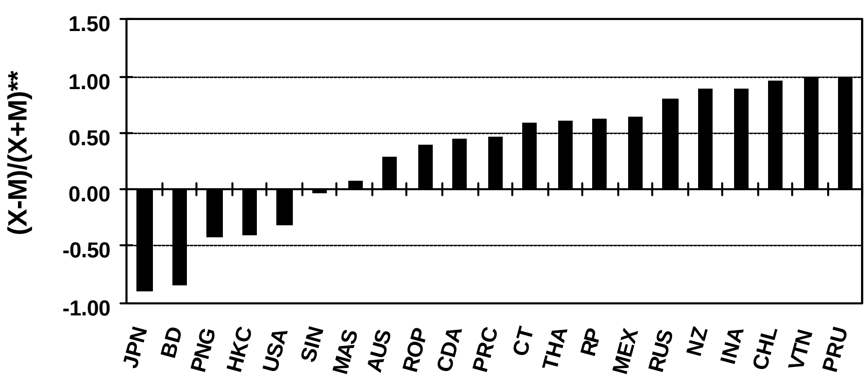
Figure 6 presents the fisheries sector *NXR*s for the APEC members, based, once again, on the 1991-1995 period. There is a wide range. While Japan does have significant exports in absolute terms, they are overwhelmed by its imports. The economy approaches the pure net importer extreme. The United States, on the other hand, might be classified as a "moderate" net importer. The American *NXR* indicates that its fishery export flows are significant in relative, as well as absolute, terms. Finally, a set of developing APEC members, for example Viet Nam and Peru, are close to being pure net exporters of fish.

In summary, the APEC members combined clearly play a dominant role in world fisheries,both in terms of production and of international trade. It follows, therefore, that changes in APEC fisheries trade policy, for example the elimination of tariffs, could be expected to have a profound impact on world trade in fisheries at large.

It is now time to examine the state of world fishery resources, with particular attention to those of the Pacific. This examination will lead to a consideration of the prospects for future increases in the level of world harvests and the likely shifts in comparative advantage among Pacific fish producers.

FIGURE 6: APEC FISHERIES SECTOR NET EXPORT RATIOS 1991-1995*

*Average net export ratio over this period



** X denotes exports in value terms
M denotes imports in value terms

Source: FAO Yearbook of Fishery Statistics

THE STATE OF WORLD FISHERY RESOURCES

The examination commences with capture fishery resources which do, at the present time, provide the basis for approximately 80-85 per cent of the world's fish production. It will be recalled that capture fishery resources are characterized by the fact that the sustainable level of harvests from the resources faces an upper bound imposed by nature and by the fact that the inherent difficulties in managing the resources militate against the upper bound ever being achieved in practice.

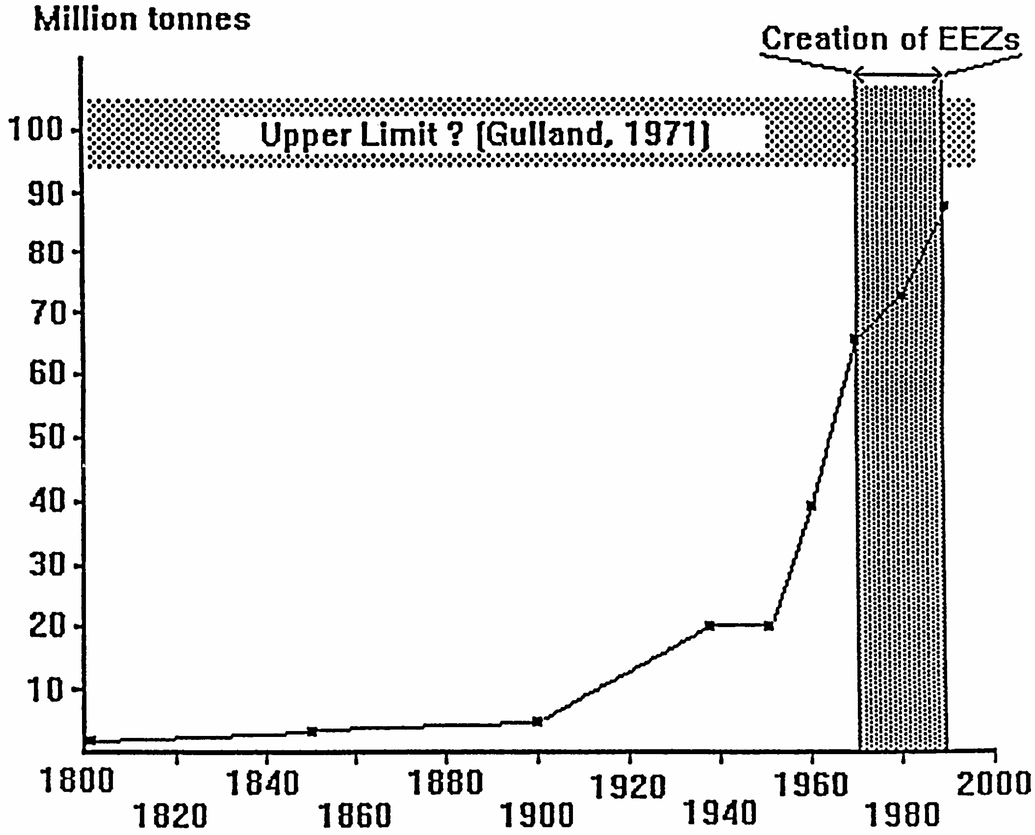
The most thorough assessment of capture fishery resources is provided by the FAO in various publications. The single most authoritative FAO sponsored document on capture fisheries is the paper prepared by Serge M. Garcia and Christopher Newton in 1995 (Garcia and Newton, 1995). The paper is in fact concerned almost exclusively with marine capture fisheries. Those fisheries account for approximately 90 per cent of total capture fishery harvests.

Garcia and Newton's starting point is a 1971 FAO volume edited by John Gulland (Gulland, 1971). In this volume, it is estimated that the theoretical maximum sustainable world harvests from capture fishery resources is 100 million tonnes per annum, with the practical maximum being in the order of 80 million tonnes. [3]

Figure 7, taken from the Garcia/Newton paper, presents an historical trend of marine capture fishery harvests from the early 19th century. Growth in world harvests began to accelerate before World War II, and then grew rapidly from about 1950 onwards. Garcia and Newton

[3] In 1971, the harvest was of the order of 65 million tonnes.

FIGURE 7:
GROWTH OF WORLD HARVEST OF FISH: MARINE FISHERIES 1800 – 1990



Source: Garcia and Newton, 1995

speculated that the Gulland maximum[4] was close to being achieved and stated that "after a long history of fisheries growth, all available data point to the conclusion that the total potential of traditional species has been reached ... " (Garcia and Newton, 1995, p. 24).

Garcia and Newton did much more, however, than argue that the Gulland ceiling may have been achieved. They warned that, in fact, many fishery resources were being subject to serious overexploitation, particularly the high valued species, for example the major demersal species. The basic management problem confronting capture species was clearly manifesting itself.

[4] As shall be seen, estimates of the global maximum were to be revised after the appearance of the Garcia and Newton paper.

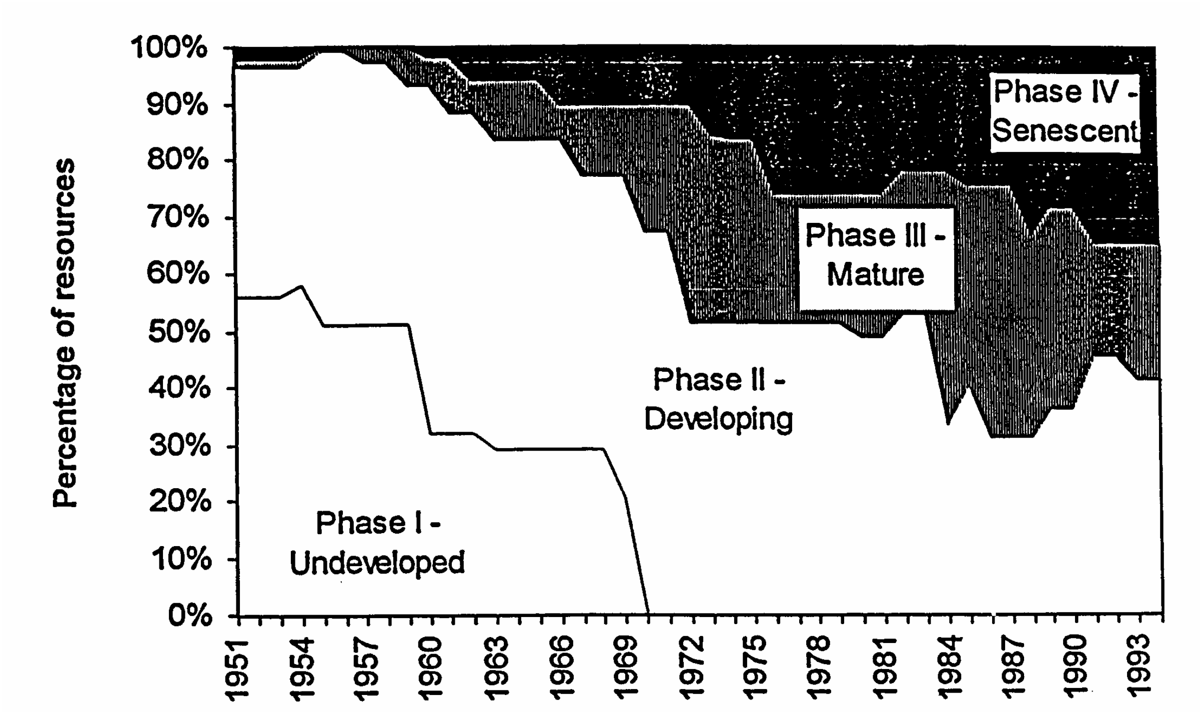
Garcia and Newton categorized fishery resources as "underdeveloped," "developing," "mature" and "senescent". Mature fishery resources were defined as those which are being harvested at the maximum average long term yield, while senescent fishery resources were defined as those fishery resources exploited beyond that limit. Undeveloped fishery resources represented resources whose rate of harvest growth was accelerating, while developing fishery resources were those whose rate of increase of harvest growth was positive, but decelerating.

Figure 8 is taken from a post-Garcia/Newton FAO document (FAO, 1997c), which shows the state of marine fishery resources plotted against time within a Garcia and Newton framework.

Significant undeveloped fishery resources have long since disappeared. Fully 60 per cent of the marine fishery resources are now seen to be "mature" or "senescent" (FAO, 1997c). Of the 60 per cent, 25 per cent represent "mature" resources. Garcia and Newton concede that "mature," or "fully fished" resources are not overexploited. They continue, however, that in light of the state of world fisheries management, the "mature" fishery resources are prime candidates for the "senescent" category in the not distant future (Garcia and Newton, 1995, p. 13).

Garcia and Newton continue by pointing out that the fishing pressure has not been evenly spread over species. As one would expect, the “senescent” category is crowded with relatively high valued species, such as several temperate zone groundfish species, along with crustaceans, such as lobster and prawn/shrimps. The pattern is, again as one would expect, that of initial heavy exploitation of high valued species, followed by the exploitation of successively less valued species (Garcia and Newton, *ibid.*). Thus, the aforementioned 60 per cent figure does, if anything, *understate* the over-exploitation of marine capture fishery resources in economic terms.

FIGURE 8:
PERCENTAGE OF MAJOR MARINE FISH RESOURCES IN VARIOUS PHASES OF FISHERY DEVELOPMENT



Source: FAO, 1997(c)

FAO publications, appearing after the Garcia and Newton paper, do allow for the possibility that the Gulland ceiling was somewhat conservative (see for example: FAO, 1997b, 1997c). The FAO place the current average annual harvest from marine capture fisheries at a level of 80-85 million tones (FAO, *ibid.*). The FAO estimates that sustainable marine capture fishery harvests could approach 100 million tonnes per annum, if there were significant improvements in fisheries management (including reduction of both discards and post harvest waste) (FAO, *ibid.*). Over the much longer term - and hence well beyond the time horizon of this study - there could be additional increases due to exploitation of less than fully utilized resources - e.g. the Indian Ocean. The FAO also warns, however, that, if improvements in resource management are not forthcoming, and if the optimism pertaining to hitherto less than fully utilized stocks proves to be unwarranted, the current level of harvests could in fact prove to be unsustainable, i.e. futureharvests could decline (FAO, *ibid.*). More about these assessments later.

In addition to its global assessment, the FAO also provides ocean by ocean assessment of marine fishery resources (FAO, 1997c). The Atlantic Ocean, as a whole, for example, is seen to have achieved, and then gone beyond, its capacity by the mid 1980s. The Pacific Ocean, as a whole, is seen to be on the verge of achieving its maximum harvests by 1999 (FAO, 1997c, p. 8).

The foregoing assessments of the Pacific (and of the Atlantic) are very broad averages. In the immense area of the Pacific, for example, there are sub-areas in which the capture fishery resources show clear signs of overexploitation, while there are sub-areas in which there still is some scope for the growth of harvests. It is, therefore, necessary to examine the sub-areas of relevance to APEC in somewhat greater detail. In so doing, the focus will be on the sub-areas of the Pacific which, by definition, are central to APEC, followed by a consideration of what might be referred to as areas of ancillary importance to APEC, such as the Indian Ocean.

The following table shows the FAO's estimate of annual landings by Pacific sub-area on the basis of five year (1990-1994) average, and shows as well the FAO's assessment when the sub-area's potential was, or will be, achieved. The assessment was based on the optimistic assumption that improvements in resource managements are possible.[5]

The Northwest Pacific (FAO Statistical Area 61) covers a sub-area which ranges from the border of China and Viet Nam through Chinese Taipei, Korea, Japan, Northwest Russia to the western reaches of the Bering Sea. Two species have dominated the harvests of the sub-area, namely Japanese pilchard (or sardine) and the immense Alaska pollock stocks. Alaska pollock provides an example of the world groundfish stocks which Garcia and Newton maintain have typically been subject to excess exploitation (Garcia and Newton, 1995). The FAO declares Alaska pollock in the Northwest Pacific to be fully overexploited, and predicts a steady decline in harvests (FAO, 1997c, p. 77). The Japanese pilchard, which are subject to substantial fluctuations, are, from the FAO perspective, difficult to assess. In any event, the FAO sees the sub-area achieving its potential in 1998.

[5] The FAO’s assessments are also based on total marine fishery resources, including mari-culture resources, which may moderately bias the assessments in some cases.

TABLE 3: AVERAGE ANNUAL LANDINGS, MARINE CAPTURE FISHERIES SUB-REGIONS OF THE PACIFIC, 1990-1994, AND YEAR IN WHICH SUB-REGIONAL POTENTIAL EXPECTED TO BE ACHIEVED

Sub-Region of the Pacific	Average Annual Landings (millions of mt)	Percentage of Total	Year in Which Sub-Region Potential Expected to be Achieved
Northwest	21	42.9	1998
Northeast	3	6.1	1990
East Central	1	2.0	1988
Southeast	15	30.6	2001
Southwest	1	2.0	1991
West Central	8	16.3	2003
Total	49	100.0	

Source: FAO, 1997(c), Table A2.1, Tables X–XV.

The companion region of the Northeast Pacific (FAO Statistical Area 67) extending from the Eastern Bering Sea to Northern California, has Alaska pollock and the set of Pacific salmon species as its most important fishery resources in economic terms. Both resources are, at best, deemed by the FAO to be "fully utilized." On an overall basis, the FAO categorizes this sub-region as overfished (FAO, 1997c), and having achieved its full potential at the turn of the decade.

Of the East-Central Pacific (FAO Statistical Area 77) extending from Southern California to Northern Colombia, little needs to be said except that the FAO places the sub-region firmly in the overfished category, and states that it achieved its potential before the turn of the current decade.

A more interesting sub-region, by way of contrast, is the Southeast Pacific (FAO Statistical Area 87) extending from mid-Colombia to beyond the southern tip of South America. In terms of volume of marine harvests, this currently ranks as the second most important sub-region of the Pacific.

Historically, this region has been dominated by small pelagics, such as Peruvian anchoveta and Chilean sardines, although large pelagics, such as Chilean jack mackerel and some demersals are taking on a larger role. The small pelagics have been subject to violent fluctuations, due primarily to environmental factors. The history of the Peruvian anchoveta is too well known to merit repeating.

The FAO estimates that the region could, conceivably, almost double its production. The FAO is quick to add, however, that these estimates are very uncertain (FAO, ibid., p. 9).

The West Central Pacific (FAO Statistical Area 77) includes Southeast Asia and most of the Pacific Island Nations Region. It ranks third in volume terms and probably higher in value terms, given the importance of tuna harvests in the region.

Many of the marine fisheries in Southeast Asia exhibit signs of overfishing. On the other hand, the industrial tuna fisheries, skipjack in particular, could, under careful management, sustain a one-third increase in harvests (FAO, ibid. p. 108).

