

# Korea's Tied Aid for Export and Competition with China

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This paper investigates the new link between the export-creating effects of Korea's tied aid and the export-diverting effects coming from China's export expansion, which have been rarely explored by the existing studies. A panel data consisting of 98-104 aid recipients of Korea through the period of 1995-2009 shows that the net export-creating effects are weaker at the export destinations where the export competition between Korea and China is fierce, while they are stronger at the export markets where it is not so severe. These findings applies to consumption goods rather than capital and intermediate goods.

Keywords: Net Export-Creating Effects, Korea's Tied Aid, China's Export-Diverting Effects, Export Competition, Consumption Goods

JEL Classification: F19, F35, O53

## I. Introduction

Korea has been a leading country regarding tied aid. According to the statistics from the Development Assistance Committee (DAC) of the OECD, it has held the highest status in terms of the share of its tied bilateral commitments in total bilateral commitments among all member countries of the OECD-DAC for many years.<sup>1</sup> As shown by Kemp and Kojima (1985), tied aid can trigger the welfare paradox of an income transfer. In other words, a recipient faces a welfare immiserizing transfer while a donor goes through a welfare enriching. Furthermore, Kemp and Wong (1993) specified that tied aid might seriously raise recipient's import costs although it can relax its budget constraints and increase its import demand. This occurs as it induces a number of distortions in the recipient and in the donor that deteriorate the recipient's terms of trade.

<sup>1</sup> Korea kept a high level of tied aid with the share of 81.68% on average between 1995 and 2009.

These distortive effects might eventually tighten its budget constraints. For such reasons, Korea, heavily dependent on tied aid, is criticized by other countries including its export competitors and international organizations. In fact, Korea has been receiving a considerable amount of pressure from foreign countries since it became a member of the OECD-DAC in 2009. Thus, it is inevitable for Korea to reduce the share of tied aid in its total aid steadily to keep step with other OECD-DAC members. As for the way to increase the amount of untied aid, this study intends to offer the direction.

The positive impacts of Korea's aid on its exports to its recipients can be offset by China's market-stealing effects. Lall et al. (2005) contended that with a similar export structure to China, the likelihood of damaging trade diversion effects in a common export destination is strengthened. In addition, Greenaway et al. (2008) demonstrated that high income Asian exporters experience a greater displacement effect from export competition with China. Therefore, Korea might be affected by China's export-diverting effects at the export markets where the export competition between them is fierce. Consequently, it is expected that the export-creating effects of Korea's aid are offset by the export-diverting effects deriving from China's export expansion, depending on the level of the export competition between Korea and China in the export destinations. This idea suggests that it is desirable to consider Korea's aid recipient markets, in which the offset-level is low, as the places where the share of its tied aid should be preferentially brought down because its net gains from the tied aid are large in these destinations. This study attempts to link the export-creating effect of Korea's tied aid and the export-diverting effect caused by competitive Chinese exportable to derive some implications regarding Korea's aid allocation policy on this wise.

However, to the best of my knowledge, the existing literatures did not deal with the link between them. Thus, this paper intends to investigate the net export-creating effects between the positive impacts of Korea's aid on its exports to its recipients and the China's market-stealing effects.

The structure of this paper is as follows: It scrutinizes its conceptual aspects in section II; in section III, empirical evidences are provided regarding the net export-creating effects; and finally in section IV, it offers a brief conclusion.

## II. Aid, Trade, and China's Market-stealing Effects

There are a number of existing studies on the relationship between aid and

trade. They mainly deal with the effects of aid on trade and vice versa. Concerning the former case<sup>2</sup>, Nilsson (1997) analyzed the effects of aid on exports for European Union donors to 108 recipients. He used the gravity model for the period 1975-92 and found an elasticity of exports with respect to aid of 0.23 that translates into a \$2.6 increase of exports for each dollar of aid given. Wagner (2003) also investigated the effects of aid on trade regarding 20 donors to 109 recipients for the years 1970-1990. He found that they are positive through direct and indirect links between aid and trade. In addition, he concluded that the effects of past aid on trade are positive. Recently, Pettersson and Johansson (2009) demonstrated that the effects of aid on donors' exports are positive through the data on all 184 countries during the period of 1990-2005. They showed that aid is positively associated with recipients' exports as well as with donors' by using a gravity model. Concerning the Korean case, Lee and Park (2007) revealed that provision of aid facilitates Korea's exports to aid recipient countries except for the period of 2000-2003, based on its 163 aid recipient markets for the period of 1991-2003. According to McGillivray and Morrissey (1998), Nelson and Silva (2008), and Martinez-Zaroso et al. (2009), most channels for the export-creating effects of aid are aid tying made by a donor and a recipient's intentions to maintain good will with the donor. With respect to the aid tying, aid is provided in the form of goods and services procured in the donor as the provision of aid is dependent upon the recipient purchasing goods from the donor. Thus, it seems likely that the aid itself is donor exports. When it comes to the latter channel, a recipient may be obligated to buy goods and services from a donor to secure the continuity of an aid flow. In other words, the recipient buys them from the donor as long as the donor continues to give aid.

Regarding the latter case, that is, aid caused by trade, McGillivray and Morrissey (1998) explained that trade can lead to further aid if donors give preference in the allocation of their aid to countries with which they have the greatest commercial links. Their idea was based on the argument that the donor rewards the LDC for purchasing its exports. The studies done by Lloyd et al. (2000) and Osei et al. (2004) are consistent with the explanation relating to the effects of trade on aid as well.

