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**Institutional Quality and the Principal–Agent
Problem in Renewable Energy ODA**
Evidence from GMM Panel Modelling



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Authorship declaration

“I hereby declare and confirm that this thesis is entirely the result of my own work except where otherwise indicated. I acknowledge the supervision and guidance I have received from Prof. Manisha Jain. This thesis is not used as part of any other examination and has not yet been published.”

13.08.2025.

Teresa Mañé Baldó

A handwritten signature in blue ink, consisting of a large, stylized 'T' and 'M' followed by a long horizontal stroke and a small flourish at the end.

Abstract

This thesis examines how institutional quality influences the allocation of climate-related Official Development Assistance (ODA) for renewable energy projects in developing countries, using the principal-agent framework. Donors face information asymmetries and agency risks when funding recipients, and measurable governance indicators may act as credibility signals that reduce monitoring costs and perceived risk. Using panel data for 42 developing countries from 2013-2023, a system Generalized Method of Moments (GMM) estimator is applied to account for dynamic effects and endogeneity. Results show strong path dependence in ODA flows, with past disbursements significantly predicting future allocations. Several institutional dimensions are positively associated with renewable energy ODA, suggesting donors reward governance characteristics aligned with effective implementation and market-friendly environments. Findings contribute to climate finance literature by disaggregating institutional quality measures and identifying specific governance attributes that attract green energy ODA, offering policy insights for recipient countries seeking to mobilize resources for the energy transition.

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A.Introduction

Since 1880, temperatures have been rising, intensifying global warming. Concerns have been growing among economists and market participants—with reason—since 98 per cent of the world has experienced warming (Tolliver et al., 2020). There is a great need for investment to confront this crisis and mitigate the disruptions it will cause.

The warming has already happened so the next course of action is to avoid further increases in temperature and adapt to existing changes; this requires allocation of limited resources which is more challenging for developing countries. Even though they are the ones that have contributed the least to global greenhouse gas emissions, they are the ones that will be more heavily impacted. Paradoxically, they are also the ones with the least resources to cope and adapt. Recognizing this, in 1992 developed countries agreed on the United Nations Framework Convention to Climate Change (UNFCCC), to assist those developing countries in most need and “particularly vulnerable” to climate change (UNFCCC, 1992 article 4.4, as cited in Weiler et al., 2018). At the 2009 Copenhagen Summit (*UNFCCC*, 2009.), developed nations formally committed to supporting climate action in developing countries. They pledged US\$30 billion in "fast-start finance" for 2010–2012, while setting a longer-term goal to mobilize US\$100 billion annually by 2020 for mitigation and adaptation efforts in the Global South (UNFCCC, 2009, Decision 2/CP. 15, para 8, as cited in Weiler et al., 2018). The Paris Agreement later reaffirmed this target and emphasized the need to substantially increase adaptation funding (UNFCCC, 2015, Preamble, para 114, as cited in Weiler et al., 2018).

Most recently, during the COP29 UN Climate Conference, it was agreed to triple finance to developing countries to protect the people and economies from climate disasters and take part in the wide benefits of the clean energy boom. The New Collective Quantified Goal (NCQG) targets at least \$300 billion annually by 2035 (UNFCCC, 2024).

Currently, most of the finance utilized by developing countries and LDCs to make front and support climate action is from Official Development Assistance (ODA). Almost 80 per cent of climate finance flows since 2019 have been in the form of ODA (WTO, 2024). Energy accessibility and clean energy transition have increasingly become priorities for ODA donors and South-South partners, with a particular focus on clean energy. Given the scale and urgency of the energy transition challenges, there needs to be a rapid and wide mobilization of finance (WTO, 2024).

But it must be considered that foreign aid faces numerous challenges. According to Svensson (2006), the cause is its unique institutional design. He considers three main issues that pose an obstacle to the benefit maximization of aid, for both donors and recipients. Firstly, the geographical and political separation between the financiers (taxpayers in donor countries) and the beneficiaries (clients in recipient countries), means there is an absence of direct experience or information about the actual impact of the aid programs, making it difficult to hold anyone accountable for poor performance. On the other hand, aid beneficiaries in recipient countries, don't have any formal political leverage over

donor politicians who approve of these programs. This creates a “broken information/accountability feedback loop”.

Secondly, aid largely functions as a government-to-government relationship between sovereign nations, which imposes “binding political constraints” on donors’ actions to alleviate poverty. Donor’s internal incentive systems often prioritize the volume of aid disbursed over its quality or actual development outcomes (Killick, 1997; Svensson, 2006).

Finally, the involvement of multiple donor agencies creates significant coordination failures. This leads to increased transaction costs due to diverse rules and procedures, duplication of analytical work, and missed opportunities. It can also undermine the recipient country’s financial and administrative capacity to govern effectively (Killick, 1997; Svensson, 2006).

These limitations show that, although climate-related ODA is vital for helping developing countries tackle climate change, its effectiveness can be affected by the structural and institutional challenges inherent to the aid system. Recognizing these obstacles is essential for understanding the factors that influence how aid is delivered and the extent to which it can achieve its intended goals.

B.Theoretical Framework

I. Economic Freedom, Institutional Quality and Renewable Energy

Environmental change represents one of the world's most pressing concerns. The energy produced through conventional methods significantly degrades environmental quality. While the world is transitioning to renewable energy, a key challenge remains: high energy demand coupled with insufficient production capacity (Mu, 2024).

According to Mu (2024), economic freedom safeguards basic human rights by protecting individuals' ability to control their own property and labour. In a free market, people can create, work, invest, and consume as they choose, provided they respect others' rights. A free economy's government permits the unrestricted movement of people, products, capital, and labour, limiting freedom only when necessary to protect and maintain these freedoms.

In recent decades, rising energy consumption has driven increased production. Countries with limited renewable energy resources have relied more heavily on traditional energy sources, which negatively impact both the environment and the economy (Hussain et al., 2022; Zeraibi et al., 2023, as cited in Mu, 2024). The adoption of renewable energy promotes economic prosperity, which in turn enhances economic freedom. Thus, green investment creates a pathway to economic freedom through economic prosperity (Dirma et al., 2024; Elbargathi & Al-Assaf, 2024). Studies of African nations show that stringent property rights and tax burdens tend to decrease renewable energy consumption, whereas

greater trade and business flexibility promotes it. Similarly, research on the EU and G20 demonstrates that renewable energy adoption has substantially influenced economic freedom (Mu, 2024).

Further, the literature links economic freedom with institutional quality, human capital, and corruption control, noting that their effects can vary by region and governance quality (Duan et al., 2022; Malanski & Póvoa, 2021, as cited in Mu, 2024). Macroeconomic variables such as inflation, foreign direct investment, and exchange rates also play a significant role in determining a country's level of economic freedom (Law & Soon, 2020; Şenalp, 2019; Rapsikevicius et al., 2021, as cited in Mu, 2024).

