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Abstract

TILF and Ecotech have been pursued in an unbalanced way during the APEC's development. While developed economies emphasize the role of the private sector in promoting Ecotech, developing economies argue that governments should also play at least a complementary role in order to maintain the momentum of the APEC trade and investment liberalization process (TILF) that has accelerated recently. Redirection of developed economies' ODA policies in favor of APEC could alleviate financial limitations of Ecotech, promoting many concrete and practical programs and balancing Ecotech with TILF. In this context, we have discussed the possibility of the existence of a positive link between international trade and aid. Also, a recipient economy's tariff can be reduced by more aid. Empirically, we found that donors with high export/GNP ratios provide less ODA to recipients with smaller export shares. While all donors provide more ODAs to recipients with lower per capita income, except the U.S., Japanese ODA policy is directed toward APEC and France and German are against it. The U.S and U.K have no particular favor or disfavor on the APEC. Therefore, as further liberalization of TILF programs will bring about higher trade interdependence, more aid from APEC developed economies could not only improve its own welfare but also promote APEC liberalization process. An obvious implication is that strengthening of Ecotech through more ODA toward the APEC and acceleration of TILF are mutually re-enforcing.

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Ⅰ. Introduction

TILF(Trade and Investment Liberalization and Facilitation) and Ecotech(Economic and Technical Cooperation) have been the two driving pillars of APEC. However, TILF and Ecotech have been pursued in an unbalanced way during the APEC's development. There are several reasons. First, industrialized economies in APEC focused more on TILF as the means of market opening of developing member economies. Second, industrialized economies which are main suppliers of capital and technology have been reluctant to Ecotech activities. Third, even the developing economies have focused more on TILF because TILF has a great immediate impact on their economies than Ecotech.

To strengthen Ecotech activities in APEC, APEC needs to secure enough financial capital. One of the possibilities is to take advantage of Official Development Assistance(ODA), with which the industrialized APEC member economies are providing to developing economies worldwide. In this paper, we examine the current status of ODA provision to APEC member economies. In addition, we examine the relationship between ODA flow and trade flow(and trade policy) to find out how trade policy(TILF) and ODA(Ecotech) is linked. The content of the paper is following. Chapter II introduces current status of APEC's Ecotech and ODA provision from and to APEC member economies. Chapter III provides a model and empirical test results. Chapter IV concludes the paper.

Ⅱ. APEC's Ecotech

1. The current Status of APEC's Ecotech

(1) The characteristics of Ecotech[1)]

By late 1997, APEC has promoted a total of 220 Ecotech projects. The classification of these projects can be seen in Table Ⅱ-1 Among the APEC working groups, committees, and other APEC fora, HRDWG has thus far been the most active--promoting 41 projects, 18.6% of the total. Next, ISTWG and CTI have promoted 37 projects(16.8% of the total), and 29 projects(13.2% of the total), respectively. Meanwhile, TIDWG has been the least active, having only 2 projects. HRDWG's active status reflects APEC member economies' concern for human resource development, and likewise ISTWG activities reflect the interest in science and technology development. CTI's fairly large number of projects can be attributed to the fact that CTI contains two sub-committees on Standards and Conformance (SC) and Customs Procedure (CP), as well as the Investment Exert Group(IEG). TIDWG does not show much activity because its main job, building a database, has already been completed, only periodic updating.

Among the six priority areas, HC has 75 projects, more than one third of the total projects. TF and ESD have 47 projects(21.4% of the total projects), and 37 projects(16.8% of the total projects), respectively. Meanwhile, there have been only five projects related to CM. This distribution is basically representative of APEC member economies'

1) This section is based on Jaebong Ro & Hyungdo Ahn(1997)'s paper.

Table Ⅱ-1. Current Status of APEC Ecotech by APEC Fora and 6 Priority Areas

6 Priority Areas / APEC Fora	1. HC	2. CM	3. EI	4. TF	5. ESD	6. SMEs	Total
1. EWG			3	7	7		17(7.7)
2. FWG	3				1	2	6(2.7)
3. HRDWG	31	2	1	2	2	3	41(18.6)
4. ISTWG	5			18	13	1	37(16.8)
5. MRCWG					4		4(1.9)
6. TELWG	8		5	4	1	4	22(10.0)
7. TWG	1		5		2		8(3.6)
8. TIDWG	1		1				2(0.9)
9. TPWG	1		4			3	8(3.6)
10. TPTWG	2	1	6	6	1		16(7.3)
11. ATC	1		1	3	2	2	9(4.1)
12. CTI	19	1	3	4	1	1	29(13.2)
13. EC	1	1	2	1	2		7(3.2)
14. PLGSME	2			2	1	9	14(6.4)
Total(%)	75(34.1)	5(2.3)	31(14.1)	47(21.4)	37(16.8)	25(11.4)	220(100)

Abbreviation

▼ HC: Developing Human Capital
▼ CM: Fostering Safe, Efficient Capital Markets
▼ EI: Strengthening Economic Infrastructure
▼ TF: Harnessing Technologies of the Future
▼ ESD: Promoting Environmentally Sustainable Development
▼ SMEs: Encouraging the Growth of Small and Medium Enterprises
▼ EWG: Energy Working Group
▼ FWG: Fisheries Working Group
▼ HRDWG: Human Resources Development Working Group
▼ ISTWG: Industrial Science and Technology Working Group
▼ MRCWG: Marine Resource Conservation Working Group
▼ TELWG: Telecommunications Working Group
▼ TWG: Tourism Working Group
▼ TIDWG: Trade & Investment Data Review Working Group
▼ TPWG: Trade Promotion Working Group
▼ TPTWG: Transportation Working Group
▼ ATC: Agricultural Technical Cooperation Experts Group
▼ CTI: Committee on Trade and Investment
▼ EC: Economic Committee
▼ PLGSME: Policy Level Group on Small and Medium Enterprises

current interests in Ecotech.

HC's active status is partly due to the ease of project promotion, as well as the interest of APEC member economies. The present projects of HC are oriented towards seminars, workshops, and trading courses, all of which are easily supported financially. On the other hand, the low number of projects related to CM does not reflect a lack of interest and concern for CM projects, but rather reflects the difficulties of financing promotion of CM.