Korea has focused on tied aid to a great extent. According to the data from

<sup>2</sup> There is also about the possibility of no relationship between them or a negative relationship in accordance with Osei et al. (2004). However, this paper focuses on the possibility of aid positively causing trade like most of other studies.

the OECD-DAC, its tied bilateral commitments in total bilateral commitments occupied 98.92% in 1995 while those of total DAC countries reached 26.98%. The shares of Korea and total DAC countries decreased to 80.81% and 9.17% in 2004, respectively, and were changed to 51.61% and 15.36% in 2009. Overall, Korea maintained a high level of tied aid with the share of 81.68% on average between 1995 and 2009 whereas total DAC countries kept a low level of tied aid with the share of 13.52% on average during the same period. Accordingly, this paper concentrates on the concept of tied aid. Tied aid can trigger the welfare paradox of an income transfer. Kemp and Kojima (1985) and Schweinberger (1990) showed that the welfare paradox of an income transfer is illustrated in a two-country model where economic aid regarding private traded consumption goods is wholly or partially tied in the two countries. In addition, Kemp (2005) extended the existing theory with respect to tied aid by accommodating non-tradable public consumption goods. Those studies indicate that the theory of tied aid operates in consumption goods. Since tied aid causes the welfare paradox of an income transfer, Korea, heavily relies on tied aid, cannot avoid sharp criticism from other countries. However, the export-creating effects of Korea's aid can be offset by China's market-stealing effects. In order to explain such argument, the concept of China's market-stealing effects needs to be looked into with existing studies.

There has been a growing concern that an overwhelming expansion of China's exports could have negative effects on those of other countries. Lall and Albaladejo (2004) found that China's displacement effects on Asian countries are strong mainly in low technology products. Ianchovichina and Walmsley (2005) stated that the NIEs may face heightened competition in global markets as China's comparative advantage shifts into high-end products. Furthermore, Lall et al. (2005) contended that export-diverting effects coming from China's export expansion are likely to be strengthened as the export structure of a country is more similar to that of China. Additionally, Greenaway et al. (2008) showed that China's market-stealing effects are strong for high-income Asian exporters.

Korea is also expected to be affected by China's export-diverting effects because the export structures of Korea and China are becoming similar to each other over time as shown by Nam et al. (2004) and Yoon and Yeo (2007). As empirical evidence, Kim and La (2012) presented that the relationship between the change of Korea's export share and the level of export similarity between Korea and China are negative for labor intensive and low skill manufactures, based on the data on 50 export markets for the period of 2000

and 2005. Furthermore, a characteristic of consumers in aid recipient countries can be a factor to provide the environment under which China's export expansion negatively affects Korea's export performance in the markets. Consumers of aid recipients seem to prefer lower-priced products to higher-priced goods, given their low income levels. According to Lambert (1972), consumers who selected the low-priced items have relatively low ability to judge product quality. Thus, the consumers of the recipients are supposed to prefer Chinese exportable products with lower price to Korean ones of higher quality.<sup>3</sup>

Therefore, it seems likely that China's market-stealing effects on Korea's exports to the recipients are significant. Especially, they are expected to be strong for consumption goods among three classifications<sup>4</sup> as consumers mainly deal with them. Eichengreen et al. (2007) also offer similar findings. They showed that China's market-stealing effects on Asian countries' exports in third markets are significant only for consumption goods, by using the data on bilateral trade flows between Asian countries and their trading partners during the period of 1990-2002.

Based on the concepts of tied aid and China's market-stealing effects, this paper can logically draw the prediction that the effects of Korea's aid on its exports to its recipients would be offset by the export-diverting effects coming from China's export expansion, and the offset level would be dependent on the level of export competition between Korea and China in the recipients. It assumes that demand in each aid recipient  $i$  is generated by a representative consumer with the weakly separable utility function as that of Dixit and Stiglitz (1977):

$$u^i = U\{x_0, V(x_1, \dots, x_n)\} \quad (1)$$

where  $x_0$  is a numeraire good produced in one sector, while  $x_1, \dots, x_n$  are differentiated goods produced in another sector.  $s_k^i$  denotes the share of

<sup>3</sup> According to the studies by Flam and Helpman (1987), Schott (2004), and Hallak (2006) who investigated the relationship between export quality and income, a country with higher income exports higher quality products. Thus, it is logical that Korea's export quality is better than that of China.

<sup>4</sup> Eichengreen et al. (2007) divided all goods into three categories such as capital goods, consumption goods, and intermediate goods.

expenditure on Korean exportable goods in differentiated good sector. Then expenditure on  $x_k$  is

$$p_k x_k = s_k^i E_i \quad (2)$$

where  $p_k$  is a price of Korean exportable, and  $E_i$  is expenditure of recipient  $i$ . For simplicity, this study assumes that the varieties of Korean exportable goods are symmetric, share the same quality, and sell at the same price.<sup>5</sup> Thus, this paper can derive the following Equation (3) through multiplying Equation (2) by the number of the varieties  $N_k$ .

$$M_k^i = N_k s_k^i E_i \quad (3)$$

where  $M_k^i$  is country  $i$ 's total imports from Korea.

