

How does Foreign Aid Enhance Developing Countries' Export Varieties?: The Role of Human Capital and Institutional Qualities[†]

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주제어: Foreign Aid, Export/Production Structure, Export Diversification,
Economic Growth, Institutional Quality, Human Capital

[ABSTRACT]

As developing countries suffer from severe export concentration, foreign aid seeks to diversify exports rather than increase exports and trade volume. This study investigated the effects of foreign aid on export product diversification and examined how the effect changes according to the rate of tertiary education enrollment and institutional quality in the recipient countries. An analysis of country pairs consisting of 25 donors and 124 recipients from 1988 to 2020 revealed that foreign aid generally positively impacts export diversification in recipient countries with high tertiary education rates and institutional quality. It showed that a high rate of tertiary education enrollment and high institutional quality are vital for increasing the effect of foreign aid on export product variety in recipient countries. Specifically, among the six measures of institutional quality used, five were positive and statistically significant for the effect of foreign aid on the variety of export products. Interestingly, institutional quality played a more significant role in foreign aid effectiveness, especially when foreign aid is delivered to recipient countries with relatively low tertiary education enrollment rates. This finding highlights the significance of implementing foreign aid for the purpose of achieving economic growth through export diversification, while considering the institutional and educational factors of recipient countries.

† 『국제관계연구』 제28권 제1호(2023년 여름호).

<http://dx.doi.org/10.18031/jip.2023.6.28.1.109>

‡ This paper is based upon the thesis submitted by Boyoung Han in fulfillment of the requirement for M.A. in international commerce at Korea University. We would like to thank Innwon Park and the anonymous reviewers for their valuable comments and suggestions.

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I. Introduction

The effectiveness of foreign aid is one of the most controversial issues in developmental economics. Some evidence suggests that official development assistance (ODA) has been ineffective and may have even harmed impoverished states.¹⁾ Specifically, they argue that official aid creates dependency, fosters corruption, and prevents countries from taking advantage of the opportunities provided by the global economy. Meanwhile, others contend that the levels of aid have historically been too low and that a substantial increase in foreign aid could reduce poverty in poor countries.²⁾

Notwithstanding the ongoing debate regarding the effectiveness of foreign aid, it is noteworthy that foreign aid has played a substantial role in global development in recent decades. According to the Organization for Economic Cooperation and Development (OECD), in 2019, the total ODA from state donors was approximately US \$168 billion, with US \$152 billion generated by the members of the Development Assistance Committee (DAC). Additionally, the average annual ODA between 2010 and 2019, as measured by 2018 prices, was approximately US \$151.5 billion.

International trade is an important channel through which foreign aid increases economic growth in developing countries. Many studies argue that product specialization helps developing countries grow economically through establishing a comparative advantage. However,

1) William Easterly, *The Tyranny of Experts: Economists, Dictators, and the Forgotten Rights of the Poor* (Washington, D.C.: Brookings Institution, 2014); Dambisa Moyo, *Dead Aid: Why Aid Makes Things Worse and How There is Another Way for Africa* (London: Penguin Books, 2010).

2) HuffPost, "Aid Ironies," https://www.huffpost.com/entry/aid-ironies_b_207181 (Accessed December 2021); Joseph Stiglitz, *Globalization and its Discontent* (New York: W.W Norton, 2002).

high dependence on primary commodities for exports increases vulnerability to the external environment. While some countries, such as Ghana and Zimbabwe, experienced success in global export markets during the 1990s, their achievements were short lived owing to their inability to diversify their export products and enhance their quality and value added. Such cases clearly demonstrate why low-income countries, especially the poorest developing nations, often become trapped in a vicious cycle that restricts production in the domestic market.

Given the growing amount of foreign aid funds allocated to enhance economic growth in developing countries, it is crucial to accurately evaluate the effectiveness of foreign aid in promoting economic development. Importantly, unlike most previous research, this study uses export diversification as an indicator of trade-driven economic growth instead of export volume. This is based on the recognition that a significant export volume alone may not be sufficient to ensure sustainable growth in developing countries. In addition, institutional quality and educational level are widely recognized as critical factors in promoting economic diversification. The extant literature has repeatedly confirmed the positive correlation between human capital and sustainable economic growth, underscoring the potential benefits of increasing investments in higher education. Therefore, this study's primary objective is to explore the impact of foreign aid on export diversification—a crucial driver of economic growth—and analyze how this impact varies based on the education and institutional quality of the recipient country.

To achieve this goal, this study employs aggregate foreign aid data and conducts an empirical analysis to evaluate the effectiveness of foreign aid in promoting economic growth. The selection of total foreign aid as the main policy variable, rather than Aid for Trade (AFT),³⁾ was based on three key justifications. First, although general foreign aid

funds are not directly targeted to increase trade, they can indirectly affect the input factors of production (e.g., labor and improvement of human capital health). It was found that foreign aid indirectly promotes economic advancement by increasing domestic savings and investments, improving infrastructure, and accumulating human capital in Pakistan and Vietnam, respectively, which can ultimately help increasing the export diversification of recipient countries.⁴⁾ Second, impoverished countries with poor institutions have difficulty monitoring whether earmarked funds are used according to their original intentions. Lastly, indirect effects generated by the improvement of production factors have received little attention; therefore, it is worth estimating the combined effects of (i) the direct effect of AfT and (ii) the indirect effect through the improvement of production factors. Hence, this study differs from previous studies that primarily analyze the direct effects of AfT (e.g. export diversification in recipient countries) by estimating the combined direct and indirect effects of overall aid. This approach allows for a distinct contribution beyond existing research.