Finally, the Southwest Pacific (FAO Statistical Area 81) comprises New Zealand and Eastern Australia. While both economies have introduced interesting and encouraging resource management techniques, the FAO sees no scope for increased harvests from the region and declares it to have long since achieved its potential.
Overall, there are only two sub-regions that appear to have the potential for significant increases in harvests from marine capture fisheries, the Southeast Pacific and the West Central Pacific. The potential increases are, however, uncertain at best.

Of the ancillary areas relevant to APEC, one could list the North Atlantic, the Southwest, the Southeast and West Central Atlantic, and the Eastern Indian Ocean. With regards to the Atlantic sub-areas, all, except the Southwest Atlantic, are deemed to be overfished.

The East Indian Ocean is one area in which the FAO foresees the possibility of a substantial expansion of capture fishery harvests. The projection, as well as being highly uncertain, is very long run, far beyond the time horizon of this report. The FAO estimates that, if its optimistic projection were justified, it could take the East Indian Ocean forty years to achieve its potential (FAO, *ibid.*).

Aquaculture is an area in which the role of APEC is particularly dominant.[6] The FAO refers to aquaculture as one of the fastest growing food production activities in the world (FAO, 1997a). Over the decade 1985-1995, aquaculture production of fish grew, in volume terms, at an average annual rate of 10.7 per cent (FAO, *ibid.*). One of the great advantages which aquaculture has over capture fisheries is the absence of the problems associated with ill-defined property rights to the resource, and the management difficulties to which they inevitably give rise.

[6] See Table 2.

To bring together the discussion on capture fisheries and aquaculture, it is useful to focus on the FAO's fishery supply projections to the year 2010. The FAO offers pessimistic and optimistic scenarios, which are presented in Table 4, along with the actual average annual production for the period 1991-1995:

TABLE 4: SUPPLIES OF FISH FOR HUMAN CONSUMPTION AND REDUCTION (MILLIONS MT)

Source of Production	Average Annual Production 1991–1995	Projected Production 2010	
		Pessimistic Scenario	Optimistic Scenario
Aquaculture	17	27	39
Capture Fisheries (Freshwater and Marine)	87	80*	105
Total	104	107	144

Source: FAO, 1997(a); *Yearbook of Fishery Statistics* (selected issues).

*The FAO has assumed that, if capture fisheries management does not improve, capture fisheries harvests may decline.

The optimistic scenario shows an increase of supply of 40 million tonnes up to the year 2010. The increase is divided evenly between aquaculture and capture fisheries. A few comments are in order.

Under the optimistic scenario, aquaculture production is projected to grow at an average annual rate of approximately 5 per cent. The projection is optimistic, but it is not wildly so, given the recent history of aquaculture. It will be recalled that world aquaculture production grew at an average annual rate of just below 11 per cent during the decade 1985-1995.

The projected increase in capture fishery harvests in the optimistic scenario is based upon the effects of improved management. In light of the severe difficulties that have been encountered in the management of capture fishery resources, we deem the projection to be exceedingly optimistic. There are a few economies, such as New Zealand, which apparently have achieved considerable success. These, however, are the exceptions. Indeed, it is noteworthy that the FAO, in its pessimistic scenario, allows for a modest growth in aquaculture harvests, but assumes a decline in capture fishery harvests.

In 1995, the last year for which complete data is available, aquaculture, in volume terms, accounted for less than 20 per cent of world production of fish. Nonetheless, it is our judgement that the bulk of any increase in sustainable harvests of fish will likely be concentrated in the aquaculture sector. [7]

[7] All this is not to deny that these are problems associated with aquiculture. Suitable aquaculture sites are not unlimited. Aquaculture production units, if poorly managed, can lead

With regards to projected demand for fish and fish products, this will depend upon population growth, per capita income growth and upon changes in relative prices. As we shall note at a later point, evidence we have suggests that the income elasticity of the demand for fish is high; but own price elasticity is moderately low. The FAO's estimates, which appear to be based on the assumption of constant relative prices, is that the increase in demand by 2010 would equal the increase in supply under the FAO optimistic scenario, i.e. the demand would increase to 140-150 million tonnes per annum (FAO, 1997a).

SHIFTS IN COMPARATIVE ADVANTAGE

The basic theory, underlying the determination of the pattern of trade, is the theory of comparative advantage, which dates back to the early 19th century. The theory postulates that, under conditions of free trade, a given economy will concentrate in the production of those goods and services in which its *relative*, or comparative, ability to produce is greatest. The economy will then export those goods and services in which it has a comparative advantage and import those in which it has a comparative disadvantage. The pattern of trade, thus dictated by comparative advantage, is not static, but can, rather, be expected to shift through time.

As a next step, one needs to explain the factors underlying comparative advantage. The most widely accepted theory of the factors underlying comparative advantage is that propounded by two 20th century Swedish economists, Eli Heckscher and Nobel Laureate Bertil Ohlin (see Krugman and Obstfeld 1994; Lindert, 1986; or any other standard text in international economics). Put in its simplest form, the Heckscher-Ohlin theory notes that economies (regions) vary in terms of their relative abundance of inputs. The theory continues that economies will be revealed to have a comparative advantage in products that use their abundant inputs, or factors of production, intensively, and a comparative disadvantage in products which use their scarce inputs intensively.[8] ii) A product is labour-intensive, if labour costs are a greater share of its value than they are of the value of other products.

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to the degradation of the surrounding environment. In principle, however these problems are not distinct in nature from those encountered by agriculture, or other terrestrial industries.

[8] A succinct definition of input/factor of production abundance and an equally succinct definition of input/factor of production intensity have been provided by Lindert (1986, p.31). These are:

i) A economy is labour abundant if it has a higher ratio of labour to other inputs than does the rest of the world.

The Heckscher-Ohlin theory has reasonably good predictive powers, but in applying it one often needs to disaggregate the inputs extensively and to add various other qualifications. One important qualification, dealt with in a rigorous manner by Paul Armington (1969), rests upon the fact that, in many industries, products within a common product category, but having different geographical origins, are imperfect substitutes for one another. Thus, for example, textiles produced in Japan may be perceived by buyers as not being identical to textiles produced in, say, the Philippines. Consequently, intra-industry, or two way, trade can and does emerge. Thus, for example, Japan might be found to be both an exporter, and an importer of textiles. The APEC Economic Committee, in its study of the impact of trade liberalization in the APEC region, notes that such two way trade accounts for an important share of trade in the region (APEC, 1997b).

In the case of fisheries, considerable disaggregation of inputs would be required. Thus, for example, climatic conditions - temperate vs. tropical - would have to be considered as a form of input. Furthermore, qualifications not normally found in other product areas would have to be introduced. For example, since fleets are mobile, we would have to consider, in assessing the fishery resource abundance or scarcity of a economy, the ocean space legally open to the economy's fleets. Fishery resources open for exploitation by the economy's distant water fleets, as well as the fishery resources within the economy's home waters, would have to be taken into account.

An Armington type of effect is also readily observable in the industry. Fish within broad species categories are imperfect substitutes for one another. No one would suggest that temperate zone bluefin tuna is a perfect substitute for tropical zone skipjack tuna. We have already emphasized the fact that two-way trade in fisheries products is to be expected in APEC, and is readily observable.

Figure 6, showing the Net Export Ratios for the APEC members, might be thought of as providing a first, and admittedly crude, approximation of an overview of comparative advantage in APEC regional fisheries. One is not surprised to find that the Net Export Ratio of Japan is close to -0.9. Japan's extensive imports of primary products is often cited by textbooks in international economics as an example of the predictive power of the Heckscher-Ohlin theory - Japan has a relative scarcity of natural resources (see for example: Lindert, 1986, p. 34). Conversely, one is not surprised to find a economy, such as Peru, with a large positive net export ratio.

Assessments of how comparative advantage has shifted in the recent past, or how it is likely to shift in the future, are necessarily highly speculative. Nonetheless, we can at least offer some comments, the first of which is based on the paper by Garcia and Newton (1995). The authors note that the advent of the EEZ regime in the late 1970s-early 1980s administered a shock to the pattern of fisheries comparative advantage/disadvantage. Distant water fishing nations found their access to fishery resources outside of the nations' home waters restricted. Coastal states found their control over fishery resources off their coasts substantially increased.[9]

As an example of the impact of the advent of the EEZ regime, Garcia and Newton cite the example of Japan and the United States. The Net Export Ratios of the two were much closer before the advent of Extended Fisheries Jurisdiction, than after (Garcia and Newton,1995.). Indeed, one finds, based on an average of the years 1980-1982, immediately prior to the close of the U.N. Third Conference on the Law of the Sea, that the American net export ratio was equal to -0.46, while that of Japan was equal to -0.62. Over the ensuing decade and a half, the American net export ratio was to rise to -0.32, while the Japanese net export ratio fell to -0.90.

The authors also argue on the basis of observation, that there appears to be a worldwide shift in fisheries comparative advantage towards developing fishing nations. The authors do not offer any reasons for this shift (Garcia and Newton, 1995.).

Other, but by no means contradictory, shifts in comparative advantage have been detected by James Anderson, an academic economist who has done extensive work in trade in fisheries products. Anderson argues that there is evidence that the growth in trade in fisheries products has favoured fisheries not suffering the effects of ill-defined property rights, which affect so many capture fisheries. These would include effectively managed capture fisheries and aquaculture operations (Anderson, 1997). Thus, those fishing nations with minimal aquaculture operations, and with capture fisheries that are not effectively managed, could, other things being equal, expect to find that their comparative advantage in fisheries production is diminishing.

Note that the Anderson arguments are consistent with our observation that future growth in world harvests, within the next 10 to 15 years is likely to come primarily from aquaculture. The arguments are also, by no means inconsistent with the Garcia and Newton assertion that comparative advantage in fisheries is tending to shift in favour of developing economies. If we examine the APEC aquaculture harvests (by volume), it is found that a preponderance - in excess of 80 per cent - was accounted for by developing members. [10]

[9] Every distant water fishing nation is also a coastal state, so there will be some offsetting influences.

[10] Admittedly this outcome is heavily influenced by one developing member, China.

THE IMPACT OF TARIFFS UPON TRADE AND WELFARE: THE THEORY

Basic economic analysis is required to predict the likely consequences of a region wide elimination of tariffs on trade in fishery products within APEC. The analysis has as its foundation the standard theory of tariffs to be found in any text on international economics (for example, Lindert, 1986). The foundation is not, however, sufficient unto itself. To it must be added, where appropriate, the economics of fisheries management.

After completing the discussion on tariffs, it is necessary to consider the impacts of non-tariff measures on trade in fisheries products. While this project is focussed on tariffs, non-tariff measures can not be totally ignored.

The central argument against the use of tariffs, or any barriers to trade, for that matter, is that their use will have the effect of distorting the pattern of trade as dictated by comparative advantage. The distortions will, in turn, result in various inefficiencies through the mis-allocation of productive resources and through the imposition of welfare losses upon consumers. Having said this, economists do concede that certain groups within the economy imposing the tariffs do gain thereby. The implication, of course, is that, if a economy which had introduced tariffs in the past decides to eliminate them, there will be groups within the economy which will lose as a result, and that there may be painful adjustments to be endured.

Prior to turning to the analysis of the impact of tariffs and their removal, it is necessary to address some definitional matters and to gain a broad overview of tariffs on fishery products in the APEC region. First, tariffs are normally defined as specific or ad valorem in nature, that is to say they are either expressed as a fixed tax per unit of the imported good (or service), or they are expressed as a percentage of the landed value of the relevant good or service. The majority of fishery product tariffs in the APEC region are expressed on an ad valorem basis (Graham *et al.*, 1998). In the following analysis, all APEC tariffs on fishery products are expressed as ad valorem tariffs.

Table 5 presents the average overall ad valorem tariffs on fishery products for the APEC members. The source of the tariff data was the APEC Fisheries Working Group survey of tariffs (APEC, 1997c). Furthermore, the average tariff rates quoted are those that will be found to be used in the quantitative assessment of the removal of fishery product tariffs in the APEC region.

TABLE 5: ESTIMATED AVERAGE TARIFF RATES ON FISH AND FISH PRODUCTS: APEC MEMBERS

APEC Member	Average Tariff Rate (%)
Australia	0.13
Brunei Darussalam	0.00
Canada	1.37
Chile	11.00
China	25.18
Hong Kong	0.00
Indonesia	4.37
Japan	6.47
Republic of Korea	15.55
Malaysia	4.62
Mexico	15.00
New Zealand	2.78
Papua New Guinea	49.12
Peru	15.00
Philippines	10.93
Singapore	0.00
Chinese Taipei	17.75
Thailand	51.20
United States of America	1.22
Russia	12.87
Vietnam	13.69

Source: APEC Working Group on Fisheries (1997c) *Survey of Tariffs on Fish and Fish Products.*

The average tariff rates display a wide dispersion over the APEC members. We can note that the tariff rates for the two members which dominate APEC fish-related imports (Japan and the United States) are moderate. Nonetheless, in comparison with other industry groups in the APEC, tariffs on fishery products tend to be high (Pacific Economic Cooperation Council, 1995). To take but one example, one normally thinks of agriculture as a sector subject to substantial protection. Yet, within the APEC region, tariffs on fisheries products are (on average) approximately 15 per cent higher than are tariffs on agricultural products (PECC, 1995).

Furthermore, the average tariff rates, as presented in Table 5, understate the true degree of protection which they offer, probably by a significant margin. As is true in many industries, the tariff rates escalate with the level of processing (Graham et al., 1998). This fact calls upon us to acknowledge the distinction between *nominal* rates of protection and *effective* rates of protection provided by tariffs. Economists argue that the true measure of protection offered an import competing industry by its economy's tariff structure is the extent to which the tariff structure enhances the value added of the firms in the industry. Value added is the total value of an industry's output, minus the cost of inputs purchased from other industries.

Formally, the Effective Rate of Protection (ERP) provided to an industry by the economy's tariff structure can be expressed as follows (Lindert, 1986):

$$ERP=(v'-v)/v$$

where v is the industry's valued added per unit of output under free trade, and where v' is the value added per unit of output under the existing tariff structure.

To illustrate, consider the following example. An industry is engaged in canning one species of fish for sale in the domestic market. Under conditions of free trade, firms in the industry would receive a price of U.S. $500 per case. The cost of raw fish required to produce one case is, under free trade, U.S. $300. Suppose further that the raw fish is imported, and suppose finally that this is the only input purchased by the canning industry from other industries. Thus under free trade, the value added per case is U.S. $200.

Now suppose that the authorities impose a 20 per cent tariff on canned fish of this species, which enables the producers in the industry to sell their product domestically for U.S. $600. No tariff is imposed on raw fish. Value added per case will now rise to U.S. $300. The nominal rate of protection is 20 per cent. The true Effective Rate of Protection is, however, actually 50 per cent.

Suppose, alternatively, that the authorities accompany the 20 per cent tariff on canned products with a 20 per cent tariff on raw fish. The canning industry would then enjoy an *ERP* of 20 per cent, which is to say that the nominal and effective rates of protection would be identical.

Now return to the observation that, in the APEC region, tariff rates on fishery products escalate with the level of processing. From this, it can safely be concluded that the higher the level of processing in the import competing fishing industries in the region, the greater is the gap between the nominal and effective rates of protection provide by tariff barriers.

The standard approach to the theory of tariffs in international economics is to focus on the impact of introducing tariffs within a given economy. From this, one can readily infer the benefits to be gained, and the adjustments to be endured, by removing tariffs imposed in the past.

In presenting the theory, it is necessary to employ some supply and demand analysis. An attempt will be made, however, to keep the complexity of the analysis to a minimum and to use a level of analysis that one might find in, say, *The Economist*.

The starting point, once again, is that tariffs distort the pattern of trade dictated by comparative advantage. From a worldwide standpoint this will, except in unusual circumstances, lead to a misallocation of resources and a resultant loss in world welfare. Economists would concede, however, that, under special circumstances, an individual economy may gain by imposing tariffs, which implies, in turn, that the economy would benefit at the expense of its trading partners.

It is anticipated that, within the economy imposing tariffs:

1) the domestic industries competing with imports will gain;
2) the government will gain additional tax revenue from the tariff;
3) the consumers will experience a decline in "welfare." That is to say, the amount of benefit/satisfaction which the consumers will enjoy from the consumption of goods and services, given their limited income, will decline. The point will be developed more fully, when we introduce the economist's concept of "Consumer Surplus."

The usual assumption which is used, rightly or wrongly, is that a given change, which results in the consumers' losing the equivalent of $100 in welfare, and the domestic industries and government each gaining $50, implies a net gain/loss for the economy as a whole of $0 (see, for example: Lindert, 1986).

