

# FACTOR ENDOWMENTS, TRADE LIBERALIZATION AND THE FUTURE OF APEC TRADE PATTERNS\*

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*The heads of state of APEC nations have committed member nations to remove all barriers to trade both among themselves and with respect to the rest of the world by 2020. The present paper uses a simple econometric model of bilateral trade flows based on country size, relative factor endowments and trade barriers of importing as well as exporting countries to estimate the shares by country of origin in imports of each of the sixteen major APEC countries and the rest of the world for each of 45 commodity groups comprising world trade in commodities. The estimates reveal that APEC trade would be expanded by 13% with complete liberalization of tariff barriers, by an additional 5% if non-tariff barriers are also removed and by another 4% if the rest of the world would also remove all barriers to trade. Variants on this base scenario show that such trade expansion could be substantially reduced were trade liberalization, capital growth or both to be reduced in the countries affected by the Asian financial crisis. (JEL F1, F17)*

## I. INTRODUCTION

The main means of achieving trade liberalization have been (1) multilateral agreements within the framework of GATT and more recently the WTO and (2) discriminatory regional agreements which attempt to liberalize trade among members of the regional agreement but not with respect to non-members. Asia-Pacific Economic Cooperation (APEC) is a group of countries in or bordering on the Pacific which since November, 1989 has chosen to take a rather different approach to trade liberalization. In particular, in Bogor, Indonesia in 1994 (the Bogor Declaration), the heads of state of APEC member countries (currently including some twenty-one countries and accounting for almost 50 percent of world trade) committed APEC to achieving

free trade by 2010 for its industrialized members and 2020 for its non-industrialized members *but without discriminating between member and non-member countries* (an approach which is known as *open regionalism*).

The fact that APEC members have been liberalizing and also growing more rapidly than other countries in other regions has made it a popular club to join. As a result, despite repeated agreements to freeze membership so as to facilitate informal relationships to develop among heads of states and at other levels, membership in APEC has been growing from twelve countries in 1989 to sixteen in 1991, to eighteen in 1993 and to twenty-one in 1998. The original twelve members were Australia, Brunei, Canada, Indonesia, Japan, Korea, Malaysia, New Zealand, Philippines, Singapore, Thailand, and the United States. China, Hong Kong, Mexico and Taiwan joined in 1991, Papua New Guinea and Chile in 1993 and Peru, Russia, and Vietnam in 1998.

Although not entirely because of the creation of APEC, APEC's shares in world trade have been growing rapidly (Nugent 1998). Even despite the severe financial and other troubles which have beset some of the Asian members of APEC in 1997 and 1998, APEC countries are expected to continue to grow at above the world average between now and 2010 or 2020. Indeed, if the terms of the Bogor Declaration are satisfied, the freeing of trade could boost APEC trade quite substantially. But, by how much?

The purpose of the present paper is to use an econometric model based on the projected endowments of each APEC country and the rest of the world to the year 2010 with and without trade liberalization to assess the magnitude of the increases in bilateral trade due to proposed trade liberalization. Given the industry-specificity of technology and the greater relevance of certain ever-changing factor endowments to the comparative advantage of certain countries in certain industries, the analysis is done separately for each of 45 individual commodity groups and

then aggregated for total trade. Because of the demonstrated relevance of dynamic comparative advantage theory and the substantial changes in relative factor endowments of countries undergoing rapid economic growth, we deem it important to identify four different factor endowments, namely, those of land, human capital, physical capital, and energy. The effects of these endowments in both the exporting and importing countries on trade flows among countries are considered. In addition to factor endowments and country size, and again for each commodity group, four different measures of the trade barriers to be liberalized are included, the tariff rates of the importing and exporting countries and the non-tariff barriers of both importing countries.

The remainder of the paper is organized as follows: Section II provides a brief survey of both APEC's accomplishments to date and the few existing studies which have attempted to assess the effects of trade liberalization by APEC countries. Section III identifies the data and methods used. Section IV presents the results and Section V the conclusions.

## **II. APEC AND PREVIOUS ASSESSMENTS OF PROPOSED LIBERALIZATION**

While enormous attention has been devoted to analyzing the effects of trade liberalization at the global level (such as in the Uruguay round) as well as at the regional level in the European Union, the North American Free Trade Association (NAFTA) and even MERCOSUR, extremely little attention has been devoted to estimating such effects within APEC. This would seem unfortunate given the large size of APEC in world trade, its special approach to liberalization, and its extremely ambitious objectives.