We first review the existing literature on the impact of foreign aid on economic growth through export diversification, considering the importance of institutional quality and education. Then we present two separate estimation models and discuss the key findings by dividing each result into ordinary least squares (OLS) and fixed-effects regressions. Finally, we conclude with the implications and limitations for future research.

3) Aid for Trade is a global initiative established by the World Trade Organization (WTO) in 2005 to assist developing countries in benefiting from trade liberalization and enhancing their ability to participate in global trade.

4) Nurul Islam, "Foreign assistance and economic development: The case of Pakistan," *The Economic Journal*, Vol. 82, No. 325 (1972); Trinh Tra, "Foreign aid and economic growth: The impact of aid on determinants of growth—the case of Vietnam," Aalto University School of Business Master thesis (Espoo: Aalto University School of Business, 2014), p. 68.

II. Literature Review

The existing empirical literature has demonstrated that trade can be a powerful engine for enhancing economic development and poverty reduction in developing countries. From the perspective of production structure, most upscale products are located in a densely connected core and tend to be high value-added products, whereas lower-income products occupy a less connected periphery and tend to be low value-added products.⁵⁾ This finding indicates that better positioning in the export network product space is associated with better local economic outcomes. To achieve sustainable economic growth, a developing country needs to transition its production from exporting low-value-added products (i.e., products produced in a less connected periphery) to high-value-added products (i.e., products produced in a densely connected core). The transition in production and exports is associated with an increase in export variety among developing countries.

Many developing countries value export diversification because they face severe “export concentration.” A few studies have argued that diversification positively impacts economic growth.⁶⁾ Additionally, they point out that it is more important to increase the variety of export products than to simply increase the trade volume of the same types of products. Regions with “less specialization and more diversified exports generally experience higher economic growth rates”⁷⁾ as having

5) C.A. Hidalgo, B. Klinger, A.-L. Barabási, and R. Hausmann, “The product space conditions the development of nations,” *Science*, Vol. 317, No. 5837 (2007), pp. 482-487.

6) Shwe Sin Oo, and Masaru Ichihashi, “How does aid for trade contribute to ASEAN’s trading?” *Graduate School for International Development and Cooperation (IDEC), Hiroshima University*, Vol. 5, No. 2 (2015).

7) Ferdous B. Farazi, “Export diversification in East Asian economies: Some factors affecting the scenario,” *International Journal of Social Science and Humanity*, Vol. 1, No. 1 (2011), p. 14.

a comparative advantage in primary export commodities makes them vulnerable to external shocks.⁸⁾ In some countries, the situation is so severe that the top three commodities constitute more than 90% of total exports.⁹⁾ Recent analyses considering the link between aid and export diversification in both the intensive and extensive margins have shown that AfT, dominated by diversification at the intensive margin, reduces the export concentration of recipient countries.¹⁰⁾ For instance, Munemo found that foreign aid less than 20% of a recipient country's GDP was conducive to significantly enhancing export diversification through factors such as level of development, infrastructure, and transaction costs.¹¹⁾ In addition, Gnanngnon and Roberts argue that AfT promotes recipient countries' export diversification through various channels including trade costs reduction and transfers of technology and innovation.¹²⁾ Kim also analyzes that AfT has positive and statistically significant impacts on both export volume and export diversification of aid-recipient countries.¹³⁾

Recent studies have highlighted the importance of institutions for recipient countries to effectively diversify their economies and achieve export growth as they play a role in increasing both trade volume and

8) Patrick N. Osakwe, "Export diversification and the dilemma of African development," *Applied Econometrics and International Development*, Vol. 7, No. 2 (2007), p. 143.

9) Yuri Kim, "Does aid for trade diversify the export structure of recipient countries?" *The World Economy*, Vol. 42 (2019), p. 2685.

10) Sèna Kimm Gnanngnon, and Michael Roberts, "Aid for trade, foreign direct investment and export upgrading in recipient countries," *Journal of International Commerce, Economics and Policy*, Vol. 8, No. 2 (2017), p. 17.

11) Jonathan Munemo, "Foreign aid and export diversification in developing countries," *The Journal of International Trade & Economic Development*, Vol. 20, No. 3 (2011), p. 349.

12) Sèna Kimm Gnanngnon, "Aid for trade and export diversification in recipient-countries," *The World Economy*, Vol. 42, No. 2 (2019), p. 398.

13) Kunhyui Kim, "Impact of aid for trade on economic development: An empirical analysis of developing nations' export and export diversification," *Journal of International Development Cooperation*, Vol. 15, No. 2 (2020), p. 42.

export product variety. In particular, internal politics—characterized by authoritarianism, corruption, and political instability—are considered the primary reasons for Africa's poor economic performance.¹⁴⁾ Thus, the government's role is imperative in achieving positive regional economic growth. Influential research by World Bank economists Burnside and Dollar on the impact of aid, policy, and growth indicates that making aid more systematically conditional on the quality of policies would likely increase its impact on developing countries' growth.¹⁵⁾ Their results also show that aid has been highly successful in reducing poverty and promoting growth in countries with sound economic management and robust governmental institutions.¹⁶⁾

In addition to the institutional quality of recipient countries, education level is a significant factor in diversification. Recent studies confirm the existence of a positive correlation between human capital and sustainable economic growth. Investment in human capital has been a significant contributor to economic growth for decades as shown by the observational data recorded for many years; specifically, it was found that foreign aid in primary education enhances economic growth in developing countries.¹⁷⁾ Furthermore, allocating more resources to higher education can contribute significantly to economic growth. University education is linked to economic performance as it increases opportunities for the transfer of knowledge production and the sharing,

14) David E. Bloom, Jeffrey D. Sachs, Paul Collier, and Christopher Udry, "Geography, demography, and economic growth in Africa," *Brookings Papers*, Vol. 1998, No. 2 (1998), p. 211.