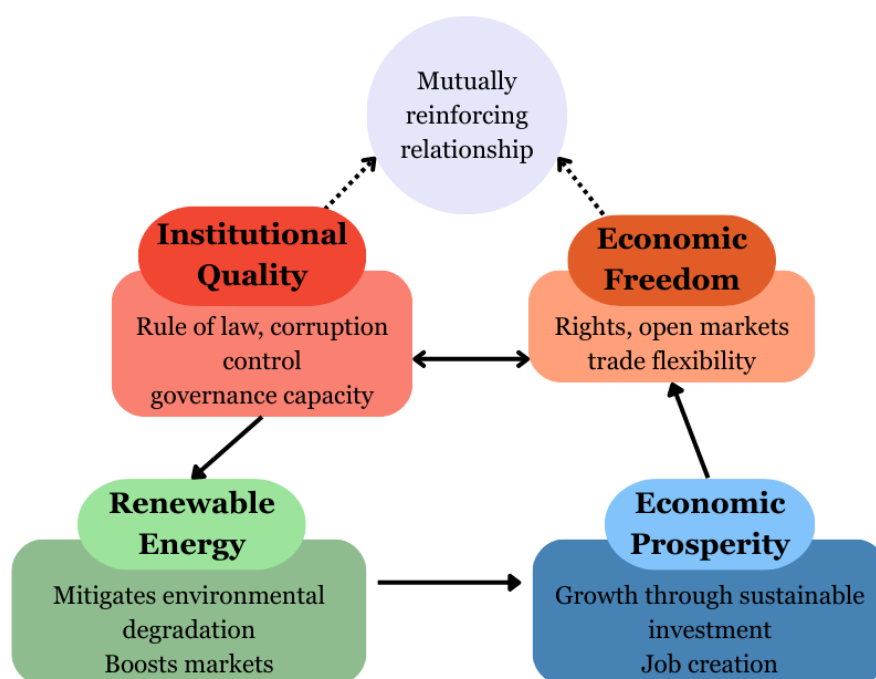
Institutional quality refers to the combined performance of human-designed constraints in the political, economic, and social interactions of a country or region (Duan & Wan, 2025). Douglass North characterized institutions as “the rules of the game” that shape social behaviour. He argues that strong institutions reduce transaction costs, enhance cooperation, and maintain adaptability and sustainability in changing socioeconomic contexts (Faundez, 2016). Institutional quality is a multidimensional concept involving efficiency, legitimacy, predictability, and adaptability, which collectively influence social and economic outcomes. The indicators for institutional quality can reflect institutional capacity and foster development and trust (Duan & Wan, 2025).

The relationship between economic freedom and institutional quality is reciprocal. According to Vondrová & Fífešková (2016), economic freedom is the part of institutional quality that allows for social responsibility and business

environment. It is what allows for the necessary conditions for investment to happen, and it reinforces the credibility of a country.

To summarize, economic freedom and institutional quality are mutually reinforcing drivers that can accelerate the renewable energy transition. Additionally, renewable energy development not only mitigates environmental degradation but also strengthens economic freedoms by expanding market opportunities, enhancing energy security, and reducing dependency on fossil fuel markets. This relationship indicates that policies aimed at improving governance structures and safeguarding economic freedoms can have a dual benefit: advancing both sustainable energy goals and broader socio-economic development.

Figure 1 Interconnections between institutional quality, economic freedom, and renewable energy in driving economic prosperity



II. Principal agent theory in donor – recipient relationships

The literature has long debated how development aid is allocated, with three main models explaining donor behaviour. Early research identified two contrasting approaches: the *recipient needs* model and the *donor interest* model. The *recipient needs* model views aid as primarily humanitarian, directed toward poverty alleviation and basic development challenges. The donor interest model, however, suggests that aid allocation is driven by donors' strategic priorities, including political alliances, trade relationships, and security concerns. These models predict different outcomes: *recipient need* suggests aid should go to the poorest and most vulnerable nations, while *donor interest* predicts aid will flow to geopolitically or economically important partners. A third model, *recipient merit*, emerged in the 1990s. This approach suggests donors prefer to give aid to countries with strong institutions and sound policies, either to reward good governance or because well-governed countries are believed to use aid more effectively (Berthélemy, 2006; Burnside & Dollar, 2000, as cited in Weiler et al., 2018).

Throughout the years, the question has risen as to why foreign assistance programmes have so rarely achieved the goals they set out for. After the Second World War, there were transfers from developed countries to developing countries, but still many developing countries have not seen improvement in economic growth. Martens et al., (2002) attribute this to the set of incentives that the actors involved in the chain of aid delivery face.

This argument is based on the principal – agent relationship. This relationship has one person, the “principal”, which benefits when another person the “agent”

performs a task with care and effort (Posner, 2000). The conflict arises because the agent has private information about its own goals, and the amount of effort they want to invest in the realization of the principal's objective. To address this, principals must write contracts which achieve the alignment of interest of both parties involved (Posner, 2000).

This relationship appears with public agencies. In this context, the principal is represented by the public. To control the agent, since it is not possible to write contracts, or for the public to be watching its agents daily, they elect representatives who will choose the agents that will carry out the public's desired activities. The public, which are the voters of these elected representatives, through their voting right can evaluate the performance of the public agencies, creating incentives for the agencies to perform well (Ostrom, 2002).

When it comes to international assistance though, this feedback system is broken. Traditional explanations as to why foreign aid does not achieve its initial established goals typically emphasise shortcomings in the recipient nations' policies. Martens et al., (2002) shifts the focus to the institutional settings, incentives, and constraints experienced by the individuals and organizations involved in aid delivery. The accountability mechanisms that exist in the context of domestic public services, do not exist in foreign aid. Taxpayers in donor countries fund aid programs, but they are disconnected, geographically and politically, from the aid beneficiaries, who have limited influence over donor decisions, despite being in a better position to observe on-the-ground performance.

Foreign aid systems involve numerous principals and agents, each with distinct aims, which leads to coordination challenges, conflicting incentives, and inefficiencies. Common issues include moral hazard, where agents act contrary to the donor's intent, and adverse selection, where agents exploit their superior information.

This constitutes a market failure, where resources are spent in ways that may not maximize the benefit of their allocation. The World Bank's report of 1998, "Assessing Aid" showed how for foreign aid to be effective in promoting economic growth it requires economic policies to be good (Pritchett & Dollar, 1998). Effective governance, characterized by macroeconomic stability, transparency, adherence to the rule of law, and low levels of corruption, fosters economic growth and poverty alleviation. Such an environment also enhances the potential impact of development aid. Evidence from aid effectiveness studies highlights that a supportive policy context and strong public institutions are critical for aid to contribute meaningfully to poverty reduction, economic progress, and improvements in social outcomes (Pritchett & Dollar, 1998). Similarly, Burnside & Dollar (2004), determine that when other determinants of growth are controlled for, aid has no effect. They show that aid only has a positive effect on growth in developing countries that have good fiscal, monetary, and trade policies, but is ineffective and has little effect when policies are poor. They explain this by the tendency of recipient countries with poor policies to divert aid to government consumption instead of financing growth-promoting investment. They conclude that the effect of aid will depend on the level of policy the country has (Burnside & Dollar, 2004).

From a Law and Economics approach, donors want to ensure the maximum effectiveness of the aid they are providing to developing countries. In recent decades, the international aid community has shifted from relying on conditionality (imposing policy requirements on recipients, ex-ante perspective) to an approach of ex-post selectivity, where countries are rewarded for already demonstrating good governance. This can be seen as a way for donor countries to overcome the market failures that appear with the information asymmetry that comes with aid allocation (Chauvet & Guillaumont, 2003; In'airat, 2014).