Table Ⅱ-2 shows Ecotech projects listed by leading economies. In this table, we see that developed economies are heading 138 projects (59.7% of the total), while ANIEs and ASEAN are heading 34 projects, 16.4% of the total, and 25 projects(11.1% of the total), respectively. Again, the figures here do imply a lack of interest in Ecotech projects by developing economies, but rather, illustrates the fact that developed economies have a greater capacity for organizing events such as conferences, seminars, workshops, etc. Developed economies are thus able to head more Ecotech projects.

While developed economies emphasize the role of the private sector

Table Ⅱ-2. Ecotech Projects by Leading Economies[1]

Leading Economies	Developed Economies	ANIEs	ASEAN[2]	Others	non leading economies	Total[3]
Number of projects	138	34	25	20	9	226

1) Developed Economies consist of the US, Japan, Canada, Australia, and New Zealand. ANIEs consist of Korea, Chinese Taipei, Hong Kong, and Singapore. ASEAN consists of Malaysia, Thailand, Indonesia, the Philippines, and Brunei. Others consists of China, Mexico, Chile, and PNG.

2) Among the ASEAN members in APEC, Singapore is classified as an ANIE.

3) Since 6 projects are led by two economies, the total is 226 rather than 220.

in promoting Ecotech, developing economies argue that the government should also play a complementary role to the private sector in Ecotech matters. However, contradictory to developed economies' opinion, Table Ⅱ-3 shows that 63.2% of the total Ecotech projects do not have private sector participation. This is mainly because the private sector's participation in Ecotech needs more time to develop due to the lack of a solid network between the government and private sector.

Table Ⅱ-3. Private Sector Participation to Ecotech Projects

6 Priority Areas Private Sector Participation	HC	CM	EI	TF	ESD	SME	Total
Yes	19	1	15	18	10	18	81
No	56	4	16	29	27	7	139

From the viewpoint of real progress, 26 projects(11.8% of the total) have been completed, while 194 projects(89.2% of the total), are still in progress. This not only exemplifies the rather short history of Ecotech promotion, but also shows that some projects are promoted continuously in a step-by-step manner.

Table Ⅱ-4 shows the content of Ecotech projects. Events such as

Table Ⅱ-4. Classification of Ecotech Projects by Content

Content	Governments' Action[1)]	Event[2)]	Information Sharing	Report	others	Undecided	Total
Number of projects(%)	32 (14.5)	79 (35.9)	39 (17.7)	59 (26.8)	2 (0.9)	9 (4.1)	220 (100)

1) 15 Projects are promoted by individual governments, while 17 projects are promoted by intergovernmental action.

2) Events include seminars, workshops, conferences, forums, training courses, round tables, exhibitions, and fairs.

workshops, conferences, seminars, etc. were the most common projects with 79, or 35.9% of the total, and report and information sharing projects were next, with 59 and 39 projects, respectively. Altogether, 168 projects of this nature were recorded(70.4% of the total), while only 32 projects(14.5% of the total), were related to governmental action. This reflects that present Ecotech projects are deficient of substantial cooperation between governments.

(2) Challenges to Ecotech

1) Duplication of work : intra- and extra-APEC

Although economic and technical cooperation is a very broad concept, economic and technical cooperation in the APEC context is defined by the specific activities that have been grouped under this rubric. The current Ecotech activities in APEC fall into the following general categories : policy dialogue, sharing technical expertise and experience, sharing information, harmonization through agreement on common standards and approaches, training, and joint funding for projects.

In terms of institutional lines, APEC's economic and technical cooperation can be divided into some 17 separate agendas ; 13 under part II of Osaka Action Agenda plus the Environment/Sustainable Development, Finance processes, Ecotech activities under CTI, and the analytical work of the Economic Committee. Some of the agendas are sector-specific while others are more cross-cutting in nature. The existence of overlapping issues means that there are various points of intersection among the 17 agendas. SME issues, for example, come up in the context of the work on Human Resource Development, Finance, Science and Technology, Market Framework Policies, and of course

very prominently in trade and investment. Environment as well comes up virtually across the board in one fashion or another. In the case of SMEs, a specific group has been established within APEC to give impetus to work in that area. In other cases, such as environment, no particular institutional body has been set up; instead, all APEC fora report on how they are taking the environment into consideration in their work programs, while the Ministerial process propels the overall agenda with officials and experts meeting on an ad hoc basis.

The range of important overlapping issues creates the need for coordination to avoid duplication, and also creates opportunities for integration of efforts. Coordination takes place at the senior official level as well as through the initiative of Working Group Lead Shepherds and Chairs of the Committees and Ad hoc fora. However, coordination efforts are not very satisfactory. APEC needs an integrated management tool for the Senior Officials to provide feed back to the various fora. At the same time, overview of APEC's work in various fora should be regularly supplied to identify the possibilities for greater collaboration and to avoid duplication.

One more possible network of collaboration and coordination is international organizations such as OECD, UN, IMF, and World Bank. These international fora have extended histories, experience, and expertise in the field of economic and technical cooperation. Therefore, APEC can utilize much of work already accomplished by these international organizations. The efforts to collaborate, coordinate, and take advantage of these international foras' expertise and experience is not very active. APEC does not have to duplicate the work already done by other international fora.

2) Limitation of project designs

Another reason for the gloomy future for Ecotech is the limitation of project designs. Basically, project designs have been limited due to the insufficient supply of capital and technology for Ecotech. Related to this, participation by developing economies has been limited due to their reserved attitude toward present Ecotech projects. Since current projects are oriented too much towards seminars, workshops, training courses, etc., results from Ecotech projects have not been satisfying for developing economies. Developing economies think more action and tangible results are needed; i.e. a substantial inflow of capital and technology from the governments of developed economies. Most projects seem to be designed and chosen based on ease of promotion, rather than the real needs of the beneficiaries. As a result, many of the projects have been divergent from developing economies' actual requests.