15) Graig Burnside, and David Dollar, "Aid, policies, and growth," *American Economic Review*, Vol. 94, No. 3 (2004), p. 864.

16) Carlos Santiso, "Good governance and aid effectiveness: The World Bank and conditionality," *The Georgetown Public Policy Review*, Vol. 7, No. 1 (2001), p. 9.

17) Elizabeth Asiedu, and Boaz Nandwa, "On the impact of foreign aid in education on growth: How relevant is the heterogeneity of aid flows and the heterogeneity of aid recipient?" *The Reviews of World Economies*, Vol. 143, No. 4 (2007), p. 16.

such as manufacturing processes.¹⁸⁾ It can thus be suggested that tertiary education enhances innovation by boosting the capacity of well-educated and qualified labor that can keep pace with the rapid changes in the manufacturing and production of high technology. Increasing the highly educated population can positively influence productivity, thereby improving the economic growth of a country in the long run, likely because better-educated individuals need less financial support or training investment to adapt to technological changes. In this study, we will analyze the effect of foreign aid on export diversification by adding additional factors that can affect export diversification.

III. Empirical Analysis

1. Data

This study employs annual data for a sample of 149 countries for the period 1988–2020 as shown in <Table 1> and <Table 2>. The sample includes 25 developed countries (donor countries) and 124 developing countries (recipient countries). Using this broad coverage of countries and time period, we can investigate how foreign aid affects the diversification of export products by recipient country characteristics. Based on these estimations, this study identifies (i) time periods and (ii) groups of countries where foreign aid has been most effective in improving export product diversification using the OLS and fixed-effects panel data models.

18) Mabrouka Bouhajeb, Haifa Mefteh, and Rania Ben Ammar, "Higher education and economic growth: the importance of innovation," *Atlantic Review of Economics*, Vol. 1, No. 2 (2018), p. 15.

<Table 1> Descriptive Statistics

Variable	Mean	Std. dev.	Min	Max
lAID _t	12.93079	6.758173	-20.72548	23.14166
EDU_T	0.002185	0.0020486	0.0000196	0.0117101
institute	-0.4229159	0.5600897	-1.928342	1.310435
Voice and Accountability	0.3070912	0.4613042	0	1
Political Stability and Absence of Violence/Terrorism	0.3086107	0.4619368	0	1
Government Effectiveness	0.2362518	0.424794	0	1
Regulatory Quality	0.2849493	0.4514066	0	1
Rule of Law	0.1855282	0.3887395	0	1
Control of Corruption	0.2011577	0.4008802	0	1
lgdp _o	16.8567	1.862618	11.98203	21.63019
lgdp _d	20.52546	1.225702	17.76698	23.506

<Table 2> Sources of Variables

Variables	Sources
Trade Volume	UN COMTRADE
Variety of Products	UN COMTRADE
Foreign Aid	Query Wizard for International Development Statistics from Organization of Economic Co-operation and Development (OECD QWIDS)
Institutional Quality (6 dimensions)	Worldwide Governance Indicators
Enrollment of Tertiary Education	World Bank Indicators
GDP	CEPII database
Distance	CEPII database
Contiguity	CEPII database
Common Language	CEPII database
Common Religion	CEPII database
Colonial Relations	CEPII database

The “UN COMTRADE” database was used to obtain trade data for the period 1988–2020 to construct the dependent variable of export product variety (a proxy to measure the structural change of a recipient country). Products were classified according to the 1992 Harmonized Commodity Description and Coding System (HS). Databases for the main explanatory variable (logarithm of foreign aid) were collected from “Query Wizard for International Development Statistics from OECD (OECD QWIDS)” for the same period, and moderating variables such as “institutional quality” and “tertiary education” were collected from “Worldwide Governance Indicators (WGI)” and “World Bank Indicators,” respectively. The institutional quality of recipient countries was measured using voice and accountability, political stability, absence of violence/terrorism, government effectiveness, regulatory quality, rule of law, and control of corruption. Each type of institutional quality represents a percentile rank among the recipient countries, ranging from 0 (lowest) to 100 (highest). The education level of the recipient countries refers to tertiary education enrollment (the value unit is estimated as % gross). Finally, it also used a few gravity variables as moderators of the effectiveness of foreign aid: gross domestic product (GDP), distance, contiguity, common language, common religion, and colonial relations.

The policy variable, foreign aid (denoted as *AID_{it}* hereafter), effectively compares the treatment group (developing countries that receive high levels of foreign aid) and the control group (developing countries that do not receive foreign aid). We further examined how the effectiveness of foreign aid changes through interactions with the moderating (amplifying) variables of institutional quality and educational level. By combining the mean of the six dimensions of institutional quality, we constructed an integrated instrumental variable named *institute*. This study used both the average of the six measures and each measure separately. Each dummy variable indicates the top 25% of each

institutional quality measure. The tertiary education enrollment rate of recipient countries, denoted as EDU_T , was employed as another moderating variable. Therefore, *institute* and EDU_T were the primary amplifying variables used to examine the effect of heterogeneity.¹⁹⁾

2. Estimation Model

We use Equation (1) to estimate the impact of foreign aid on the trade volume and variety of export products of recipient countries. To control for endogeneity in the effects of foreign aid on increasing trade volume and/or the variety of export products in recipient countries, we employed a panel data analysis that utilizes pair-fixed and time-fixed effects.

