

Determinants of South Korea's grants for adaptation aid

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ABSTRACT

Despite global commitments to adaptation finance, climate-vulnerable countries continue to face substantial gaps between their adaptation needs and access to financial resources. While these persistent discrepancies have motivated extensive research on donors' allocation of adaptation aid, existing studies have largely focused on multilateral institutions or aggregate donor behavior, donor-specific analyses remain underdeveloped, limiting insights into the heterogeneity of individual donor behavior. This study contributes to the literature by investigating the determinants of South Korea's grant-based adaptation aid. Using a dyadic dataset on South Korea's adaptation grants to 141 recipient countries from 2014 to 2022, the analysis applies a two-stage Cragg model. The first-stage selection model estimates the probability of adaptation grants allocation with logistic regression analysis, while the second-stage model, conditional on the selection results from the first stage, employs pooled OLS (Ordinary Least Squares) with robust standard errors to assess factors determining adaptation aid volumes. Building on the previous literature, the study tests the influence of recipient needs, recipient merits and donor interests. The results show that recipient needs (physical vulnerability and adaptive capacity) and recipient merits do not significantly influence South Korea's decisions on adaptation aid allocation, yet donor's economic interests captured by total trade emerge as the robust predictor across model specifications. These findings indicate the synergy between adaptation grants and donor's economic interests, which suggests opportunities to design adaptation programs to balance objectives to mitigate damage from climate risks and strengthen economic linkages for South Korean industries. Nevertheless, the results underscore the need for South Korea to align with international normative principles prioritizing vulnerable countries by embedding vulnerability assessment frameworks into program appraisal.

Key words: Climate Change, Grant-Based Adaptation Aid, Adaptation Finance, South Korea, Determinants

1. Introduction

Increasingly frequent and severe extreme weather events, together with gradual long-term environmental shifts, have generated what scholars describe as a new normal that disproportionately burdens developing countries with limited adaptive capacity and inadequate resilience systems (IPCC, 2022). These accelerating climate anomalies have reinforced the need for stronger

collective action, and global efforts under UNFCCC (United Nations Framework Convention on Climate Change) have sought to coordinate policies and targets across countries. Nevertheless, the Adaptation Gap Report (UNEP, 2024) underscores that highly vulnerable states continue to face substantial disparities between adaptation¹⁾ needs and available international finance, especially as countries with climate vulnerabilities have demanded greater assistance to mitigate impacts from

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climate risks (Lee and Lim, 2024). The rising demands on adaptation aid have prompted growing empirical interests in how donor communities allocate adaptation aid, that is, which determinants influence donors' decisions to allocate adaptation resources to recipient countries (Burton, 2004; Stadelmann et al., 2011).

Against the backdrop of expanding research on donors' disbursement decisions, this study examines multiple model specifications with two-stage Cragg model (Cragg, 1971) to address South Korea's allocation of adaptation finance with the research question, i.e., how South Korea determines the distribution of grant-based adaptation aid with a dyadic dataset²⁾ based on OECD CRS Rio markers³⁾ from 2014 to 2022 or what factors determine disbursement of South Korea's adaptation grants.⁴⁾ To avoid misinterpretations in the results of quantitative analysis with dataset characterized by a large number of zero-valued observations, this study distinguishes estimation models between two stages (selection and allocation) in order to identify which determinants affect South Korea's allocation system of grant-based adaptation aid in perspective of the probability of assistance and its amount (Lee and Lim, 2024).

Additionally the observed years represent fluctuations in South Korea's adaptation aid (OECD, 2024a) driven by variations in adaptation-related loans, which serves the reason for the study to focus on grant-based adaptation aid by South Korea for more stabilized analysis.

1.1. Literature Review

Existing Studies on aid allocation determinants generally converge around three perspectives: recipient needs (Clist, 2011; Mazels and Nissanke, 1984; Trumbull and Wall, 1994), recipient merits (Berthélemy and Tichit, 2004; Burnside and Dollar, 2000; Dollar and Levin, 2006; Hoeffler and Outram, 2011; Younas, 2008) and donor interests (Alesina and Dollar, 2000; Berthélemy, 2006; Tuman and Strand, 2006). Building on factors of aid allocation in general, a growing body of adaptation-specific literature has identified factors to influence disbursement of adaptation aid finance with special attention to equity, access, vulnerabilities (Barret, 2014; Betzold and Weiler, 2018; Ciplet et al., 2013; Duus-Otterstrom, 2015; Persson and Remling, 2014; Robertsen et al., 2015; Weiler et al., 2018).