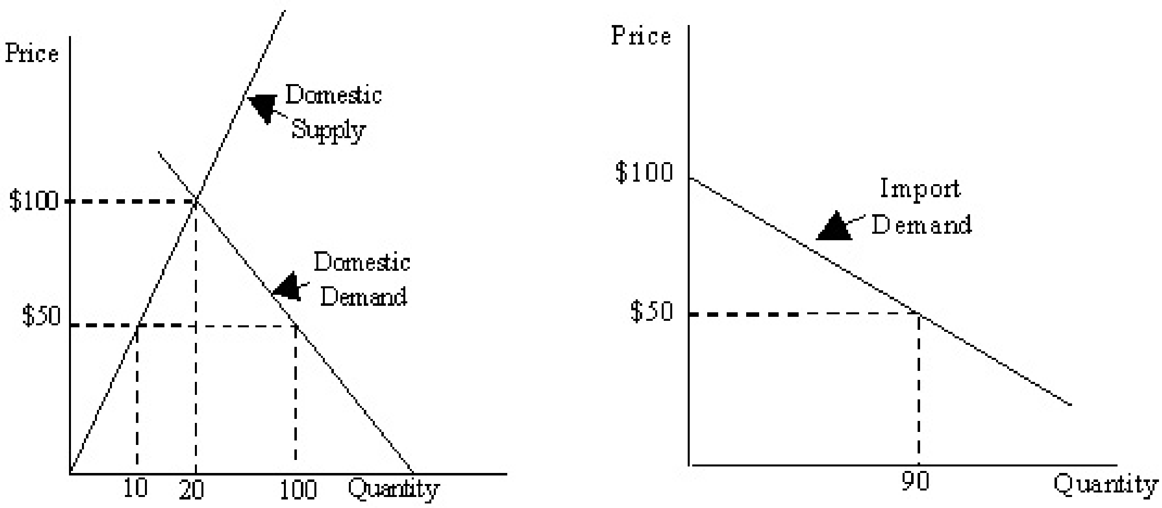
Since the issue in question is the removal of tariffs in a single sector, what economists refer to as partial equilibrium analysis can be used, as opposed to the far more complex general equilibrium analysis that would have to be used if one was examining the removal of all tariffs within a economy. At a later point, however, comments about general equilibrium considerations will be provided.

To use even the simpler partial equilibrium analysis, it is necessary to review certain key concepts, namely: A) import demand and export supply; and B) consumer surplus and producer surplus.

A) Import Demand and Export Supply

The key point to be made here is that a economy's import demand function for a product is derived from the economy's overall demand for the product and the economy's domestic supply of the product. Consider Figure 9, in which no tariffs are assumed to exist.

FIGURE 9

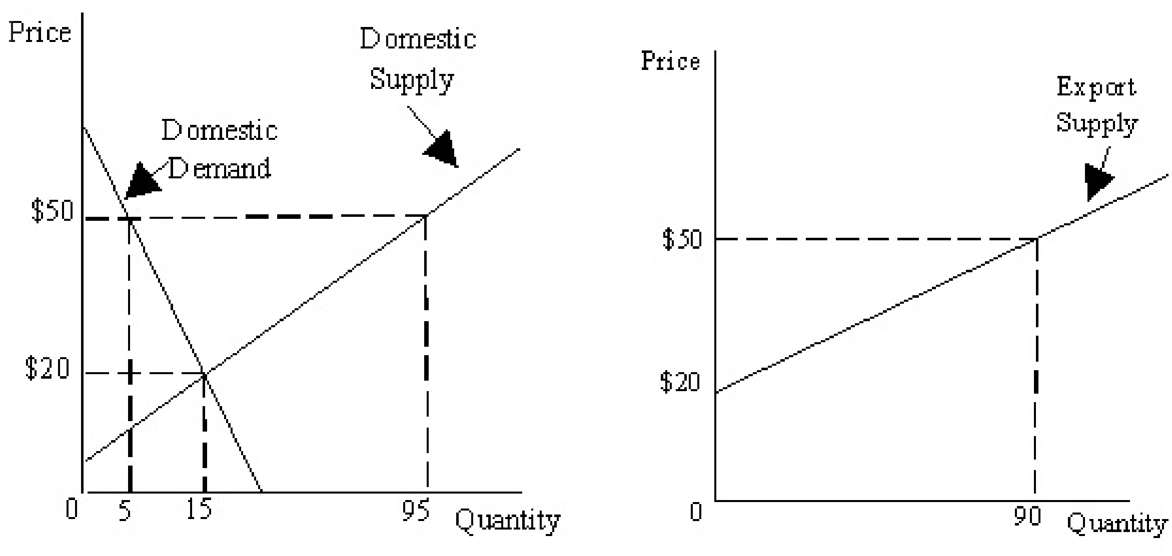


Suppose that the world price of the product (adjusted for transportation costs) was $100. The economy would import nothing. On the other hand, if the world price was $50, the total quantity demanded within the economy would be 100 units, while the quantity supplied domestically would be 10, leaving the gap of 90 to be filled by imports.

A economy's import demand with respect to a given product is thus more price elastic, that is to say more price sensitive, than the economy's overall demand for the product. If the price of the imported product rises, less will be imported, both because the consumers will wish to consume less of the product, and because the domestic suppliers will be encouraged to produce more.

For completeness sake, an export supply function for an exporting economy is illustrated in Figure 10. Similar to an import demand function, an export economy's export supply function is derived from total domestic supply and domestic demand for the product. The export supply function is more price elastic than the overall domestic supply function. If the price of the export product rises, the economy will export a greater quantity, both because of increased output within the economy and because the economy's consumers will consume less.

FIGURE 10

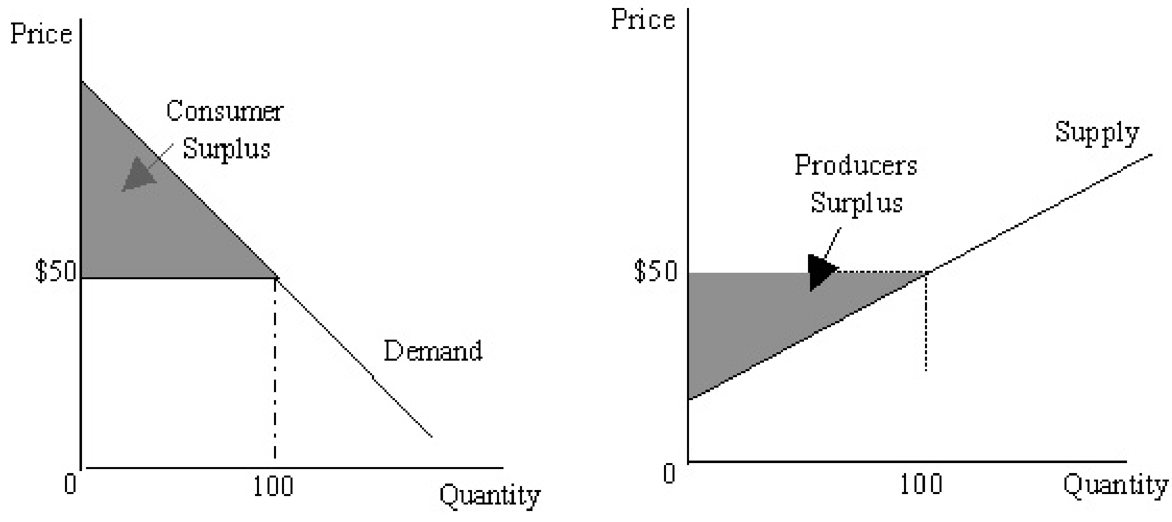


B) Consumer Surplus and Producer Surplus

These admittedly rather esoteric concepts are necessary for an understanding of the economic impact of the imposition, or removal, of a tariff. "Consumer Surplus" is a measure of the value to consumers of a product which they purchased over and above the amount consumers have paid for the product. The corresponding concept of "Producer Surplus" is a measure of the revenue received by producers from the sale of a product in excess of the cost of production. Consider Figure 11 (a) and (b) which involves the purchase and sale of 100 units of a product at a price of $50.

The benefit to consumers of acquiring 100 units per period of time is represented by the area under the demand curve at 100 units. Part of the benefit is offset by the cost to the consumers ($50 x 100), but not all. Return to Figure 9. The diagram indicates, for example, that the consumers would have been prepared to pay $100 for the 20th unit. If the price is $50, they will only have to pay $50 for that 20th unit – hence there is a "surplus" to be enjoyed by the consumers on that unit. In fact, the diagram reveals that the consumers would have been prepared to pay more than $50 for *each* of the first 99 units – indeed much more than $50 for the first few units. In Figure 11(a), the total "Consumer Surplus" is represented by the shaded area With regards to Producers Surplus, the cost to the producers of supplying 100 units is represented by the area under the supply curve at 100 units. This is less than the total receipts of the producers ($50 x 100). The difference, represented by the shaded area in Figure 11(b), is Producer Surplus.

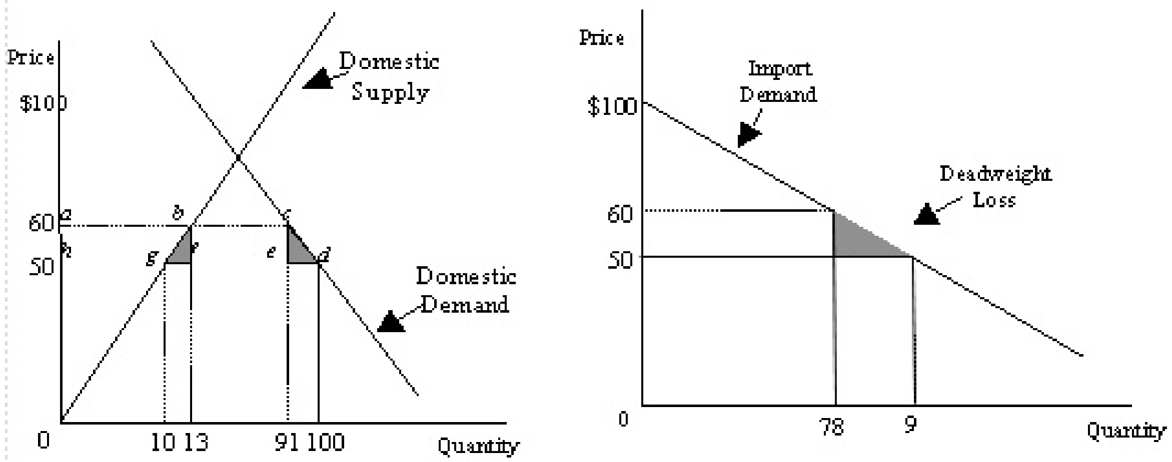
FIGURE 11



(a) (b)

With these basic concepts in mind, let us now consider the impact of the imposition of a tariff on a particular product by one economy, assuming that one economy is too small to have any significant impact upon the world price of the product. Suppose that the world price of the product is $50 and that the authorities introduce a 20 per cent ad valorem tariff (that is to say, a tariff of $10) on the product. Consider now Figure 12.

FIGURE 12



In this example, the tariff raises the domestic price from $50 to $60. The domestic consumers lose, with Consumer Surplus being reduced by the area *acdh* in Figure 12(a). This loss in consumer welfare is offset *in part* by the gain of the domestic industry which is competing with the imports. The increase in Producer Surplus is represented by the area *abgh* in the same figure. There is a further offset through increased government tariff revenue ($10 x 78), represented by the area *bcef*.

The offset is incomplete, however. Consider the triangles *cde* and *bfg*, which together constitute what economists refer to as Deadweight Loss. This represents the "net" loss to the overall economy of the importing economy caused by the distortions created by the introduction of the tariff.

The area *cde* is referred to as the Consumption Effect and reflects the fact that consumers are driven to consume less of the product. The area *bfg*, referred to as the Production Effect, reflects the additional, and unnecessary, production, or acquisition, cost to society of the product.

In Figure 12(b), the Deadweight Loss, shown by *cde* (Consumption Effect) and *bfg* (Production Effect) in Figure 12(a), is consolidated. It is shown as the shaded area under the Import Demand Function. Generally speaking (with some qualification), the more price elastic is the import demand function, the greater will be the combined Consumption and Production effects of the tariff, and hence the greater will be the Deadweight Loss. If, for example, the import demand function was perfectly price *inelastic* – domestic demand for, and production of, the good were completely insensitive to price changes – the import demand function would be represented by a vertical straight line. The Deadweight Loss would be zero.

There are several qualifications which must now be added. First, if the product in question plays a major role in the economy, the "partial equilibrium" analysis used here is likely to be inadequate. Some of the intersectoral consequence of the imposition of the tariff would not be captured by the analysis. It would then be necessary to turn to a general equilibrium analysis, such as was used by the APEC Economic Committee in its analysis of trade liberalization in general in the region (APEC, 1997).

On the other side of the ledger, the examples developed so far are those of an economy which is too small to have an impact on the world price of the product. If the economy is large enough to affect the world price of the relevant product, then the so called "terms of trade" effect will become relevant. A country's terms of trade can, in broad general terms, be thought of as the number of units of imports that a country can obtain per unit of exports (see, for example, Krugman and Obstfeld, 1994). If the world prices of the goods and services which a country imports fall, while the world prices of the country's export goods and services remain constant, then the country's terms of trade would be said to have improved. If indeed the economy is large enough to affect the world price of the relevant product, then one of the impacts of the tariff will be to force down the world price of the product, because total world demand for the product would fall as a consequence of the tariff. Other things being equal, the country's terms of trade would improve thereby. This "terms of trade" effect of the tariff would produce a further offsetting benefit for the importing economy. The additional benefit would obviously come at the expense of the exporting economies.

This leads to a major qualification of the analysis that has been presented so far. All of the analysis has been in terms of single economies. But the issue at point concerns the fisheries tariff policy of APEC members as a group. Consequently, while it is reasonable to suppose that for most APEC members the "terms of trade" effect of changes in their tariffs on fish and fish products would be weak, one could expect that the "terms of trade" effect of a change in tariff policy of the APEC members combined would be substantial given APEC's dominant position in world fisheries. In fact, however, in Chapter III of this report it will be argued that, while there will probably be a short run "terms of trade" effect, the long run "terms of trade" effect of an APEC-wide removal of fisheries tariffs is likely to be negligible because of the availability of adequate increased supply from aquaculture at constant costs to meet the relatively small increase in demand.

The question of the impact of tariff removals can now be addressed in a straightforward manner. Everything goes into reverse. Within the importing economies that are removing tariffs, the consumers will clearly benefit. The industries competing with the imports would face contraction, with the surviving firms presumably becoming more efficient. The government would lose revenue. The key point, however, is that the gain to the consumers could be expected to outweigh the losses to domestic producers and the government. The net gains to these importing economies could, it is true, be mitigated by the "terms of trade" effect, if the latter was significant.

Since the "terms of trade" effect for the APEC region as a whole could be significant, albeit only in the short run, it is necessary to comment on the impact upon the exporting economies of a tariff-policy-induced increase in the price of their products. While the diagrammatic analysis done for importing economies is not repeated for exporting economies, it would indeed be the case that the consumers in the exporting economy would experience a loss in consumer surplus. It can be easily demonstrated, however, that this loss would be more than offset by the gain in producer surplus.

This report is concerned with the impact of the removal of tariffs on fisheries products. Nonetheless, it is necessary to comment as well on non-tariff measures and their impact upon trade flows. If tariffs are removed, but then simply replaced by non-tariff measures (NTMs), trade flows could end up by being more distorted than they were before.

In 1994, the PECC Task Force on Fisheries Development and Cooperation completed a survey of fishery NTMs. The survey was then published in the journal *INFOFISH International*, in 1995 (Munro, 1995). The following table shows the major NTMs employed by APEC members as reported in the aforementioned survey.

TABLE 6: FISH AND FISH PRODUCTS NON-TARIFF MEASURES EMPLOYED BY APEC MEMBERS 1995

1. Import Quotas for Selected Species
2. Ban on Imports of Selected Species Excepted for Specific End Uses
3. Health and Sanitary Regulations
4. Requirement of Exceptionally Rigorous Documentation by Importing Firms
5. Ban on Imports of Certain Species from Certain Export Economies on Grounds that the Latter are Engaged in Unacceptable Conservation Practices.

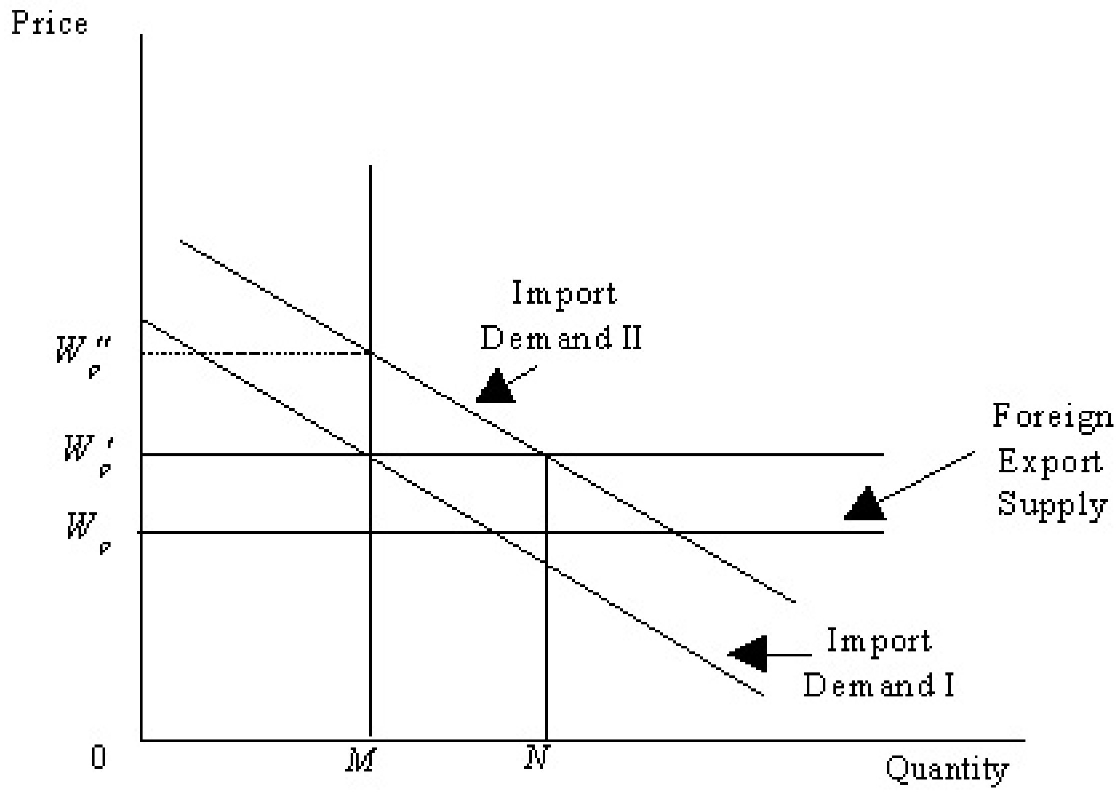
Source: Munro, 1995.