3) Growing number of Fora

As APEC progresses, more fora and sub-fora are newly established and many more government officials and scholars are attending the various meetings and fora in APEC. This reflects the expanding coverage of and interest in economic and technical cooperation activities. However, some fora which were initially tentatively set up tend to continue their lives by the inertia of an organization. A certain forum, which has little contribution to Ecotech efforts or is outdated, exists because of the lack of restructuring efforts from the member economies. Therefore, there exists much room to economize and make the APEC's Ecotech process efficient.

4) Passive attitude of Governments toward Ecotech

The current status of Ecotech projects show that their impact has been somewhat low, despite the great volume. Further, it is questionable whether or not holding events like seminars or conferences actually promotes substantial cooperation. Many such projects are one-time events and do not have any follow-up actions. In many cases, reports are simple references that are not influential to policy making. As a result, information sharing or distribution projects have limited meaning and effectiveness. It is true that we should not expect a huge impact from Ecotech projects considering that many of them are in their primitive stages. Still, unless general improvements are made, the current status of these projects foreshadows a not-so-bright future for Ecotech.

The problem arises because of two main reasons. One is the financial limitation. Ecotech programs such as vocational training and technology transfer require money and are difficult to handle in their implementation. Therefore, economies tend to prefer holding seminars and conferences or writing reports. Second, some governments, mainly those of advanced economies, tend to put the Ecotech responsibility on the private sector, mostly universities and institutes which are naturally inclined to writing reports or holding seminars and conferences. This limits the horizon of economic and technical cooperation in APEC.

(3) Official Development Assistance (ODA) and Ecotech

Among various problems current APEC's Ecotech program has, securing financial resources is the most critical one to tackle with. Sufficient financial support for APEC's Ecotech will allow Ecotech

program to be more action and result oriented, and to include more concrete projects such as construction of bridges, telecommunication networks or vocational schools. To finance Ecotech programs with substance, all developed and some developing economies in APEC should contribute in the form of official development assistance. Also, it is necessary to set up a mechanism which will link member economies' ODA programs to APEC's Ecotech needs. In the following section, we will examine the current status of ODA provision to APEC member economies.

2. ODA and APEC

(1) ODA provision from the developed economies in APEC

Table Ⅱ-5 shows the ODA to APEC member economies. China is the largest beneficiary of ODA and Indonesia is the second. Vietnam, Philippines, and Thailand received the significant amount. Table Ⅱ-6 shows the ODA provision of the developed economies in APEC. Five developed economies in APEC take 46.3% and 36.7% of world total ODA provision in 1995 and 1996, respectively. In terms of ODA/GDP ratio, Canada and Australia provide the larger share while US provides the smallest. In terms of absolute amount, Japan provides the largest of 14,489 million US$ in 1995 and 9,439 US$ in 1996. US was the largest doner before 1992, but Japan become the largest after 1993.

Table Ⅱ-7 shows the ODA provision of five developed economies in APEC to APEC member economies. Among five developed economies, New Zealand provided the largest share to the APEC member economies, 9.6% of total ODA provision in 1995/1996.

Table Ⅱ-5. ODA to APEC member economies

(Unit: million US$, %)

	1990	1991	1992	1993	1994	1995	1996
Mexico	159	278	317	424	431	390	289
Chile	100	126	136	185	158	160	203
Peru	399	614	409	580	417	427	410
Brunei	4	4	5	5	5	4	-
China	2,166	1,999	3,050	3,271	3,238	3,534	2,617
Hong Kong	38	36	-39	30	27	18	13
Indonesia	1,748	1,874	2,079	2,018	1,642	1,390	1,121
Korea	52	55	-3	-41	-114	58	-147
Malaysia	469	290	206	94	68	115	-452
Philippines	1,280	1,053	1,716	1,487	1,058	886	883
Singapore	-3	8	20	24	17	17	-
Chinese Taipei	36	3	6	7	6	0	16
Thailand	801	721	773	611	578	865	832
Viet Nam	190	237	575	258	897	827	927
Papua New guinea	376	397	442	309	326	373	385
Total	7,815	7,695	9,692	9,262	8,754	9,064	7,097

Source: OECD, *Development Co-operation*, Various issues

Table Ⅱ-6. ODA Provision of the developed economies in APEC

(million US$, %)

	1990	1991	1992	1993	1994	1995	1996
Australia	955	1,050	1,015	953	1,191	1,194	1,121
(ODA/GNP)	0.34	0.38	0.37	0.35	0.34	0.36	0.30
Canada	2,470	2,604	2,515	2,400	2,250	2,067	1,795
(ODA/GNP)	0.44	0.45	0.46	0.45	0.43	0.38	0.32
Japan	9,069	10,952	11,151	11,259	13,239	14,489	9,439
(ODA/GNP)	0.31	0.32	0.30	0.27	0.29	0.28	0.20
New Zealand	95	100	97	98	110	123	122
(ODA/GNP)	0.23	0.25	0.26	0.25	0.24	0.23	0.21
USA	11,394	11,262	11,709	10,123	9,927	7,367	9,377
(ODA/GNP)	0.21	0.20	0.20	0.15	0.14	0.10	0.12
ODA Total	23,983	25,968	26,487	24,833	26,717	27,628	21,854

Source: OECD, *Development Co-operation*, Various issues

Australia is the second, 4.0%. However, Canada and Japan provide less than 0.5% of total ODA to APEC member economies, and US provided less than 0.1% throughout 1980s and 1990s. In total, five developed economies provided 0.54% their total ODA to APEC member economies. Overall, ODA provision of five developed economies to APEC member economies stayed at the minimal level and in a decreasing trend.

Table Ⅱ-7. ODA provision of APEC developed economies to APEC member economies

(Unit: million US$, %)

	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96
Australia	46.1	45.5	46	47.5	46.4	45
(ODA share)	4.6	4.5	4.7	4.7	4.1	4.0
Canada	5.5	6.4	6.1	5.9	6.7	5.5
(ODA share)	0.2	0.3	0.2	0.04	0.3	0.3
Japan	36.3	38.4	38.7	33.3	32.2	54.5
(ODA share)	0.3	0.3	0.3	0.2	0.2	0.4
New Zealand	11.5	8.6	9.1	9.8	11.4	11.9
(ODA share)	11.7	8.7	9.4	9.4	9.8	9.6
USA	2.8	2.6	2.2	2.7	2.6	2.2
(ODA share)	0.02	0.02	0.02	0.02	0.03	0.02
ODA Total	102.2	101.5	102.1	99.2	99.3	119.1

Note: Numbers upto 1991/92 are the sum of upper 25 countries of ODA provisions. Numbers after 1992/93 are the sum of upper 15 countries of ODA provisions. Therefore, it's possible that numbers after 1992/93 is undervalued.