It is expected that the price of Korean exportable in its aid recipient markets  $P_k$  is higher than that of China in the same markets  $P_c$  as China's labors are significantly cheaper. Table 1 helps to confirm such prediction by showing Korea's and China's average export unit values in the aid recipient markets for 2002 and 2009 periods by sector.<sup>6</sup> Such unit values as proxies for their prices are calculated by dividing the export value by the quantity based on HS 96 version 6-digit codes, the most disaggregated level in terms of international trade data. The products which have different units from kilogram are eliminated and the unit values which are below or equal to the 1<sup>st</sup> percentile and equal to or above the 99<sup>th</sup> percentile are also removed in order to minimize the different unit effects and measurement errors, according to the study by Minondo (2010). In addition, current export values are transformed into constants by employing

<sup>5</sup> Hallak (2006) also made similar assumption for the same reason.

<sup>6</sup> The three sectors are sorted in HS 96 version in accordance with the classification of Eichengreen et al. (2007) based on SITC revision 2 as follows: capital goods fall into the category consisting of 84, 85(-), 86, 87(-), 88, and 89 codes; consumption goods are defined as including 01-24, 30, 61-66, 8527-8528, 8703, 8711-8713, 90-92, and 94-97 codes; intermediate goods are composed of 25-29, 31-60, 67-83, 93, and 99 codes.

the US import price index. Table 1 reveals that Korea's average export unit value in its aid recipient markets is higher than that of China across all sectors.

Table 1. Korea's and China's average export unit values in Korea's aid recipient markets by sector

	Capital goods	Consumption goods	Intermediate goods
2002 KEUV	14.38	13.56	8.01
2002 CEUV	7.78	9.13	4.12
2009 KEUV	22.81	18.85	8.88
2009 CEUV	12.17	13.68	5.27
Ave_KEUV	18.59	16.21	8.44
Ave_CEUV	9.98	11.41	4.69
No. of Commodities	226	337	1622

Note: KEUV (CEUV) represents Korea's (China's) average export unit value in its 103 aid recipient markets and its unit of measurement is US dollars per kilogram. In addition, Ave\_KEUV (CEUV) means the average KEUV (CEUV) between 2002 and 2009.

Source: The author's own estimates based on the UNCOMTRADE dataset.

In addition, it is presumed that consumers of aid recipients prefer lower-priced products to higher-priced goods as mentioned above. Table 2 supports this argument by presenting Korea's and China's average export shares in Korea's aid recipient markets by sector. The former is smaller than the latter for 2002 and 2009 periods across all sectors, which suggests that those consumers with

Table 2. Korea's and China's average export shares in Korea's aid recipient markets by sector

	Capital goods	Consumption goods	Intermediate goods
2002 KES	0.02	0.01	0.01
2002 CES	0.04	0.04	0.03
2009 KES	0.02	0.01	0.01
2009 CES	0.13	0.08	0.06
Ave_KES	0.02	0.01	0.01
Ave_CES	0.08	0.06	0.05
No. of Export markets	98	104	100

Note: KES (CES) represents Korea's (China's) average export share in its aid recipient markets. In addition, Ave\_KES (CES) means the average KES (CES) between 2002 and 2009.

Source: the author's own estimates based on the UNCOMTRADE dataset.

the high level of preference for lower-priced products demand Chinese exportable goods more than Korean ones due to the price gap between them as shown in Table 1.

Then it is derivable that the share of expenditure on Korean exportable goods decreases as export competition between Korea and China in recipient  $i$  increases:

$$\frac{\partial s_k^i}{\partial (EC_{kci})} < 0 \quad (4)$$

where  $EC_{kci}$  is the Export Competition between Korea and China in recipient  $i$ . Thus,  $s_k^i$  is a function of  $EC_{kci}$ . Under the assumption that the former is a linear function of the latter, the following reduced form can be derived.<sup>7</sup>

$$s_k^i = c - \alpha EC_{kci}, \quad \alpha > 0 \quad (5)$$

where  $c$  and  $\alpha$  are constants. In addition,  $E_i$  can be expressed as follows:

$$E_i = T_k^i + e_i \quad (6)$$

where  $T_k^i$  is Korea's aid to recipient  $i$  and  $e_i$  is country  $i$ 's own expenditure plus other countries' aid. Subsequently, the partial derivative of  $M_k^i$  with respect to  $T_k^i$  is

$$\frac{\partial M_k^i}{\partial T_k^i} = N_k (c - \alpha EC_{kci}) \quad (7)$$

<sup>7</sup> Although the impacts of the export competition between Korea and other countries on the share can be taken into account, this paper regards them as negligible on the basis of the dominance of China's exports in low income countries.



Since Korea's aid to recipient  $i$  is tied to a great extent and  $EC_{kci} \geq 0$ ,  $c > \alpha EC_{kci} \geq 0$ . Accordingly, the slope of  $T_k^i$  is less steep as the value of  $EC_{kci}$  increases. In other words, the export-creating effects of Korea's aid are weaker as the export competition between Korea and China in the recipients is fierce. It implies that they are offset by the export-diverting effects deriving from China's export expansion, and that the offset-level is higher at the export destinations where the export competition between Korea and China is severe, while it is lower at the export markets where it is not so strong. Furthermore, these effects are applicable only to consumption goods, given that the theory of tied aid operates only in the group commodities and China's market-clearing effects are strong for them as stated above.

### III. Empirical Analysis

This section identifies the net export-creating effects between the impacts of Korea's aid on its exports to its recipients and the China's market-stealing effects by using a panel data consisting of 98-104 recipients for Korea's aid through the period of 1995-2009.