It can be remarked in passing that it is often difficult to identify those NTMs which are truly trade distorting. Consider Item 3.

The key point to be made about NTMs, that act as trade barriers, is that over time they have the potential to produce greater distortions to trade than do tariffs. It is common in textbooks on international economics to demonstrate that tariffs and non-tariff barriers can have equivalent effects. The claim is not incorrect, but it is misleading, because it is based upon strictly static analysis.

Consider Figure 13 which shows a particular economy's import demand for a particular product. It is assumed that the economy faces a perfectly elastic foreign export supply. Let W_p be the world price and let W'_p be the world price plus the tariff: $W'_p = W_p(1+t)$, where t is the ad valorem tariff rate. When the import demand is Import Demand I, a quantity *OM* is imported. The same result could be achieved by imposing a NTM in the form of an import quota of *OM* per period. With the quota, the price within the economy would rise to W'_p.

FIGURE 13



Now, however, suppose that the import demand shifts out to Import Demand II. With the tariff, the quantity imported would increase to *ON*. With an import quota, on the other hand, the quantity imported remains the same and the price within the economy simply rises to W''_p. Similarly, if the foreign export supply shifted outwards due to, say, a decrease in foreign production costs, the consumers in the importing economy would, under a tariff regime, enjoy a portion of the benefits from the cost reduction and imports would increase. With an import quota in place, the consumers would enjoy none of the cost reduction benefits and the level of imports would remain unchanged.

What has been discussed to this point is what might be referred to as the "classical" theory of tariff and NTM policy. This discussion must be supplemented with two other considerations, one of which is common to trade policy in general, and one of which is peculiar to the fisheries. The first concerns the problem of adjustment in the import competing industry when faced by a removal of trade barriers. The second concerns the problem of resource management and the interaction between such management and trade policy.

With regards to adjustment in the import competing industry, the simple diagrammatic analysis which has been used, suggests that, when tariffs are removed and the import competing industry contracts, productive resources will flow smoothly and easily out of the importing competing industry to be used elsewhere in the economy with greater efficiency. This view of the world does, in fact, overlook the fact that some of the conventional capital and some of the "human capital" employed in the industry may be use specific. To use some jargon taken from the economics of fisheries management, it could be said that such conventional and “human” capital lacked “malleability,” by which we mean flexibility or adaptability.

Where the capital in the contracting import competing industry is non-malleable, then one cannot deny that a difficult, and likely painful, adjustment problem will have to be confronted, requiring specific government programs, such as retraining. To say, however, that the adjustment is difficult is not an argument for continued restrictive trade policy. To accept such an argument would be to revert to the protectionist mistakes of earlier times and to impose a permanent burden on the economy.

It can be conjectured that, among the net fish importing members of APEC, the degree of the adjustment problem may be influenced by the size of the member's net export ratio. If the member is a "moderate" net importer, with a net export ratio greater than -0.5 (say -0.2, for example), then the contraction in the import competing segments of the fishing industry will be accompanied by an expansion in the export oriented components of the industry. It may thus be possible for some of the required adjustment to take place on an intra-industry basis, which will probably prove to be easier than adjustments which have to take place on an inter industry basis.

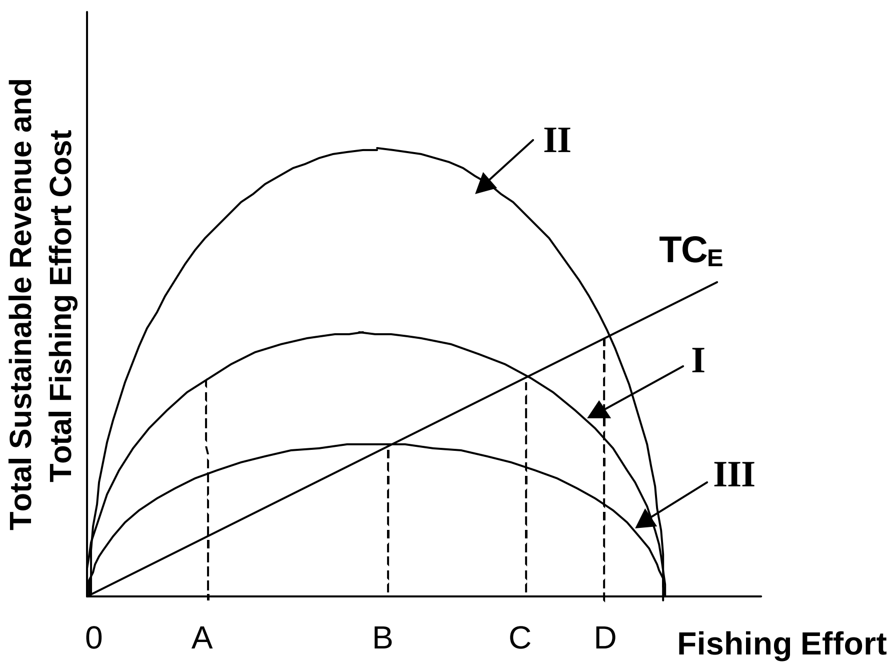
The second issue of resource management and its interrelationship with trade in fisheries is a more complex one. There is now an increasing recognition of such an interrelationship (PECC, 1997). The interrelationship is seen to occur on two levels with the first being the impact of trade policy upon resource management.

In order to understand the impact of trade policy upon resource management, we must first digress to explore in somewhat greater detail, the basic economic problem associated with many capture fisheries. At an earlier point in the report, it was argued that, historically, many capture fisheries have been characterized by an absence of effective property rights to the resource. This “common property” (or ”common pool”) characteristic, the argument continued, leads to an overexpansion of the fishery and an overexploitation of the resource. The problem is illustrated in Figure 14, which is to be found throughout the fisheries economics literature (see, for example, Munro and Scott, 1985).

In Figure 14, it is assumed that the price of harvested fish and the unit cost of fishing effort are both constant, and that the fishery is a “pure open access,” one, in which there are no effective property rights to the resource, and in which there is no effective government regulation of the fishery.

Consider Curve I, which represents the initial sustainable revenue (gross) from harvesting. Each point on the curve is determined by the sustainable harvest associated with a given level of fishing effort, multiplied by the initial price for harvested fish, which we shall denote as p_I. The straight line TC_E represents the total cost of fishing effort.

Figure 14



If the rate at which future economic returns from the fishery are discounted is equal to zero, then it can be argued (see Munro and Scott, 1985) that, on economic grounds, the fishery should, from society's point of view, be stabilized at a level of fishing effort OA, at which the sustainable net economic benefits (resource rent) from the fishery will be maximized. Under conditions of open-access, however, the fishery will expand to a level of fishing effort OC, at which the resource rent is fully dissipated, and which is commonly referred to, in the economics literature, as Bionomic Equilibrium (Munro and Scott, 1985). Thus, the argument continues, conditions of open access lead to an excessive expansion of the fishery, and hence an overexploitation of the resource.

Now consider the effect of an increase in the price of harvested fish from p_I to p_{II}, $p_{II} > p_I$. The sustainable revenue curve will appear to shift outwards to Curve II. The consequence will be that the level of fishing effort will expand to OD, thus aggravating the problem of overexploitation. Conversely, if commencing at price p_I, the price of harvested fish falls to $p_{III} < p_I$, the sustainable revenue curve will shift inwards to Curve III. Bionomic Equilibrium will now be at OB. Thus the problem of resource overexploitation will have been mitigated.

Now let us apply this analysis to the impact of trade policy upon resource conservation. If a net fish importing nation is plagued with over-exploited fishery resources, then we can anticipate the following. A reduction in tariffs on imported fish products will reduce the price received for harvested fish by domestic fishers. This, in turn, will result in a contraction of the domestic fisheries, and thus a mitigation of the resource overexploitation encountered in these fisheries.

It should also follow, however, that if the fisheries in the net export economies are ineffectively managed, the reduction in tariffs could aggravate the resource conservation problem in these economies. If the reduction in tariffs has a "terms of trade" effect, which raises the price of harvested fish to the net exporters, then the result would be intensified over-exploitation of the resources. Thus, the case could be made that, under such circumstances, free trade in fisheries could prove to be non-optimal from a resource conservation perspective (see, for example: Brander and Scott, 1998). There is a threefold response to this proposition.

Ineffective economic management of fishery resources is often characterized as an example of market failure. There does, in fact, exist a whole set of arguments against free trade based upon perceived market failure. The argument against free trade in fisheries can thus be considered as one of the set.

The general counterargument to the market failure arguments for protection is that it is far better, far more efficient, to attack the market failure directly, rather than indirectly by creating trade distortions (Krugman and Obsfeldt, 1994). Thus, in the case of fisheries, it is far more sensible to attack the problem of ineffective resource management directly. As the PECC Fisheries Task Force Symposium on the Interrelationship between Fisheries Management Practices and International Trade emphasized in its report, free trade and sound fishery management are not in conflict. On the contrary, they serve to complement one another (PECC, 1997).

The second element of the response is that a review of the development of fisheries trade reveals that comparative advantage is shifting in the direction of well managed fisheries. While aquaculture has been emphasized, this applies equally well to a well-managed capture fisheries. The move towards freer trade in fisheries, and the resultant unfettering of comparative advantage, should enhance APEC wide attempts to improve the management of fishery resources.

The third element of the response is to note that, while there may be a short run “terms of trade effect” to an APEC wide removal of fisheries related tariffs, the long run “terms of trade effect” is likely to be negligible because of the availability of increased supply from aquiculture, a constant returns to scale industry. Thus, any possible negative impact of tariff reduction on resource conservation in net export economies would, at most, be transitory.

The second level at which the interrelationship between resource management and trade management manifests itself involves the impact of resource management upon trade, rather than the other way around. This second manifestation is perhaps the more serious of the two.

The PECC Fisheries Task Force symposium concluded that there was a case to be made for the claim that "bad resource management leads to bad trade" (PECC, 1997). There is increasing evidence that the perception of ineffective resource management will give encouragement to those in net fish importing economies who wish to see the introduction of non-tariff measures, ostensibly for conservation purposes. The supposed purpose of the measure is to "compel" the net exporting economies to improve their resource management. The measures are trade barriers, nonetheless.

Moves towards eco-labelling sponsored by non-governmental organizations (NGOs) provide an important example (PECC, 1997). Eco-labelling programs, if successful, will lead to price differentials, with unlabelled products fetching lower prices. Thus, the program will have the same effect as a discriminatory tax. Moreover, the programs can, in some instances, go much farther and lead to de facto boycotts of the unlabelled products by the private sector, or governments, which could, in turn, have a devastating effect on certain export oriented fishing industries. Consequently, the threat remains that, moves towards freer trade through the removal of tariffs, could be undermined by the spread of NTMs, imposed in the name of improved resource management.

The appropriate conclusion is not that attempts to reduce barriers to trade in fish and fish products are futile. It is rather that trade issues in fisheries must not be addressed in isolation from resource management issues. To repeat an earlier comment, free trade in fish and fish products, and sound resource management do not stand in opposition to one another. Rather they are complements, which should prove to be mutually re-enforcing.

SOME PRELIMINARY CONCLUSIONS

The following chapter, Chapter III, will present a quantitative assessment of the removal of tariffs on fish and fish products in the APEC region. The final conclusions of the report must obviously follow that assessment. Nonetheless, we can, at this stage offer some preliminary conclusions.

The first conclusion is that the APEC region dominates both world fisheries production and trade. Thus, fisheries trade policy changes introduced within APEC must be expected to have a profound effect upon the world at large.

The second conclusion is that the growth in world fisheries production and in the volume of trade will come primarily from aquaculture, and, possibly to some extent, from improved management of capture fishery resources. Comparative advantage is shifting away from fish producing nations with ineffectively managed fishery resources.

A third conclusion is that the long run terms of trade effect of a removal of tariffs on fish and fish products can be expected to be negligible because of the availability of increased supply from aquiculture at constant costs of production. From our second and third conclusions, it follows that the argument to the effect that the removal of tariffs would aggravate resource management problems in APEC net fish exporting members appears to have little merit. On the contrary, the unfettering of comparative advantage can be expected to promote, rather than hinder, the move towards better managed fisheries in the APEC region.

The removal of the APEC tariffs on fish and fish products would obviously benefit the net exporting members of APEC. Given the absence of a long run terms of trade effect of the removal of tariffs, our analysis indicates that net importing members should also benefit overall from the improved efficiencies brought about by freer trade. There would, of course, be adjustments within these economies that would have to be addressed.

It is evident that the removal of tariffs on fish and fish products would produce benefits which would be spread throughout the APEC region. Nonetheless, a cloud remains on the horizon. Tariffs are but one component of trade barriers. The benefits arising from the removal of tariffs could easily be undermined by the spread of NTMs. Particularly dangerous are those NTMs imposed in the name of improved resource management.

The appropriate response to this threat is to recognize that it is inappropriate to regard trade policy in fisheries and resource management in isolation from one another. Ineffective resource management can serve to undermine the move towards freer trade; improved resource management will strengthen that move. Freer trade, in its turn, will serve to maximize the benefits to the region of improved resource management.

III. QUANTITATIVE ESTIMATES

THE FISHERIES TRADE LIBERALIZATION MODEL

To provide specific quantitative estimates of the impact on trade flows of the elimination of tariffs on fish and fish products, a model of fisheries trade was constructed (see Appendix B). This model uses the price elasticities estimated from import equations for fish and fish products (see Appendix A) to calculate the increase in fisheries imports. This is based on the plausible assumption that consumers will react to price decreases resulting from tariff reductions in the same way as they would to any other price decrease. In other words, the estimated price elasticities from the import equations are also assumed to apply to price reductions to the consumer resulting from the elimination of fisheries tariffs. Besides the tariff levels and price elasticities, the other important factor determining the impact is the level of imports of fish and fish products in the 1995 base year.

The increase in fisheries exports in the model required to meet the increase in import demand is assumed to be spread among the world's economies based on their 1995 market share of global exports. This simple assumption is reasonable and is justified by the impossibility of estimating supply functions for fisheries exports due to data limitations. The estimates of the increase in imports and exports produced by this model are long-run equilibrium results and do not show the time profile of the response resulting from the phase out of fisheries tariffs over a multi-year period. The estimates also assume that sufficient supply will be forthcoming at the existing price to meet the required increase in exports. This assumption is relatively reasonable given that aquaculture is expected to be the dominant source of the increased production of fish and fish products and aquaculture is an industry that can be expected to have constant returns to scale.

THE ESTIMATES OF THE IMPACT OF ELIMINATING FISHERIES TARIFFS

The average tariffs to be eliminated are shown by category of import in Table 7 for all of the APEC member economies. The overall average tariff rates for the member economies are shown in Figure 15. All other things being equal, the economies with the highest tariff rates in a specific category are expected to have the largest impact from tariff elimination. The economies with the highest tariffs are: Thailand (51.20 percent); Papua New Guinea (49.12 per cent); China (25.18 per cent); and Chinese Tapei (17.75 percent). Tariff rates on oils and meals are lower than for other categories. Tariffs on crustaceans and molluscs are slightly higher on average than on fish, and tariffs on canned fish products are a little higher still.