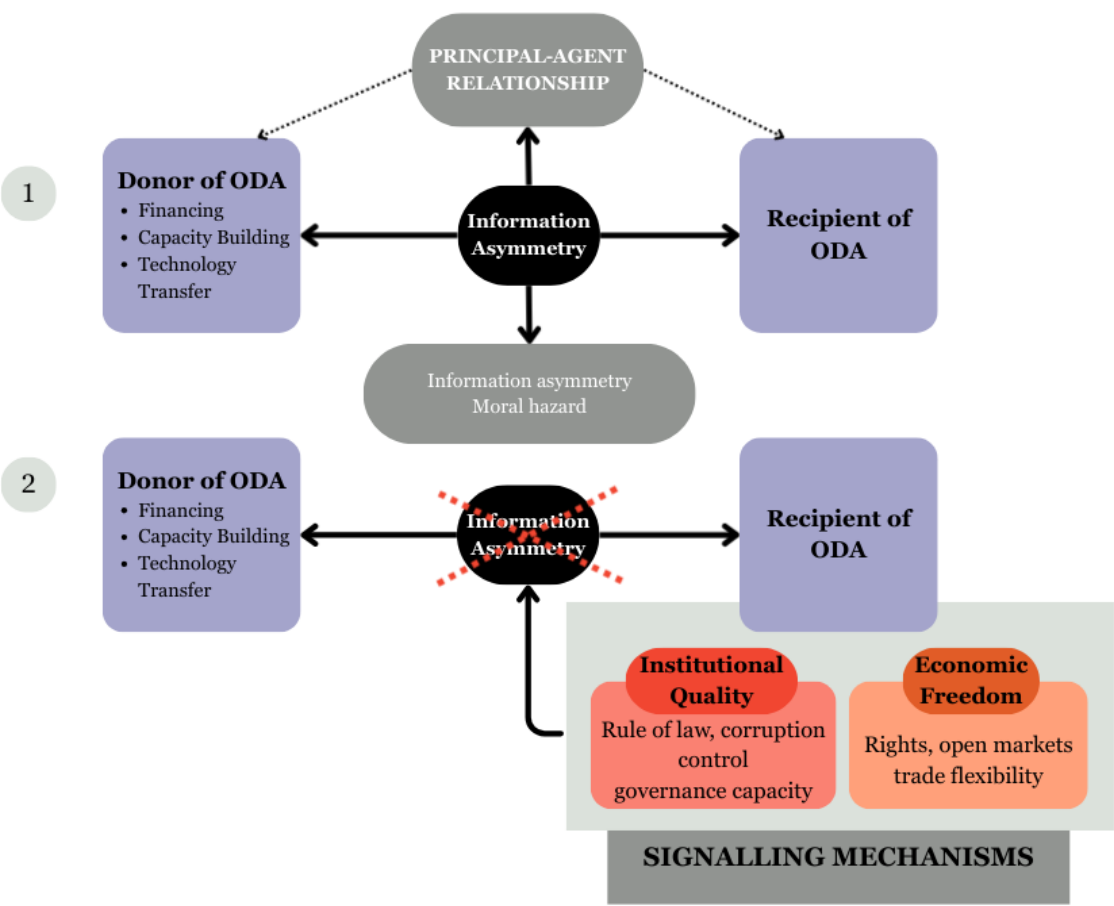
Monitoring costs is an additional challenge that we can see in the donor-recipient relationship. Donor monitoring of aid to developing countries imposes significant administrative and transaction costs that affect both recipients and donors. Recipient governments often face a heavy reporting burden due to the multitude of donor requirements, with examples including preparing thousands of reports annually and hosting numerous donor missions, as seen in countries like Tanzania and Mozambique (Hayes & Zyl, 2008; Svensson, 2006). This quantity of reporting and oversight tasks increases transaction costs and diverts resources away from development activities. Furthermore, weak coordination among donors increases these challenges, leading to duplicated efforts and inefficiencies in aid management (Feyzioglu et al., 1998).

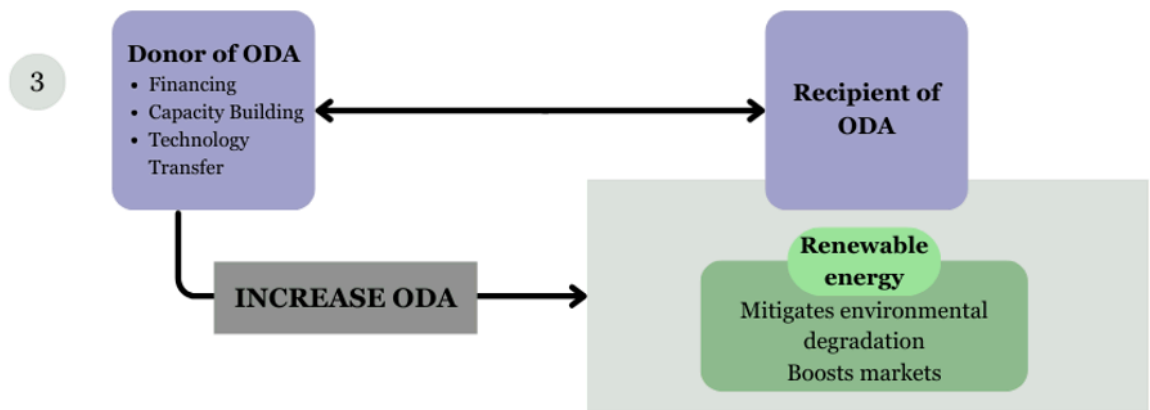
Ultimately, principal-agent theory offers a valuable lens for understanding how donors allocate aid in the face of information asymmetries and governance uncertainties. The presence of multiple agents with possible misaligned incentives, combined with the lack of direct accountability mechanisms, creates risks of moral hazard and adverse selection. In response, it is possible that donors

shift toward selectivity, channelling aid to countries that already exhibit institutional characteristics associated with good governance. These characteristics can serve as a signal of reliability, implementation capacity, and policy alignment.

Within this framework, this thesis investigates if there are specific institutional features that serve as credible signals to donors, thereby attracting greater ODA disbursements for renewable energy in developing countries.

Figure 2 The role of signalling in overcoming information asymmetries in renewable energy ODA allocation





III. Literature gaps

The existing literature extensively explores the determinants of foreign aid allocation and the impact of institutional quality on various development outcomes, but a gap remains concerning the specific relationship between institutional governance and renewable energy-related Official Development Assistance (ODA). ODA is government aid for specific targets of economic and welfare of developing countries. It has been the principal source of financing for development aid since the OECD’s Development Assistance Committee (DAC) established it as the “gold standard” of foreign aid in 1969 (*Official Development Assistance (ODA) OECD, 2025.*).

Research indicates that institutional quality, encompassing aspects like accountability, political stability, government effectiveness, regulatory quality, rule of law, and corruption control, significantly influences overall climate finance flows (Lubinga & Mazenda, 2024). However, most empirical studies on institutional governance and climate financing tend to focus narrowly on corruption or aggregate financial aid data, leading to the need to investigate how climate financing is affected by institutional governance indicators, and which specific indicators have an impact.

Additionally, while there are studies that have started to focus on the relationship between institutional quality and renewable energy investments, they often focus on capital flows like Foreign Direct Investment (FDI) or debt financing, and not always specifically address ODA (Dube & Horvey, 2023; Feyzioglu et al., 1998; Kushawaha & Jain, 2024b).

The literature also points to broader challenges in aid effectiveness, such as the disconnect between financiers and beneficiaries, and coordination failures among multiple donor agencies, which can undermine effective governance in recipient countries (Svensson, 2006). Understanding how institutional quality mediates these challenges in the context of renewable energy ODA is therefore critical. The precise influence of disaggregated institutional quality indicators on the allocation of renewable energy-related ODA specifically from official donors remains an unexplored area.

IV. Justification of the study and research question

Guided by the principal-agent framework, this thesis seeks to determine how institutional quality in developing-country recipients shapes DAC donors' allocation of renewable energy ODA, and to identify the institutional characteristics that most influence donor investment decisions.

The main hypotheses of this thesis are presented in Table 1.