Source: OECD, *Development Co-operation*, Various issues

Table Ⅱ-8 shows the ODA provision of APEC developed economies to APEC member economies in detail. In 1995/96, US provided 2 APEC member economies with ODA, Japan 8 economies, Canada 4 economies, Australia 7 economies, and New Zealand provided 5 economies.

Table Ⅱ-8. Recipients in APEC Economies during 1995/96

(million US $)

USA		Japan		Canada		Australia		New Zealand	
Philippines	1.3	Indonesia	9.5	China	2.3	Papua New Guinea	21.1	Papua New Guinea	4.5
Peru	1.0	China	8.9	Peru	1.3	Indonesia	8.4	Indonesia	2.8
		Thailand	5.8	Indonesia	1.0	Philippines	4.9	Philippines	1.8
		Philippines	5.3	Philippines	0.9	Viet Nam	3.8	Viet Nam	1.7
		Korea	2.0			China	3.4	China	1.1
		Mexico	1.8			Thailand	2.0		
		Malaysia	1.8			Malaysia	1.3		
		Viet Nam	1.0						

(2) ODA provision of non-APEC developed economies to APEC member economies

Table Ⅱ-9 shows the ODA provision of non-APEC developed economies to APEC member economies during 1995/96, Germany and England provided 0.12% and 0.10% of their total ODA to APEC

Table Ⅱ-9. ODA provision of Non-APEC developed economies to APEC member economies

(Unit: million US$, %)

	1980/81	1986/87	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96
France	1.9	2	2.9	4.5	4.6	3.3	2.7	2.9	0
(ODA share)	0.04	0.04	0.03	0.06	0.05	0.04	0.03	0.03	0.00
Germany	5.9	6.4	7.3	7.4	6.8	9.2	10.1	11	11
(ODA share)	0.14	0.13	0.10	0.09	0.08	0.11	0.12	0.13	0.12
Italy	1.4	3.8	4.6	3.1	5	7	8.4	4.9	0
(ODA share)	0.20	0.15	0.13	0.09	0.14	0.18	0.26	0.20	0.00
United Kingdom	1.6	3.1	3.7	3.2	3.4	3.9	5	3	3.2
(ODA share)	0.07	0.16	0.13	0.10	0.10	0.12	0.16	0.09	0.10
ODA Total	10.8	15.3	18.5	18.2	19.8	23.4	21.6	21.8	14.2

Note: Numbers upto 1991/92 are the sum of upper 25 countries of ODA provisions. Numbers after 1992/93 are the sum of upper 15 countries of ODA provisions. Therefore, it's possible that numbers after 1992/93 is undervalued.

Source: OECD, *Development Co-operation*, Various issues

member economies. During 1994/95 and before, France, Germany, Italy, and England provided the relatively significant amount(compared with the developed APEC member economies) to APEC member economies. Even in 1995/96 when France and Italy cut the ODA provisions to APEC member economies significantly, ODA provisions of Germany and England exceeded that of US in terms of share and absolute amount.

Ⅲ. A theoretical and empirical background for tying Ecotech to TILF

1. The link between aid and trade: a discussion

Discussions in the previous section lead us to look at ways to balance regional economic cooperation (Ecotech) and liberalization process (TILF). As far as TILF is concerned, APEC has advanced to a new stage by agreeing to EVSL(Early Voluntary Sectoral Liberalization) program. It is intended to accelerate trade liberalization by inducing member economies to take specific measures for sectoral liberalization before Bogor goal. One might evaluate that the principle of 'Open Regionalism' has obtained a concrete shape finally. Unfortunately, however, if we carefully look into EVSL, we may end up with an impression that the EVSL program is prejudiced to APEC developed economies such as the U.S., Canada and Australia. The target sectors for liberalization are mostly major exports of those economies to APEC developing economies. One may argue that it is inevitable because of high tariff and non-tariff barriers of developing economies. Nevertheless, in order to maintain the momentum of APEC and accelerate regional efforts for further liberalization, it is important to attain mutual balance and benefit.

Further liberalization due to TILF programs such as EVSL will bring about higher trade interdependence. If we want to balance TILF and Ecotech, it may be helpful to establish an underlying link between aid and trade dependence. It is generally believed that international aid is provided mostly from non-economic objective such as political and humanitarian purpose rather than economic objectives. Therefore,

it may be difficult to relate donors' pattern of giving aid with any economic activities. As we have been arguing, it is important to balance Ecotech and TILF in order to maintain the momentum of APEC and accelerate regional efforts for further liberalization. Both theoretical and empirical investigation of the existence of link between any economic objective and aid are more than necessary for the plausibility of our arguments. In this context, the purpose of this section is two-fold. First, we look into the economic explanation of how a donor economy may link aid to economic objectives. Second, having established such possibilities, we conduct some empirical analysis on the relation between ODA and trades.

In the context of linkage between trade and aid, Table Ⅲ-1 provides us with some idea. There seems to exist a strong correlation between per capita ODA and trade exposures in OECD DAC member economies. Among 5 major donor economies(U.S., Japan, France, Germany, U.K.), those with higher export exposures such as France, Germany and U.K. record higher ODA/GNP ratios. The ODA/GNP ratios of low export exposure economies like the U.S and Japan are relatively smaller.[2] It could imply that despite the principle of

Table Ⅲ-1. Comparison of ODA/GNP and Export/GNP in major DAC members

	U.S	Japan	France	Germany	U.K	Netherlands	Italy	Sweden	Canada	Australia
ODA/ GNP	0.12	0.20	0.48	0.33	0.27	0.81	0.20	0.84	0.32	0.28
Export/ GDP	0.08	0.09	0.19	0.21	0.22	0.49	0.21	0.35	0.34	0.15

Note: data compiled by the authors using OECD DAC statistics and IFS.