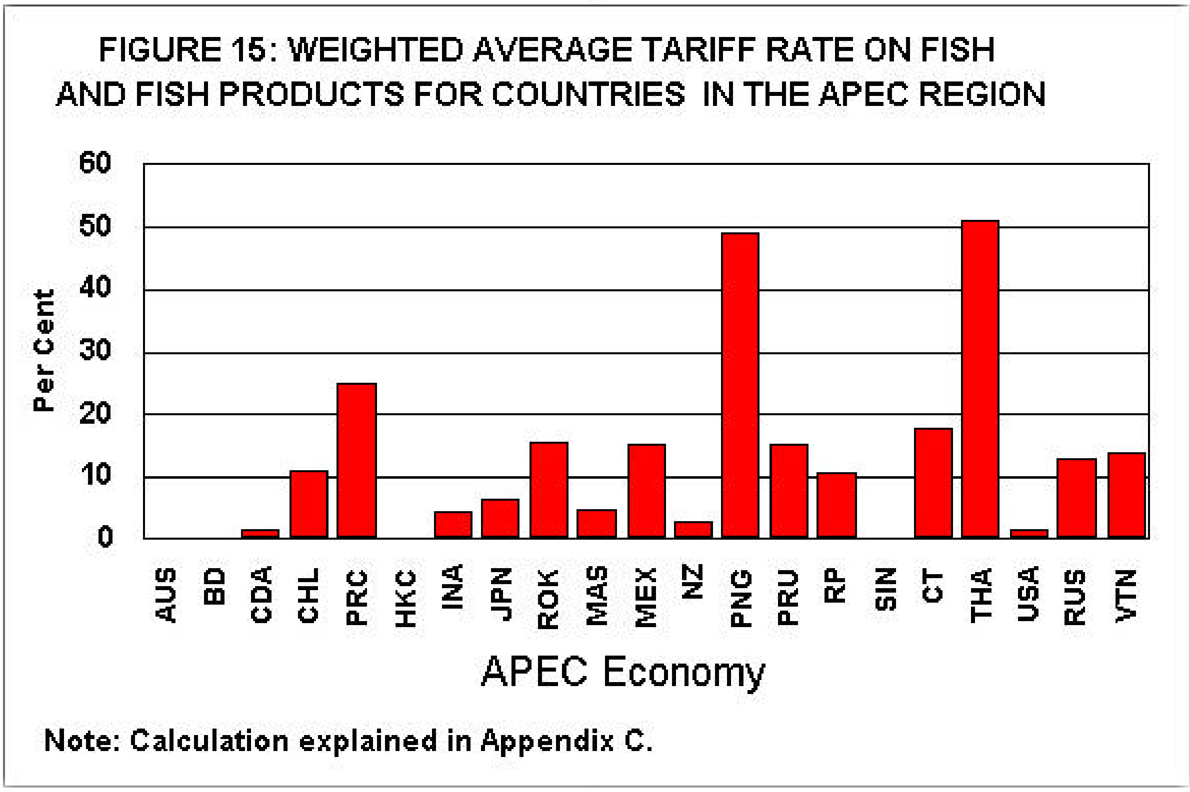
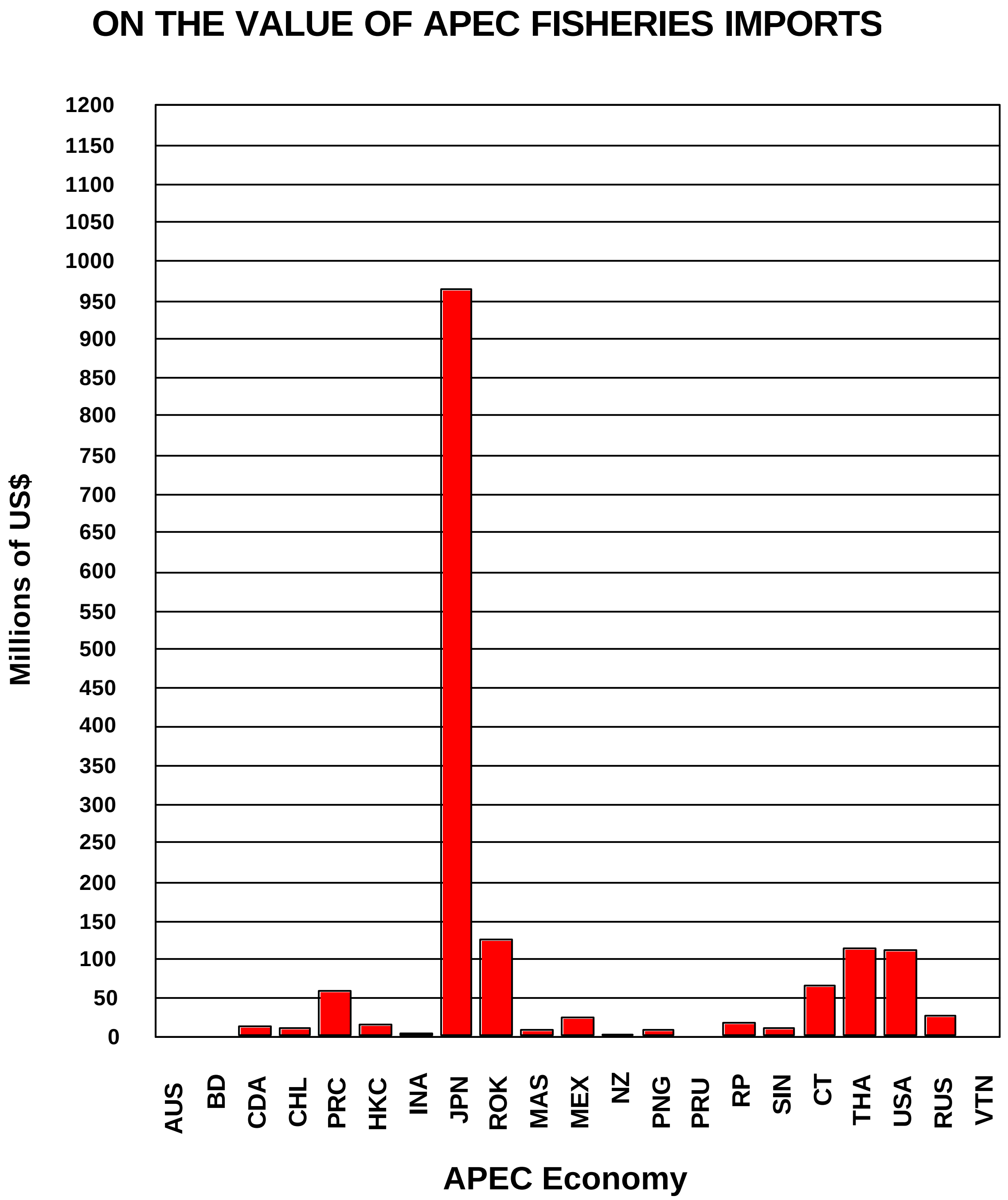


FIGURE 15: WEIGHTED AVERAGE TARIFF RATE ON FISH AND FISH PRODUCTS FOR COUNTRIES IN THE APEC REGION

Note: Calculation explained in Appendix C.

The summary results for imports and exports by economy of removing APEC tariffs on fish and fish products are provided in Table 8. Figure 16 portrays graphically the impact on the value of imports. Detailed results by product category for the volume and value of imports and exports are provided in Tables 9-12. Note that these are long-term equilibrium results assuming that tariffs are completely eliminated at a point in time. They could also be interpreted as the long-term equilibrium results associated with any desired pattern of phased reductions.

FIGURE 16: IMPACT OF ELIMINATION OF TARIFFS ON THE VALUE OF APEC FISHERIES IMPORTS



The overall increase in APEC fisheries imports is 619 thousand metric tons or $1.6 billion (Table 8). This represents 5.9 per cent of APEC fisheries imports by volume and 4.8 percent by value. An increase of this size, representing by volume a little more than half of one year's increase in world imports and a little more than two-thirds of one year's increase in APEC imports, spread over the multi-year adjustment period can probably be accommodated without putting significant upward pressure on fish prices. Japan is the economy that will experience the largest share of the increase in imports by value: 178 thousand metric tons or 29 percent of the total APEC increase by volume and $965 million or 60.2 percent of the total APEC increase by value. Thailand will experience an increase in volume of imports that is 70 per cent of that in Japan, but a much smaller increase of $114 million in value. Other economies experiencing large increases in the value of imports are: Korea ($125 million);the United States ($112 million); Chinese Taipei ($65 million); and China $59 million. Economies that will experience lesser increases in exports are: Russia ($29 million); Mexico ($26 million) the Philippines ($20 million); Hong Kong, China ($18 million); Canada ($15 million); Singapore ($13 million); Chile ($13 million); Papua New Guinea ($11 million); Malaysia ($10 million); Indonesia ($6 million); New Zealand ($2.4 million); Vietnam ($0.5 million); Peru ($0.4 million); and Australia ($0.3 million).

The increase in imports is influenced by the current magnitude of the import market, and by the current level of tariffs. The increase in imports in Japan is high even though tariffs are low because of its very high level of imports, whereas the increase in imports in Thailand is high because of its high tariff levels.

The increase in imports will be supplied by an increase in the volume of exports of APEC and non-APEC members. The export volume increase for APEC members of 303 thousand metric tons, and the export value increase for APEC members of $789 million each account for 49 per cent of the total world increase. This represents an increase of 2.6 per cent in the volume of exports of APEC members and of 2.7 percent by value. Overall net exports in value of the APEC region (defined as the value of APEC exports minus the value of APEC imports) will fall by $816 million and net exports of the rest of the world will rise by the same amount. The APEC economies that will experience the largest increases in the value of exports are: Thailand ($122 million); the Russian Federation ($93 million); the United States ($83 million); China ($81 million); Chinese Taipei ($68 million) (Table 8). Other economies that will experience large increases are: Indonesia ($46 million); Canada ($42 million); Korea ($41 million); and New Zealand ($31 million). Of these economies experiencing large increases in exports, economies that will experience significant increases in the value of net exports (exports minus imports) are: Russia ($64 million); Indonesia ($40 million); New Zealand ($29 million); Canada ($26 million); China ($22 million); Chile ($19 million); Peru ($17 million);

Malaysia ($15 million); Vietnam ($13 million); and Thailand ($9 million);. Other APEC economies that will experience small increases in the value of net exports are: Australia; Brunei Darussalam; Hong Kong, China; Chinese Taipei; and Singapore. APEC economies that will experience increases in imports in excess of exports are: most notably Japan(-$946 million); then Korea (-$84 million); the United States (-$28 million); Papua New Guinea (-$11 million); the Philippines (-$8 million); and Mexico (-$7.4 million).

Among the detailed categories of fisheries imports (Tables 9 and 10), the largest increases will occur for fish, fresh, chilled or frozen (386 thousand metric tons or $819 million) followed by: crustaceans and molluscs (74 thousand metric tons or $447 million); crustaceans and molluscs, canned (28 thousand tons or $182 million); fish, canned (43 thousand metric tons or $99 million); and fish dried, salted or smoked (15 thousand metric tons or $21 million); meals (46 thousand tonnes or $23 million); and oils (28 thousand metric tons or $13 million). The high value products are crustaceans and molluscs and fish, fresh, chilled or frozen. Oils and particularly meals are low value products where the increase in tonnage is high relative to the value. Most of the increase in value for Japan, Thailand, China, Korea, and the Philippines, the economies experiencing the largest increase in imports, come from increases in fish, fresh, chilled or frozen and from crustaceans and molluscs.

The largest portion of APEC's increase in exports will come from increases in: fish, fresh, chilled or frozen (176 thousand tons or $373 million); crustaceans and molluscs (39 thousand tons or $237 million); and fish, canned (20 thousand tons or $46 million) (Tables 11 and 12).

A COMMENTARY ON THE QUANTITATIVE ANALYSIS

Pivotal to the quantitative analysis of the impact of the removal of tariffs on fish and fish imports are the (own) price elasticities of the relevant import demand functions. The (own) price elasticity coefficient of a demand function is the percentage change in quantity demanded for a product divided by the percentage change in price for the same product. In absolute terms (that is to say, ignoring plus and minus signs) a coefficient greater than 1.0 denotes a price elastic demand function, and a coefficient less than 1.0 denotes a price inelastic demand function.

A good place to start out in judging the veracity of the quantitative estimates is with the price elasticity of the overall domestic demand for fish in the APEC members. If there are differences, or absence of differences, between these price elasticities and the estimated price elasticities of the import demand functions, which the theory cannot explain, then clearly a problem exits.

Detailed estimates of demand function for fish and fish products of APEC members are not readily available, except for Japan and the United States, the two APEC members which dominate fish/fish product imports in the APEC region.

The results for both Japan (Eales, Durham and Wessells, 1997) and for the United States (Wellman, 1992) are remarkably similar. The demand for fish products in Japan is moderately (own) price inelastic, with the price elasticity coefficients (in absolute terms) varying according to fish product category from a low of 0.24 to a high of 0.66 (Eales, et al., *ibid.*). The results from the quantitative analysis of the impact of fisheries tariffs in the APEC region, indicate that the import demand (all species) price elasticities for Japan and the United States are moderately higher than those for overall domestic demand for fish products in the two economies. The estimated import demand price elasticities are 0.74 for Japan and 0.78 for the United States. This is precisely what the economic theory would lead us to expect. It will be recalled from Chapter II that the import demand function is derived from the domestic demand and domestic supply functions of the relevant product (see Figure 9). At a given price, the quantity of imports demanded will be equal to the difference between the total quantity demanded domestically and the total quantity supplied domestically. If the price falls the quantity of imports demanded can be expected to increase, both because of the increase in the quantity demanded domestically, and because of the decline in the quantity supplied domestically. Consequently, one should expect the elasticity of the import demand to be higher than that of the overall domestic demand for the product. This is a reason to be confident in the empirical results.

TABLE 7: AVERAGE APEC FISHERIES TARIFF BY CATEGORY

	Categories							
	Fish, Fresh, Chilled or Frozen	Fish, Dried, Salted or Smoked	Crustaceans and Mulluscs	Fish, Canned	Crustaceans and Mulluscs, Canned	Oils	Meals	Total
AUS	0.00	0.00	0.00	0.56	0.00	0.00	0.00	0.13
BD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CDA	0.09	0.28	1.11	4.30	2.41	3.78	1.13	1.37
CHL	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
PRC	30.63	51.29	33.41	45.00	45.00	30.00	11.50	25.18
HKC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INA	21.18	15.48	22.33	24.32	25.00	10.00	0.00	4.37
JPN	4.86	11.51	7.21	9.54	8.64	4.10	0.00	6.47
ROK	14.26	20.00	19.29	20.00	20.00	3.00	5.00	15.55
MAS	0.00	12.69	9.12	19.58	17.50	6.67	0.00	4.62
MEX	19.39	20.00	18.46	20.00	20.00	8.00	15.00	15.00
NZ	0.00	0.00	1.93	2.93	3.72	3.80	9.50	2.78
PNG	54.35	55.00	55.00	50.22	55.00	11.00	11.00	49.12
PRU	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
RP	16.78	30.00	24.55	26.67	22.00	10.00	3.00	10.93
SIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CT	26.57	29.48	33.75	29.64	29.13	6.67	0.00	17.75
THA	60.00	60.00	60.00	30.00	30.00	10.00	6.00	51.20
USA	0.80	1.94	0.70	5.03	3.09	2.10	0.00	1.22
RUS	10.00	17.00	10.00	23.00	28.00	15.00	5.00	12.87
VTN	26.67	20.00	16.67	40.00	25.00	7.00	5.00	13.69

TABLE 8: SUMMARY OF THE IMPACT OF ELIMINATION OF TARIFFS ON APEC FISHERIES TRADE					
	Increase in Fisheries Imports (metric tons)	Increase in Fisheries Imports (1000 US $)	Increase in Fisheries Exports (metric tons)	Increase in Fisheries Exports (1000 US $)	Change in Net Fisheries Exports (1000 US $)
AUS	92	329	1,924	8,722	8,393
BD	0	0	5	13	13
CDA	4,567	15,191	13,411	41,576	26,384
CHL	4,894	13,050	24,766	32,091	19,041
PRC	79,385	59,240	21,568	81,453	22,214
HKC	6,919	18,059	6,919	20,066	2,007
INA	4,650	5,674	16,068	45,968	40,294
JPN	178,104	965,095	7,422	19,055	(946,039)
ROK	51,884	124,961	12,922	41,040	(83,921)
MAS	5,379	9,658	5,705	24,403	14,745
MEX	25,067	26,473	5,185	19,100	(7,372)
NZ	2,344	2,426	9,786	31,200	28,774
PNG	7,769	11,033	113	353	(10,680)
PRU	450	383	26,854	17,067	16,683
RP	35,985	19,949	3,702	11,952	(7,998)
SIN	5,077	13,133	5,077	14,592	1,459
CT	16,876	64,795	28,955	67,853	3,058
THA	124,837	113,770	33,029	122,369	8,599
USA	28,209	111,539	34,786	83,068	(28,471)
RUS	35,706	28,871	42,013	93,277	64,406
VTN	394	478	2,476	13,017	12,539
APEC TOTAL	618,590	1,604,108	302,685	788,234	(815,874)
ROW			315,905	815,874	815,874

TABLE 9: IMPACT OF ELIMINATION OF TARIFFS ON APEC FISHERIES IMPORT VOLUMES BY CATEGORY (METRIC TONS)