However, most existing analyses center on multilateral organizations, average OECD donor behavior or pooled samples. As Clist (2011) notes, these approaches risk neglecting meaningful cross-donor variations. Although a limited number of studies have investigated individual donors such as Germany, Sweden, and the United Kingdom (Betzold and Weiler, 2018; Clist, 2011), the research on South Korea's adaptation-aid allocation remains limited. This gap is distinguishing given South Korea's rising visibility in climate change areas with its policies and commitments reflected in national initiatives such as the Green New Deal ODA Strategy (Government

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- 1) There are various definitions on adaptation. Here in this study, adaptation is defined as 'to reduce the vulnerability of human or natural systems to the current and expected impacts of climate change, including climate variability, by maintaining or increasing resilience, through increased ability to adapt to, or absorb, climate change stresses, shocks and variability and/or by helping reduce exposure to them (OECD, 2011), since the dataset is derived from OECD CRS rio markers.
 - 2) Standard panel dataset emphasizes temporal variations at the individual actors. Conversely, dyadic panel data reflects interactions between the Donor(South Korea) and recipient countries in a given year in this study, which is adequate for the study to identify which variables affect the decision making processes in line with Weiler et al. (2018).
 - 3) Rio markers are a classification system utilized by OECD (Organization for Economic Cooperation Development) to monitor aid relative to Rio conventions. Since 2011, OECD has collected adaptation-related activities reported by DAC donors through OECD CRS (Creditor Reporting System), and the adaptation dataset has become one of the most widely used sources for analysis of adaptatpion finance (OECD, 2011).
 - 4) This study deals with ODA grants as main scope of aid. ODA(Official Development Assistance) is defined as grants and loans to the official sector of countries and territories on the DAC list of ODA recipients, INGOs(International Nongovernmental Organizations), multilateral development institutions which are provided by official agencies, including states and local governments, or by their executive agencies; and each transaction of which is administered with the promotion of the economic development and welfare of developing countries as its main objective; and is concessional in character. In DAC statistics, this implies a grant element (www.oecd.org/en/topics/sub-issues/oda-eligibility-and-conditions).

of Korea, 2021).

Building on Weiler et al. (2018), the analysis assesses how three determinants—recipient needs, donor interests and recipient merits—shape South Korea's allocation decisions on grant-based adaptation aid. Consistent with Weiler et al. (2018), the study divides recipient needs into physical vulnerability and adaptive capacity to separately examine the significance of two dimensions.

- H1a. Physically vulnerable countries receive more grants for adaptation aid for climate change from South Korea. (Recipient needs)
- H1b. Countries exhibiting limited adaptive capacity benefit from more grants for adaptation aid for climate change from South Korea. (Recipient needs)
- H2. Countries with better governance receive more grants for adaptation aid from South Korea. (Recipient merits)
- H3. Countries representing more relevant economic, strategic or political interests with South Korea receive more grants for adaptation aid from South Korea. (Donor interests)

In summary, this study investigates the extent to which recipient needs, recipient merits, and donor interests influence South Korea's allocation of adaptation-related grants following Weiler et al. (2018). By doing so, it offers a focused assessment of the motivations underpinning South Korea's adaptation-finance decisions and contributes empirical evidence to the broader adaptation-aid literature.

2. Materials and Methods

2.1. Variables

2.1.1. Independent Variables

(1) Recipient Needs

① *Physical Vulnerability*

Following Weiler et al. (2018), this study firstly employs the exposure variable from the Notre Dame

Global Adaptation Index (ND-GAIN, 2024) to assess physical vulnerabilities. The measure captures countries' long-term exposure to climate change through projected changes in temperature, precipitation, and agricultural yields. Because the variable exhibits no temporal variations and is scaled from 0 to 1, it helps to reduce potential collinearity. Consistent with the hypothesis H1a, the study expects a positive relationship, whereby countries with higher exposure value receives greater bilateral grants for adaptation aid by South Korea.

In line with Weiler et al. (2018), the second indicator is the Climate Risk Index (CRI) (Germanwatch, n.d.), which quantifies short-term damages of extreme weather events based on human and economic losses. The measure focuses on short-term climate extremes and is published annually. Lower CRI values denote higher vulnerability, therefore, the variable is inverted for analytical alignment with the ND-GAIN exposure index and prior studies. Under this specification, the study anticipates a positive relationship between CRI and South Korea's grants for adaptation aid, consistent with the hypothesis H1a.

② *Adaptive Capacity*

Adaptive capacity in this study is measured using three dummy variables (least developed countries (LDCs), African countries, and small island developing states (SIDS)), GDP per capita, and the ND-GAIN adaptive capacity index. The three group dummies capture countries with limited adaptive capacities: LDCs and African countries imply limited financial resources, whereas SIDS represent heightened exposure to climate-vulnerable risks. Following Weiler et al. (2018), the study treats these categories separately, recognizing that donors often differentiate their interventions across groups. Consistent with this, a positive relationship is expected between three vulnerable dummies and South Korea's grant-based adaptation aid.