2) Besides, other small European economies show both high export exposures

international aid, there is some underlying relationship between trade relations and ODA.

First, we look into the possibility of donor economies' motivation to link aid and trade. In this regard, Lahiri et al.(1997 a. b) provides us a good starting point. Let's consider the following general equilibrium of international trade. Suppose there are three economies; an APEC donor economy (D), an APEC recipient economy(A) and a Non-APEC recipient economy(N). The donor economy gives foreign aid of the amount T to A and N with shares of λ and 1-λ. Both recipients import non-numeraire goods from D. We assume that only APEC recipient economy A imposes tariff(or tariff equivalents) t on imports in order to focus on the situation of APEC cooperation and it is assumed thatλ is a function of t to see the effects of tying aid to tariff reform. For the purpose of describing model, we employ the trade expenditure function(E) following the models of Lahiri. et al. First, budget constraints of three economies can be written as follows:

$$E^D(1, p, U^D) = -T \tag{1}$$

$$E^A(1, p, U^A) = \lambda(t) \cdot T + t \cdot m^A \tag{2}$$

$$E^N(1, p, U^N) = (1-\lambda)T \tag{3}$$

$$m_i = E_p^i, \ i = D, A, N \tag{4}$$

$$m^B + m^A + m^N = 0, \tag{5}$$

---

and ODA/GNP ratios.

Now allow changes in aid, tariff and shares λ by totally differentiating budget constraints of (1), (2), and (3). From (1),

$$E^D{}_p\,dp + E^D{}_u\,dU^D = -dT \tag{6}$$

From (2),

$$E^A{}_p\,dp + E^A{}_p\,dt + E^A{}_U\,dU^A = \lambda(t)dT + T\lambda(t)dt + tdm^A + m^A dt \tag{7}$$

λ_t denotes partial derivative of λ with respect to tariff. Therefore, in our model, shares of aid are tied with recipient economy A's tariff reform. Presumably, λ_t is negative.

From (3),

$$E^N{}_p\,dp + E^N{}_U\,dU^N = (1-\lambda)dT - T\lambda_t\,dt \tag{8}$$

Total differentiation of (4)

$$dm^A = E^A{}_{pp}\,dp + E^A{}_{pU^A} + dpE^A{}_{pp}\,dt \tag{9}$$

Suppose the APEC donor economy maximizes its own utility. We can easily see from (6) that maximizing donor economy's utility is equivalent to maximizing p as $m^D < 0$. Therefore, we need to obtain expression for price effect by totally differentiating world budget constraint of (5). First, we focus on APEC recipient economy that imposes tariff on imports from the APEC donor economy. By substituting (9) in (7), we obtain the expression for utility change in economy A.

$$(E^A{}_U - tE^A{}_{pU^A})dU^A = \lambda(t)dT - m^A dp + T\lambda(t)dt + tE^A{}_{pp}dp + tE^A{}_{pp}dt \quad (10)$$

Totally differentiating world budget constraint (5), we obtain;

$$E^D{}_{pp}dp + E^D{}_{pU^D}dU^D + E^A{}_{pp}dp + E^A{}_{pp}dt + E^A{}_{pU^A}dU^A + E^N{}_{pp}dp + E^N{}_{pU^N}dU^N = 0 \quad (11)$$

Substituting each economy's expressions for utility changes, (6), (8) and (10) into (11), we obtain the following expression for changes in price.

$$Zdp = \left(\frac{E^D{}_{pU}}{E^D{}_U} - \frac{\lambda E^A{}_{pU}}{E^A{}_U - tE^A} - \frac{(1-\lambda)E^N{}_{pU}}{E^N{}_U}\right)dT - \left[\left(\frac{E^A{}_{pU}}{E^A{}_U - tE^A{}_{pU}} - \frac{E^N{}_{pU}}{E^N{}_U}\right)t\lambda_t + E^A{}_{pp}\left(1 + \frac{tE^A{}_{pU}}{E^A{}_U - tE^A{}_{pU}}\right)\right]dt$$

where

$$Z = E^D{}_{PP} + E^D{}_{pU^D} + E^A{}_{PP} - k^D m^D - \frac{k^A}{1 - tk^A}(m^A - tE^A{}_{pp}) - k^N m^N \quad (12)$$

Let $E^i{}_{pU}/E^i{}_U = k^i$. Then pk^i becomes the marginal propensity to consume non-numeraire good. Note that $1-tk^i$ is usual tariff multiplier. Rewriting (12),

$$Zdp = AdT + Bdt \tag{13}$$

where

$$A = k^D - \frac{\lambda k^A}{1 - tk^A} - (1 - \lambda)k^N$$

$$B = -(\frac{k^A}{1-tk^A} - k^N)\, T\lambda_t - E^A{}_{PP}(1 + \frac{tk^A}{1 - tk^A})$$

Taking advantage of (13), we may rewrite donor's welfare change equation (6) as follow.

$$E^D{}_{U^D} dU^D = -\frac{Z + m^D \cdot A}{Z} dT - m^D B \cdot dT \tag{14}$$

Identification of signs of A, B in expression (14) enables us to find out welfare changes of donor economy due to changes in aid and tariff, noting that m^D and Z have negative signs.