	Categories							
	Fish, Fresh, Chilled or Frozen	Fish, Dried, Salted or Smoked	Crustaceans and Mulluscs	Fish, Canned	Crustaceans and Mulluscs, Canned	Oils	Meals	Total
AUS	0	0	0	92	0	0	0	92
BD	0	0	0	0	0	0	0	0
CDA	445	130	1,098	1,793	229	696	176	4,567
CHL	809	4	55	3,735	2	287	2	4,894
PRC	41,834	4,311	1,389	555	702	560	30,034	79,385
HKC	4,585	236	1,185	489	250	48	126	6,919
INA	1,990	3	1,164	100	51	1,340	0	4,650
JPN	127,518	105	35,021	901	11,292	3,268	0	178,104
ROK	35,358	276	7,761	138	6,927	1,039	387	51,884
MAS	0	965	879	2,748	664	123	0	5,379
MEX	1,403	49	685	2,209	1,145	18,363	1,211	25,067
NZ	0	0	70	162	31	13	2,068	2,344
PNG	635	0	0	6,986	0	0	148	7,769
PRU	365	3	0	2	2	0	78	450
RP	31,025	8	1,996	512	1,419	83	943	35,985
SIN	3,907	49	736	71	245	3	66	5,077
CT	3,008	62	10,851	448	1,780	728	0	16,876
THA	104,724	934	9,695	63	1,171	937	7,313	124,837
USA	12,881	183	979	11,828	2,288	50	0	28,209
RUS	15,154	7,448	257	9,607	224	0	3,016	35,706
VTN	59	0	11	144	2	0	178	394
APEC TOTAL	385,701	14,764	73,832	42,583	28,426	27,538	45,745	618,590

TABLE 10: IMPACT OF ELIMINATION OF TARIFFS ON APEC FISHERIES IMPORT VALUE BY CATEGORY (THOUSAND US $)

	Categories							
	Fish, Fresh, Chilled or Frozen	Fish, Dried, Salted or Smoked	Crustaceans and Mulluscs	Fish, Canned	Crustaceans and Mulluscs, Canned	Oils	Meals	Total
AUS	0	0	0	329	0	0	0	329
BD	0	0	0	0	0	0	0	0
CDA	974	428	6,521	5,343	1,544	300	81	15,191
CHL	3,277	18	249	9,379	11	114	2	13,050
PRC	30,783	7,725	3,279	2,122	684	434	14,212	59,240
HKC	8,764	297	6,457	1,023	1,440	21	58	18,059
INA	2,080	24	2,401	232	109	828	0	5,674
JPN	528,035	1,670	324,214	10,782	98,592	1,802	0	965,095
ROK	68,379	1,216	22,864	1,458	30,012	800	232	124,961
MAS	0	917	1,830	5,232	1,561	117	0	9,658
MEX	3,003	386	1,660	6,611	6,531	7,592	690	26,473
NZ	0	0	456	497	218	29	1,226	2,426
PNG	545	0	5	10,397	0	0	86	11,033
PRU	289	38	1	6	21	0	29	383
RP	15,486	98	975	1,044	1,825	70	451	19,949
SIN	7,469	62	4,010	149	1,411	1	30	13,133
CT	9,175	205	41,632	1,117	12,146	520	0	64,795
THA	85,638	970	20,291	255	1,394	652	4,570	113,770
USA	45,515	45,515	9,134	33,234	22,773	64	0	111,539
RUS	9,626	5,812	961	9,488	1,412	0	1,573	28,871
VTN	125	0	44	208	31	0	70	478
APEC TOTAL	819,162	20,686	446,983	98,906	181,714	13,346	23,310	1,604,108

TABLE 11: IMPACT OF ELIMINATION OF TARIFFS ON APEC FISHERIES EXPORT VOLUMES BY CATEGORY (METRIC TONS)								
	Categories							
	Fish, Fresh, Chilled or Frozen	Fish, Dried, Salted or Smoked	Crustaceans and Mulluscs	Fish, Canned	Crustaceans and Mulluscs, Canned	Oils	Meals	Total
AUS	681	4	989	25	189	10	26	1,924
BD	0	0	0	5	0	0	0	5
CDA	8,034	1,019	2,924	551	622	130	131	13,411
CHL	6,411	145	379	1,523	720	4,375	11,213	24,766
PRC	11,277	275	6,547	1,060	2,345	4	61	21,568
HKC	4,585	236	1,185	489	250	48	126	6,919
INA	11,847	347	2,663	828	353	4	4	16,068
JPN	5,699	23	488	508	413	87	204	7,422
ROK	7,831	38	2,253	1,310	1,175	73	241	12,922
MAS	2,189	22	2,400	378	672	0	44	5,705
MEX	2,890	23	1,403	144	635	2	89	5,185
NZ	6,620	21	2,608	159	130	51	197	9,786
PNG	84	0	29	0	0	0	0	113
PRU	678	8	299	357	21	5,986	19,505	26,854
RP	1,474	11	836	1,243	134	0	3	3,702
SIN	3,907	49	736	71	245	3	66	5,077
CT	26,869	25	1,637	214	41	10	160	28,955
THA	11,187	390	5,971	9,063	6,390	3	24	33,029
USA	24,224	437	3,086	1,774	953	3,431	881	34,786
RUS	38,762	1,241	1,178	143	239	127	323	42,013
VTN	473	29	1,483	17	461	0	13	2,476
APEC TOTAL	175,722	4,342	39,093	19,862	15,988	14,345	33,332	302,685
ROW	209,979	10,422	34,739	22,721	12,438	13,193	12,413	315,905

TABLE 12: IMPACT OF ELIMINATION OF TARIFFS ON APEC FISHERIES EXPORT VALUE BY CATEGORY (THOUSAND US $)

	Categories							
	Fish, Fresh, Chilled or Frozen	Fish, Dried, Salted or Smoked	Crustaceans and Mulluscs	Fish, Canned	Crustaceans and Mulluscs, Canned	Oils	Meals	Total
AUS	1,446	6	5,986	58	1,207	5	13	8,722
BD	0	0	2	10	0	0	0	13
CDA	17,063	1,428	17,701	1,279	3,975	63	67	41,576
CHL	13,616	204	2,296	3,538	4,603	2,120	5,714	32,091
PRC	23,951	385	39,635	2,461	14,988	2	31	81,453
HKC	9,738	330	7,174	1,136	1,599	23	64	20,066
INA	25,160	486	16,124	1,924	2,259	2	13	45,968
JPN	12,103	32	2,956	1,180	2,638	42	104	19,055
ROK	16,631	53	13,639	3,043	7,514	36	123	41,040
MAS	4,649	31	14,530	877	4,294	0	22	24,403
MEX	6,137	32	8,493	335	4,058	1	45	19,100
NZ	14,060	30	15,787	369	829	25	100	31,200
PNG	178	0	175	0	0	0	0	353
PRU	1,440	11	1,809	830	136	2,901	9,939	17,067
RP	3,131	15	5,058	2,886	859	0	2	11,952
SIN	8,299	68	4,456	166	1,568	1	33	14,592
CT	57,064	34	9,908	497	264	5	82	67,853
THA	23,760	547	36,148	21,050	40,851	2	12	122,369
USA	51,447	613	18,684	4,119	6,092	1,663	449	83,068
RUS	82,324	1,739	7,131	332	1,525	61	165	93,277
VTN	1,005	41	8,979	40	2,946	0	6	13,017
APEC TOTAL	373,203	6,084	236,673	46,132	102,204	6,952	16,985	788,234
ROW	445,959	14,602	210,310	52,773	79,510	6,394	6,325	815,874

IV. CONCLUSIONS

On the basis of our analysis, it can be concluded that the economic impact of the removal of tariffs on fish and fish products in the APEC region would be significant, but modest. It is estimated that, in value terms, the long run increase in imports in the region, arising from the elimination of tariffs, would be less than 5 per cent of the 1995 level in value. The corresponding increase in exports would be equal to slightly less than 3 per cent of the 1995 level.

While there is no denying that adjustments would definitely have to be made in industries, within the region, competing with imports, it is clear that the *entire* APEC region would enjoy economic benefits from the removal of the tariffs. Moreover, the arguments that the removal of tariffs would undermine attempts to improve resource management throughout the region are not credible. On the contrary, with comparative advantage shifting in favour of those producers having well managed fisheries, free trade and sound resource management are mutually supportive.

It should also be stressed that the economic impact of the removal of the tariffs, modest though it may be, will be significant for the entire world. This is a reflection of the dominant role, which the AEPC members collectively play in world fisheries. Consequently, the example set by APEC, in the elimination of tariffs, could lead to pressure for the removal of tariffs on fish and fish products in the non-APEC regions of the world, for example the European Union. Such a “multiplier” effect could only serve to enhance the long run economic benefits to the region arising from the removal of tariffs.

It is our considered opinion that those NTMs, which act as barriers to trade, probably have a greater distorting impact upon trade flows in fish and fish products in the region, than do tariffs. As a consequence, it is worth cautioning that, while the removal of tariffs would produce region wide economic benefits, these benefits could easily be lost through an unchecked spread of NTMs.

APPENDIX A
REGRESSION RESULTS FOR IMPORT DEMAND EQUATIONS FOR FISH AND FISH PRODUCTS

THE SPECIFICATION OF THE IMPORT DEMAND EQUATION

In order to obtain estimates of the elasticity of import demand of fish and fish products with respect to their price, import demand equations with the following specification were estimated over the 1980 to 1995 period for which data is available from the FAO.

$$\mathbf{log(m_{ij})} = \forall_{ij} + 0_{ij} \cdot \log\,(pm_{ij} \cdot e_i \div p_i) + (_{ij} \cdot \log\,(c_i \div (e_i \cdot p_i))$$

where **m_{ij}** is imports of economy i of product category j in metric tonnes;
pm_{ij} is the price per tonne of imports of economy i of product category j in U.S. dollars;
e_i is the exchange rate of the currency of county i with respect to the U.S. dollar;
p_i is the consumer price index of economy i; and
c_i is nominal consumer expenditures in the national currency.

A variant of this specification substitutes real GDP in 1990 U.S. dollars for consumer expenditures as the activity variable for some of the economies where consumer expenditures is not available.

The crucial coefficient in this specification is 0, the price elasticity of import demand. According to the theory of demand, it should be negative. The interpretation of this coefficient is complicated in an import demand equation because its impact reflects the net response of domestic demand and supply. This coefficient can be used to estimate the impact on imports of eliminating the tariff on fish and fish products as it measures the net response of domestic demand to a reduction in price facing domestic consumers such as would occur if the tariff were eliminated.

The coefficient, (, is the income elasticity of demand. It should usually be positive, but could be negative in the case of an inferior good.

THE ESTIMATION RESULTS FOR IMPORT DEMAND EQUATIONS

The results of estimating the basic specification for total fish and fish products by economy using ordinary least squares is shown tables A1 and A2. Twenty of the APEC economies are included. As Vietnam only imported fish and fish products in four years over the 1980 to 1995 period, it was not possible to estimate an import demand function for that economy

Of the 20 economies for which import demand equations were estimated, seventeen had the correct sign on the relative price variable, and nine of these were statistically significant with a t-statistic value on the coefficient greater than 2. Only three economies had the wrong sign on the relative price variable.

The results of estimating the basic specification for the various categories of fish and fish product imports by economy is shown in tables A3 to A12. The seven categories taken from the *Yearbook: Fisheries Statistics, Commodities* published by the FAO are:

1. Fish, fresh, chilled or frozen;

1. Fish, dried, salted or smoked;

1. Crustaceans and Molluscs;

1. Fish canned;

1. Crustaceans and Molluscs, canned;

1. Oils; and

1. Meals.

The estimation results for the more detailed import categories are as satisfactory as the overall results. The price elasticities have the correct sign in 109 of the estimates and 73 of these are significant by the criterion of a t-statistic greater than 2. In only 28 of the estimates do the price elasticities have the wrong sign.

For the categories where the estimated price elasticities from the regressions had the wrong sign, a judgmental estimation approach was followed. Under this approach, price elasticities were calibrated for the individual product categories as an average of the price elasticities of similar economies for which econometric elasticity estimates were available.. For this purpose, the economies were grouped into four groups: group 1 is Australia, New Zealand, Canada, and the United States; group 2 is China, Hong Kong, Korea, Japan, and Chinese Taipei; group 3 is the ASEAN economies; and group 4 is Chile, Mexico and Peru. Russia was treated separately. The price elasticities by product category for Russia were calibrated at the average of all the economies for which estimates were available. Table A13 shows the price elasticities calibrated by this judgmental approach as well as the econometric estimates.

Table A13 also summarizes the econometric estimates for the price elasticities by category. For purposes of this average, calibrated elasticities are excluded. The average elasticities for the various categories ranges between 0.88 for meals to 1.84 for Oils. The average elasticity for the total category is 0.90. The elasticities for the various economies vary significantly within a category and the elasticities for the various categories vary significantly across economies.

TABLE A1: REGRESSION RESULTS FOR TOTAL FISHERIES IMPORTS

Dependent Variable: Logarithm of Volume of Fisheries Imports (metric tons)

Economy	Intercept	Relative Price	Logarithm of Real Consumer Expenditures or real GDP* (US $)	Adj. R^2	D.W.	Number of Obs.
AUS	14.17822 (45.54)	-1.527856 (-9.58)	-0.728912 (-3.03)	0.860	2.13	16
BD*	23.22935 (0.78)	-0.304166 (-0.73)	-1.810329 (-0.50)	-0.220	1.72	9
CDA	15.09153 (19.23121)	-2.058418 (-7.96)	0.047605 (0.11)	0.900	0.88	16
CHL	26.11573 (5.37)	-3.119135 (-3.82)	-0.848687 (-1.95)	0.462	0.70	16
PRC*	-2.177427 (0.67)	-0.115159 (-0.17)	2.042267 (5.74)	0.886	2.29	12
HKC*	-1.125408 (-0.43)	-0.329347 (-1.41)	1.293525 (6.72)	0.930	0.90	11
INA	13.84184 (1.85)	-0.404905 (-0.36)	-0.257132 (-0.27)	-0.140	0.45	16
JPN	18.04255 (5.51)	-0.744883 (-1.79)	0.485153 (2.21)	0.962	1.02	16
ROK	20.90178 (6.18)	-1.296517 (-2.61)	2.219190 (8.61)	0.831	0.90	16
MAS	12.26636 (5.47)	0.641529 (1.13)	-0.057665 (-0.12)	0.257	0.79	16
MEX	13.68888 (11.76)	-1.594880 (-2.63)	-0.188440 (-1.54)	0.373	0.99	16
NZ	11.51207 (11.32)	-1.170984 (-17.97)	-0.037697 (-0.21)	0.957	2.11	16
PNG	8.045913 (5.57)	-1.032581 (-1.48)	0.757231 (1.63)	0.146	0.52	16

* Indicates Real GDP used as activity variable instead of Consumer Expenditures.

TABLE A2: REGRESSION RESULTS FOR TOTAL FISHERIES IMPORTS						
Dependent Variable: Logarithm of Volume of Fisheries Imports (metric tons)						
Economy	Intercept	Relative Price	Logarithm of Real Consumer Expenditures or GDP* (US $)	Adj. R^2	D.W.	Number of Observations
PRU	10.87373 (2.30)	-0.077914 (-1.21)	-0.208745 (-0.80)	0.119	2.28	15
RP	10.21098 (2.27)	-0.010450 (-0.01)	-1.318873 (-0.96)	0.076	0.69	16
SIN	11.18850 (84.29)	0.167049 (1.48)	0.158200 (3.62)	0.814	3.11	16
CT*	14.59412 (13.04)	-1.303968 (-5.22)	0.369978 (5.53)	0.937	1.04	15
THA	11.28471 (14.13)	1.227071 (5.41)	3.243194 (11.24)	0.913	1.17	16
USA	11.89946 (20.22)	-0.790143 (-3.20)	0.928796 (7.78)	0.840	1.01	16
RUS	14.27999 (25.02)	-0.808623 (-3.66)	-0.277718 (-2.56)	0.706	2.88	11
VTN	NA	NA	NA	NA	NA	NA
* Indicates Real GDP used as activity variable instead of Consumer Expenditures.						