#### *1. Econometric Method and Data Description*

The empirical model of this paper is an augmented gravity model following Wagner (2003), Martinez-Zarzoso et al. (2009), and Pettersson and Johansson (2009). The gravity model has been widely used to explain bilateral trade flows. According to Anderson (1979), Bergstrand (1985), and Anderson and van Wincoop (2003), the traditional gravity model specifies that trade between two countries is explained by nominal incomes and populations of the trading countries, by the distance between their economic centers, and by a number of trade impediment and facilitation variables. This paper augments the traditional gravity model with bilateral aid from Korea, the level of export competition between Korea and China which reflects China's market-stealing effects, and the interaction term between them. Furthermore, since the exporter is limited to Korea, the augmented gravity model regards its income and population as constants.<sup>8</sup> In addition, this study uses one period lagged aid flows

<sup>8</sup> Concerning a panel analysis, they vary over time like time effects. Thus, they can be included into the specification as variables. However, the regression results for the specification with them are the same as those for the specification which regards them as constants. The results are also

to somewhat handle potential endogeneity referring to aid being caused by exports as adopted by Pettersson and Johansson (2009). The specification of the augmented gravity model is as follows:

$$\begin{aligned} \ln KoEX_{it} = & \alpha + \beta_1 \ln GDP_{it} + \beta_2 \ln Pop_{it} + \beta_3 \ln Dis_i + \beta_4 PTA_i + \beta_5 \ln Aid_{it-1} \\ & + \beta_6 \ln ESI_{it} + \beta_7 \ln Aid_{it-1} * \ln ESI_{it} + \psi_i + \zeta_t + \varepsilon_{it} \end{aligned} \quad (8)$$

where the ‘ $\ln$ ’ term denotes a natural logarithm.  $KoEX_{it}$  is Korea’s exports to aid recipient  $i$  in period  $t$ <sup>9</sup>;  $GDP_{it}$  and  $Pop_{it}$  are a gross domestic product and population of recipient  $i$  in period  $t$ , respectively;  $Dis_i$  is a bilateral distance between Korea and recipient  $i$ ;  $PTA_i$  is a dummy variable capturing preferential trade agreements between Korea and recipient  $i$ ;  $Aid_{it-1}$  is Korea’s aid to recipient  $i$  in period  $t-1$ ;  $ESI_{it}$  is an export similarity index between Korea and China in recipient  $i$  in period  $t$  as a proxy for the level of export competition between Korea and China in the country. It is the index first used by Finger and Kreinin (1979) which measures a level of competition between country  $k$  and country  $c$  in country  $i$ , and is computed as follows:

$$ESI(kc, i) = \left\{ \sum Min[X_r(ki), X_r(ci)] \right\} \times 100 \quad (9)$$

where  $X_r(ki)$  is the share of the product  $r$  in the exports of country  $k$  to country  $i$ , and  $X_r(ci)$  is the share of the product  $r$  in the exports of country  $c$  to country  $i$ .

In Equation (8),  $Aid_{it-1} * ESI_{it}$  represents an interaction term between Korea’s aid to recipient  $i$  and export similarity index between Korea and China in the country  $i$ . It is introduced to identify that the export-creating effects of Korea’s aid are offset by the export-diverting effects arising from China’s export expansion and the offset-level is determined by the level of export competition

consistent with those of the method used by Martinez-Zarzoso et al. (2009): restricting a coefficient for exporter’s income to be equal to that of importer’s income, they used the logarithm of exporter’s income multiplied by importer’s income as a variable regarding exporter’s and importer’s incomes. The case of the population follows the same explanation.

<sup>9</sup> From a Korean point of view,  $M_k^i$  in section II is regarded as  $KoEX_i$ .

between Korea and China in the country. In other words, it is employed to test Equation (7) empirically. Similarly, Collier and Dehn (2001) also used the interaction term between donor's aid and recipient's export price shock to investigate that the adverse effects of the price shocks on its growth can be offset by increases in the aid. In addition,  $\Psi_i$  are recipient effects that are as proxies for multilateral resistance factors as stated by Anderson and Van Wincoop (2003);  $\zeta_t$  are specific time effects that control for omitted variables common to all trade flows but that vary over time;  $\varepsilon_{it}$  is a random disturbance. Concerning the trade impediment and facilitation variables, the dummy variables regarding a common border, common language, and colonial relationship between Korea and aid recipients are not relevant in Korea's case as explained by Sohn (2005). Thus, they do not appear in the specification.

This paper can adopt various econometric methods such as the OLS, Fixed Effect, Random Effect, and Hausman-Taylor analyses to estimate Equation (8). The OLS analysis can be biased due to unobserved individual factors. Thus, the Fixed and Random Effect analyses could be better methods as they can control them. However, the Fixed Effect analysis is more appropriate for estimating Equation (8) than the Random Effect method in case that unobserved individual factors are correlated with explanatory variables. Nevertheless, the Fixed Effect analysis cannot offer the estimates for time-invariant variables. Hence, the Hausman-Taylor analysis can be a good alternative. It can not only offer the estimated coefficients of the time-invariant variables but also control for potential endogeneity referring to exports causing aid flows by using appropriate instruments.<sup>10</sup> Validity for the instruments can be ensured through the Hausman test of over-identification. Thus, the null hypothesis of the Hausman test based on the differences between the Fixed Effect and Hausman-Taylor estimations should not be rejected.

The employed data in this paper cover the years 1995-2009 and include 98-104 recipients of Korea's aid for which there are data available.<sup>11</sup> Table 3 shows the list of recipient countries for Korea's aid.