First, the welfare effects of aid by APEC donor D is subject to its regional trade structure. The direction of D's welfare changes due to change in T depends upon marginal propensities to consume non-numeraire goods of D, A and N. The sign of the coefficient of dT is determined by the sign of A, which is the difference between domestic (Donor) and the rest of world(APEC and Non-APEC recipients) marginal propensity to consume weighted by shares of aid. Positive A is a necessary and sufficient condition for dT to have a negative coefficient. A positive sign of A means donor's marginal propensity to consume non-numeraire good is bigger than weighted average marginal propensity to consume of the rest of world. If that is the case, increase of aid always reduces donor's welfare. If A is negative,

donor's welfare change is indeterminate as it increases aid. I.e., if donor's marginal propensity to consume non-numeraire good is smaller than weighted average marginal propensity to consume of the recipients, donor's welfare could either increases or decreases as donor increases aid. We may interpret this relation in terms of donor economy's trade structure. If an economy's export is significantly dependent on foreign consumption, one may infer that the case reflects higher foreign marginal propensity to consume domestic products, and there is a possibility that a donor economy can improve its welfare by giving more aid. The second term of (13), B, describes the relationship between APEC recipient's trade policy and donor's welfare. Note that several factors like EApp, and recipient's marginal propensities determine the sign of the second term. The sign of E^{A}_{pp} is negative because E^{A}_{p} is economy A's import. λt is partial derivative of A's share of aid with respect to A's tariff. If the donor economy ties aid to recipients tariff reduction, its sign would be in the negative. Therefore, in order to determine the sign of the second term, one has to determine the sign of the difference between A's tariff multiplied marginal propensity to consume and N's marginal propensity. As the second term of B is always positive, bigger marginal propensity of A than that of N is a necessary condition for donor's welfare to improve as A's tariff is reduced. This implies that an APEC donor economy has an incentive to seek tariff reduction of A particularly when it is dependent on APEC importers more than non-member importers.

Second, D's trade structure also determines the relationship between aid and tariff. Suppose the donor economy maximizes its own welfare. As it is equivalent to maximizing p, so let's set $dp = 0$. From (13), we obtain the following relationship between dt and dT when the donor maximizes its own welfare.

$$dt = -(A/B)dT \tag{15}$$

From (15), we can consider the effects of change in aid on A's tariff. If A/B is positive, we arrive at the desired relationship; an increase in aid would lead to reduction of tariff. However, it requires more complicated conditions because one has to consider both signs of A and B. There are a couple of conditions for an increase in aid to lead to tariff reduction. Suppose that donor's marginal propensity to consume its product is bigger than that of the weighted average of recipients' marginal propensities(that is, a positive sign of A). Then we need a positive sign of B for a decrease in tariff due to more aid. A sufficient condition for B to take a positive sign is that the tariff multiplied marginal propensity of economy A is bigger than that of economy N. It is possible that A's tariff reduction can be induced by higher flow of aid to A only if donor D is relatively more trade interdependent with recipient A than N, when the donor economy's domestic consumption of its non-numeraire good is relatively bigger than that of exports. On the contrary, if donor's marginal propensity to consume its product is smaller than that of the weighted average of recipients' marginal propensities, we need a negative sign of B for an aid increase to induce tariff reduction. A necessary conditions for B to take a negative sign is that the tariff multiplied marginal propensity of A is smaller than that of economy N.

Third, assuming that a given amount of aid T is distributed between A and N with shares of λ and $(1-\lambda)$, we can see that change in tariff of A has effects of shares of aid. Suppose that the amount of aid T is fixed, $dT=0$. From (12), we obtain,

$$\lambda_t = \frac{E^A{}_{PP}}{T} \cdot \frac{(1 + \frac{tk^A}{1 - tk^A})}{\frac{tk^A}{1 - tk^A} - k^N} \tag{16}$$

If the donor economy fixes the amount of aid, T, partial derivative λ_t takes a negative sign only when APEC recipient A's marginal propensity to consume is bigger than non-APEC recipient N's marginal propensity. Therefore, reduction of A's tariff would lead to increase in aid to A when the donor's export is more dependent on A than on N.

2. The link between aid and trade: an empirical observation

The discussion of the previous subsections can be summarized as follows. If donor's marginal propensity to consume its non-numeraire good is bigger than weighted average marginal propensity to consume of the rest of world, more aid always reduces donor's welfare. On the other hand, it is possible for the donor's welfare to improve as it increases aid, when donor's marginal propensity to consume non-numeraire good is smaller than weighted average marginal propensity to consume of the recipients. We may interpret this relation in terms of donor economy's trade structure. If a donor is not a significant export-oriented economy, it can not improve its welfare by giving more aid. On the contrary, however, recipients' consumption of donor's product (namely, Donor's export) is relatively important, a donor that maximizes its own utility could improve its welfare by increasing aid.

This observation leads us to look into statistical linkage between

trade dependence and aid, under the assumption that donors maximize their own utility w.r.t aid. Also, if APEC recipient's marginal propensity to consume is bigger than that of non-APEC recipients, donor's welfare always improves with the reduction of APEC's recipient's tariff. Having established such a theoretical link between trade structure and aid, we may investigate whether there is such link, in practice. An empirical investigation has significant meaning in the context of our discussion on maintaining and enhancing the momentum of economic cooperation of APEC, particularly vis-a-vis regional trade and investment liberalization. If there is any link between aid and trade, it may support the idea that APEC regional aid providers should redirect their aid policies like ODA. As further liberalization will lead to higher economic interdependence, so redirecting their ODA policies toward APEC economies improve not only recipient's welfare but also donor's.

We conduct an empirical investigation on the relationship between ODA and various economic variables. The target economies are 5 major OECD ODA donor economies; the U.S., Japan, France, Germany and the U.K. Each economy provides ODA to more than 100 economies. However in our investigation, we included those recipient economies of which average export shares exceed .1% of each donor's total export between 1985-1995, which is authors' arbitrary threshold for meaningful export market. The numbers of qualified recipients ranges from 31 (Japan) to 44(U.K.). Let's consider the following model.

$$ODA = \alpha + \beta_1 Cap + \beta_2 \exp ort + \beta_3 tariff + \beta_4 APEC + \varepsilon \qquad (17)$$

where, Cap and export refers to per capita income and export shares respectively. Tariff is sum of simple average tariff level and ratio of

non-tariff measures in total HS line of each recipient economy.[3] APEC is a dummy variable for recipient economies that are APEC members.

Table Ⅲ-2 through Table Ⅲ-6 shows regression results for each economy. Column 2,3,4 in each table contains results from 3 different estimations using different forms of independent variables, ODA, Cap and export. In the first model(column 2), natural log of absolute value of ODA is regressed on export share and natural log of per capita income. In the second model, changes in ODA share is regressed on changes in export share and changes in per capita income. In the

Table Ⅲ-2. U.S.