TABLE A3: REGRESSION RESULTS FOR SEVEN CATEGORIES OF FISHERIES IMPORTS						
Dependent Variable: Logarithm of Volume of Fisheries Imports (metric tons)						
Economy/ Category	Intercept	Relative Price	Logarithm of Real Consumer Expenditures or real GDP* (US $)	Adj. R^2	D.W.	Number of Observations
AUS1	12.31924 (30.24)	-1.254718 (-4.47)	-0.493347 (-1.80)	0.547	1.30	16
AUS2	9.849448 (47.66)	-0.227212 (-8.24)	-0.741894 (-2.73)	0.838	1.48	16
AUS3	15.58932 (14.64)	-2.466986 (-6.09)	-1.603765 (-2.38)	0.702	1.77	16
AUS4	11.15563 (20.79)	-0.620276 (-2.22)	0.005725 (0.02)	0.193	2.20	16
AUS5	11.69448 (12.98)	-1.050336 (-2.59)	-1.176887 (-2.55)	0.402	1.45	16
AUS6	7.023932 (15.48)	-1.643188 (-2.68)	0.238182 (0.26)	0.344	1.37	12
AUS7	7.277455 (11.75)	-2.362209 (-4.56)	2.477803 (2.58)	0.598	2.08	16
BD1*	64.19318 (1.78)	-1.114100 (-3.06)	-6.877577 (-1.58)	0.503	1.97	9
BD2*	38.47169 (1.28)	0.407146 (0.59)	-4.060702 (-1.14)	0.280	0.10	9
BD3*	12.42954 (0.41)	-0.290460 (-0.59)	-0.698241 (-0.19)	-0.226	2.24	9
BD4*	42.04948 (1.95)	1.683802 (2.01)	-4.624870 (-1.80)	0.678	1.03	9
BD5*	95.84362 (3.15)	-0.375803 (-0.32)	-10.97803 (-2.96)	0.461	1.53	9
BD6*	99.64216 (0.66)	-5.039327 (-2.89)	-11.60259 (-0.63)	0.758	1.39	5
BD7*	-12.22404 (-0.27)	-0.969589 (-1.68)	2.252998 (0.40)	0.531	2.24	5

TABLE A4: REGRESSION RESULTS FOR SEVEN CATEGORIES OF FISHERIES IMPORTS						
Dependent Variable: Logarithm of Volume of Fisheries Imports (metric tons)						
Economy/ Category	Intercept	Relative Price	Logarithm of Real Consumer Expenditures or real GDP* (US $)	Adj. R^2	D.W.	Number of Observations
CDA1	12.28420 (14.65)	-2.792668 (-4.13)	1.940798 (3.75)	0.610	0.71	16
CDA2	8.224803 (9.30)	-3.171773 (-5.95)	4.494648 (4.94)	0.715	1.45	16
CDA3	15.07054 (12.94)	-1.836222 (-5.95)	-0.574586 (-1.17)	0.845	0.99	16
CDA4	9.522052 (8.85)	-0.772069 (-2.37)	1.797380 (2.81)	0.724	0.83	16
CDA5	8.710200 (11.23)	-0.754461 (-2.50)	1.906199 (4.66)	0.661	1.10	16
CDA6	2.650713 (0.86)	-0.743712 (-2.41)	5.568163 (2.14)	0.706	0.54	16
CDA7	-2.013782 (-0.39)	-0.257431 (-0.15)	10.27281 (2.58)	0.526	0.83	16
CHL1	0.736447 (0.68)	0.369530 (2.39)	-3.432867 (-23.58)	0.994	2.08	8
CHL2	15.30956 (4.25)	-1.829779 (-3.73)	-0.150583 (-0.51)	0.756	3.62	6
CHL3	10.77803 (7.27)	-0.952235 (-5.03)	-1.309852 (-8.28)	0.996	2.19	6
CHL4	36.97027 (3.86)	-5.036522 (-3.05)	-2.017095 (-2.47)	0.346	0.70	16
CHL5	12.08409 (6.30)	-1.308920 (-4.55)	-0.075326 (-0.62)	0.791	1.88	6
CHL6	-14.87994 (-4.51)	2.784708 (5.47)	-6.400477 (-9.98)	0.988	3.28	7
CHL7	NA	NA	NA	NA	NA	NA

TABLE A5: REGRESSION RESULTS FOR SEVEN CATEGORIES OF FISHERIES IMPORTS						
Dependent Variable: Logarithm of Volume of Fisheries Imports (metric tons)						
Economy/ Category	Intercept	Relative Price	Logarithm of Real Consumer Expenditures or real GDP* (US $)	Adj. R^2	D.W.	Number of Observations
PRC1*	-12.33541 (-4.11)	-0.337654 (-0.69)	3.206574 (7.82)	0.948	1.95	12
PRC2*	2.272244 (0.37)	-0.941171 (-1.57)	1.087039 (1.23)	0.047	1.12	12
PRC3*	-13.32626 (-5.47)	-0.070770 (-0.20)	3.066948 (10.24)	0.908	0.87	12
PRC4*	-21.88760 (-4.32)	-0.909541 (-2.34)	3.852911 (5.98)	0.844	1.62	9
PRC5*	-25.71780 (0.92)	-0.960935 (-0.90)	4.312842 (1.26)	0.831	1.78	9
PRC6*	-13.84545 (-5.43)	-0.353075 (-1.97)	2.801540 (8.35)	0.895	2.16	9
PRC7*	3.747752 (1.38)	1.031454 (1.65)	1.194111 (3.31)	0.767	2.86	12
HKC1*	3.812412 (2.09)	-0.995723 (-9.05)	0.879503 (6.03)	0.987	1.78	11
HKC2*	-0.338393 (-0.16)	-0.562422 (-2.62)	1.054415 (4.35)	0.646	2.02	11
HKC3*	-7.194908 (-1.15)	0.574518 (0.88)	1.519192 (3.74)	0.740	0.65	11
HKC4*	-9.315154 (-3.73)	-0.645580 (-1.89)	1.779471 (10.70)	0.970	2.04	11
HKC5*	-15.73358 (-1.99)	0.942621 (1.04)	1.827691 (4.59)	0.936	1.80	11
HKC6*	-26.53803 (-1.64)	-6.463267 (-4.40)	3.599875 (2.50)	0.744	2.63	9
HKC7*	8.243550 (0.93)	0.017098 (0.02)	0.160062 (0.21)	-0.242	0.77	11

TABLE A6: REGRESSION RESULTS FOR SEVEN CATEGORIES OF FISHERIES IMPORTS						
Dependent Variable: Logarithm of Volume of Fisheries Imports (metric tons)						
Economy/ Category	Intercept	Relative Price	Logarithm of Real Consumer Expenditures or real GDP (US $)	Adj. R^2	D.W.	Number of Observations
INA1	3.678977 (2.28)	0.845279 (3.16)	2.829538 (3.77)	0.452	1.99	16
INA2	11.54136 (5.95)	-0.987518 (-3.88)	-1.109115 (-1.07)	0.814	1.35	16
INA3	23.92036 (4.51)	-2.338896 (-3.66)	-3.371348 (-2.38)	0.472	0.83	16
INA4	6.574535 (1.48)	0.071034 (0.12)	1.356402 (1.46)	0.138	1.75	16
INA5	14.17043 (6.19)	-1.150141 (-4.34)	0.837162 (1.44)	0.533	1.75	16
INA6	18.35907 (2.11)	-1.744077 (-1.46)	-3.689670 (-2.06)	0.738	0.67	16
INA7	14.25822 (2.15)	-0.487899 (-0.48)	-0.069346 (-0.08)	-0.127	0.53	16
JPN1	22.75238 (4.15)	-1.567340 (-2.12)	0.301579 (0.87)	0.914	1.01	16
JPN2	10.43476 (4.89)	-0.036908 (-0.15)	-0.010487 (-0.09)	-0.151	1.67	16
JPN3	17.12328 (8.44)	-0.652500 (-2.52)	0.271016 (2.74)	0.943	0.8	16
JPN4	8.287129 (2.20)	-0.080392 (-0.17)	1.174693 (8.36)	0.950	0.81	16
JPN5	3.620107 (1.50)	0.612757 (1.69)	1.082928 (14.66)	0.940	0.95	16
JPN6	13.79257 (8.71)	-0.990708 (-5.74)	0.332866 (1.18)	0.821	1.03	16
JPN7	4.047917 (0.89)	0.679158 (0.96)	1.880428 (3.55)	0.866	1.83	16

TABLE A7: REGRESSION RESULTS FOR SEVEN CATEGORIES OF FISHERIES IMPORTS						
Dependent Variable: Logarithm of Volume of Fisheries Imports (metric tons)						
Economy/ Category	Intercept	Relative Price	Logarithm of Real Consumer Expenditures or real GDP* (US $)	Adj. R^2	D.W.	Number of Observations
ROK1	19.11337 (5.71)	-1.084536 (-2.20)	2.046425 (6.77)	0.752	0.86	16
ROK2	17.82612 (7.00)	-1.515440 (-4.95)	0.567030 (0.81)	0.636	0.69	16
ROK3	15.51585 (5.35)	-0.770251 (-1.92)	2.456607 (8.71)	0.834	1.42	16
ROK4	17.87682 (4.82)	-1.568526 (-3.56)	2.048837 (3.70)	0.683	0.97	16
ROK5	23.78389 (2.50)	-2.119943 (-1.84)	3.556690 (3.86)	0.716	0.94	16
ROK6	20.70755 (8.06)	-1.950836 (-4.59)	2.446118 (5.77)	0.767	1.15	16
ROK7	10.29449 (0.84)	-0.183809 (-0.09)	3.374836 (3.22)	0.509	0.98	16
MAS1	18.62532 (5.89)	2.133136 (4.27)	-1.419864 (-2.29)	0.723	1.49	16
MAS2	4.410038 (2.36)	-0.875943 (-3.02)	0.964655 (2.83)	0.568	1.53	16
MAS3	5.698710 (4.60)	-0.275536 (-1.48)	0.910712 (3.54)	0.584	1.33	16
MAS4	14.63691 (11.27)	-1.198029 (-2.38)	-0.651776 (-2.29)	0.587	1.31	16
MAS5	9.838523 (4.32)	0.080551 (0.20)	-0.250143 (-0.60)	-0.121	1.24	16
MAS6	-7.136878 (-2.06)	-0.746101 (-0.93)	2.554657 (3.85)	0.477	1.25	15
MAS7	18.85306 (8.92)	0.492415 (1.14)	-1.584496 (-4.01)	0.501	0.74	16

TABLE A8: REGRESSION RESULTS FOR SEVEN CATEGORIES OF FISHERIES IMPORTS						
Dependent Variable: Logarithm of Volume of Fisheries Imports (metric tons)						
Economy/ Category	Intercept	Relative Price	Logarithm of Real Consumer Expenditures or real GDP* (US $)	Adj. R^2	D.W.	Number of Observations
MEX1	11.67566 (8.18)	-1.398185 (-2.14)	-0.153581 (-1.19)	0.283	0.86	16
MEX2	14.29780 (5.54)	-0.314790 (-0.55)	-0.924826 (-4.87)	0.602	0.62	16
MEX3	12.06267 (9.39)	-0.818093 (-2.31)	-0.372564 (-2.66)	0.497	1.44	16
MEX4	19.93847 (4.56)	-4.470391 (-2.70)	-0.386919 (-1.39)	0.327	1.94	16
MEX5	23.07907 (3.41)	-5.282497 (-2.03)	-0.382745 (-1.38)	0.291	1.54	15
MEX6	10.40965 (6.80)	-3.237766 (-4.86)	-0.153611 (-0.85)	0.769	0.92	16
MEX7	10.48159 (8.08)	0.036120 (0.04)	-0.072237 (-0.47)	-0.132	1.12	16
NZ1	-18.04232 (-1.34)	-1.823219 (-6.02)	4.826657 (1.96)	0.753	0.72	16
NZ2	3.922454 (0.57)	-2.993303 (-6.07)	1.190318 (0.90)	0.736	1.38	16
NZ3	12.20698 (4.31)	-2.067583 (-9.75)	-0.064757 (-0.14)	0.865	2.90	16
NZ4	13.62676 (12.72)	-0.94301 (-9.45)	-0.593407 (-3.00)	0.894	1.89	16
NZ5	6.166409 (2.92)	0.407088 (1.86)	-0.049642 (-0.13)	0.089	1.47	16
NZ6	-2.860434 (-0.51)	-1.364388 (-4.22)	1.612552 (1.65)	0.744	1.39	11
NZ7	7.305021 (0.80)	-2.249475 (-2.81)	0.194245 (0.12)	0.512	1.46	8

TABLE A9: REGRESSION RESULTS FOR SEVEN CATEGORIES OF FISHERIES IMPORTS						
Dependent Variable: Logarithm of Volume of Fisheries Imports (metric tons)						
Economy/ Category	Intercept	Relative Price	Logarithm of Real Consumer Expenditures or real GDP* (US $)	Adj. R^2	D.W.	Number of Observations
PNG1	11.46358 (3.23)	-0.481314 (-0.87)	-1.426188 (-1.25)	0.032	0.52	16
PNG2	-4.512313 (-0.41)	-1.057429 (-2.36)	2.754966 (0.77)	0.209	0.62	15
PNG3	-6.046618 (-0.77)	-0.549776 (-1.54)	3.437517 (1.38)	0.158	0.7	16
PNG4	8.091182 (4.98)	-1.882678 (-3.14)	0.763614 (1.48)	0.44	0.93	16
PNG5	1.064053 (0.15)	-2.309950 (-4.37)	1.798347 (0.88)	0.771	1.77	13
PNG6	NA	NA	NA	NA	NA	NA
PNG7	10.08293 (2.44)	-0.941542 (-1.05)	-1.134720 (-0.91)	0.08	0.99	11
PRU1	NA	NA	NA	NA	NA	NA
PRU2	-1.750325 (-0.60)	0.011473 (0.29)	0.236046 (1.43)	0.066	1.03	12
PRU3	-6.273731 (-2.43)	-0.068216 (-1.76)	0.542598 (3.78)	0.559	1.93	11
PRU4	3.669868 (0.59)	-0.025747 (-0.43)	0.064539 (0.18)	-0.178	1.49	13
PRU5	NA	NA	NA	NA	NA	NA
PRU6	0.560509 (0.05)	-0.446201 (-2.58)	0.043729 (0.07)	0.358	1.8	12
PRU7	NA	NA	NA	NA	NA	NA

TABLE A10: REGRESSION RESULTS FOR SEVEN CATEGORIES OF FISHERIES IMPORTS						
Dependent Variable: Logarithm of Volume of Fisheries Imports (metric tons)						
Economy/ Category	Intercept	Relative Price	Logarithm of Real Consumer Expenditures or real GDP* (US $)	Adj. R^2	D.W.	Number of Observations
RP1	8.772964 (4.76)	-1.625406 (-3.86)	-4.977758 (-4.52)	0.852	0.83	16
RP2	9.465649 (3.12)	-1.383361 (-2.64)	-0.353691 (-0.66)	0.530	1.65	16
RP3	12.21907 (10.86)	-1.638060 (-11.20)	0.594361 (0.96)	0.920	1.62	16
RP4	20.66610 (14.40)	-2.935846 (-7.27)	3.803727 (5.80)	0.885	1.68	16
RP5	23.52337 (5.40)	-4.810415 (-3.90)	1.369282 (1.54)	0.468	1.67	16
RP6	11.96971 (2.57)	-2.649545 (-2.03)	-1.419872 (-1.44)	0.501	0.42	16
RP7	10.12633 (5.29)	-0.253842 (-0.32)	-1.081226 (-1.88)	0.100	0.89	16
SIN1	8.759797 (26.15)	0.177457 (0.70)	0.517389 (6.76)	0.808	1.79	16
SIN2	9.020453 (30.75)	-0.739124 (-6.36)	0.247418 (2.71)	0.768	1.50	16
SIN3	8.099242 (12.92)	0.190666 (0.50)	0.468848 (3.01)	0.505	0.68	16
SIN4	11.33612 (13.03)	-1.966980 (-2.85)	0.108010 (0.73)	0.305	0.51	16
SIN5	6.800230 (16.76)	-0.593386 (-4.64)	0.559992 (11.95)	0.909	2.00	16
SIN6	7.476021 (9.48)	-1.160548 (-3.47)	-0.068861 (-0.44)	0.413	1.47	16
SIN7	15.86137 (25.93)	0.476587 (1.24)	-1.156613 (-8.64)	0.932	2.11	16

TABLE A11: REGRESSION RESULTS FOR SEVEN CATEGORIES OF FISHERIES IMPORTS						
Dependent Variable: Logarithm of Volume of Fisheries Imports (metric tons)						
Economy/ Category	Intercept	Relative Price	Logarithm of Real Consumer Expenditures or real GDP* (US $)	Adj. R^2	D.W.	Number of Observations
CT1	2.041987 (1.04)	-0.286608 (-1.87)	1.407575 (7.14)	0.989	1.71	15
CT2	-2.613976 (-0.34)	-0.380304 (-0.38)	1.555774 (2.22)	0.264	0.72	15
CT3	7.435090 (4.90)	-1.154625 (-6.51)	1.128072 (9.00)	0.970	1.52	15
CT4	0.252659 (0.05)	-0.310211 (-0.35)	1.393699 (4.94)	0.925	1.26	15
CT5	-4.622321 (-1.43)	0.467832 (0.91)	1.590456 (11.57)	0.941	0.86	15
CT6	12.06269 (3.56)	-1.473542 (-3.27)	0.027294 (0.12)	0.541	1.05	11
CT7	12.77999 (5.94)	-0.657816 (-1.60)	0.277779 (1.56)	0.738	0.52	15
THA1*	15.09011 (12.91)	-0.810774 (1.65)	1.886779 (2.64)	0.724	0.61	16
THA2	11.12728 (15.78)	-1.317400 (-5.95)	-1.275778 (-1.89)	0.775	0.89	16
THA3	13.21881 (14.44)	-0.297705 (-1.25)	2.222229 (7.06)	0.877	1.72	16
THA4	14.20938 (3.97)	-1.728358 (-2.36)	1.479670 (1.20)	0.219	0.59	16
THA5	11.40608 (18.07)	-0.540681 (-3.45)	1.185733 (4.03)	0.490	2.39	16
THA6	14.85584 (10.07)	-1.070680 (-1.89)	6.124271 (7.48)	0.890	0.34	13
THA7	17.04870 (6.02)	0.491803 (0.45)	12.66058 (8.45)	0.871	1.11	15

* Imports of fresh, chilled or frozen tuna were excluded from both the left and right hand side of the equation because tuna imports were primarily brought in to provide the raw material for canned tuna exports and were thus not sensitive to relative import prices.