Consistent with Weiler et al. (2018), GDP per capita is a measure for domestic financial capacity to manage climate risks. The variable is retrieved from the World Development Indicators, log-transformed to address skewness and specified with one-year lag. As national

income increases, countries can increasingly finance their own adaptation measures, reducing dependence on external support. Accordingly, the hypothesis H1b anticipates a negative linear relationship between GDP per capita and South Korea's grants for adaptation aid.

Lastly, the adaptive capacity sub-index of ND-GAIN (scaled 0–1) captures countries' capacities in six sectors—water, food, ecosystem services, health, infrastructure, human habitat—summing up 12 indicators including disaster-preparedness systems, infrastructure quality, access to sanitation and electricity. Because higher values denote lower adaptive capacity, and the variable is specified with one-year lag, the study expects a positive relation between this measure and South Korea's grants for adaptation aid.

(2) Recipient Merits

In line with Weiler et al. (2018), the World Bank's Worldwide Governance Indicators (WGIs) (World Bank, 2024b) represent one of the most widely used cross national datasets for assessing governance quality. The variable is composed of six composite dimensions including political stability and absence of violence/terrorism, rule of law and control of corruption, regulatory quality. This study employs WGIs (World Bank, 2024b) to capture recipient governments' institutional quality. In alignment with Weiler et al. (2018), all the dimensions are summed up with equal weights. The variable is specified with one-year lag in the models. Higher WGI scores suggest stronger governance capacity, therefore the analysis expects a positive relationship between WGIs and grants for adaptation aid by South Korea.

Secondly as for environment governance indicator, Weiler et al. (2018) argue that efficient resource use enhances countries' capacity to manage climate-related risks, placing it as a key component of good governance. Accordingly, environment governance in this study refers to the institutional and legal arrangements through which states manage environmental resources and climate challenges. Empirically, it is captured through a composite "Environment Governance" variable that sums

a country's ratification of three Rio Conventions (UNFCCC, the Convention to combat desertification and Convention on Biological Diversity) and the establishment of National Adaptation Plan (NAP) (UN, 2024). Each ratified convention and the existence of NAP contribute one point, yielding scores from 0 to 4.

Since 1998, OECD has tracked support for Rio Conventions using Rio markers (OECD, 2011), and UNFCCC (2024) highlights the establishment process under COP16 to support national adaptation planning. The variable is lagged by one year. Higher scores reflect stronger environmental governance, and the analysis anticipates that higher values on this measure correspond to greater allocation of South Korea's adaptation grants.

(3) Donor Interests

To capture donor interests, this study first employs trade flows (exports and imports) from South Korea to recipient countries using annual trade data from the Korea International Trade Association (KITA, 2025), which differs from Weiler et al. (2018), in order to reflect the context of South Korea where imports as well as exports are equally important in the sense that imports of natural resources of recipient countries play critical roles in manufacturing products and goods to be exported.

The variable is log-transformed to address skewness and specified with one-year lag. Higher trade levels indicate greater economic engagement and, by extension, stronger donor interests. Accordingly, the study expects a positive correlation between trade volume and South Korea's grants for adaptation aid.

Secondly, similarities in diplomatic positions are measured using voting alignment at UN General Assembly (Weiler et al., 2018). Following Bailey et al. (2017), ideal points are estimated through an Item Response Theory (IRT) model and normalized to a mean of zero and a standard deviation of one. Ideal points are updated annually, specified with one-year lag. The study anticipates a positive relationship between diplomatic similarity between two countries and South Korea's adaptation-related grants.

Thirdly, geographic distance is used as an indicator of

strategic interests. Bilateral distance data are taken from the CEPII Gravity data (CEPII, 2024), log-transformed and defined as the distance between national capitals. Donors typically exhibit stronger strategic interests in geographically closer countries (Betzold and Weiler, 2018; Clist, 2011; Weiler et al., 2018). Consistent with this, the study expects a negative relationship between distance and South Korea's grants for adaptation aid, implying that closer partners receive larger volumes of assistance.

Lastly, the indicator of overseas visits by heads of state is employed as a measure to represent political interests of donors. Foreign visits by heads of state tend to occur in pursuit of national interests in international relations and involve high-level decisions between political leaders to facilitate diplomatic processes. Diplomatic contacts in person are likely to expedite decision-making processes (Jung, 2022). The indicator sums up all of both inbound and outbound heads of state visits of both countries in a given year, which is specified with one-year lag. The measure is expected to have a positive relationship with South Korea's adaptation grants.