<sup>10</sup> This paper selects the  $\ln Aid$  and the interaction term between the  $\ln Aid$  and the  $\ln ESI$  as the time-varying endogenous variables in the Hausman-Taylor analysis since the  $\ln Aid$  can cause endogeneity problem as Martinez-Zarzoso et al. (2009) and Pettersson and Johansson (2009) stated.

<sup>11</sup> The reason why this study selects the period is that it would like to use sufficient trade data which UNCOMTRADE dataset offers. Year 1995 is the time when world trade started to increase significantly due to the effectuation of WTO agreement and Year 2009 is the completed and latest one obtained from UNCOMTRADE dataset.

Table 3. List of recipient countries for Korea's aid employed for regression analysis

Algeria	Ecuador	Malawi	Saudi Arabia
Angola	Egypt	Malaysia	Senegal
Antigua and Barbuda	El Salvador	Maldives	Seychelles
Argentina	Eritrea	Mali	Sierra Leone
Armenia	Ethiopia	Marshall Isds	Solomon Isds
Azerbaijan	Fiji	Mauritania	Sri Lanka
Bahrain	Gabon	Mauritius	Sudan
Bangladesh	Gambia	Mexico	Syria
Barbados	Ghana	Mongolia	Tajikistan
Belize	Grenada	Morocco	Thailand
Benin	Guatemala	Mozambique	Togo
Bolivia	Guyana	Nepal	Tonga
Brazil	Haiti	Nicaragua	Trinidad and Tobago
Burkina Faso	Honduras	Nigeria	Tunisia
Burundi	India	Oman	Turkey
Cote d'Ivoire	Indonesia	Pakistan	Turkmenistan
Cameroon	Iran	Palau	Uganda
Chad	Jamaica	Panama	Tanzania
Chile	Jordan	Papua New Guinea	Uruguay
Colombia	Kazakhstan	Paraguay	Uzbekistan
Congo	Kenya	Peru	Vanuatu
Costa Rica	Kiribati	Philippines	Venezuela
Croatia	Kyrgyzstan	Moldova	Viet Nam
Djibouti	Lebanon	Rwanda	Yemen
Dominica	Libya	Saint Lucia	Zambia
Dominican Rep.	Madagascar	S. V. and Grenadines	Zimbabwe

Export data come from the United Nations Commodity Trade Statistics Database (UNCOMTRADE). The 3-digit codes of SITC revision 2 are employed for the variable  $ESI_{it}$ . The data on aid are obtained from the database of the OECD-DAC. As Martinez-Zarzoso et al. (2009) used, this paper selects gross ODA disbursements in current US dollars instead of aid commitments since it focuses on the funds actually released to recipients. GDP and Population data are provided by the World Development Indicator. The data on the distance

come from the gravity dataset of CEPII which is a French research center. The distance is calculated by using latitudes and longitudes of the most important cities or agglomerations in terms of population. For the sector estimations, this paper divides all commodities into three sectors such as capital goods, consumption goods, and intermediate goods. The commodity group for each sector follows the classification of Eichengreen et al. (2007). This classification distinguishes the three sectors on the basis of SITC revision 2. Capital goods include machinery and transport equipment (7 code). Consumption goods cover food (0 code), beverages and tobacco (1 code), miscellaneous manufactured articles (8 code), television and radio receivers (761-763 codes), passenger motor vehicles and cycles (781 and 785 codes), and medicinal and pharmaceutical

Table 4. Statistical summary of variables

Classification	Variable	No. of Ob.	Mean	Std. Dev.	Min	Max
Capital goods	$\ln\text{KoEX}_{it}$	1470	16.381	2.771	3.970	22.991
	$\ln\text{GDP}_{it}$	1470	22.976	2.022	17.869	28.133
	$\ln\text{Pop}_{it}$	1470	15.789	1.993	9.754	20.868
	$\ln\text{Dis}_i$	1470	9.128	0.478	7.602	9.885
	$\ln\text{Aid}_{it-1}$	1372	11.192	4.121	0	17.886
	$\ln\text{ESI}_{it}$	1470	3.296	0.909	0	4.615
	$\ln\text{Aid}_{it-1}*\ln\text{ESI}_{it}$	1372	38.164	18.056	0	74.277
Consumption goods	$\ln\text{KoEX}_{it}$	1560	15.829	2.439	8.136	22.133
	$\ln\text{GDP}_{it}$	1560	22.848	2.044	17.869	28.133
	$\ln\text{Pop}_{it}$	1560	15.622	2.098	9.754	20.868
	$\ln\text{Dis}_i$	1560	9.144	0.473	7.602	9.885
	$\ln\text{Aid}_{it-1}$	1456	11.020	4.202	0	17.886
	$\ln\text{ESI}_{it}$	1560	2.481	0.933	0	4.194
	$\ln\text{Aid}_{it-1}*\ln\text{ESI}_{it}$	1456	28.642	16.201	0	66.369
Intermediate goods	$\ln\text{KoEX}_{it}$	1500	16.482	2.613	1.386	22.468
	$\ln\text{GDP}_{it}$	1500	22.936	2.027	17.869	28.133
	$\ln\text{Pop}_{it}$	1500	15.752	2.019	9.754	20.868
	$\ln\text{Dis}_i$	1500	9.135	0.477	7.602	9.885
	$\ln\text{Aid}_{it-1}$	1400	11.162	4.115	0	17.886
	$\ln\text{ESI}_{it}$	1500	3.029	0.839	0	4.365
	$\ln\text{Aid}_{it-1}*\ln\text{ESI}_{it}$	1400	34.841	16.737	0	74.175

Note: KoEX, GDP, and Aid are measured in current US dollars, and Pop and Dis are measured in persons and kilometers, respectively. The value of ESI ranges from 0 to 100.

products (54 code). All the remaining goods (2-6 and 9 codes) are classified as intermediates. Table 4 presents a statistical summary for the data used in the estimations.