Much of the literature on APEC has been descriptive of what it has been doing and prescriptive of what it should do in the future. Any assessment of its likely success should take into account that it is not a formal negotiating body that binds its members to international agreements. Member countries come together because of mutual consensus and confidence in

the objective of promoting trade and growth through open regionalism. This basic objective has been reiterated and elaborated on in initiatives taken in subsequent APEC meetings (Seoul 1991, Blake Island, 1993, Bogor 1994, Osaka 1995, Manila 1996, Vancouver 1997 but not Kuala Lumpur 1998). In addition to its trade liberalization initiative, APEC has given special attention to harmonization and liberalization of rules with respect to Foreign Direct Investment (FDI) and other invisible barriers to trade.

In the case of trade liberalization, each individual member state is free to pace its progression to the Bogor goals as it wishes and decide its own terms of liberalization as long as it reaches the common goal of total liberalization by the year 2010 (or 2020 for non-industrial members). Although, this arrangement raises doubts about the feasibility of this ambitious Bogor target, prior to the Asian economic crisis of 1997-1998 at least, substantial progress had been made in liberalization and outlining voluntary plans for further liberalization.

Within the intentionally small APEC secretariat (located in Singapore), a Committee on Trade and Investment (CTI) was established in 1993 to assist in the process of achieving trade and investment liberalization and related issues. The committee has taken an active role in transforming trade and investment liberalization from vision into action. Among the issues tackled by the CTI are: the data bases for tariffs and non-tariff barriers, trade in services, deregulation, dispute mediation, WTO negotiations, implementation, customs procedures, standards, mobility of entrepreneurs, intellectual property rights, competition policy, government procurement, and rules of origin. (Asian-Pacific Economic Cooperation 1997a, 1997b).

Aside from general studies of this sort, we know of but two studies which have tried to quantitatively assess the potential impact of trade liberalization by APEC. Both such studies have used computable general equilibrium (CGE) models of trade liberalization.

One of these was by the Economic Committee of APEC (1997). It focused on the effects of five different policy scenarios: (1) the removal of all tariffs by APEC members on goods imported from APEC but not from those imported from the rest of the world, (2) the same as (1) but supplemented by a reduced tariffs on imports from the rest of the world, (3) the same as (1) but supplemented with reciprocal reduction of tariffs by APEC on imports from the EU and by EU on imports from APEC, (4) the same as (3) except the reciprocal tariff reduction is with the rest of the world less the EU instead of with the EU, and (5) global trade liberalization (i.e., with all tariffs removed everywhere). In this study, Non-tariff Barriers (NTBs) were converted to their tariff equivalents and hence the liberalization experiments included liberalization of both types of trade barriers. All simulations were relative to actual 1995 trade flows.

For APEC as a whole, in scenario (1) imports would rise by 20%, in scenario (2) by 20.6%, in scenario (3) by 22.4%, in scenario (4) by 23.5% and in the global liberalization scenario (5) by 24.3%. Very similar results for the same five scenarios were obtained for APEC exports. Imports of the world would rise by 9.5% in scenario (1), by 11.5% in scenario (2), by 13.6% in scenario (3), by 14.4% in scenario (4) and by 21.6% in scenario (5). Since these estimates were based on a full-fledged multi-regional CGE model, increases in real income, wage rate and rental rates from each of the scenarios were also obtained. In dollar terms, the increases in real income were generally about one-tenth of those in imports.

The other study is by Petri (1998). It, too, uses a multi-regional CGE model in which prices are flexible and their flexibility brings about equilibrium in product and factor markets. A rather novel feature of Petri's model is that it deals with Foreign Direct Investment (FDI). To model FDI, the model distinguishes the activities and products produced by domestically owned firms from those produced by FDI firms in the same country or region. As such, the products

produced by domestic and FDI firms differ but compete imperfectly with one another. Demand is then allocated between the two types of products on the basis of both price and quality considerations. This is similar to how imports and domestic production are dealt with in most CGE models. Rates of return on the different possible destinations of FDI are taken into consideration in their allocation across countries as well as industries.