Table 1 Summary of hypotheses on donor allocation of renewable energy ODA

Hypothesis Code	Hypothesis Description	Empirical Expectation
H1	Donors allocate more renewable energy ODA to countries with higher institutional quality, as these countries are perceived as more effective and reliable agents, minimizing monitoring costs and misaligned incentives.	Significant and positive association with institutional quality indicators.
H1a	Countries with stronger control of corruption are seen as lower-risk agents, reducing moral hazard.	Control of corruption is positively associated with renewable energy ODA.
H1b	Governments with more effective governance are better at absorbing aid and implementing donor projects.	Government effectiveness is positively associated with ODA.
H1c	Open markets reflect liberal policies and reduced capture by specific interests.	More open economies receive more renewable energy ODA.
H1d	Regulatory efficiency reflects reduced barriers to project execution and better implementation.	Regulatory efficiency is positively associated with ODA.
H2	Donors continue to fund countries where past disbursements have occurred due to sunk costs and informal trust built over time, reducing uncertainty in agency relationships.	Lagged ODA values are positively associated with current disbursement levels.

C. Methodology

This chapter outlines the methodological approach used to assess how institutional quality influences the level of ODA directed toward renewable energy projects in 42 developing countries from 2013 to 2023.

First, the data is visually examined to check for variance and for the presence of non-linearity and any segmental association (see Supplementary Figure 1 in Annex). The econometric model is then specified where ODA from official donors is the dependent variable, and variables representing institutional quality are the independent variables. These ones are corruption control, government

effectiveness, open markets, financial development index, government size, rule of law, and regulatory efficiency. GDP per capita, inflation rate, number of policies or laws passed in the country related to energy transition or climate change, and natural resource rents, interest rate, crude oil price, population size, and urban population are all controlled for in the analysis.

Initially, fixed effects and random effects models (see Supplementary Table 1 for two-way fixed effects results) are performed for estimation. After performing the Hausman test, results suggested best fit to be fixed effect. Based on exploratory diagnostics and theoretical relevance, a reduced set of key variables was selected for the system GMM model to ensure parsimony and instrumental validity.

I. Research design

This longitudinal ecological study followed 42 developing countries¹ over the period from 2013 to 2023. A cross-country balanced panel dataset was used to analyse the relationship between ODA reception and institutional quality. While the data is available for several countries, it has missing observations for some years. The initial selection of countries was based on the list provided by the UN World Economic Situation and Prospects 2024 which includes developing countries from low income to upper-middle income per capita (Affairs, 2024).

¹ The developing countries included are: Algeria, Bangladesh, Bolivia, Brazil, Burkina Faso, Burundi, China, Colombia, Costa Rica, Côte d'Ivoire, Dominican Republic, Fiji, Guatemala, Haiti, Honduras, India, Indonesia, Jordan, Kenya, Liberia, Madagascar, Malawi, Mali, Mexico, Mongolia, Mozambique, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Peru, Rwanda, Senegal, Solomon Islands, South Africa, Sri Lanka, Tanzania, Thailand, Togo, Uganda, Vanuatu, and Zambia.

The estimation technic used was the system generalized method of moments model to tackle endogeneity issues. The selection of the model is based on extensive literature (Doku et al., 2021; Dube & Horvey, 2023; Kushawaha, 2024; Kushawaha & Jain, 2024b; Lubinga & Mazenda, 2024; E. K. Ofori et al., 2023) GMM model is widely used in panel data analysis, especially for studies involving developing countries, due to several advantages it offers.

II. Data and sample

1) Country and timeframe selection

The focus is on 42 developing countries selected from the list provided by the UN World Economic Situation and Prospects 2024 (Affairs, 2024). There is no unified definition of a “developing” country, they are often categorized as such based upon a range of characteristics such as level of gross domestic product (GDP), sanitation, access to water, hygiene, level of life expectancy and infant mortality (Rishworth & Elliott, 2020). It must be noticed as well, that as of 2016, the World Bank decided to stop making the distinction between developed and developing countries, which marked a pivotal moment in the way of thinking about the geographic distribution of poverty and prosperity (Tariq Khokhar, 2015). For the purpose of this thesis though, the use of this nomenclature will continue. The focus on developing countries is for their representation of 80 per cent of total population in the world, and that most of future population growth will happen in these countries (Sánchez Rodríguez & Fernández Carril, 2024).

The initial selection of developing countries from the UN World Economic Situation and Prospects 2024 had to be reduced because of a lack of available

data. From the initial list of countries which where a total of 112², the sample was reduced to 42. The decision was made to eliminate the countries that had missing values in the dependent variable, focusing on data availability. The period of focus is from 2013 to 2023, which is the latest available data for most variables and the earliest available to have a full data set.

2) Data sources

Table 2 Variable description and data sources

Variable	Variable Description	Data Source	Expected Outcome
ODA in green energy projects	Annual DAC disbursements to renewable energy projects (e.g. hydro, solar, wind, geothermal) across all technologies. Measured in constant 2023 USD millions.	OECD CRS	Main outcome of interest
Inflation rate (annual %)	Annual % change in consumer prices, based on CPI using the Laspeyres formula. Aggregation method: median.	World Bank	-
GDP per capita	GDP divided by midyear population, measured in current US dollars.	World Bank	+
Real interest rate (annual %)	Lending rate adjusted for inflation using the GDP deflator.	World Bank	-
Average crude oil price	Annual average international crude oil price (\$/bbl). Same across all countries.	World Bank	+
Climate Change Policy Law	Count of national executive provisions (laws, decrees, plans) on climate change adopted in a given year. Unit: number.	QoG Environmental Indicators Dataset	+

² Initial list of developing countries: Afghanistan, Algeria, Angola, Argentina, Bangladesh, Belize, Benin, Bhutan, Bolivia (Plurinational State of), Botswana, Brazil, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Central African Republic, Chad, China, Colombia, Comoros, Congo, Costa Rica, Côte d'Ivoire, Cuba, Democratic People's Republic of Korea, Democratic Republic of the Congo, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Fiji, Gabon, Gambia, Ghana, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, India, Indonesia, Iran (Islamic Republic of), Iraq, Jamaica, Jordan, Kenya, Kiribati, Lao People's Democratic Republic, Lebanon, Lesotho, Liberia, Libya, Madagascar, Malawi, Malaysia, Maldives, Mali, Mauritania, Mauritius, Mexico, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Papua New Guinea, Paraguay, Peru, Philippines, Rwanda, Samoa, Sao Tome and Principe, Senegal, Sierra Leone, Solomon Islands, Somalia, South Africa, South Sudan, Sri Lanka, State of Palestine, Sudan, Suriname, Syrian Arab Republic, Taiwan Province of China, Thailand, Timor-Leste, Togo, Trinidad and Tobago, Tunisia, Türkiye, Tuvalu, Uganda, United Republic of Tanzania, Uruguay, Vanuatu, Venezuela (Bolivarian Republic of), Viet Nam, Yemen, Zambia, Zimbabwe

Population size	Midyear estimate of total resident population. Unit: absolute number.	World Bank	+
Urban population (% of total)	Share of population living in urban areas based on national definitions. Weighted average.	World Bank	+
Total Natural Resource Rents	Sum of oil, natural gas, coal, and forest as a % of GDP. Serves as a proxy for resource dependency.	World Bank	+
Financial Development Index	Index scaled 0-1. Geometric average of normalized subcomponents reflecting depth, access, and efficiency of financial institutions and markets.	IMF Financial Development Database	+
Government Size	Index constructure from multiple indicators through average measuring how much government intervenes in the economy (tax burden, government spending), scaled 0-100	Heritage Foundation Economic Freedom Index	+/- ³
Open Markets	Index reflecting openness to trade and investment includes trade freedom, investment freedom, and financial freedom averaged. Values from 0-100.	Heritage Foundation Economic Freedom Index	+
Regulatory Efficiency	Index measuring quality of regulatory frameworks, includes business freedom, labour freedom, monetary freedom. Values from 1-100.	Heritage Foundation Economic Freedom Index	+
Rule of Law	Measures confidence in and adherence to legal rules and contract enforcement. Values from -2.5 to 2.5.	WGI	+
Government Effectiveness	Captures quality of public services and policy implementation and design. Values from -2.5 to 2.5.	WGI	+
Control of Corruption	Measures perception of misuse of public power for private gain. Values -2.5 to 2.5.	WGI	+

All variables were collected annually for the 2013–2023 period for 42 developing countries, harmonized for use in a panel dataset. The final dataset merges institutional, macroeconomic, and environmental variables from international and publicly available databases to ensure comparability and transparency.