## 2. Empirical Results

Table 5 reports the regression results by sector according to Equation (8). For consumption goods, the estimated coefficients of the  $\ln A_{id}$  are positively significant at 1% level, while those of the interaction terms between the  $\ln A_{id}$  and the  $\ln ESI$  are negatively significant at the same level. As for a specific explanation for the interaction term without a component of the  $\ln ESI$ , the slope of the  $\ln A_{id}$  is 0.049, 0.029, 0.022, 0.017, and 0.007 at the minimum (0), 1<sup>st</sup> quartile (2.042), 2<sup>nd</sup> quartile (2.692), 3<sup>rd</sup> quartile (3.153), and 4<sup>th</sup> quartile (4.194) of the  $\ln ESI$ , respectively. Regarding that for the interaction term with the component, it is 0.063, 0.032, 0.023, 0.016, and 0.0001 at the corresponding values of the  $\ln ESI$ . These results imply that the positive slope of the  $\ln A_{id}$  is less steep as the value of the  $\ln ESI$  increases. In other words, the net export-creating effects between the positive impacts of Korea's aid on its exports to its recipients, and the China's market-stealing effects vary depending on the level of export competition between Korea and China in the recipients. Concerning capital and intermediate goods, the estimated coefficients of the two variables are either insignificant or opposite in terms of their signs. These findings are consistent with our expectation established in section II: the net export-creating effects are weaker at the export destinations where the export competition between Korea and China is tough and takes place only for consumption goods. The coefficient signs and statistical significance regarding income<sup>12</sup>, population, distance, and preferential trade agreement variables are, by and large, consistent with previous studies. In particular, Egger and Pfaffermayr (2003), Martinez-Zarzoso and Nowak-Lehmann (2003), Brun et al. (2005), and Pettersson and Johansson (2009) support the negative coefficient for the population variable. In addition, the null hypothesis for the over-identification test of the Hausman-Taylor analysis is not rejected for all the specifications. Thus, the instrument variables for the Hausman-Taylor estimations are valid.

<sup>12</sup> There are no significant changes in the regression results for all the specifications in case that nominal GDP in PPP instead of nominal GDP is used as the income variable.

Table 5. Regression results

Hausman-Taylor Estimation (DV: $\ln\text{KoEX}_{it}$ )						
	Capital goods		Consumption goods		Intermediate goods	
$\ln\text{GDP}_{it}$	1.431*** (13.40)	1.426*** (13.29)	1.171*** (18.63)	1.167*** (18.53)	0.947*** (12.64)	0.924*** (12.10)
$\ln\text{Pop}_{it}$	-0.548*** (-3.39)	-0.552*** (-3.31)	-0.217*** (-3.26)	-0.216*** (-3.25)	-0.0003 (-0.00)	0.014 (0.17)
$\ln\text{Dist}_{it}$	-1.081* (-1.76)	-1.054* (-1.65)	-0.684*** (-3.30)	-0.683*** (-3.29)	-0.620** (-2.50)	-0.632** (-2.44)
PTA <sub>i</sub>	1.304 (1.03)	1.326 (1.00)	0.627 (1.44)	0.635 (1.46)	1.502*** (2.90)	1.515*** (2.81)
$\ln\text{Aid}_{it-1}$	-0.003 (-0.20)	-0.039** (-2.03)	0.049*** (5.79)	0.063*** (4.42)	-0.034*** (-2.85)	0.012 (0.61)
$\ln\text{ESI}_{it}$		-0.161*** (-2.57)		0.076 (1.22)		0.233*** (3.16)
$\ln\text{Aid}_{it-1} * \ln\text{ESI}_{it}$	0.001 (0.21)	0.013** (2.23)	-0.010*** (-3.30)	-0.015*** (-2.56)	0.016*** (4.68)	0.0001 (0.02)
No. of Observations	1372	1372	1456	1456	1400	1400
$\chi^2(19\sim 20)$	566.2***	570.2***	1326.8***	1327.0***	747.0***	738.2***
Over-identification Test: $\chi^2(16\sim 17)$	9.97	7.10	3.11	5.22	2.27	18.35

Note: \* significance at 10% level, \*\* significance at 5% level, and \*\*\* significance at 1% level. ( ) is z-value. In addition, the values for year dummy and constant do not appear in the table although they are included into the analysis.

Table 6 presents the results of robustness tests for the regression results reported in Table 5. Zero and non-reported values regarding the bilateral aid can cause bias in estimating Equation (8). Thus, this study follows the method introduced by Pettersson and Johansson (2009) to control for them, which is to set those values to one and introduce no-aid-dummy in the specification. Compared with the results of Table 5, the statistical significance of the estimated coefficients of the  $\ln\text{Aid}$  for capital and intermediate goods explicitly changed. In other words, the estimated coefficients of the  $\ln\text{Aid}$  become insignificant in Table 6, whereas they are positively significant at 1-5% level in Table 5. There, however, is little significant change for consumption goods although the

scale for the estimated coefficients of the  $\ln\text{Aid}$  improves to some extent. Thus, it can be concluded that the regression results for consumption goods are robust across different specifications.