Dependent/ independent	Ln(ODA share)	Changes in ODA	ODA share
Constant	10.27(1.335)	-35.119(-0.391)	-0.340(-0.385)
Export share	0.009(0.052)		
Changes in export share		164.175(0.445)	-5.322(-1.911)*
Ln(per capita income)	-0.613(0.551)		
Changes in per capita income		-0.0006(-0.006)	
Per capita income			0.0004(1.721)*
Tariff	-0.012(-0.428)	-3.598(-1.430)	0.032(1.616)
APEC Dummy	-0.105(-0.167)	-29.262(-0.263)	1.910(1.511)
d.f	31	32	32
R2	0.053	0.069	0.350
F-statistic	0.283	0.486	3.642**

Note: * means statistical significance at 90% level.
** means statistical significance at 95% level.
*** means statistical significance at 99% level.

3) The tariff data is compiled from the UNCTAD database on non-tariff measures(TRAINS).

Table Ⅲ-3. Japan

Dependent/ independent	ODA1	ODA2	ODA3
Constant	1.3.662(7.923)***	1.785(0.173)	0.790(0.516)
Export share	0.054(0.395)		
Changes in export share		-22.299(-2.813)***	-0.345(0.366)
Ln(per capita income)	-1.117(-5.165)***		
Changes in per capita income		0.009(1.615)	
Per capita income			-0.0001(-2.444)**
Tariff	-0.005(-0.592)	0.696(2.870)***	0.030(1.737)
APEC Dummy	1.128(2.537)**	27.799(1.522)	2.284(2.176)**
d.f	23	22	23
R2	0.686	0.486	0.561
F	8.226	3.319	4.793

third, we used ODA shares, per capita income and changes in export shares. The obvious reason why we run above three different models is that we don't know how we can appropriately reflect underlying economic objectives in terms of either per capita income or exports.

Table Ⅲ-2 and Table Ⅲ-3 reports regression results for the U.S and Japan whose ODA/GNP ratios are relatively lower than other major donor economies. However, regression results of these two economies are quite different from each other. Table Ⅲ-2 shows results from cross section estimation for 41 economies in the U.S. case. Independent variables seem to have statistical significance only in the model 3. There does not seem to exist any significant relations between ODA level and independent variables adopted in the other two regressions. From model 3, we can see that export share and the level of per capita income are statistically significant at 90% level of confidence. However, the signs of those two variables are against our

presumption on the motivation behind giving aid. That is, ODA shares going to each recipient economy are negatively related to export shares while higher ODA shares are associated with higher per capita income economies.

Table Ⅲ-3 reports results from cross section estimations for 32 economies in the case of Japan. Overall, they seem to perform better than the case of the U.S. In every equation, most independent variables are statistically significant either at 95% or 99% level of confidence, though the first two models explains Japanese ODA policy better than the model 3. However, like in the case of the U.S., ODA shares are negatively related to exports: both the coefficients of level and change of export shares have negative signs. Particularly, increase in export shares had significant negative effects on ODA share changes. Japanese ODA to a recipient economy decreases as Japanese export share to her increases. On the contrary, per capita income show strong negative relationships with ODA, which makes a good sense in view of the basic purpose of international aid.[4] There are a couple of interesting points in the Japanese case: tariff and APEC dummy variables seem to have relatively strong explanatory power. The coefficients of tariff are significantly positive in a relative sense. Also, the coefficients of APEC dummy shows that the Japanese ODA policy is mainly directed to developing economies in APEC regions.

From the estimation results from economies of lower export exposures, we may arrive at the conclusion suggested by our theoretical model. Their ODA policies are negatively influenced by exports. According to our previous discussion on the link between aid

4) According to a recent publication on ODA policy by Japanese government, the share of untied aid of Japan is the highest in the world.

policy and trade structures, a donor economy maximizing its own welfare is better off by giving less aid when she is less dependent on foreign consumption of its own product. Therefore, the empirical results vis-à-vis ODA and exports seem to support the theoretical link between them. It is apparent that there is some contrast between the U.S and Japanese ODA policies. Given the principle purpose of foreign aid, the U.S. ODA policy does not appear to be consistent with it because it is found that the U.S is giving more aid to economies with higher per capita income. Also, the U.S. does not give any favor to the APEC recipient economies. In contrast, Japanese ODA policy is clearly favorable not only to recipients with lower per capita income but also to the APEC recipients.

Table Ⅲ-4 through Table Ⅲ-6 contains regression results for the other three major donor economies who are more export oriented than the previous two economies. There is a couple of points worth to note

Table Ⅲ-4. France

Dependent/ independent	ODA1	ODA2	ODA3
Constant	10.374(5.700)***	31.975(1.645)	0.017(2.061)**
Export share	0.714(1.109)		
Changes in export share		-39.596(-1.186)	-0.011(-1.606)
Ln(per capita income)	-0.724(-3.499)***		
Changes in per capita income		0.002(0.542)	
Per capita income			-0.0005(-0.925)
Tariff	0.002(0.076)	-0.037(-0.052)	-0.0009(-0.432)
APEC Dummy	-1.203(-2.617)**	-20.729(-1.272)	-0.0072(-1.726)*
d.f	34	33	34
R2	0.488	0.180	0.309
F-statistic	5.256***	1.104	2.460*

for this group. First, in all cases, model 1 explains ODA policies of these economies best. In this model using level data, all variables except tariff have statistically significant coefficients. Second, in most cases, independent variables have signs in common, implying that their ODA policies have similarities in nature.

Table Ⅲ-4 shows results from cross section estimation for 34 economies in the French case. Overall, there does not exist significant relations between ODA level and export, while per capita income and APEC dummy variables have statistical significance at 99% and 95% level of confidence, respectively. French ODA policy is clearly directed to lower income economies. Notably, French ODA is significantly directed away from APEC economies. Presumably, France is more concerned about non-economic objectives.