Since coordinated investment liberalization is another major objective of APEC and has been progressing rapidly, the effects of this more certain form of liberalization were estimated together with trade liberalization. Two different simulations were performed, one in which these liberalizations are on a most favored nation (MFN) basis and the other in which the simulations are confined to APEC partners. In the former case, exports would increase (relative to the base case) by 38.7% for the North American members of APEC (UCAN), 28.8% for Japan, 30.1% for the NIE members, 58.6% for the four ASEAN members, 51.7% for China and 2.7% for the rest of the world. World exports would increase by 22.2%, world imports by 23%, UCAN's imports by 26.7%, Japan's by 49.6%, NIE members by 52%, ASEAN members by 50.1%, China's by 73.8% and the ROW by 9.9%. With liberalization confined to APEC partners, the gains in exports and imports are on average about 30% lower than when liberalization is conducted on an MFN basis. While not providing separate results of trade and investment liberalization, Petri (1998) concludes that much of the overall gain in trade and welfare is due to FDI liberalization.

### **III. DATA AND METHODS**

While CGE models have many advantages for simulating the effects of trade liberalization, they also have disadvantages. Chief among these is that they rely on assumptions about thousands of parameter values of unknown realism and that they are sufficiently large and complex that the results are often difficult to understand. Many modeling assumptions are

arbitrary, such as whether prices are flexible, the choice of closing rules, the nature of the adjustment mechanisms, and results are often shown to be rather sensitive to the choices among different modeling assumptions. In addition to these general limitations, a practical limitation of the aforementioned multi-regional CGE models is that with many regions, the number of commodity-sectors is very limited (only three in the Petri study and eight in the APEC study).

The approach taken here is a more data-based, econometric one which attempts to explain bilateral gross trade flows by combining the factor endowments of standard international trade theory with country size and trade barriers. Specifically, it uses data on factor endowments by country and commodity-specific trade restrictions to explain variations in the shares of each exporting country in the imports of each importing country for each of 45 (narrowly defined) commodity groups. The approach is inspired by an earlier study by Noland (1990) which analyzed the prospective changes in the trade composition of Pacific Basin developing countries. While Noland's study was devoted to bilateral trade flows for individual commodities, it was also influenced by the earlier ones of aggregate net exports by Leamer (1987) and Saxonhouse (1988). Specifically, its purpose was to project the future composition of trade among Pacific Rim countries. For each commodity group, the following equation is estimated:

$$M_{ijt} = a + \sum_k b_{ik} V_{kjt} + U_{ijt} \quad (1)$$

where  $M_{ijt}$  = the share of imports from country  $j$  in national income of country  $i$  in year  $t$ ,  $a$  = industry share of world income,  $b_{ik}$  = coefficient indicating the impact on the import share of endowment  $k$  of country  $j$  at time  $t$ ,  $V_{kjt}$  expressed as a share of national income of endowment  $k$  in country  $j$  in year  $t$  and  $U_{ijt}$  = a disturbance term.

### **Measures and Data**

In comparison to the Noland study, the present study takes advantage of a much more

substantial data set on the trade flows of each APEC country with all other APEC countries as well as the rest of the world for each of 45 commodity groups. It also makes use of existing data on each of four types of resource endowments. In order to analyze the effect that achievement of the Bogor Declaration would have on member countries, the above equation is augmented so as to incorporate trade control measures. Both tariffs and NTBs are included. Although the direct effects of these trade barriers are largely confined to imports, by artificially raising domestic prices relative to world prices, such barriers can also discourage exports.

To obtain satisfactory measures of tariff barriers over time, one needs to convert any tariffs in the form of specific taxes (per unit of weight or volume) to their *ad valorem* equivalent in a consistent way. For this reason, one needs both a trade classification system that is consistent across countries as well as over time and to be able to relate this to the industrial classification system. Thanks to the work of the Customs Cooperation Council in Brussels, the Harmonized Commodity Description and Coding System (Harmonized System) has established a standardized product nomenclature and coding system (U.S. Congress, Senate Committee on Finance 1987 and Bhagwati and Hudec, ed. 1996). Yet, since the data employed in this study pertain to the period between 1970 and the mid-1990s, and the harmonized system and conversions was not available for the earlier part of this period, data from both individual member countries' coding systems and the harmonized system had to be used. The resulting measures of tariff rates are quantitative indexes that combine *ad valorem* with specific tariffs. Given their lesser degree of transparency, the task of creating an index of country and commodity-specific NTBs is even more formidable. For this reason, our measures of NTBs are dummy variables.