$$Y_{ijt} = \beta_0 + \beta_1 LAID_{it} + \beta_2 EDU_T_{it} + \beta_3 institute_{it} + \beta_4 contig_{ij} + \beta_5 ldist_{ij} + \beta_6 colony_{ij} + \beta_7 comlang_off_{ij} + \beta_8 comrelig_{ij} + \beta_9 l gdp_o_{it} + \beta_{10} l gdp_d_{it} + u_{ijt} \quad (1)$$

In Equation (1), j denotes an importer country, i is an exporter country, and t is time. The dependent variable is the logarithm of either the trade volume or the product variety of exporter country i . The policy variable represents the logarithm of foreign aid, EDU_T indicates the enrollment rate of tertiary education in recipient countries, and *institute* represents the indicator of the top 25% of the mean of the six institutional quality dimensions. The remaining variables are for the gravity model, in which *contig* denotes a proxy of geographical contiguity; *ldist* is the logarithm of the distance between the most populated cities of the donor and

19) We do not report the triple interaction terms of $LAID_{it}$, EDU_T and *institute* in the following tables of results on purpose because every regression comes up with statistically insignificant results and do not necessarily affect the main findings.

recipient countries; *colony* is the existence of an ever-colonial relationship. *Comlang_off* and *comrelig* indicate the existence of a common language and common religion, respectively. Finally, *lgdp* is a logarithm of the country size in both the importer country (*lgdp_o*) and the exporter country (*lgdp_d*).

$$Y_{ijt} = \beta_0 + \beta_1 LAID_{it} + \beta_2 EDU_{it} + \beta_3 institute_{it} + \beta_4 lgdp_o + \beta_5 lgdp_d + c_{ij} + f_t + u_{ijt} \quad (2)$$

Every variable in Equation (2) is the same as that in Estimation (1). The only difference is that pairs of importer and exporter country fixed- and time-fixed effects are included.

IV. Results

1. Overall Estimation

〈Table 3〉 displays the impact of foreigners on total trade volume. In Columns (1)–(8), in which the first half represents OLS regressions and the second half represents fixed-effects regressions, foreign aid does not have a statistically significant impact on trade volume.

Column (2) in 〈Table 3〉 shows that the high tertiary education enrollment rate of recipient countries has a positive impact on trade volume, but when it interacts with foreign aid, it no longer has a positive or statistically significant impact. Column (3) shows that high institutional quality has a positive but statistically insignificant effect on the effect of foreign aid on increasing trade volumes. With every additional 1% increase in foreign aid and institutional quality (the top 25% of the six government indicators), the trade volume of the recipient countries

increases by 0.007%. Column (4) shows that when foreign aid is given to recipient countries, high institutional quality and a high rate of tertiary education have a positive and negative statistically significant impact, respectively, on the effect of foreign aid in increasing trade volume. Specifically, for every additional combination of a 1% increase in foreign aid and institutional quality, recipient countries' trade volume increases by 0.017% ($p < 0.05$), while for every additional combination of a 1% increase in foreign aid and the enrollment rate of tertiary education, recipient countries' trade volume decreases by 5.345% ($p < 0.05$).

Overall, the fixed-effects regressions showed contrasting results. Column (6) indicates that when foreign aid is given to recipient countries with high tertiary education enrollment rates, their trade volume increases but the effect is not statistically significant. With every additional combination of a 1% increase in foreign aid and tertiary education, recipient countries' trade volume increases by 0.81%. However, unlike Column (3), Column (7) shows that while high institutional quality of recipient countries alone positively impacts trade volume, when combined with foreign aid, the impact is negative. Column (8) presents a partially contrasting result of Column (4), in which a high tertiary education rate has a positive but statistically insignificant impact on the effect of foreign aid in increasing recipient countries' trade volume, whereas high institutional quality has a negative and insignificant impact. To be precise, for every additional combination of a 1% increase in foreign aid and the enrollment rate of tertiary education, recipient countries' trade volume increases by 1.164%, while for every additional combination of a 1% increase in foreign aid and institutional quality, recipient countries' trade volume decreases by 0.004%. In summary, these results suggest that the high institutional quality of recipient countries does not necessarily have a significant impact on the effect of foreign aid in increasing the trade volume.

At the same time, the GDP in both donor and recipient countries, contiguity, a colonial relationship, and a common language all have positive and statistically significant impacts on the effect of foreign aid in increasing recipient countries' trade volume. Meanwhile, the distance between donor and recipient countries has a negative impact on the effect of foreign aid in increasing trade volume.

In summary, the high enrollment rate of tertiary education and high institutional quality of recipient countries both do not necessarily have significant impacts on the effect of foreign aid in increasing the export volume.

<Table 3> Impact on the Trade Volume (Total)