³ The expected relationship between Government Size and foreign green energy investment is theoretically ambiguous. While large government spending and taxation may deter investment by crowding out private actors or reducing economic efficiency, in certain contexts, a more active public sector may support green energy development through strategic co-financing, infrastructure, or subsidies. The net effect is likely to depend on the quality and orientation of government expenditure and fiscal policy (Dube & Horvey, 2023).

3) Variables and operationalization

a) Dependent variable

The variable chosen to represent foreign green energy flows into developing countries was obtained from the Creditor Reporting System flows database from the OECD⁴. The selected variable represented the disbursements from Development Assistance Committee (DAC) countries⁵ in the form of grants, loans, and equity investment⁶. The channels of transmission for the expenditures are, public sector, NGOs and civil society, public-private partnerships (PPP), multilateral organisations, teaching institutions, research institutes or think-tanks, private sector institutions or not specified. The sector delimitation is energy generation, renewable sources. These include energy generation, renewable sources – multiple technologies, hydro-electric power plants, solar energy for centralised grids, solar energy for isolated grids and standalone systems, solar energy – thermal applications, wind energy, marine energy, geothermal energy, biofuel-fired power plants.

The values included in the study are the aggregated results of the different elements. The reason is for lack of available data if distinguished between types of disbursements, channels of transmission, and type of energy generation. The year span from 2013 to 2023 assures maximization of data availability.

⁴ OECD. (n.d.). Creditor Reporting System (CRS) Aid Activities database. Retrieved May, 2025, from [https://data-explorer.oecd.org/vis?fs\[...\]](https://data-explorer.oecd.org/vis?fs[...])

⁵ List of DAC members: Australia, Austria, Belgium, Canada, Czechia, Denmark, Estonia, the European Union, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

⁶ Grants are funds provided free of interest and with no repayment obligation. ODA loans are repayable with interest at rates below those of commercial banks. Equity investments are counted as ODA only if they have a clear development purpose, with equity sales reported as negative ODA (capped) and dividends recorded for transparency (*Official Development Assistance – Definition and Coverage*, 2018.).

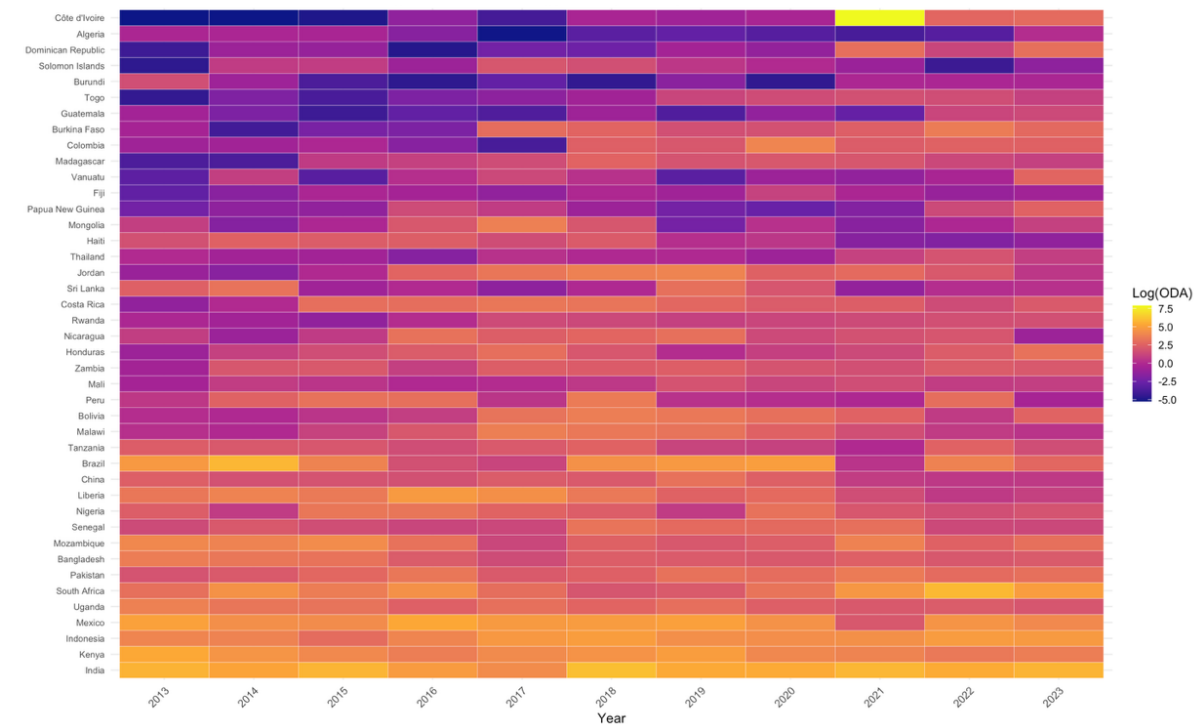
Figure 2 displays the evolution from 2013 – 2023 of the log-transformed ODA allocation to renewable energy projects across 42 recipient countries from 2013 to 2023. The horizontal axis represents the years, while the vertical axis lists the countries, ranging from India and Kenya to Côte d’Ivoire and Solomon Islands. The colour gradient reflects the level of ODA disbursed in constant USD (log-transformed): darker shades of blue and purple indicate lower levels of investment, while brighter tones of yellow and orange correspond to higher disbursement values.

A clear pattern emerges in which countries such as India, Indonesia, Mexico, and Brazil consistently receive higher levels of renewable energy ODA throughout the period, as evidenced by the warm colour tones across multiple years. In contrast, countries like Algeria, Côte d’Ivoire, and Burundi tend to receive lower and more sporadic levels of investment, often represented by cooler tones. Some countries exhibit isolated peaks in investment, for example, Algeria shows a sharp increase around 2020.

The image shows how variation occurs mostly between countries instead of within countries. Several academic and institutional papers provide evidence and explanation to the fact that ODA tends to be more stable or less volatile over time than other types of international financial flows. ODA is relatively non-volatile, with changes that are more incremental and policy-driven than market-based flows (Jorge Rivera & Sara Harcourt, 2025; OECD, 2025; Office of the Secretary-General of UNCTAD, 2025). View in Supplementary Figure 2 in Annex for world

map visualization of the distribution of ODA throughout the 42 countries from 2013 to 2023.