According to standard neoclassical trade theory, in a world characterized by free trade and competition, a country's net imports will be affected by the country's relative factor endowments.

Barriers to trade are irrelevant in such models. For explaining gross trade flows, however, gravity models are commonly used which pay much more attention to country size and distance than to factor endowments. Our objective is to project gross bilateral trade flows under a variety of assumptions about trade liberalization in an environment in which trade restrictions are relevant and in which factor endowments are likely to change substantially over time. Hence, we choose a reduced form of a hybrid model that explains bilateral gross trade flows between all pairs of APEC countries and the rest of the world (ROW) in terms of (1) four measures of relative factor endowments, (2) both tariffs and NTBs, and (3) country size of all such pairs of countries. The four measures of relative factor endowments are: land per capita, human capital per capita, capital per capita and energy resources per capita.

Next, we identify our data sources, beginning with those for the endowment variables and concluding with those for our measures of trade restrictions. For land endowment, following common practice wherever feasible, we use hectares of arable land per capita to represent land endowment. The data are taken from the World Bank's *1997 World Development Indicators*. Human capital endowment is represented by the average schooling years of individuals aged fifteen and over (Psacharopoulos 1973) based on data taken from the "International Measures of Schooling Years and Schooling Quality" portion of the Barro-Lee data set made available by the World Bank on its world wide web site. Following Psacharopoulos (1973), (physical) capital per capita is measured by, first, constructing incremental capital-output ratios (ICORs) for each country and for each of the three different years under study, second, multiplying these country and year-specific ICORs by the country- and year-specific values of GNP (in U.S. dollars of 1985) to obtain Capital stock (Robinson 1969), and third, dividing these country- and year-specific values of the capital stock by the total labor force. The investment and labor force data

used in computing the capital-labor ratios are taken from: *International Financial Statistics Yearbooks* published by the International Monetary Fund and the World Bank's *1997 World Development Indicators*, respectively. The resulting capital-labor ratios are thus valued uniformly in U.S. dollars per worker.

While other sources of energy exist and data on stocks would be more appropriate than that on flows, for lack of data on them in sufficient quality across countries and over time, we follow common practice (Ramazani and Maskus 1993; Leamer 1987) in measuring energy endowments in physical units (million liters) by crude petroleum production per capita. Data on crude petroleum production are taken from the *Europa World Year Book* and that on population from the *1997 World Development Indicators*.

For each individual commodity group, the measure of the dependent variable is the value of imports in United States dollars of each individual country from each designated exporting country (the 16 APEC countries and the rest of the world) expressed as a share of the importing country's GNP, again expressed in United States dollars in each of the three years (1975, 1985 and 1992). The use of single year observations at intervals roughly a decade apart is to capture the long-term effect of structural change among dependent and independent variables. While data for only 16 instead of the 18 pre-1998 APEC member countries could be obtained, the excluded member countries (Brunei and Papua New Guinea) are of negligible importance to the overall size of APEC and world trade. The values of imports of four digit SITC revision 2 code were taken from the "Statistics Canada World Trade Database" data file in the "World Trade Flows, 1970-1992" CD-ROM from the National Bureau of Economic Research. Such data were aggregated into the 45 commodity groups identified in Table 1 and then divided by GNP.

The structure of most tariff schedules is extremely complicated, typically involving some

ten thousand items only recently fully standardized with the Harmonized tariff code. To obtain tariff rate data for the early 1970's, early 1980's and early 1990's, the country-specific tariffs from national classification systems had to be transformed into averages for the internationally standardized classification system. For the early 1980s and 1990s, the data on both tariff rates and NTBs were collected from the "Tariff and Non-Tariff Barriers by Country" data file in the same aforementioned "World Trade Flows, 1970-1992, with Production and Tariff Data" CD-ROM from the National Bureau of Economic Research, Inc., the *Survey of Impediments to Trade and Investment in the APEC Region* published by the Pacific Economic Cooperation Council for the APEC Secretariat, and from the APEC Secretariat's World Wide Web.