2.1.2. Dependent Variables

Consistent with Weiler et al. (2018), this study constructs a dyadic panel dataset of South Korea's grants for adaptation aid to recipient countries from 2014 to 2022 using the OECD Creditor Reporting System (OECD, 2024b) in constant 2022 USD. The dependent variables are derived from Rio-marker classifications for climate change adaptation, which require donors to identify whether adaptation is the principal or a significant objective (OECD, 2011).

Extensive literature conducts analysis on limitations on the Rio markers. Previous literature indicates risks of double counting caused by flexibilities in interpretations of adaptation activities and inconsistencies of reporting across donor agencies. These are exacerbated by self-reporting nature, therefore empirical assessments

identify over-reporting of adaptation aid especially with projects in the category of significant adaptation aid (Michaelowa and Michaelowa, 2011; Weikmans et al., 2017).

To address over-reporting and limitations of Rio markers in line with Weiler et al. (2018), Adaptation Watch (2015) and Wingqvist et al. (2011), this study constructs two specifications: (a) per-capita⁵ grants for principal adaptation aid and (b) per-capita grants for principal plus 50% discounted significant adaptation aid, which is a method in line with practices in accounting of climate change for donors. Annual commitments are aggregated for each South Korea-recipient dyad and log-transformed, and zero values are assigned when no adaptation grants are reported.

Per-capita values are calculated by dividing annual commitments by population size retrieved from the World Development Indicators (World Bank, 2024a). Using both specifications enhances robustness and improves the validity of the dependent variables by reducing potential over-reporting in adaptation-aid reporting.

2.1.3. Control Variables

Building on Weiler et al. (2018), this study includes total grants per capita from South Korea as a control variable. It is constructed from OECD CRS data by dividing annual grant commitments by population figures from the World Development Indicators (World Bank, 2024a). This variable is specified with one-year lag and transformed using the logarithm to correct for skewness. Since grants for adaptation aid constitute a subset of total grant aid, the two are expected to correlate strongly.

The number of population for recipient countries serves as a second control variable, also drawn from the World Development Indicators (World Bank, 2024a). As noted by Weiler et al. (2018), more populous countries tend to attract greater strategic attention, yet population size simultaneously reduces per-capita grant levels. The variable is lagged by one year and log-transformed.

5) The purpose to use per capita adaptation aid is to enhance cross-country comparability in line with Weiler et al. (2018). Total absolute aid volumes may fail to capture the relative intensity of adaptation aid distributed to individuals of recipient countries.

Accordingly, the variable is expected to be positively associated with the likelihood of receiving South Korea’s grants for adaptation aid at the selection stage but negatively related with per-capita allocations at the allocation stage.

2.2. Methods

Drawing on previous literature (Betzold and Weiler, 2018; Clist, 2011; Weiler et al., 2018), this research utilizes a two-stage Cragg model to explore the determinants of South Korea’s grants for adaptation aid. Consistent with prior works, the first stage examines the likelihood that South Korea selects a recipient country for adaptation grants, whereas the second stage estimates the amount allocated. As Clist (2011) notes, the two stages are econometrically distinct; therefore, second-stage findings should be interpreted conditionally on receiving South Korea’s adaptation grants. Highly skewed variables are log-transformed to approximate a normal distribution, and all time-variant predictors are specified with one-year lag⁶⁾ to account for decision-making delays. Year fixed effects are incorporated to capture annual variations.

Following Weiler et al. (2018), the empirical strategy specifies four models. Models 1 and 2 estimate per-capita principal grants for adaptation aid, using the ND-GAIN exposure sub-index in Model 1 and the Climate Risk Index (CRI) in Model 2. Models 3 and 4 expand the dependent variable to include principal grants plus 50% discounted significant adaptation aid per capita while retaining the same variables. The analysis is conducted using the STATA program. The equation of the first model is as follows;

$$\begin{aligned} \text{logit}(\pi_i) &= \beta_0 + \beta_1 x_{1i} + \dots + \beta_n x_{ni} \\ \pi_i &= P(y_i = 1 | x_{1i}, \dots, x_{ni}) \end{aligned} \tag{1}$$

The X_{ni} denote the set of explanatory variables

affecting the likelihood that South Korea provides grants for adaptation aid. Year fixed effects are incorporated in all specifications for both the selection and allocation stages.