Figure 3 Cross-country trends in renewable energy ODA (Log Values), 2013–2023



b) Main explanatory variables

The aim of the study is to analyse the relationship between ODA received by a set of developing countries and their institutional quality indicators. A selection of 7 indicators is chosen from different sources: IMF Financial Development Database⁷, Heritage Foundation Economic Freedom Index⁸, and World Governance Indicators⁹. The following are the selected variables to measure the

⁷ International Monetary Fund. (2025). IMF Data Portal: Legacy Data. <https://legacydata.imf.org/?sk=f8032e80-b36c-43b1-ac26-493c5b1cd33>

⁸ The Heritage Foundation. (2025). Index of Economic Freedom: All Country Scores. <https://www.heritage.org/index/pages/all-country-scores>

⁹ World Bank. (2025). Worldwide Governance Indicators. <https://www.worldbank.org/en/publication/worldwide-governance-indicators>

quality or effectiveness of the different countries, view Annex Figure 6 to 12 for visualization of the variable's values for each country for the selected years.

Corruption control is widely recognized as a robust measure of governance quality, capturing the extent to which public power is exercised for private gain, including both petty and grand corruption (Kaufmann et al., 2009). Its inclusion as a variable is critical in development and aid-related research because corruption significantly influences the allocation and effectiveness of ODA and foreign investment. Empirical studies consistently show that better control of corruption improves the impact and efficient use of ODA by reducing rent-seeking behaviours and increasing government transparency and accountability (Dávid-Barrett et al., 2020; H.-Y. Lee et al., 2016).

In the context of climate finance, a perception of a country being highly corrupt has been seen to have a negative impact on the amount of climate finance inflows. In Upper – Middle – Income Countries (UMICs), the control of corruption has shown significant positive linkage with climate finance received over the years (correlation coefficient of 0.586, $p < 0.1$) (Lubinga & Mazenda, 2024). Prior studies show that corruption has a significant negative impact on climate finance (Habib & Zurawicki, 2002). In some models, the control of corruption produced negative and statistically significant estimates, particularly in higher quantiles (50th, 75th, and 90th), suggesting that only countries with moderate to high levels of corruption control attract climate finance. This could imply that a certain level of corruption might be tolerated or even become an implicit factor in aid allocation in some contexts (Lubinga & Mazenda, 2024).

Government size, typically encompassing low government spending, low tax burden, and government enterprises (Graafland, 2019). Both the Fraser Institute and Heritage Foundation include government spending and tax rates in their measurement of “small government”, but while the Heritage Foundation does not include the dimension of government enterprise it considers fiscal health as a dimension (which has been excluded in this study because of lack of data availability)(Graafland, 2019).

World Bank research (Knack, 1999) suggests that heavy reliance on ODA can influence government size indirectly by encouraging rent-seeking and weakening governance structures, possibly leading to larger but less effective bureaucracies.

Open markets constitute one of the four broad categories of economic freedom, alongside government size, rule of law, and freedom from government regulation. This category specifically includes trade freedom, investment freedom, and financial freedom (Graafland, 2019). This dimension is from the Heritage Economic Freedom Index, on the other hand, the Fraser Institute works with the Freedom to Trade with Foreigners indicators. This one is based on measures such as taxes on international trade and non-tariff regulatory trade barriers (Kapuria-Foreman, 2007).

In the context of renewable energy capital flows, market openness measures the ability to trade with other countries and the ease of investment capital flows. This measure is included because it provides insights into institutional quality (Dube & Horvey, 2023). The relationship between open markets and ODA is limited as a direct connection, but several studies highlight the link through related

concepts: several studies have demonstrated that Aid-for-Trade programs, a significant component of ODA, correlates positively with efforts to open markets and promote trade (Endres & Greal, 2023; Hoekman & Shingal, 2024; Martínez-Zarzoso, 2010).

Financial development (FD) is a critical factor in global economic interactions and sustainable development (Han & Cheng, 2023). The literature explores how financial institutions mobilize climate finance (Kawabata, 2019). FD is considered crucial because an efficient financial sector can effectively redistribute resources to support private sector performance and economic growth (Appiah-Otoo et al., 2022). It can promote environmental quality through eco-friendly innovations and green technologies (Salahuddin et al., 2015; Shahbaz et al., 2013 as cited by Ofori et al., 2023).

The moderating role of financial development is studied in the relationship between foreign aid and economic growth in Africa (proxied by domestic credit to the private sector and money supply) in the aid-economic growth nexus. This is done to understand how a well-developed financial system might enable better aid management and enhance aid effectiveness. FD is considered in the model due to its established influence on economic growth (Nkusu and Sayek, 2004; Seven and Yetkiner, 2016; Tsaurai, 2018 as cited in Appiah-Otoo et al., 2022).

FD also plays a crucial role in public investment in renewable energy (RE), where financial markets and financial institutions' conditions are significant control variables and can moderate the effect of public debt on RE investment. They are included because they are essential for the growth of relatively new technologies

and can influence RE investment through diversification and risk reduction (Kushawaha & Jain, 2024b). It is interesting to introduce it as it can signal whether the public sector in the country is willing to make investment in renewable energy.

Regulatory efficiency is identified as a key institutional indicator that influences climate financing. Institutional governance is fundamental in influencing government's ability to adapt and modify actions in response to climate change issues (Lubinga & Mazenda, 2024). Regulatory quality, a component of regulatory efficiency, as stated by Lubinga & Mazenda (2024), is a specific factor analysed as a determinant for countries receiving climate finance, which is classified as ODA. A stronger institutional and regulatory environment is generally perceived to facilitate better aid utilization and effectiveness.

Additionally, Kushawaha (2024) argues that an improved environment, including stronger regulatory efficiency, creates a more conducive setting for a more enabling environment for different forms of foreign investment that contribute to development outcomes, like green growth in his paper. While it focuses primarily on Foreign Direct Investment (FDI), instead of ODA, the underlying argument about institutional quality attracting and effectively using foreign capital is still relevant to aid effectiveness (I. K. Ofori et al., 2023).

Rule of Law is an institutional governance indicator that measures the public's perception of the legal system, police, ownership rights, and compliance with contracts. It is consistently found to be positively correlated with foreign capital investment and economic growth. It is considered a significant factor in driving

climate finance flows (Doku et al., 2021). As a component of institutional quality, rule of law measures the protection of property rights, judicial effectiveness, and government integrity. Its positive relationship with renewable energy capital flows indicates that a strong institutional framework can induce investment (Dube & Horvey, 2023).

The rule of law is considered a core governance component and is linked with governance quality, which in turn affects aid allocation decisions by some donors. However, overall ODA flows have mixed effects on rule of law measures, with some studies even finding negative associations when considering total aid without sectoral distinctions (Knack, 2001; Rajan and Subramanian, 2007 as cited in Dawson & Swiss, 2020).

Government effectiveness is categorized as an economic indicator. In an analysis of renewable energy capital flows in Africa, government effectiveness was found to have a positive relationship, indicating that a strong institutional framework can encourage renewable energy investment (Dube & Horvey, 2023). Additionally, another study in Upper Middle-Income Countries (UMICs) showed how government effectiveness had a significant positive linkage with the amount of climate finance received. However, in Least Developed Countries (LDCs), it had a significant negative linkage (Lubinga & Mazenda, 2024). It is interesting to note as well that studies on economic growth emphasize that government effectiveness is positively correlated with foreign capital investment (Assi et al., 2020).