### **The Model**

The following equation is estimated for each of the forty-five commodities:

$$M_{ijt} = a + \sum_1^k \beta^k X_{it}^k + \sum_1^k \delta^k Z_{jt}^k + \gamma_1 TRE_{it} + \gamma_2 TRI_{jt} + \gamma_3 NTB_{it} + \gamma_4 NTB_{jt} + \eta_1 GNP_{it} + \eta_2 GNP_{jt} + U_{ijt} \quad (2)$$

$t = 1975, 1985$  and  $1992$ ,  $M_{ijt}$  = the share of imports of that commodity from country  $j$  in GNP of importing country  $i$  at time  $t$ ,  $X_{it}^k$  = endowments of resource  $k$  ( $k=1, 2,3,4$ ) of importing country  $i$  at time  $t$ ,  $Z_{jt}^k$  = endowments of resource  $k$  of exporting country  $j$  at time  $t$ ,  $TRI_{it}$  = tariff rate of importing country  $i$  at time  $t$ ,  $TRE_{jt}$  = tariff rate of exporting country  $j$  at time  $t$ ,  $NTB_{it}$  and  $NTB_{jt}$  = dummy variables for non-tariff barriers in the importing and exporting countries, respectively at time  $t$ , and  $U_{ijt}$  = a disturbance term. The remaining symbols are parameters.

### **Econometric Specification**

In our econometric specification, we attempt to mitigate (if not totally eliminate) several problems: (1) endogeneity of some right hand side variables, (2) incomplete continuity in the measurement of the dependent variable, (3) the possible presence of unmeasured characteristics and (4) multicollinearity.

The potential for endogeneity arises in both the trade barrier variables and the endowment variables in that both trade barriers and capital accumulation could be induced by import penetration. Potential endogeneity in the tariff data is mitigated by using measures of tariff rates which are (to the extent possible) lagged slightly relative to the trade share data to be explained. A similar approach is taken for human capital endowment and appropriate instruments are used to remove endogeneity in the capital endowment per worker.

Problems (2), (3) and (4) are treated as follows. Since the dependent variable is bounded below at zero, we estimate the equation with both OLS and Tobit procedures. The influences of unmeasured country and year characteristics are reduced by using fixed effects procedures in our panel. Finally, multicollinearity is reduced (though not eliminated) by excluding variables that are highly correlated with another explanatory variable. A variable excluded for this reason was  $NTB_{it}$  since this variable was highly correlated with both  $TRI_{it}$  and  $NTB_{jt}$ . While estimates were obtained with both OLS and Tobit, each with and without fixed effects, the Tobit estimates with fixed effects provided much better fits and higher levels of significance for the explanatory variables. For this reason, only these estimates will be reported below.

#### **IV. RESULTS**

As noted above, Tobit, fixed effects estimates of the abbreviated version of equation (2) and using instruments for capital per worker are obtained separately for each of the 45 commodity groups listed in Table 1. The results for the relevant parameters  $\gamma_1$ ,  $\gamma_2$  and  $\gamma_4$  are presented in Table 1 with asterisks (\*, \*\*, and \*\*\*) indicating those which are statistically significant. Surprisingly many of these parameters are statistically significant in each case. In almost all cases, the parameters have the expected negative signs, especially so in the case of TRI and TRE. These negative signs suggest that our use of slightly lagged trade restrictions has been

successful in removing what would be a positive simultaneous bias if higher rates of import penetration triggered efforts to raise protective rates in the importing country. Note that no less than 23 of the 45 TRI coefficients and 13 of the TRE coefficients are negative and significant at the 5% level. In most of the cases, if either TRI and TRE has the "wrong" sign, the coefficient of NTBE is negative and significant. The magnitudes of the coefficients are also rather plausible. Since the estimating equation does not yield elasticities directly, these have to be generated from the point estimates of the parameters by taking into consideration both imports and GNP by calculating the percentage change in imports attributable to a one percent reduction in the tariff rate of the importing country. The largest of the percentage increases in such imports is about 1.5% for both glass products (commodity group 31) and wood products (commodity group 18). Many of them are much more modest (in the 0.05%-0.60% range).