Table 6. Robustness tests

	Hausman-Taylor Estimation (DV: $\ln\text{KoEX}_{it}$ )					
	Capital goods		Consumption goods		Intermediate goods	
$\ln\text{GDP}_{it}$	1.420*** (13.32)	1.418*** (13.22)	1.168*** (18.66)	1.162*** (18.56)	0.946*** (12.61)	0.921*** (12.03)
$\ln\text{Pop}_{it}$	-0.544*** (-3.42)	-0.548*** (-3.34)	-0.222*** (-3.37)	-0.221*** (-3.36)	-0.003 (-0.03)	0.011 (0.13)
$\ln\text{Dist}_i$	-1.040* (-1.73)	-1.026 (-1.63)	-0.657*** (-3.19)	-0.654*** (-3.18)	-0.608** (-2.44)	-0.612** (-2.35)
$\text{PTA}_i$	1.284 (1.03)	1.309 (1.01)	0.611 (1.42)	0.620 (1.44)	1.496*** (2.89)	1.509*** (2.79)
$\ln\text{Aid}_{it-1}$	0.033 (1.28)	-0.009 (-0.27)	0.077*** (3.85)	0.094*** (3.98)	-0.025 (-1.01)	0.034 (1.10)
$\text{NAid}_{it-1}$	0.422 (1.59)	0.321 (1.20)	0.324 (1.53)	0.367* (1.73)	0.099 (0.41)	0.224 (0.92)
$\ln\text{ES}_{it}$		-0.148** (-2.32)		0.086 (1.38)		0.240*** (3.24)
$\ln\text{Aid}_{it-1} * \ln\text{ES}_{it}$	0.0004 (0.11)	0.012** (1.99)	-0.010*** (-3.41)	-0.016*** (-2.78)	0.016*** (4.68)	-0.001 (-0.13)
No. of Observations	1372	1372	1456	1456	1400	1400
$\chi^2(20\sim 21)$	572.0***	573.8***	1342.3***	1344.7***	749.2***	737.2***
Over-identification Test: $\chi^2(17\sim 18)$	9.07	5.87	4.55	3.73	4.98	17.92

Note: \* significance at 10% level, \*\* significance at 5% level, and \*\*\* significance at 1% level. ( ) is z-value. In addition, the values for year dummy and constant do not appear in the table although they are included into the analysis.

#### IV. Conclusion

The most significant contribution of this paper is to explore the new link between the export-creating effects of tied aid and the market-stealing effects



through the evidence from Korea and China. In other words, it investigates whether the export-creating effects of Korea's aid are offset by the export-diverting effects deriving from China's export expansion, and the offset-level is determined by the level of export competition between Korea and China in the aid recipients. To do that, it uses a panel data consisting of 98-104 aid recipients of Korea through the period of 1995-2009. As the result, it shows that the offset-level is higher at the export destinations where the export competition between Korea and China is stiff while it is lower at the export markets where it is not so intense, and these effects are taken only for consumption goods.

These findings suggest some implications regarding Korea's aid allocation policy. Since there is a great deal of international pressure on Korea to lower the share of tied aid in its total aid to the average level of OECD-DAC members, it is necessary to deeply take into account the way to do that. According to this study, it is desirable to preferentially target its aid recipients experiencing the mild export competition between Korea and China as concern nations for the reduction of tied aid. That is because it can be possible to obtain justification from the world for the delay in the reduction of tied aid in the aid recipient markets where the export competition is fierce based on the logic that the net gains from tied aid are small there. What this study significantly considers to derive such policy implications is that the export competition between Korea and China in Korea's aid recipient markets is different from that in the middle or high income markets. There is a high probability that consumers of aid recipients prefer lower-priced products to higher-priced goods based on their low income levels, while it is expected that those of the middle or high income markets take no preference or the reverse behavior arising from a higher level of their preference for high quality. Thus, the critical findings of this study can be derived under the high expectation that consumers of Korea's aid recipient markets prefer Chinese exportable with lower price to Korean ones with higher quality.

This research also leaves room for further study. This paper employs the case of Korea and China to investigate the net export-creating effects between the positive impacts of Korea's aid on its exports to its recipients and the China's market-stealing effects. However, this study may be extended into a research including other countries such as the OECD countries.