Variables	(1) ltrade	(2) ltrade	(3) ltrade	(4) ltrade	(5) ltrade	(6) ltrade	(7) ltrade	(8) ltrade
IAIDt	-0.004 (0.004)	0.006 (0.009)	-0.001 (0.004)	-0.002 (0.004)	-0.002 (0.002)	-0.004 (0.004)	-0.001 (0.002)	-0.004 (0.004)
EDU_T* IAIDt		-4.044 (2.678)		-5.345** (2.706)		0.806 (1.201)		1.164 (1.223)
EDU_T		97.802** (42.532)		75.607* (43.571)		63.379* (34.405)		56.686* (34.065)
institute* IAIDt			0.007 (0.007)	0.017** (0.008)			-0.004* (0.002)	-0.004 (0.003)
institute			0.483*** (0.090)	0.317*** (0.098)			0.310*** (0.104)	0.331*** (0.124)
lgdp_o	1.294*** (0.023)	1.313*** (0.026)	1.260*** (0.024)	1.310*** (0.026)	0.574*** (0.089)	0.391*** (0.096)	0.495*** (0.093)	0.309*** (0.100)
lgdp_d	1.222*** (0.034)	1.205*** (0.038)	1.230*** (0.034)	1.216*** (0.038)	0.724*** (0.113)	1.020*** (0.136)	0.754*** (0.113)	1.054*** (0.136)
contig	1.591*** (0.616)	2.001*** (0.463)	1.468** (0.637)	2.028*** (0.505)				
ldist	-0.558*** (0.068)	-0.579*** (0.077)	-0.614*** (0.068)	-0.649*** (0.077)				
colony	1.211*** (0.187)	1.379*** (0.222)	1.196*** (0.185)	1.387*** (0.219)				
comlang_off	0.380*** (0.140)	0.330** (0.162)	0.351** (0.141)	0.278* (0.165)				
comrelig	0.632*** (0.178)	0.267 (0.199)	0.493*** (0.176)	0.180*** (0.197)				
_cons	-38.318*** (0.969)	-38.359*** (1.031)	-37.247*** (0.980)	-35.484*** (1.090)	-21.525*** (2.761)	-24.427*** (3.201)	-20.705*** (2.767)	-23.617*** (3.180)

Variables	(1) ltrade	(2) ltrade	(3) ltrade	(4) ltrade	(5) ltrade	(6) ltrade	(7) ltrade	(8) ltrade
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pair fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
N	21641	13453	21101	13128	21788	13512	21247	13186
R ²	0.611	0.635	0.618	0.639	0.111	0.114	0.109	0.111

Notes: 1) Standard errors in parentheses

2) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

〈Table 4〉 presents Columns (1)–(8), with the first and second halves showing the results of the linear and fixed-effects regressions, respectively. The results indicate that the more foreign aid a recipient country receives, the higher export product concentration the country experiences. Column (2) shows that the high tertiary education enrollment rate of recipient countries this time has a positive but statistically insignificant impact on increasing the variety recipient countries' product exports (hereafter, export product variety) when it interacts with foreign aid: with every additional combination of a 1% increase in foreign aid and tertiary education, export product variety increases by 1.39%. At the same time, Column (3) reveals that high institutional quality has a positive and statistically significant impact on the effect of foreign aid in increasing export product variety: with every additional combination of 1% increase in foreign aid and institutional quality, export product variety increases by 0.013% ($p < 0.01$). Column (4) presents that when foreign aid is awarded to recipient countries with both high institutional quality and a high tertiary education rate, only high institutional quality generates a positive and statistically significant impact on the effect of foreign aid in increasing export product variety, whereas the high rate of tertiary education once again has a positive but statistically insignificant impact. Every additional combination of a 1% increase in foreign aid and institutional quality increases export product variety by 0.016% ($p < 0.01$).

Moreover, every additional combination of a 1% increase in foreign aid and enrollment rate of tertiary education increases export product variety by 0.352%.

The results of the fixed-effects regressions are similar to those of the OLS regressions in terms of export product variety. Specifically, Column (6) shows that a high tertiary education enrollment rate in recipient countries negatively impacts increasing export product variety, but when combined with foreign aid, it has a positive and statistically significant effect. With every additional 1% increase in foreign aid and tertiary education, export product variety increases by 1.28% ($p < 0.05$). Column (7) indicates that institutional quality also has a positive and statistically significant impact on the effect of foreign aid in increasing export product variety: with every additional 1% increase in foreign aid and institutional quality, export product variety increases by 0.006% ($p < 0.01$). Column (8) presents a similar result to that in Column (4), in which both a high tertiary education rate and high institutional quality have a positive and statistically significant effect on the effect of foreign aid on export product variety. More precisely, for every additional combination of a 1% increase in foreign aid and the enrollment rate of tertiary education, export product variety increases by 0.911%, while for every additional combination of a 1% increase in foreign aid and institutional quality, export product variety increases by 0.005% ($p < 0.01$). Also, the results of the OLS analysis show that GDP has a positive and negative influence on the effect of foreign aid in export product diversification in donor and recipient countries, respectively. However, the fixed-effects analysis offers contrasting results, showing that GDP on both sides have a positive influence on the effect of foreign aid in increasing export product variety. Additionally, contiguity, distance, a colonial relationship, and a common language between donor and recipient countries all positively impact the effect of foreign aid in

increasing the variety of products, whereas a common religion has a negative impact.

In short, the high enrollment rate of tertiary education and high institutional quality of recipient countries both have impacts on the effect of foreign aid in increasing the export diversification.

<Table 4> Impact on the Variety of Products (Total)