In the interest of space, the remaining result, those for the effects of the endowment variables are available on request.

### **Simulations**

To estimate the likely impact of achieving the free trade goals of the Bogor Declaration, the endowment variables are projected ahead another decade and then multiplied by their respective parameter values. For the assumptions about trade barriers, we consider the following alternatives: (1) the tariff rates and NTBs for 2010 remain as they were in the early 1990s, (2) all such tariff rates of APEC countries are eliminated and (3) all tariff barriers are removed in the rest of the world as well, (4) both tariffs and NTBs are eliminated by APEC countries, and (5) both tariffs and NTBs are eliminated in the rest of the world as well.

Table 2 provides a comparison of the results of assumptions (2), (3), (4) and (5) relative to the status quo case (1) for imports of APEC from APEC, APEC from the world and the rest of

the world (ROW) in each of several scenarios. In the first three rows of Table 2 are the results for these three different variables in the Base Scenario. The results given in the first column of each row are the percentage increases obtained by comparing scenario (2) with (1), i.e., capturing the influence of APEC's removal of tariffs. The entries in the second column in the table show the percentage increases in imports obtained by comparing scenario (3) with (1). Correspondingly, those in the third and fourth columns represent the results obtained by comparing imports generated from scenarios (4) with (1) and (5) with (1).

From the first row, one can see that, if in the Base Scenario tariffs are eliminated only by APEC countries, their imports would rise by 19.6%; if NTBs are eliminated as well, APEC imports would rise by 27.2%. If the rest of the world joined APEC in eliminating tariffs only, APEC imports would rise by an additional 2% (from 19.62% to 21.75%). If the rest of the world joined APEC in eliminating both tariffs and NTBs, APEC imports from APEC would rise by an additional 4% (from 27.17% to 31.25%).

Similarly, the entries of the second row of the table show that APEC imports from the world as a whole would rise by 13.26% with elimination of tariffs by APEC alone, by 15.38% if the rest of the world joined APEC in tariff elimination, by 18.77% if APEC removed both tariffs and NTBs and by 22.85% if the whole world achieved free trade. The last row in Table 2 gives the corresponding results for these scenarios for imports of the rest of the world.

In view of the reluctance of the U.S. Congress to assign fast-track trade negotiation authority to the president and the expected lingering effects of the Asian financial and currency crisis, all the assumptions of the above "Base Scenario" may be considered overly optimistic. To achieve greater realism, in the subsequent sections of the table, we make the same four comparisons relative to the status quo situation, but in each case with less optimistic assumptions

about likelihood that all APEC countries will be able to liberalize.

Section two of the table presents the corresponding results for a scenario in which the countries affected by the Asian currency and financial crisis (Japan, Korea, Indonesia, Malaysia and China) would not join other APEC members in liberalization either among each other or with respect to the rest of the world. The next section presents the corresponding results for an even more pessimistic case in which even the non-Asia crisis members of APEC liberalize only among each other but not with respect to either Asia-crisis countries or the rest of the world. The fourth section makes the same comparisons for a case in which the U.S. joins the Asia-crisis countries in refusing to liberalize by the target date. The fifth section takes a different tack; it assumes that the main effect of the Asian crisis would be to slow down the growth rate of capital in these countries by 50 percent relative to the rates assumed in the Base Scenario. Finally, the bottom section of the table presents the results of the same comparisons in a scenario combining the slower growth of capital with the failure to liberalize for Asia-crisis members of APEC.

Within each of these alternative scenarios the pattern of results is similar. The import growth rate of each region is raised the broader is the scope (both to include NTBs and geographically) of liberalization. In all cases, the impacts are largest in percentage terms in the case of intra-APEC trade but, although varying somewhat according to the particular scenario, the extra growth in the rest of the world's imports is also quite impressive.