Countries with higher governance effectiveness are generally more successful in attracting and managing ODA. Effective governance builds donor trust and

facilitates larger ODA inflows (Aid Circumvention report, The World Bank Group, 2024). However, some studies highlight a complex bidirectional relationship: while higher government effectiveness attracts more ODA, excessive dependence on ODA may weaken government incentives and reduce its effectiveness by leading to rent-seeking behaviour and corruption (S. Lee & Im, 2015).

c) Control variables

The selection of control variables when analysing the effect of institutional quality variables on the level of ODA in green energy projects in developing countries are the following:

GDP per capita reflects the economic development of the recipient country, influencing both the need for and the allocation of ODA. Commonly used in empirical studies as a key control (Eyraud et al., 2013; Kushawaha, 2024; Lubinga & Mazenda, 2024; I. K. Ofori et al., 2023), it is included as a control for its relevance in previous literature. In some studies, it is seen as a proxy for available financial resources that could encourage renewable energy investments (Salim and Rafiq, 2012; Omri and Nguyen, 2014 as cited in Kushawaha & Jain, 2024a).

Inflation rate represents macroeconomic stability, which is important since high inflation might deter investment or signal economic fragility, influencing aid flows, it is recognized as a crucial factor (Adu et al., 2013; Mu, 2024; Seti et al., 2025). Inflation is used as a control variable in models examining economic freedom and energy efficiency. It is included to account for its potential influence on the economic freedom index (Mu, 2024).

Natural resource rents serve as a proxy for resource dependency. Resource-rich countries may receive different aid patterns. It affects a country's economic structure, trade policies, and investment attractiveness. But, it is stated that it does not directly influence renewable energy capacity since this one is dependent on sector-specific factors like investment levels, policy frameworks, and technological advancements (Kushawaha, 2024).

Policy and Laws, this variable represents the amount of climate change-related legal provisions passed in a country in a given year. It is directly related to the institutional commitment to climate and green policies. It can signal the commitment of the recipient country with the purpose of the amount received in terms of green energy projects.

Population size, controls for the scale of the country, which can affect total aid received given larger countries often receive larger absolute amounts of ODA. Population is often used in climate finance literature. In climate finance models, the population variable is positive and statistically significant, with the largest magnitude observed at the 50th quantile. This can imply that economies with moderate population growth tend to receive the most climate financing (Doku et al., 2021; Lubinga & Mazenda, 2024).

Urban population reflects demographic shifts and urbanization, potentially affecting energy demand structure and infrastructure needs which are relevant to green energy projects. Urbanization is included as a control variable in models assessing renewable energy capital flows (Dube & Horvey, 2023; Lubinga & Mazenda, 2024). It is introduced because it helps explain the performance and

stability of an economy, and it influences both investment and renewable energy consumption within a country (Dube & Horvey, 2023).

d) Index construction

To create the indicators for Government Size, Open markets, and Regulatory Efficiency the data from the Heritage Foundation Economic Freedom Index was used. Each subcategory of the index was created by performing the average of the variables that formed it, as done in (Prendi, 2021.). For government size, the variables government spending and tax burden were used. The variable of fiscal health was excluded because of lack of values. For open markets, the variables of business freedom, labour freedom, and monetary freedom were used. And finally, for regulatory efficiency, the variables of trade freedom, investment freedom, and financial freedom were used.

4) Data preparation and treatment

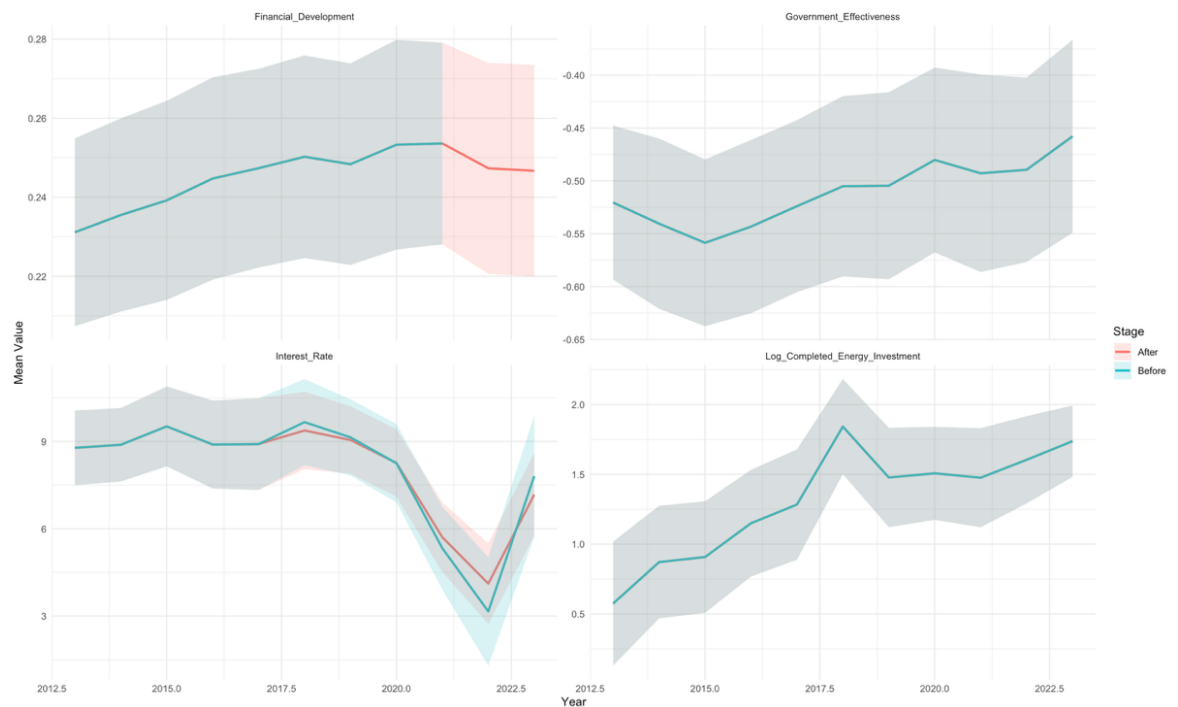
a) Missing data

Most of the variables are continuous, as seen in the Supplementary Figure 3 in Annex. All columns are present; none is entirely missing. Most rows of the dataset are fully observed, and only a small proportion of data points are missing (6.1 per cent).

By observing Supplementary Figure 4 in the Annex, we see the missingness map. The missing values are not uniformly distributed, but concentrated in a few specific variables: Energy Investment, Financial Development, Interest Rate, and Government Effectiveness.

Missing values were imputed using the Last Observed Carried Forward (LOCF) imputation method, given the stable year-to-year behaviour. This is observed in Figure 4, with the average trends with confidence bands:

Figure 4 Average trends with confidence bands (2013 – 2023) before and after imputation



b) Variable transformation

For this study, the logarithmic transformation is applied to the dependant variable, ODA in green energy projects, to reduce right-skewness and allow for a more linear relationship with the explanatory variable. This transformation helps stabilize variance and ensures that the model coefficients can be interpreted in terms of percentage changes.

Additionally, the variables urbanization and population are rescaled by dividing their values by 100. This normalization is necessary because these variables have very large absolute values, which can disproportionately influence the regression estimates and impede model convergence. By rescaling them we ensure better comparability with other covariates and improve numerical stability in estimation.

D. Results

I. Descriptive statistics

The descriptive statistics provide a summary of the variables used for the analysis. A summary of the average, variation and range can be seen in Table 3. The mean score for the dependent variable is 1.3, with a variation of 2.36, this shows variation among the amount of ODA for renewable energy projects received by the developing countries. The log-transformed dependent variable presents a negative minimum value, which corresponds to original investment below 1 million USD. This is consistent with expected variation in ODA flows across countries and years, where smaller disbursements are common.