Variables	(1) lvariety	(2) lvariety	(3) lvariety	(4) lvariety	(5) lvariety	(6) lvariety	(7) lvariety	(8) lvariety
lAIDt	-0.006*** (0.002)	-0.017*** (0.004)	-0.009*** (0.002)	-0.013*** (0.004)	-0.001 (0.001)	-0.005*** (0.002)	-0.003*** (0.001)	-0.006*** (0.002)
EDU_T*lAIDt		1.386 (1.536)		0.352 (1.456)		1.281** (0.534)		0.911* (0.495)
EDU_T		77.751*** (24.948)		32.335 (23.312)		-15.234 (11.430)		1.393 (9.902)
institute*lAIDt			0.013*** (0.004)	0.016*** (0.004)			0.006*** (0.001)	0.005*** (0.001)
institute			0.660*** (0.039)	0.473*** (0.046)			0.152*** (0.043)	0.106* (0.056)
lgdp_o	0.744*** (0.011)	0.749*** (0.012)	0.723*** (0.010)	0.749*** (0.012)	0.337*** (0.035)	0.246*** (0.044)	0.255*** (0.035)	0.124*** (0.045)
lgdp_d	-0.002 (0.018)	-0.015 (0.019)	-0.014 (0.016)	-0.014 (0.018)	0.029 (0.059)	0.007 (0.069)	0.029 (0.055)	0.012 (0.062)
contig	0.830*** (0.228)	0.449*** (0.163)	0.565*** (0.208)	0.426** (0.192)				
ldist	0.183*** (0.043)	0.203*** (0.047)	0.092** (0.038)	0.106** (0.044)				
colony	0.084 (0.122)	0.146 (0.133)	0.067 (0.109)	0.147 (0.128)				
comlang_off	0.155** (0.073)	0.030 (0.080)	0.060 (0.067)	-0.040 (0.078)				
comrelig	-0.126 (0.085)	-0.455*** (0.092)	-0.374*** (0.076)	-0.590*** (0.087)				
_cons	-8.44*** (0.516)	-8.365*** (0.513)	-6.894*** (0.470)	-7.400*** (0.504)	-1.237 (1.303)	1.017 (1.515)	0.138 (1.216)	2.908** (1.392)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pair fixed effects	No	No	No	No	Yes	Yes	Yes	Yes
N	23507	14094	22870	13719	23835	14192	23193	13817
R ²	0.632	0.683	0.685	0.709	0.236	0.220	0.225	0.200

Notes: 1) Standard errors in parentheses

2) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

2. Heterogeneous Effects Estimation

As the OLS results of each individual dimension of institutional quality for the effect of foreign aid on the variety of products may be biased, we present the results of each of the six aggregates of institutional quality using fixed-effects regressions. With one exception, they all generate positive and statistically significant impacts on the effect of foreign aid in increasing export product variety. The exception is “control of corruption,” which does not show a negative impact but is statistically insignificant.

First, if foreign aid is provided to a recipient country with high institutional quality in terms of “voice and accountability,” it positively and significantly increases the variety of its products. Specifically, with every additional 1% increase in foreign aid and voice accountability, the export product variety increases by 0.004% ($p < 0.05$). Second, foreign aid given to a recipient country with high institutional quality with respect to “political stability and absence of violence/terrorism” positively and significantly increases export product variety. With every additional 1% increase in foreign aid, political stability, and the absence of violence/terrorism, export product variety increases by 0.005% ($p < 0.01$). Third, if foreign aid is given to a recipient country with high institutional quality in terms of “government effectiveness,” it positively and significantly increases export product variety. With every additional integration of a 1% increase in foreign aid and government effectiveness, export product variety increases by 0.004% ($p < 0.05$). Fourth, if foreign aid is provided to a recipient country with high institutional “regulatory quality,” it positively and significantly increases export product variety. With every additional integration of a 1% increase in foreign aid and regulatory quality, export product variety increases by 0.012% ($p < 0.01$), which is the most significant institutional quality supporting the variety

of products. Fifth, if foreign aid is given to a recipient country with high institutional quality regarding “rule of law,” it positively and significantly increases export product variety. With every additional integration of a 1% increase in foreign aid and the rule of law, export product variety increases by 0.007% ($p < 0.01$). Finally, if foreign aid is provided to a recipient country with high institutional quality with respect to “corruption control,” it increases export product variety. With every additional integration of a 1% increase in foreign aid and corruption control, export product variety increases by 0.0005%, which is close to zero. While the GDP rates of both donor and recipient countries are positive, the GDP of donor countries seems to be more important in increasing export product variety.

In summary, the significance of each institutional quality of a recipient country on the effect of foreign aid in increasing the export diversification is in the following order: “regulatory quality,” “rule of law,” “political stability and absence of violence/terrorism,” “voice and accountability,” “government effectiveness,” and “control of corruption” which almost has no impact.

<Table 5> Impact of Individual Institutional Quality on the Variety of Products

Variables	(1) lvariety	(2) lvariety	(3) lvariety	(4) lvariety	(5) lvariety	(6) lvariety
lAIDt	-0.003** (0.001)	-0.003** (0.001)	-0.003*** (0.001)	-0.006*** (0.001)	-0.005*** (0.001)	-0.002 (0.002)
voice_desti*lAIDt	0.004** (0.002)					
stability_desti*lAIDt		0.005*** (0.002)				
gov_desti*lAIDt			0.004** (0.002)			
regulation_desti*lAIDt				0.012*** (0.002)		
rule_desti*lAIDt					0.007*** (0.002)	

Variables	(1) Lvariety	(2) lvariety	(3) lvariety	(4) lvariety	(5) lvariety	(6) lvariety
corruption_desti*IAIDt						0.000 (0.002)
voice_desti	-0.049** (0.024)					
stability_desti		-0.024 (0.023)				
gov_desti			-0.008 (0.021)			
regulation_desti				-0.028 (0.024)		
rule_desti					-0.070*** (0.023)	
corruption_desti						-0.041 (0.027)
lgdp_o	0.336*** (0.035)	0.331*** (0.035)	0.336*** (0.035)	0.326*** (0.035)	0.338*** (0.035)	0.338*** (0.035)
lgdp_d	0.030 (0.059)	0.030 (0.059)	0.031 (0.059)	0.035 (0.059)	0.030 (0.059)	0.029 (0.059)
_cons	-1.212 (1.304)	-1.144 (1.306)	-1.249 (1.299)	-1.134 (1.299)	-1.221 (1.303)	-1.232 (1.302)
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	23835	23835	23835	23835	23835	23835
R ²	0.237	0.237	0.237	0.239	0.237	0.237

Notes: 1) Standard errors in parentheses
2) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