Of particular interest are the comparisons of corresponding entries across the different scenarios. From comparisons of corresponding entries in the second and fifth scenarios, one can see that failure to liberalize by Asia-crisis APEC countries would lower import growth in all regions and in all variants of liberalization more than would a 50% reduction in the growth of capital in these same countries. The differences are relatively larger for the tariff liberalization

cases in the first two columns of the table. Despite its already rather low tariffs, because of its size, when the U.S. joins Asia crisis countries in refusing to liberalize as in the fourth scenario, import growth is lowered by around 50% in all regions and under all assumptions about liberalization relative to the second scenario. Indeed, in the narrowest form of liberalization (i.e., tariff reduction only among APEC countries), the increase in rest of the world's imports relative to the Base Scenario would be rather negligible (0.30%). Overall, the various scenarios show that even the rest of the world has much to gain in trade growth in the broadest possible liberalization by APEC. Also, trade could decline only if important APEC members should fail either to accumulate as much capital as in the past or especially to liberalize their tariff and NTB regimes.

Table 3 shows how the total increase in imports from column (3) in the Base Scenario portion of Table 2 would be distributed among the 16 APEC countries included in the econometric analysis (i.e., all 18 pre-1998 members except Brunei and Papua New Guinea). As can be seen, even though the U.S. and Japan are expected to remain the largest importers, the countries whose imports would increase the most (in percentage change terms) are China and Thailand (because of their present relatively high trade barriers). For the same reason, Hong Kong, Singapore and the U.S. are at the low end because of their relatively low trade barriers.

The first column of Table 4 shows how the overall APEC imports would be distributed across the 45 commodity groups in the status quo version of the Base Scenario. The second column "After" shows how they would be distributed in case in which APEC members would eliminate both tariffs and NTBs among each other (akin to column (3) of the Base Scenario in Table 2). Finally, in the last column of the table is the commodity composition of the overall change in imports between these two cases. While commodity groups 36 (other machinery), 12 (petroleum and products) and 41 (motor vehicles) are expected to remain the most important

ones, the largest shares of the overall increase in imports are expected to be agricultural products (commodity groups 1, 3, 4 and 5) due to the relatively high existing barriers to import in such products.

Although our methodology (an endowments based econometric model) is extremely different from the multi-regional CGE models used by both Petri (1998) and APEC (1997), and our level of disaggregation (45 commodity groups) in the trade data is considerably greater than theirs (eight or less), the estimates resulting from this study are remarkably similar to theirs. Both sets of studies indicate that APEC trade would be quite significantly enhanced if APEC countries were to achieve its Bogor target of removing all tariffs.

## **V. CONCLUSIONS**

Several important policy implications might be drawn from this analysis. At face value at least, the results would seem to indicate that APEC liberalization of trade could be quite important in terms of trade and income growth of both APEC countries and the world. The removal of tariff barriers would have the greatest impact, increasing APEC imports (and presumably exports as well) by over 13%. Eliminating NTBs would increase APEC imports by an additional 5.5%. Coupling this finding with the finding of Petri (1998) that the effects of trade liberalization would be further enhanced if it were done on an MFN basis or if combined with FDI liberalization, the benefits could be even greater. Another important source of benefits of APEC liberalization would be by stimulating liberalization of barriers to import in the rest of the world. Indeed, if such liberalization by the rest of the world were also complete, our estimates show that APEC imports would rise by an additional 4.1%. Rest of the world imports would also be increased by liberalization by APEC, but the greatest expansion in ROW imports would come from liberalization in the rest of the world. Indeed, our estimates suggest that ROW imports from

the world as a whole would rise by almost 12%. Quite naturally, and as demonstrated in the five lower scenarios of Table 2, the projected increases in imports attainable from trade liberalization would be considerably smaller if some important APEC members were unable either to accumulate capital or to liberalize their trade barriers.

The credibility of these findings is strengthened by the following considerations. (1) In general, the underlying empirical estimates of the various determinants of  $M_{ij}$ , the shares of imports from country  $i$  in the total GNP of importing country  $j$ , presented in Table 1 seem both qualitatively and quantitatively plausible for the vast majority of commodity groups. More of the parameter estimates are statistically significant than in other studies of this kind, the signs are mostly as expected (although strict predictions could not be derived given the eclectic and reduced form character of the model). Even the magnitudes of the effects seem reasonable. The fact that the magnitudes of the elasticities implied by these results are generally rather modest rules out the possibility that our relatively large estimates of the trade effects of APEC liberalization could be due to substantial over-estimation of these critical parameters. (2) The results are also rendered credible by the similarity of our estimates of the benefits of APEC achievement of its Bogor target of complete liberalization of imports by at least 2020 and those of previous studies using rather different methods.

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