The second model estimates the conditional outcome for recipient countries where $y1_i$ equals 1. The dependent variable $y2_i$, which is bigger than 0, measures the amount of grants for adaptation aid commitments in constant 2022 USD. At the second stage pooled OLS with robust standard errors is used due to the heteroscedasticity in regression model. The second stage equation is:

$$y2_i = \beta_0 + \beta_1 x_{1i} + \dots + \beta_n x_{ni} + \epsilon_i \tag{2}$$

where X_{ni} are independent and control variables for South Korea to determine the amount of grants for adaptation aid to recipient countries and ϵ is the error term.

3. Results and Discussions

3.1. Descriptive Statistics

Findings indicate that international adaptation grants from 2014 to 2022 reflect a steadily expanding financing landscape. Donors committed approximately USD 136.75⁷⁾ billion, surpassing mitigation allocations. This expansion was driven largely by significant-objective adaptation grants programs (USD 103.87 billion), rather than principal-objective adaptation grants (USD 32.88 billion). Adaptation finance during this period concentrated in climate-sensitive sectors, including agriculture (19%), general environmental protection (15.2%), multi-sector activities (12.7%), and water supply and sanitation (10%). Least developed countries (LDCs) received the largest share (32.19%) among income groups, yet a substantial proportion (41.5%) was directed to global or regional programs, underscoring the role of global-level interventions. Governments were the dominant channels

6) While South Korea’s ODA project formulation follows an N-2 planning framework, substantive inter-ministerial decision making processes with Ministry of Foreign Affairs, Prime Minister’s Office, and Ministry of Finance tend to be concentrated in N-1 year. A one-year lag therefore captures the timing at which explanatory variables influence adaptation aid allocation. Methodologically, applying two-year lag is more likely to result in reduced statistical precision.

7) All the adaptation aid are represented in constant 2022 USD in commitments.

Table 1. Summary statistics for all numerical variables in statistical models

Variables	Observations	Mean	SD	Min	p50	Max
Exposure	1,048	0.454	0.079	0.267	0.46	0.722
CRI (inverted)	758	0.01912	0.0260861	0.008	0.012307	0.429184
LDC dummy	1,224	0.346	0.476	0	0	1
SIDS dummy	1,224	0.227	0.419	0	0	1
Africa dummy	1,224	0.389	0.487	0	0	1
GDP per capita	1,194	4,181.44	3,511.76	262.18	3,301	18,357.68
Adaptive capacity	976	0.606	0.125	0.368	0.61	0.899
WGI	1,215	-2.928	3.819	-13.16	-2.817	5.221
Environment governance	1,224	2.306	1.079	0	3	4
Total trade (mn, USD)	1,224	3,660	22,600	0	110	310,000
Distance (km)	1,197	9,842.646	3,896.171	955.651	10,261.17	19,447.35
Population (mn)	1,224	46	169	0.01	9.9	1,420
UN voting at general assembly	1,195	1.354	0.569	0	1.4	7.88
Overseas visits by heads of state	1,215	0.079835	0.2944517	0	0	2
Total grant aid (mn, USD)	1,224	7.2	13.9	0	1.104	149.5
Grant-based adaptation aid	1,224	0.798	2.87	0	0.0001	33.082

(37.9%), with recipient governments accounting for 16.7%, alongside multilateral organizations (29.2%), NGOs (17.7%), and the private sector (5%). OECD DAC members provided 92.6% of adaptation-grant commitments, led by EU institutions, the United States, Germany, the Netherlands, and the United Kingdom. South Korea contributed USD 1.1 billion during this period, ranking 15th among donor groups. Overall, the data highlights the rising centrality of adaptation grants and a diversified set of channels and modalities.

Against this global backdrop, South Korea's grant-based adaptation finance rose substantially from USD 42.49 million in 2014 to USD 325.49 million in 2022—an increase of more than six-fold—driven largely by KOICA, which accounted for 70% of South Korea's adaptation grants with focus on adaptation interventions. By income group, low- and middle-income countries (LMICs) received the largest share (40.6%), followed by LDCs (34.6%), while upper-middle-income countries (UMICs) and unallocated programs received smaller portions. Sectorally, South Korea concentrated its adaptation grants in agriculture (20%), water supply and sanitation (16.3%), and multi-sector activities (12.7%). Donor-government channels dominated (58%), compared

with 34% through multilateral organizations. Project-type interventions accounted for 87%, reflecting South Korea's emphasis on scalable adaptation programs.

Taken together, three patterns emerge. Firstly, both international donors and South Korea expanded their adaptation-grants portfolios, with South Korea showing sharper growth since 2018. Secondly, while global adaptation finance heavily supported unallocated or regional programs, South Korea demonstrated a more country-specific orientation, directing most resources to LMICs and LDCs and channeling around 70% of total adaptation grants through KOICA (Korea International Cooperation Agency). Lastly, in terms of sectors, both prioritized agriculture, water, and multi-sector interventions. However, international donors utilized diverse channels in relatively balanced portions whereas South Korea predominantly relied on the Donor government channel (South Korea).