〈Table 6〉 indicates how the four different extents of tertiary education enrollment in recipient countries have different impacts on the effect of foreign aid in increasing export product variety when institutional quality is already high and foreign aid is provided. We divided tertiary education enrollment into four dimensions and examined how it interacts with various enrollment rate conditions to conduct a more detailed analysis of the relationship between institutional quality and the positive impact of foreign aid on increasing export product diversification in recipient countries. When foreign aid is provided to

recipient countries with a tertiary education enrollment rate in the top 5%, the effect of their institutional quality on enhancing the impact of foreign aid in increasing product diversity is higher than that of the top 25%. Specifically, within the range of recipient countries with tertiary education enrollment in the top 5%, every additional 1% increase in institutional quality increases export product variety by 0.009% ($p < 0.05$). When foreign aid is given to recipient countries with a tertiary education enrollment rate in the top 25%, the effect of their institutional quality on enhancing the impact of foreign aid in increasing export product variety is lower than that of the top 5%. Specifically, within the range of recipient countries with tertiary education enrollment in the top 25%, every additional 1% increase in institutional quality increased product export variety by 0.004% ($p < 0.10$).

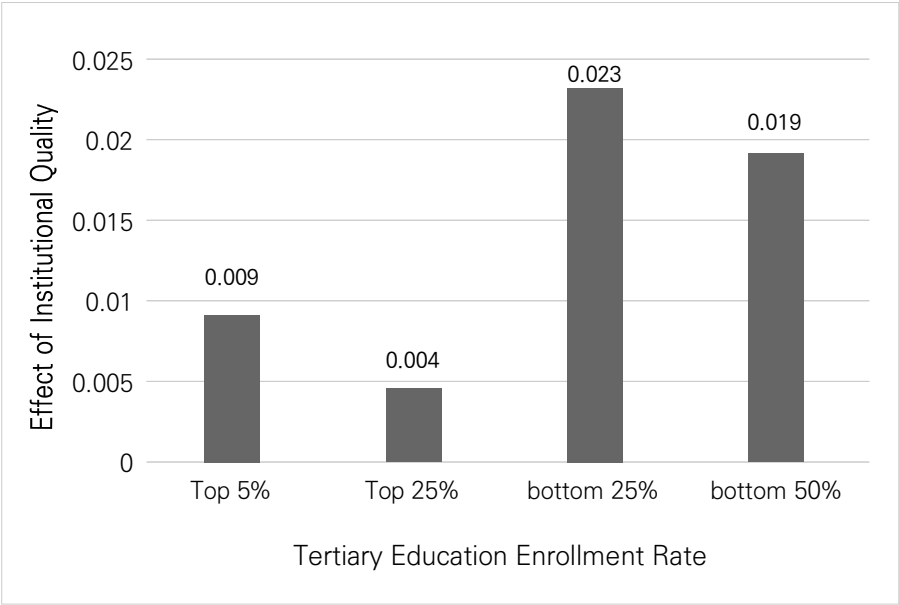
By contrast, when foreign aid is given to recipient countries with a tertiary education enrollment rate in the bottom 25%, the effect of their institutional quality on enhancing the impact of foreign aid on increasing export product variety is higher than that of both the top 5% and top 25%. Within the range of recipient countries with tertiary education enrollment in the bottom 25% only, every additional 1% increase in institutional quality increased export product variety by 0.023% ($p < 0.01$). When foreign aid is given to recipient countries with a tertiary education enrollment rate in the bottom 50%, the effect of their institutional quality on enhancing the impact of foreign aid on increasing export product variety is higher than that of both the top 5% and the top 25%, but lower than that of the bottom 25%. Within the range of recipient countries with tertiary education enrollment in the bottom 25% only, every additional 1% increase in institutional quality increased export product variety by 0.019% ($p < 0.01$).

<Table 6> Tertiary Education and Institutional Quality on the Variety of Products

	Top 5%	Top 25%	Bottom 25%	Bottom 50%
Variables	(1) lvariety	(2) lvariety	(3) lvariety	(4) lvariety
lAIDt	-0.001 (0.002)	-0.001 (0.002)	-0.006 (0.004)	-0.005*** (0.001)
institute*lAIDt	0.009** (0.003)	0.004* (0.002)	0.023*** (0.003)	0.019*** (0.003)
institute	0.204*** (0.054)	0.295*** (0.047)	-0.283*** (0.089)	-0.035 (0.074)
lgdp_o	0.426*** (0.055)	0.376*** (0.045)	-0.223* (0.128)	-0.146* (0.083)
lgdp_d	0.036 (0.095)	0.043 (0.079)	0.160 (0.156)	0.062 (0.094)
_cons	-2.797 (2.117)	-2.001 (1.746)	3.560 (3.395)	5.062** (2.139)
Time fixed effects	Yes	Yes	Yes	Yes
Pair fixed effects	Yes	Yes	Yes	Yes
N	10067	12452	3867	7353
R ²	0.248	0.251	0.249	0.239

Notes: 1) Standard errors in parentheses
2) * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

<Figure 1> Tertiary Education and Institutional Quality on the Variety of Products



In general, if a recipient country's tertiary education enrollment rate is low, its institutional quality plays a more significant role in enhancing the effect of foreign aid in increasing export product variety (Figure 1). In contrast, if a country's tertiary education enrollment rate is high, its institutional quality still plays a positive but less significant role in increasing the effect of foreign aid on product diversity. This may be because the effectiveness of high institutional quality in enhancing the impact of foreign aid on export product diversification is more prominent in recipient countries in which less people have achieved a higher level of education. In other words, if a recipient country has a high number of well-educated people, the role of its government in enhancing the effect of foreign aid is less important because better-educated human capital has enhanced knowledge of regulations and is vocationally better trained with a capacity for higher productivity. Therefore, even if the country's institutional quality is low, a well-educated population can affect the production of a variety of export products more positively than a recipient country that depends solely on institutions.