The regression results in Table Ⅲ-5 and 6 tell us that the U.K and Germany have a unique aspect in common; unlike the regression results from the previous economies, ODA shares are positively related with exports. Results from German case show that, like in the case of France, model 1 performs better than others. In the first model, all the independent variables except tariff are statistically significant either at 90% or 95% of confidence level. First of all, ODA level is positively related with export shares; Germany is giving more aid to recipient economies, which are bigger export market to her. However, per capita income has very significant negative coefficient, while APEC dummy takes a negative sign. Germany's ODA is directed toward non-APEC poor economies. Again tariff is insignificant. Results from the U.K case is very similar except that the APEC dummy is insignificant. Therefore we may arrive at .the following conclusion that economies with relatively high export exposures provide recipient economies of higher export shares with more ODA

Table Ⅲ-5. Germany

Dependent/ independent	ODA1	ODA2	ODA3
Constant	11.787(4.607)***	-8.843(-0.234)	1.998(1.969)*
Export share	1.150(2.647)**		
Changes in export share		-35.661(-0.539)	0.348(0.240)
Ln(per capita income)	-0.799(-2.524)**		
Changes in per capita income		0.001(0.566)	
Per capita income			0.0005(-1.424)
Tariff	-0.020(-1.618)	1.119(1.409)	-0.004(-0.239)
APEC Dummy	-0.831(-2.085)*	3.259(0.149)	-1.020(-2.017)*
d.f	23	23	23
R2	0.496	0.133	0.179
F-statistic	3.694**	0.575	0.816

Table Ⅲ-6. The U.K.

Dependent/ independent	ODA1	ODA2	ODA3
Constant	21.481(5.189)***	-4.188(-1.121)	-1.414(-1.403)
Export 1	1.790(2.624)**		
Export 2		-16.600(-0.700)	2.566(1.287)
Per Capita 1	-2.402(-5.060)***		-0.00006(-0.113)
Per Capita 2		0.0004(0.192)	
Per Capita 3			
Tariff	-0.047(-1.379)	-0.079(-0.545)	0.115(2.414)**
APEC Dummy	0.705(1.032)	9.551(1.740)	-0.360(0.460)
d.f	35	35	35
R2	0.774	0.142	0.564***
F-statistic	13.701***	0.663***	5.195***

From the empirical results disussed above, we may summarize stylized facts of ODA policies of major donor economies. First, donors

with high export/GNP ratios(the U.S and Japan) provides less ODA to recipients that takes smaller export shares. Second, except the U.S, all donors provide more ODAs to recipients with lower per capita income. Third, Japanese ODA policy is directed toward APEC while France and German are against it. The U.S and U.K have no particular favor or disfavor on the APEC. In all cases, tariff does not play any significant role in formulating ODA policies.

In conclusion, it is fair to say that there exists a link between aid and trade structures. Therefore, we may obtain the following policy implication on the APEC considering increasing trade interdependence among its member economies. The U.S and Japan, two major players of the APEC, show very contrasting ODA policies toward the APEC. While the U.S. is one of the most aggressive economy w.r.t regional trade and investment liberalization, its ODA policy is not very active toward the region. On the other hand, Japanese contribution is significant though it is generally regarded as relatively conservative regarding regional liberalization. If the balanced development of Ecotech and TILF is desirable for the APEC, it is desired for the U. S. to redirect their ODA policies toward the APEC developing economies.

Ⅳ. Summary and conclusions

TILF and Ecotech have been pursued in an unbalanced way during the APEC's development. In order to maintain the momentum of the APEC cooperation which has accelerated recently, it is important to strengthen Ecotech activities. While developed economies emphasize the role of the private sector in promoting Ecotech, developing economies argue that the government should also play at least a complementary role. As the biggest obstacle to Ecotech activities is the financial limitation, redirection of ODA policies of APEC developed economies may solve financial problems.

In this paper, we have discussed the possibility of the existence of link between international trade and aid. Theoretically, the welfare of a donor economy can be improved by giving more aid depending on the its trade structures. If a donor is highly export dependent, it can be better off by providing more ODA. Particularly, a recipient economy's tariff can be reduced by more aid when the donor is relatively more dependent on the recipient country than other economies. From empirical observations, we found that donors with high export/GNP ratios provide less ODA to recipients that take smaller export shares. Therefore, as further liberalization of TILF programs will bring about higher trade interdependence, more aid from APEC developed economies could not only improve its own welfare but also promote APEC liberalization process. An obvious implication is that strengthening of Ecotech through more ODA toward the APEC and acceleration of TILF are mutually re-enforcing.

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국문요약

무역과 투자자유화 및 원활화(TILF)와 경제 및 기술협력(Ecotech)은 APEC의 양대 과제임에도 불구하고 APEC의 발전과정을 살펴볼 때 경제 및 기술협력(Ecotech)사업에 대한 APEC의 노력은 매우 미약했던 것으로 평가된다. APEC 역내 선진국들은 경제 및 기술협력 사업추진에 있어서 민간부문의 역할의 중요성을 강조하는 반면 개도국들은 정부부문의 적극적 역할의 필요성을 주장하고 있다. 경제 및 기술협력 사업추진에 있어서 가장 중요한 문제중의 하나는 재원확보인데 이를 위해 APEC 역내 선진국들이 제공하고 있는 공적개발원조(ODA)를 활용하는 방안을 고려해 볼 수 있다.

본 논문은 국제무역량과 원조의 규모사이의 관계를 규명하고 있다. 국민총생산 대비 수출량의 비율이 높은 공여국의 원조공여액은 수혜국의 국민총생산 대비 수출비율이 낮을수록 적은 규모로 나타나고 있다. 공여국들은 대체로 일인당 국민소득이 상대적으로 낮은 수혜국에 더 많은 규모의 공적개발원조를 제공하고 있으나 일본은 APEC 회원국들에게 더 큰 규모의 ODA를 제공하고 있는 한편 프랑스와 독일은 APEC 비회원국들에게 더 제공하고 있다. 한편 미국과 영국은 APEC 회원국/비회원국 여부에 별 영향을 받지 않고 있다. ODA 자금을 경제기술협력사업의 강화에 활용하는 한편 ODA 공여수준을 자유화 수준에 연계시킴으로써 APEC의 무역 및 투자자유화는 더욱 촉진될 수 있을 것이다.

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