3.2. Regression Results

Table 2 and 3 represent results of regression analysis with two dependent variables. Table 2 presents the findings from selection stage for two dependent variables, while Table 3 shows those of allocation stage for the

same dependent variables.

3.2.1. Recipient Needs

(1) Physical Vulnerability

The exposure sub-index of ND-GAIN shows statistically significant and positive effect in Models 3 of Table 2 at the selection stage; however, it does not retain significance in the allocation stage for each dependent variable. These findings indicate that the indicator fails to support the hypothesis H1a, suggesting that South Korea does not consider higher long-term physical vulnerabilities.

Additionally, the Climate Risk Index (CRI) does not have statistical importance with two dependent variables in Table 2 at the selection stage, yet the measure shows statistical significance with positive coefficients on the dependent variables in Models 2 and 4 of Table 3 at the allocation stage, suggesting that countries with short-term climate risks are not likely to be prioritized to receive

grant-based adaptation aid by South Korea but, once chosen, they tend to receive larger amounts of adaptation grants. Overall, these findings do not support the hypothesis H1a.

(2) Adaptive Capacity

Turning to vulnerable statuses (LDCs, Africa, and SIDS), the LDC dummy is negatively related with both dependent variables and is statistically significant across all models in Tables 2 and 3 at both stages. This result does not validate the hypothesis H1b, indicating that LDC status does not drive South Korea's allocation of grants for adaptation aid. The Africa dummy is statistically insignificant in all models in Table 2 and 3 at both stages except Models 2 in Table 2 and 3 respectively where coefficients are positive at the selection stage and negative at the allocation stage. These results also do not validate the hypothesis H1b, suggesting that Africa is not prioritized for South Korea's adaptation grants.

Table 2. Selection stage: Logistic regression analysis

	M (1)	M (2)	M (3)	M (4)
	Dev1: grants for principal adaptation aid per capita		Dev2: grants for principal and discounted significant adaptation aid per capita	
Exposure	1.960 (1.554)		3.466** (1.459)	
CRI		0.097 (0.176)		0.030 (0.210)
LDC dummy	-1.274*** (0.337)	-1.244*** (0.382)	-1.297*** (0.359)	-1.248*** (0.398)
SIDS dummy	0.586* (0.349)	0.677* (0.403)	0.392 (0.327)	0.486 (0.394)
Africa dummy	-0.370 (0.274)	-0.719** (0.319)	-0.277 (0.278)	-0.434 (0.330)
GDP per capita	-1.023*** (0.221)	-1.401*** (0.263)	-0.944*** (0.234)	-1.236*** (0.265)
Adaptive capacity	-1.122 (1.298)	-2.154 (1.485)	-1.117 (1.352)	-1.567 (1.588)
WGI	0.044 (0.042)	0.069 (0.049)	0.075* (0.043)	0.114** (0.047)
Environment governance	-0.019 (0.124)	-0.058 (0.158)	-0.027 (0.121)	-0.215 (0.163)
Total trade	0.196*** (0.065)	0.224*** (0.078)	0.210*** (0.069)	0.269*** (0.085)
Geographic distance	-0.090 (0.252)	-0.050 (0.289)	-0.738** (0.337)	-0.501 (0.367)
UN voting at general assembly	0.587 (0.750)	2.470*** (0.929)	0.649 (0.889)	3.492*** (1.133)
Overseas visits by heads of state	0.341 (0.311)	0.227 (0.328)	0.065 (0.419)	0.061 (0.465)
Total grants aid per capita	2.902*** (0.342)	2.382*** (0.407)	3.633*** (0.505)	3.934*** (0.726)
Total population	0.323*** (0.118)	0.202 (0.144)	0.426*** (0.115)	0.355*** (0.145)
con	-1.997 (3.269)	5.305 (3.842)	3.138 (3.429)	7.651* (4.136)
N	916	665	916	665
Loglikelihood	-428.297	-318.669	-419.151	-298.289

Note: *p<0.10, **p<0.05, ***p<0.01; robust standard errors in parentheses; year dummies included but not shown