V. Conclusion

1. Implication

This study examined the relationship between foreign aid and measures related to export product diversification, including rates of tertiary education enrollment and institutional quality in recipient countries, both of which were found to be important for enhancing the effect of foreign aid in increasing product variety in recipient countries. In addition, this study revealed that each individual type of institutional

quality (except for “corruption of control”) had positive and statistically significant impacts on the effect of foreign aid in increasing the recipient countries’ export diversification. By comparing the recipient countries with specific ranges of tertiary education enrollment rates (the top 5%, top 25%, bottom 25%, and bottom 50%), we can deduce that institutional quality generally plays a more important role in the effect of foreign aid when foreign aid is given to recipient countries where the tertiary education enrollment rate is relatively low (the bottom 25% and the bottom 50%).

Based on these results, in order for aid policies to be successfully implemented, it is imperative for recipient countries to have competent workers capable of utilizing aid resources effectively and establish institutions that ensure adequate compensation for the workforce involved in utilizing aid resources. Additionally, this study found that institutions operate complementarily at lower education levels and generally substitute each other at higher education levels, contributing to the enhancement of aid effectiveness. In other words, the need for institutions is emphasized more strongly at lower education levels for aid effectiveness.

Developing countries should shift their production structure from production activities for low value-added products to production activities for high value-added products, with the goal of reducing their dependency on primary commodity exports and increasing their competitiveness in global export markets. For example, Thailand is a very successful case in export diversification by receiving foreign aid. The country’s export was concentrated on rice in the 1960s; however, the government upgraded natural resource-based industries and encouraged exports of labor-intensive manufactured products.²⁰⁾ The

20) UNCTAD, “Exports diversification and employment in Africa,” (2018), p. 50, <https://>

government strived to create the appropriate business environment to pursue the dual export diversification strategy by using the ODA appropriately.²¹⁾ As a result, Thailand became one of the world's top six countries on agri-food exports today. Because most impoverished countries lack the resources and capacity to independently achieve export diversification and high value-added production activities, foreign aid from developed countries is a crucial source of support. However, to ensure aid effectiveness in enhancing recipient countries' export competitiveness, issues of "ownership" and "alignment" should be emphasized²²⁾ and appropriate objective measures should be developed to maximize aid management. Any mismanagement or ineffectiveness of foreign aid in achieving sustainable export diversification goals can have severe consequences as it can potentially hinder recipient countries' economic growth.²³⁾ Hence, both donor and recipient countries should recognize the significance of aid effectiveness and work toward improving it by engaging with the relevant amplifiers.

2. Limitations

This study has some limitations that should be addressed in future studies. Due to the difference in the standard deviations of the two variables, $IAIDT_t*EDU_T$ and $IAIDT_t*institute$, it is unclear whether tertiary education enrollment or institutional quality is more significant in enhancing the effect of foreign aid on export product variety in the recipient country. To determine this, one standard deviation was

unctad.org/system/files/official-document/aldc2018d3_en.pdf (Accessed May 2023).

21) Isra Sarntisart, "Growth, structural change and inequality: The experience of Thailand," *World Institute for Development Economic Research*, Vol. 2000, No. 207 (2000).

22) Kim (2019), p. 2684.

23) Raghuram Rajan, and Arvind Subramanian, "Does Aid Affect Governance?" *American Economic Review*, Vol. 97, No. 2 (2007), p. 327.

applied to each variable throughout the regression. In addition, our future research will encompass the analysis of the sectoral effects of foreign aid and examine how aid in specific fields contributes to the interaction with key variables, ultimately leading to the diversification of export products in recipient countries.

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[국문초록]

해외 원조의 수출다각화 성공 조건: 수원국 인적자본과 정부제도의 역할

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개발도상국의 산업 수출 확대를 통한 빈곤 탈출 및 지속적인 경제 개발을 위해서는 저부가가치 제품 생산 활동에서 고부가가치 제품 생산 활동으로 수출 구조의 전환이 필요하다. 본 논문은 개발도상국의 수출 구조 전환을 위해 해외 원조와 수원국의 고등교육 입학률 및 제도수준이 미치는 영향에 대해 분석한다. 1988년부터 2020년까지 25개 공여국과 124개 수혜국을 대상으로 분석한 결과에 따르면, 해외 원조는 고등교육 입학률과 제도 수준이 모두 높은 수원국의 수출 다각화에 긍정적인 영향을 미치는 것으로 밝혀졌다. 구체적으로, 제도수준 하위 6개의 지표 중 5개 지표에서 해외원조의 수출다각화 효과에 긍정적이고 통계적으로 유의미한 영향을 미치는 것으로 나타났다. 특히, 고등교육 입학률이 상대적으로 낮은 수원국에서 제도의 중요성이 더욱 높게 나타났다. 이러한 결과는 교육수준이 낮은 경우, 원조를 통해 수출다각화를 개선하는 데 제도의 중요성이 높아지고, 교육수준이 높은 경우, 즉 높은 수준의 인적자본을 갖춘 경우, 제도의 중요성이 상대적으로 낮아진다는 점을 보여주었다. 이는 수출다각화를 통한 경제성장 목표를 달성하기 위해 해외원조 운용의 중요성을 인식하고, 수원국의 제도적, 교육적 요인들을 고려하여야 함을 시사한다.

주제어: 해외원조, 수출구조, 수출다각화, 인적자본, 제도수준

투 고 일: 2023.05.07.

심 사 일: 2023.05.22.

게재확정일: 2023.06.01.