### *References*

- Anderson, J. E. 1979. "A Theoretical Foundation for the Gravity Equation", *American Economic Review*, vol. 69, no. 1, pp. 106-116.
- Anderson, J. E. and E. van Wincoop. 2003. "Gravity with Gravitas: A Solution to the Border Puzzle", *American Economic Review*, vol. 93, no. 1, pp. 170-192.
- Bergstrand, J. H. 1985. "The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence", *Review of Economics and Statistics*, vol. 67, no. 3, pp. 474-481.
- Brun, Jean-Francois., C. Carrere, P. Guillaumont and J. de Melo. 2005. "Has Distance Died? Evidence from a Panel Gravity Model", *World Bank Economic Review*, vol. 19, no. 1, pp. 99-120.
- Collier, P. and J. Dehn. 2001. "Aid, Shocks, and Growth", Working Paper 2688, World Bank.
- Dixit, A. K. and J. E. Stiglitz. 1977. "Monopolistic Competition and Optimum Product Diversity", *American Economic Review*, vol. 67, no. 3, pp. 297-308.
- Egger, P. and Pfaffermayr, M. 2003. "The proper panel econometric specification of the gravity equation: A three-way model with bilateral interaction effects", *Empirical Economics*, vol. 28, no. 3, pp. 571-580.
- Eichengreen, B., Y. Rhee and H. Tong. 2007. "China and the Exports of Other Asian Countries", *Review of World Economics*, vol. 143, no. 2, pp. 201-226.
- Finger, J. M. and M. E. Kreinin. 1979. "A Measure of Export Similarity and its Possible Uses", *Economic Journal*, vol. 89, no. 356, pp. 905-912.
- Flam, H. and E. Helpman. 1987. "Vertical Product Differentiation and North-South Trade", *American Economic Review*, vol. 77, no. 5, pp. 810-822.
- Greenaway, D., A. Mahabir and C. Milner. 2008. "Has China displaced other Asian countries' exports?", *China Economic Review*, vol. 19, no. 2, pp. 152-169.
- Hallak, J. C. 2006. "Product Quality and the Direction of Trade", *Journal of International Economics*, vol. 68, no. 1, pp. 238-265.
- Ianchovichina, E. and T. Walmsley. 2005. "Impact of China's WTO accession on East Asia", *Contemporary Economic Policy*, vol. 23, no. 2, pp. 261-277.
- Kemp, M. C. 2005. "Aid Tied to the Donor's Exports", *Pacific Economic Review*, vol. 10, no. 3, pp. 317-322.
- Kemp, M. C. and S. Kojima. 1985. "Tied Aid and the Paradoxes of Donor-Enrichment and Recipient-Im impoverishment", *International Economic Review*, vol. 26, no. 3, pp. 721-729.
- Kemp, M. C. and K. Wong. 1993. "Paradoxes associated with the administration of foreign aid", *Journal of Development Economics*, vol. 42, no. 1, pp. 197-204.
- Kim, C. S. and J. J. La. 2012. "Effects of Consumer Sophistication on Export Competition between Korea and China", *Korea and the World Economy*, vol. 13, no. 1, pp. 99-113.
- Lall, S. and M. Albaladejo. 2004. "China's competitive performance: a threat to East Asian manufactured exports?", *World Development*, vol. 32, no. 9, pp. 1441-1466.

- Lall, S., J. Weiss and H. Oikawa. 2005. "China's Competitive Threat to Latin America: An Analysis for 1990-2002", Oxford Development Studies, vol. 33, no. 2, pp. 163-194.
- Lambert, Z. V. 1972. "Price and Choice Behavior", Journal of Marketing Research, vol. 9, no. 1, pp. 35-40.
- Lee, K. W. and G. H. Park. 2007. "An Evaluation of Korea's 20-Year ODA", KDI Journal of Economic Policy, vol. 29, no. 2, pp. 43-74. (in Korean)
- Lloyd, T. A., M. McGillivray, O. Morrissey and R. Osei. 2000. "Does Aid Create Trade? An Investigation for European Donors and African Recipients", European Journal of Development Research, vol. 12, no. 1, pp. 107-123.
- Martinez-Zaroso, I. and F. Nowak-Lehmann. 2003. "Augmented Gravity Model: An Empirical Application to Mercosur-European Union Trade Flows", Journal of Applied Economics, vol. 6, no. 2, pp. 291-316.
- Martinez-Zaroso, I., F. Nowak-Lehmann, S. Klasen and M. Larch. 2009. "Does German Development Aid Promote German Exports?", German Economic Review, vol. 10, no. 3, pp. 317-338.
- McGillivray, M. and O. Morrissey. 1998. "Aid and Trade Relationships in East Asia", World Economy, vol. 21, no. 7, pp. 981-995.
- Minondo, A. 2010. "Exports' quality-adjusted productivity and economic growth", Journal of International Trade and Economic Development, vol. 19, no. 2, pp. 257-287.
- Nam, Y. S. et al. 2004. "Economic Effects of Korea-China FTA and the Main Issues", Joint Research Series on FTA Issues 04-07, Seoul: Korea Institute for International Economic Policy. (in Korean)
- Nelson, D. and S. J. Silva. 2008. "Does Aid Cause Trade? Evidence from an Asymmetric Gravity Model", Working Paper 2008/21, University of Nottingham.
- Nilsson, L. 1997. *Aid and Donor Exports: The Case of the EU Countries*, in: *Essays on North-South Trade*, Lund Economic Studies, 70, pp. 45-77.
- Osei, R., O. Morrissey, and T. A. Lloyd. 2004. "The Nature of Aid and Trade Relationships", European Journal of Development Research, vol. 16, no. 2, pp. 354-374.
- Pettersson, J. and L. M. Johansson. 2009. "Tied Aid, Trade-Facilitating Aid or Trade-Diverting Aid?", Working Paper 2009:5, Uppsala University.
- Schott, P. K. 2004. "Across-Product Versus Within-Product Specialization in International Trade", Quarterly Journal of Economics, vol. 119, no. 2, pp. 647-678.
- Schweinberger, A. G. 1990 "On the Welfare Effects of Tied Aid", International Economic Review, vol. 31, no. 2, pp. 457-462.
- Sohn, C. H. 2005. "Does the Gravity Model Explain South Korea's Trade Flows?", Japanese Economic Review, vol. 56, no. 4, pp. 417-430.
- Wagner, D. 2003. "Aid and trade-an empirical study", Journal of the Japanese and International Economies, vol. 17, no. 2, pp. 153-173.
- Yoon, Y. M. and T. D. Yeo. 2007. "Trade Structures and Relations among China, Japan, and Korea", Journal of the Korean Economy, vol. 8, no. 1, pp. 121-145.

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