Table 3. Allocation stage: Pooled OLS with robust standard errors

	M (1)	M (2)	M (3)	M (4)
	Dev1: principal adaptation grants per capita		Dev2: principal and discounted significant adaptation grants per capita	
Exposure	0.003 (0.056)		-0.048 (0.066)	
CRI		0.009** (0.004)		0.011* (0.006)
LDC dummy	-0.027*** (0.010)	-0.031*** (0.011)	-0.031** (0.013)	-0.034 (0.014)
SIDS dummy	0.008 (0.015)	0.002 (0.013)	0.031* (0.017)	0.011 (0.017)
Africa dummy	0.009 (0.009)	0.019* (0.010)	0.001 (0.01)	0.016 (0.011)
GDP per capita	-0.003 (0.006)	0.000 (0.007)	-0.014 (0.009)	-0.003 (0.010)
Adaptive capacity	0.102** (0.050)	0.121*** (0.046)	0.069 (0.060)	0.101* (0.057)
WGI	0.001 (0.001)	0.001 (0.001)	0.002 (0.002)	0.002 (0.002)
Environment governance	0.004 (0.004)	-0.001 (0.005)	0.009 (0.006)	0.005 (0.007)
Total trade	0.005* (0.003)	0.005* (0.003)	0.003 (0.003)	0.003 (0.003)
Geographic distance	-0.005 (0.007)	-0.006 (0.009)	-0.010 (0.008)	-0.013 (0.009)
UN voting at general assembly	0.008 (0.041)	-0.015 (0.039)	0.009 (0.042)	-0.033 (0.044)
Overseas visits by heads of state	0.010 (0.008)	0.009 (0.008)	0.012 (0.011)	0.005 (0.011)
Total grants per capita	0.028*** (0.008)	0.031*** (0.009)	0.090*** (0.013)	0.096*** (0.014)
Total population	-0.015*** (0.004)	-0.015*** (0.004)	-0.014*** (0.005)	-0.014*** (0.005)
con	0.158 (0.096)	0.131 (0.107)	0.339*** (0.128)	0.222 (0.138)
N	344	264	518	396
R-sq	0.328	0.395	0.404	0.429

Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; robust standard errors in parentheses; year dummies included but not shown

The SIDS dummy shows statistical significance only in Models 1 and 2 of Table 2 at the selection stage, with positive coefficients for principal adaptation grants per capita. However, it loses significance in nearly all allocation-stage models, except Model 3 of Table 3 at allocation stage. This evidence does not support the hypothesis H1b, indicating that SIDS are not considered to be prioritized in South Korea's grant-based adaptation aid.

The adaptive capacity sub-index of ND-GAIN shows no statistical significance in selection-stage model but becomes significant with positive coefficients in all allocation-stage models except Model 3 of Table 3. These findings do not support the hypothesis H1b, suggesting that the variable does not influence the likelihood of receiving grants for adaptation aid, but among selected countries, those with limited adaptive capacity tend to benefit from larger adaptation grants by South Korea.

Finally, GDP per capita is negatively related with both

dependent variables and statistically significant in all selection-stage models in Table 2. However, it loses significance in all allocation-stage models in Table 3. Thus, the evidence does not validate the hypothesis H1b, indicating that GDP per capita affects the likelihood of receiving South Korea's adaptation grants but does not determine the volume of support once countries are selected.

3.2.2. Recipient Merits

For recipient merits, WGIs display positive, significant coefficients in Models 3 and 4 of Table 2 at the selection stage, yet the variable loses statistical significance in all Models of Table 3 at the allocation stage. These results do not support the hypothesis H2, indicating that governance quality exerts limited influence on South Korea's grants for adaptation aid.

Environment governance is statistically insignificant across all models in Tables 2 and 3. Thus, the results fail

to validate the hypothesis H2, suggesting that environment governance does not shape South Korea's allocation of grants for adaptation aid.

3.2.3. Donor Interests

Regarding donor interests, total trade to recipient countries show positive and statistically significant effects on both dependent variables across all four selection-stage models in Table 2 and two allocation-stage models (Models 1 and 2) in Table 3. These findings validate the hypothesis H3, indicating that higher levels of South Korean exports increase both the likelihood of being chosen for adaptation grants and the amount received.

Geographic distance consistently displays negative coefficients across all model specifications in Tables 2 and 3, though statistical significance appears only in Models 3 of Table 2 at the selection stage. These patterns do not support the hypothesis H3, suggesting that geographic proximity does not meaningfully influence South Korea's grant-based adaptation aid allocation.

UN voting alignment shows limited statistical significance only in Models 2 and 4 of Table 2 at the selection stage, where the measure is positively related with the likelihood of allocation of grants for adaptation aid. However, it isn't statistically important in all allocation-stage models in Table 3. These findings do not support the hypothesis H3, indicating that the variable does not play a substantive role in determining South Korea's grants for adaptation aid.

Lastly, the measure of overseas visits by heads of state is statistically insignificant across all models in Tables 2 and 3. Thus, the results do not support the hypothesis H3, meaning that the measure does not determine South Korea's allocation of adaptation grants.