TABLE A12: REGRESSION RESULTS FOR SEVEN CATEGORIES OF FISHERIES IMPORTS						
Dependent Variable: Logarithm of Volume of Fisheries Imports (metric tons)						
Economy/ Category	Intercept	Relative Price	Logarithm of Real Consumer Expenditures or real GDP* (US $)	Adj. R^2	D.W.	Number of Observations
USA1	13.21967 (24.50)	0.277231 (0.87)	-0.023744 (-0.12)	-0.049	1.41	16
USA2	10.12818 (24.47)	-0.263773 (-1.70)	0.143502 (1.07)	0.059	1.97	16
USA3	5.635125 (4.12)	-0.312602 (-1.63)	2.110532 (7.82)	0.975	1.41	16
USA4	9.465620 (3.88)	-1.175854 (-2.25)	1.047693 (1.89)	0.798	0.55	16
USA5	10.91813 (8.28)	-1.374958 (-4.07)	0.699151 (1.62)	0.497	1.35	16
USA6	3.329172 (2.28)	-0.174753 (-0.69)	1.711079 (4.15)	0.545	1.17	16
USA7	8.934862 (4.42)	-2.738711 (-5.98)	0.055998 (0.09)	0.766	1.42	16
RUS1*	62.69898 (3.18)	-0.544476 (-4.83)	-3.655966 (-2.54)	0.777	2.18	11
RUS2*	137.9170 (4.33)	-1.121316 (-6.21)	-9.267029 (-4.00)	0.802	3.13	11
RUS3*	200.2685 (4.76)	-0.622200 (-2.48)	-14.13809 (-4.66)	0.713	1.73	10
RUS4*	142.2433 (6.42)	-0.808510 (-3.32)	-9.628551 (-6.08)	0.855	2.03	11
RUS5*	33.84764 (0.11)	-1.359389 (-0.35)	-1.510840 (-0.06)	0.623	2.15	4
RUS6*	69.47630 (7.11E+36)	1.565250 (1.60E+37)	-5.061058 (-7.21E+36)	1.000	2.93	3
RUS7*	151.2446 (1.73)	-1.046774 (-2.00)	-10.30980 (-1.62)	0.167	1.62	11

TABLE A13: ESTIMATED IMPORT PRICE ELASTICITIES BY CATEGORY								
Economy	Categories							
	Fish, Fresh, Chilled or Frozen	Fish, Dried, Salted or Smoked	Crustaceans and Mulluscs	Fish, Canned	Crustaceans and Mulluscs, Canned	Oils	Meals	Total
AUS	1.25[*]	0.23[*]	2.47[*]	0.62[*]	1.05[*]	1.64[*]	2.36[*]	1.53[*]
BD	1.11[*]	1.06[c]	0.29	1.94[c]	0.38	5.04[*]	0.97	0.30
CDA	2.79[*]	3.17[*]	1.84[*]	0.77[*]	0.75[*]	0.74[*]	0.26	2.06[*]
CHL	1.40[c]	1.83[*]	0.95[*]	5.04[*]	1.31[*]	1.85[c]	0.64[c]	3.12[*]
PRC	0.34	0.94	0.07	0.91[*]	0.96	0.35	0.42[c]	0.12
HKC	1.00[*]	0.56[*]	0.66[c]	0.65	1.54[c]	6.46[*]	0.42[c]	0.33
INA	1.07[c]	0.99[*]	2.34[*]	1.94[c]	1.15[*]	1.74	0.49	0.40
JPN	1.57[*]	0.04	0.65[*]	0.08	1.54[c]	0.99[*]	0.42[c]	0.74
ROK	1.08[*]	1.52[*]	0.77	1.57[*]	2.12	1.95[*]	0.18	1.30[*]
MAS	1.07[c]	0.88[*]	0.28	1.20[*]	1.63[c]	0.75	0.66[c]	0.44[c]
MEX	1.40[*]	0.31	0.82[*]	4.47[*]	5.28[*]	3.24[*]	0.64[c]	1.59[*]
NZ	1.82[*]	2.99[*]	2.07[*]	0.94[*]	1.06[c]	1.36[*]	2.25[*]	1.17[*]
PNG	0.48	1.06[*]	0.55	1.88[*]	2.31[*]	2.07[c]	0.94	1.03
PRU	1.40[c]	1.07[c]	0.07	0.03	3.30[c]	0.45[*]	0.64[c]	0.08
RP	1.63[*]	1.38[*]	1.64[*]	2.94[*]	4.81[*]	2.65[*]	0.25	0.01
SIN	1.07[c]	0.74[*]	0.90[c]	1.97[*]	0.59[*]	1.16[*]	0.66	0.44
CT	0.29	0.38	1.15[*]	0.31	1.54[c]	1.47[*]	0.66	1.30[*]
THA	0.81[d]	1.32[*]	0.30	1.73[*]	0.54[*]	1.07	0.66[c]	0.44[c]
USA	1.95[c]	0.26	0.31	1.18[*]	1.38[*]	0.17	2.74[*]	0.79[*]
RUS	0.54[*]	1.12[*]	0.62[*]	0.81[*]	1.36	1.84[c]	1.05[*]	0.81[*]
VTN	1.07[c]	1.06[c]	0.90[c]	1.94[c]	1.63[c]	2.07[c]	0.66[c]	0.44[c]
Average ex. calibrated	1.21	1.09	0.94	1.55	1.65	1.84	0.88	0.90
Correct Sign	13	18	18	18	14	17	11	17
Of which Significant	10	13	10	14	10	12	4	9
Wrong Sign	6	2	2	2	5	3	8	3

* indicates that the elasticity is significant using a t-statistic greater than 2 as criterion.
c indicates that the elasticity was calibrated based on the elasticity of similar economies as described in this appendix.
d indicates that the import price elasticity Thailand is for imports excluding tuna.

APPENDIX B
STRUCTURE OF APEC FISHERIES TRADE LIBERALIZATION SIMULATION MODEL

The structure of the APEC Fisheries Trade Liberalization Simulation Model is very straightforward and simple. It contains equations for imports of fish and fish products in volume and value for each of the APEC member economies and equations for the volume and value of exports for each APEC member economy and the Rest of the World.

IMPORTS

The change in real imports of the various categories of fish and fish products for an economy are, in general, equal to the tariff rate for the category divided by one plus the tariff rate times the price elasticity of the category times real imports of the category. The tariff rate is divided by one plus the tariff rate to calculate the percentage reduction in price resulting from the elimination of the tariff.

$$\Delta m_{ij} = (\tau_{ij} / (1 + \tau_{ij})) \cdot \eta_{ij} \cdot m_{ij}$$

where)$\mathbf{m_{ij}}$ is increase in imports of economy i of product category j in metric tonnes;
J$_{\mathbf{ij}}$ is the average tariff on product j in economy i;
0$_{\mathbf{ij}}$ is the price elasticity of import demand for product j in economy i;
$\mathbf{m_{ij}}$ is imports of economy i of product category j in metric tonnes;

An exception to the general rule is the economies of Hong Kong and Singapore. In this case, imports by product category are determined by exports of product category :

$$\Delta m_{ij} = \Delta x_{ij}$$

The import price deflators for Hong Kong and Sinagpore are equal to 90 per cent of the export price deflator to allow an appropriate margin on reexports.

$$pm_{ij} = .9 \cdot px_{ij}$$

Another exception to the general rule is for Thailand. In this case, imports of fresh tuna is excluded from category 1when the change due to the elimination of the tariff is calculated and another component representing the demand for fresh tuna imports to meet the demand for canned tuna exports is included (the 1.77 coefficient represents the weight ratio between fresh and canned tuna)..

$$\Delta m_{18,\,j} = (\tau_{18,\,j} / (1+\tau_{18,\,j}) \cdot \eta_{18,\,j} \cdot (m_{18,\,j} - mtuna_{18}))$$
$$+1.77 \cdot \Delta x_{18,4}$$

The total impact on imports in metric tonnes for economy i is calculated by summing over the impact by category for economy i.

$$\Delta m_{i8} = \sum_{j=1}^{7} \Delta m_{ij}$$

The impact on category j in U.S. dollars for economy i is calculated by multiplying the impact in tonnes by the price per tonne of imports.

$$\Delta m\$_{ij} = pm_{ij} \cdot \Delta m_{ij}$$

The total impact in U.S. dollars is also calculated by summing over the categories.

$$\Delta m\$_{i8} = \sum_{j=1}^{7} \Delta m\$_{ij}$$

The total impact on imports in metric tonnes for the APEC region is calculated by summing the total real impact over the 21 member economies.

$$\Delta m_{apec} = \sum_{i=1}^{21} \Delta m_{i8}$$

The total impact on the value of imports for the APEC region is calculated by summing the total impact in U.S. dollars over the 21 member economies.

$$\Delta m\$_{apec} = \sum_{i=1}^{21} \Delta m\$_{i8}$$

EXPORTS

The change in real exports of the various categories of fish and fish products for an economy k including the rest of the world as well as the 21 APEC member economies are equal to:

$$\Delta x_{kj} = \omega_{kj} \cdot \Delta m_{apec}$$

where)$\mathbf{x_{kj}}$ is increase in imports of economy k of product category j in metric tonnes;
T$_{\mathbf{ij}}$ is the share of economy k in world imports of product.

The total impact on exports in metric tonnes for economy i is calculated by summing over the impact by category for economy k.

$$\Delta x_{k8} = \sum_{j=1}^{7} \Delta x_{kj}$$

The impact on exports of category j in U.S. dollars for economy k is calculated by multiplying the impact in tonnes by the APEC average price per tonne of exports of category j.

$$\Delta x\$_{kj} = pm_j \cdot \Delta x_{ij}$$

The APEC average price per tonne of exports is calculated by dividing the impact on nominal imports of category j by the impact on real imports of category j.

$$px_j = \sum_{i=1}^{21} \Delta m\$_{ij} \div \sum_{i=1}^{21} \Delta m_{ij}$$

The total impact on exports in U.S. dollars for economy k is calculated by summing over the categories.

$$\Delta x\$_{k8} = \sum_{j=1}^{7} \Delta x\$_{kj}$$

APPENDIX C
DATA USED IN APEC FISHERIES TRADE LIBERALIZATION SIMULATION MODEL

The data used in the APEC Fisheries Trade Liberalization Model fall into three groups: fisheries trade; tariffs; and economic.

FISHERIES TRADE

The fisheries trade data used are those provided by the Food and Agricultural Organization of the United Nations on annual exports and imports of fishery products by economy. In terms of product types, data are reported for seven commodity groups as follows:

- FISH, fresh, chilled or frozen
- FISH, dried, salted or smoked
- CRUSTACEANS and MOLLUSCS
- FISH, canned
- CRUSTACEANS and MOLLUSCS, canned
- OILS
- MEALS

Traded quantities and values are reported in metric tonnes and US dollars. The special tabulation of FAO data for APEC economies covers the period 1980 through to 1995, the latest year of the publication of the *Yearbook: Fishery Statistics, Commodities*.

Details appear in two separate sections: by quantity and value. Each section shows the economies in alphabetical order. Economy totals of imports and exports are highlighted in the top two lines, followed by the seven commodity details of imports and exports.

Summaries are provided for the APEC community and the world.

FISH AND FISH PRODUCT TARIFFS

Very detailed information (over 100 pages) on the tariffs that apply to the various categories fish and fish products for the 21 member economies of APEC was provided by the PEC Fisheries Working Group. Average tariffs for each of the seven FAO categories of fish and fish products were calculated by taking a simple average of the tariffs applicable to items falling within the category. A simple average was used because full data was not available on the composition of items within the categories. The overall average tariff was calculated by weighting the average tariff for the category by the proportion of import value falling within the category.

As will be noted, a few member economies have zero tariffs on fish and fish products -- those being Australia, Brunei Darussalam, Hong Kong and Singapore.

ECONOMIC DATA

The economic data on the value of consumer expenditures, consumer price indexes, exchange rates, and GDP were taken, where possible, from the International Monetary Fund, *Financial Statistics Yearbook 1997.* For Hong Kong, Chinese Taipei and Vietnam, who are not members of the IMF, data had to be taken from United Nations or national sources.

A detailed Phase I report, which was submitted June 10, 1998 and revised July 23, 1978, was prepared providing background on the data used in this report.

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Japan's Comments on an APEC/FWG Study:
Free Trade and Investment in the Fisheries Sector of the Asia-Pacific Region:
An Economic Analysis of Tariffs (Ref: F98/CP/00267)

Fisheries Agency of Japan
June 1999

1 Introduction

This analysis was tasked originally to analyze possible economic impacts of tariffs on fishery products in a objective manner. However, in actuality, it has turned out to be a tool to unilaterally support and propagate the position for abolition of tariffs, and thus overstepped from its original intention. Furthermore, a specific position is maintained with respect to impacts of the abolition of tariffs on fishery management, which obviously contradicts the instruction from the Fisheries Working Group that an objective analysis should be carried out. Therefore, inappropriate portions of the draft text, such as the assertion that tariff elimination would support regional economy, should be deleted in order to make the analysis fully compatible with the instruction from the Working Group.

2 Liberalization of trade in fishery products, which are exhaustible renewable resources, will not lead to benefiting the regional economy. It would be misleading to treat the issue of liberalization of fishery product trade in the same way as for industrial products because such an approach could disrupt the sustainability of the resources.

(1) The conditions of populations of many of the fishery resources now subjected to international trade have been deteriorating to a great extent. According to the Food and Agriculture Organization of the United Nations (FAO), more than 60% of usable fishery resources in the world cannot stand any increase in the catch from the present level. Consequently, to liberalize trade in fishery products and introduce free competition in fisheries would lead to excessive fishery activities, rapidly causing depletion of fishery resources on both regional and global levels. This would eventually end up in collapse of regional economy, as seen in the case of cod resources in the Atlantic coastal area of Canada.

(2) What is pursued by trade liberalization is the realization of an international division of labor in fishery production in accordance with the principle of relative superiority. This will further increase the ubiquitous capability to export fishery products (10 countries account for 49% of overall seafood exports), further deteriorating the state of fishery resources targeted by those countries. It is quite possible for many countries that intensified competition will prompt depletion of the resources, leading to decrease in production and shrinkage of exports.

(3) Unlike industrial products, foods, which are "resources for survival," should not be subjected to international division of labor solely based on the principle of relative superiority. In view of anticipated constraints in food supply and subsequent political instability in the years ahead, such an approach will put have-nots in an increasingly difficult position to secure their food supply.

(4) The international division of labor will accelerate the trend for mono-culture in food production, weakening the capability for survival of each nation in the face of changes in international situations, natural disasters and changes in environmental conditions.

(5) This analysis, if we understand it correctly, presents a scenario, quite unfair to Japan, that the benefit of tariff elimination can be realized at the sacrifice only of Japan.

3 Liberalization of trade in fishery products will adversely affect fishery management (in other words, cause increase in the cost for environmental conservation.)

(1) It is misleading to promote trade liberalization conducive to increased catches at a time when FAO and other organizations are discussing ways to drastically curtail fishing efforts based on the recognition that 60% of the world's fishery resources are harvested excessively.

(2) Investors seeking to evade international fishery regulations are transferring their vessels to countries, which are non-members to international organizations, for the reason of convenience, and engage in lawless and disorderly operations to produce fishery products at extremely low costs, thereby contributing to depletion of the fishery resources. To guarantee an equal access for such free-riders and outlaws to consuming market by means of liberalization of trade in fishery products is nothing but promoting equality in a very negative sense. Such a measure would drive fishermen abiding by international rules--such as those in Japan-- from price superiority and cause collapse of fishery resources. It is advised, rather, that responsible consuming countries should introduce responsible trade policies (including imposition of special levies) and reinforce the system for orderly trade and fishery resource management.

(3) Increased investment in management and enforcement by nations with a due sense of responsibility, such as Japan, will cause increase in management cost, and subsequently raise the prices of fishery products harvested within a legitimate framework. This will push down relative prices of fishery products harvested illegally or outside management quota, causing expanded demand for the fishery products in question as well as excessive harvesting of the

resources. It means that fishery products, in which legitimate management costs are incorporated, are exposed to competition from those free of such management costs. For this reason, it is a matter of urgency to build up an appropriate and responsible trade system, including the current tariff and non-tariff measures, in order to help sound development of the activities of law-abiding fishermen and the regional economy on which such fishermen base their livelihood.

(4) Some argue that the shift to the principle of relative superiority will lead to better managed fisheries, especially expansion of demand for aquaculture products. But cost burdens for management are totally ignored in such arguments. Further, not all fish species are cultured, especially those species such as tuna, cod and Patagonian toothfish, that are widely traded and present concerns in terms of resource conservation.

(5) Abolition of tariffs prove to have detrimental consequences when we consider the costs for environmental conservation arising out of excessive fishing and the costs for reinforcing management--both of which do not occur or seriously counted in other industry sectors--as well as the costs to deal with the problems of the industry affected by increasing imports.