3.2.4. Control Variables

Across all models in Tables 2 and 3, South Korea's total grants per capita are positively and statistically significantly related with two dependent variables at both stages. This pattern indicates that this variable is the strong predictor of South Korea's grants for adaptation

aid among all explanatory variables.

For the population size, the results show statistical significance in most model specifications—Models 1, 3, and 4 of Table 2 at the selection stage, and all the Models of Table 3 at the allocation stage. Population is positively related with the likelihood of receiving adaptation grants at the selection stage, but negatively associated with per-capita allocations at the allocation stage. These findings imply that population increases the probability of selection for South Korea's grants for adaptation aid, yet more populous countries typically receive a smaller proportion of adaptation aid per capita.

4. Conclusion

Vulnerable countries facing unprecedented climate risks continue to experience substantial gaps between adaptation needs and international support (UNEP, 2024). These persistent discrepancies have motivated studies on adaptation-aid allocation at the aggregate level of OECD DAC donors or multilateral organizations. However, despite the importance of analytical value on individual donors (Clist, 2011), studies examining individual donors—including South Korea—remain limited.

Against this backdrop, this study investigates the drivers shaping South Korea's grants for adaptation aid using a two-stage Cragg Model and a dyadic dataset covering 141 recipient countries from 2014 to 2022. Building on prior studies (Betzold and Weiler, 2018; Clist, 2011; Weiler et al., 2018), the first-stage selection model estimates the probability that countries receive South Korea's grants-based adaptation aid, while the second-stage allocation model uses pooled OLS with robust standard errors to examine determinants of the amount allocated. The analysis evaluates how recipient needs, recipient merits, and donor's interests shape South Korea's allocation patterns by testing four hypotheses.

Regarding recipient needs, the findings show that physical vulnerabilities don't influence South Korea's allocation decisions, in contrast to previous studies (Betzold and Weiler, 2018; Weiler et al., 2018). Both short-term climate risks as well as long-term

vulnerabilities don't play roles in South Korea's allocation of adaptation grants.

Adaptive capacity—captured through vulnerable statuses (LDCs, Africa, SIDS), the ND-GAIN adaptive capacity index, and GDP per capita—does not generally motivate South Korea's allocation decisions. These findings align with existing research (Betzold and Weiler, 2018; Weiler et al., 2018), except for GDP per capita, which shows a distinct effect in Weiler et al. (2018).

In contrast to prior studies (Berthélemy and Tichit, 2004; Dollar and Levin, 2006; Weiler et al., 2018), this research finds that recipient merits—World Governance Indicators (WGIs) and environment governance—do not determine South Korea's allocation of grants for climate change adaptation.

Turning to donor's interests, total trade from South Korea to recipient countries consistently emerge as a strong predictor of adaptation-aid allocation. This suggests that South Korea places greater weight on economic interests relative to diplomatic or strategic interests, reflected in UN General Assembly voting alignment, geographic distance and overseas visits of heads of state. These results are consistent with earlier findings (Berthélemy, 2006; Tuman and Strand, 2006).

Taken together with all the statistical findings, the quantitative results indicate that donor interests significantly determine South Korea's allocation of grants for adaptation aid. Among all the measures, total trade (exports and imports) emerge as the most influential predictor, demonstrating strong and consistent statistical effects on its decisions on allocation of grants for adaptation aid.

The results further suggest strong interplay between South Korea's adaptation grants and economic interests. This pattern implies the opportunities for South Korea to pursue adaptation objectives while maintaining economic partnerships by designing programs that address climate-related risks in vulnerable countries with economic engagement. This approach would allow South Korea to integrate both objectives into program design by actively utilizing public-private partnerships or formulating adaptation aid programs in areas where South

Korea's industries have comparative advantages.

Nevertheless, these findings indicate that South Korea's grant-based adaptation aid does not systematically consider recipient needs in the context of physical vulnerability and adaptive capacity in decision making processes on distribution of adaptation aid. Integrating vulnerability and adaptive capacity indicators in program appraisal frameworks would allow South Korea to align with international normative principles to put priorities on vulnerable countries in allocating adaptation finances. (Duus-Otterström, 2016; Grasso, 2010)

Finally challenges on interpretations of statistical results on rejected hypotheses lead to future studies on qualitative analysis on how recipient needs (physical vulnerability and adaptive capacity), recipient merits or donor interests are operationalized at organizations with interviews with policy makers or document reviews.

Acknowledgment

This paper is based on parts of the doctoral dissertation of co-author (Kim, Soyoung) at Kyunghee University.

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