Panel B includes the main explanatory variables. We can observe that Corruption Control, Government Effectiveness, and Rule of Law range from highly negative to positive values, with means below zero, indicating average governance performance in developing countries. For Financial Development, it has a mean of 0.24, indicating a moderate level for developing countries of financial development. Government Size, Open Markets, and Regulatory Efficiency from

the Heritage Foundation Economic Freedom Index, are normalized to have a mean of 0 which facilitates comparability.

Panel C includes control variables related to macroeconomic stability and demographic characteristics. Inflation and Interest Rate show large variability across countries, with some negative values, which indicate deflationary periods or anomalous reporting periods. Policy and Law capture the number of climate-related policies and laws passed in a country related to climate change, it has a range from 0 to 8, indicating that the maximum amount that has been passed in a country in a given year is 8. Population and Urbanization have been rescaled, to ensure comparability and model stability.

The variability across countries that is observed indicates the importance of using a panel regression model to account for these differences.

Table 3 Descriptive statistics

Panel	Variable	Obs.	Mean	SD	Min	Max
Panel A: Dependent variable	ODA	462	1.31	2.37	-5.27	7.90
Panel B: Explanatory variables	Corruption Control	462	-0.55	0.48	-1.60	0.78
	Financial Development	462	0.25	0.16	0.00	0.74
	Government Effectiveness	461	-0.51	0.54	-2.23	0.81
	Government Size	462	0.00	1.11	-2.27	4.76
	Open Markets	462	0.00	1.34	-3.67	3.01
	Regulatory Efficiency	462	0.00	1.12	-3.62	3.35

Panel	Variable	Obs.	Mean	SD	Min	Max
Panel C: Control variables	Rule of Law	462	-0.49	0.45	-1.51	0.58
	Crude Oil	462	0.00	0.00	0.00	0.00
	GDP capita	462	3.50	3.15	0.19	16.94
	Inflation rate	462	5.81	5.83	-3.23	49.72
	Interest rate	462	8.06	8.73	-13.64	52.44
	Natural Resource Rents	462	6.72	6.97	0.04	35.26
	Policy and Law	462	0.77	1.22	0.00	8.00
	Population	462	0.21	1.44	0.00	21.92
	Urbanization	462	6.43	16.32	0.00	90.75

1) Boxplots

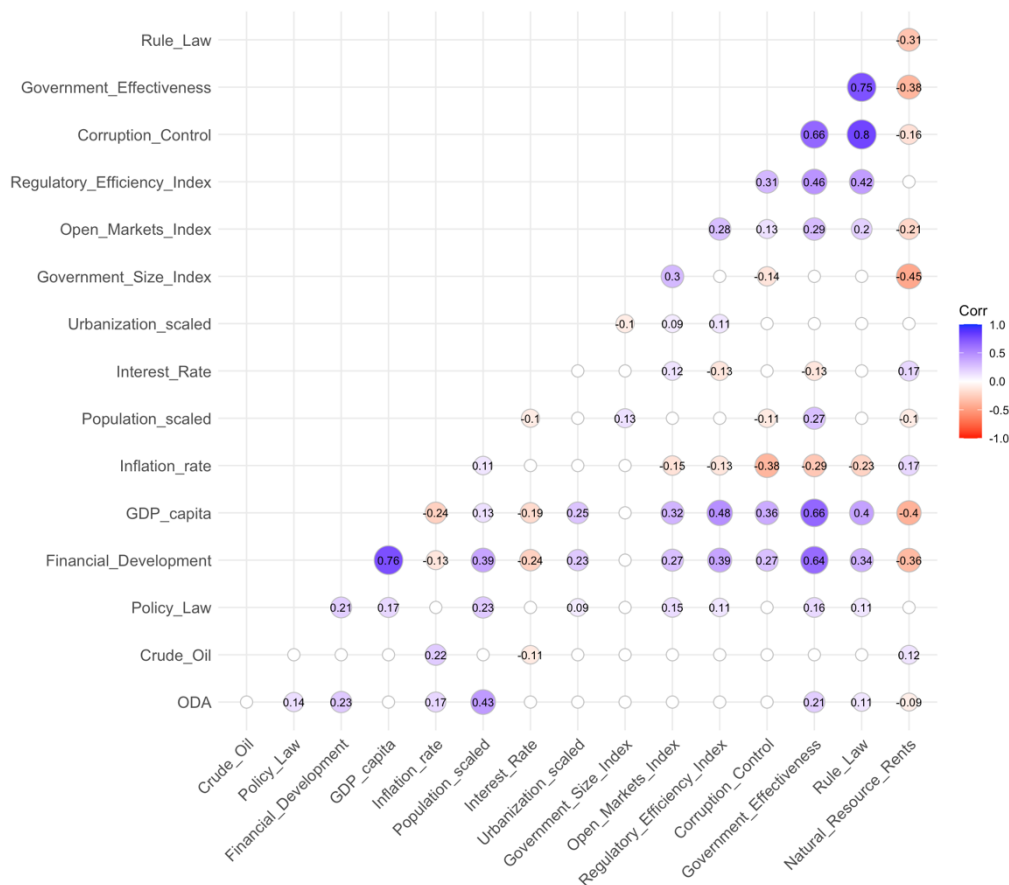
Supplementary Figure 13 in Annex displays the value distribution of all the variables included in the study. The red dots represent outliers. While the graph displays a great number of outliers and skewedness, it is decided not to treat the variables. This is not seen as a problem because we are dealing with the variables from different countries, and it is relevant to be able to observe differences. The within-country variation over time is minimal, being cross-country differences the main source of variance. For this reason, it is decided not to use winsorization techniques or others that will cover these differences between countries.

2) Correlation matrix

Spearman correlation matrix shows the correlation between the analysed variables (see Figure 5). This correlation matrix shows the strength and direction of linear relationships among institutional, economic, demographic, and energy-related variables. Each cell displays the Spearman correlation coefficient between

two variables, with colour and size visually indicating the magnitude and direction of the correlation (blue for positive, red for negative).

Figure 5 Spearman correlations between the studied covariates¹⁰



The following variables show a strong positive correlation: corruption control and government effectiveness ($\rho = 0.80$). These governance indicators are highly positively correlated, which indicates that countries with more effective governments also tend to control corruption better. Rule of Law and corruption control ($\rho = 0.75$) also shows high positive correlation, meaning that countries with stronger legal frameworks tend to exhibit lower levels of corruption. Similar relationship is seen between financial development index and GDP per capita (ρ

¹⁰ Only statistically significant correlations ($p < 0.05$) are shown in the figure.

= 0.76) meaning that higher-income countries generally have more developed financial systems. Finally, regulatory efficiency index and government effectiveness ($\rho = 0.66$) show that efficient regulatory environments tend to co-exist with higher government effectiveness.

It could be that institutional quality tends to cluster, so countries that perform well in one governance area often perform well in others.

Strong negative correlation is observed between ODA and inflation rate (Spearman $\rho = -0.43$), signalling that higher inflation rates could be associated with lower levels of ODA, possibly reflecting macroeconomic instability discouraging long-term disbursement. GDP per capita has a negative correlation with natural resource rents (Spearman $\rho = -0.40$). This inverse relationship may reflect the “resource curse,” where countries that rely heavily on natural resources tend to have lower levels of GDP per capita. Finally, the negative correlation between government size index and Rule of Law (Spearman $\rho = -0.45$) could mean that a higher government size index is associated with a weaker Rule of Law. Having higher government size meaning a smaller government, less fiscally intrusive, since it is implying more economic freedom in this context. This relationship has been observed in previous studies (*Government at a Glance OECD*, 2017; La Porta et al., 1999).

Weak or no correlation is observed between crude oil prices and most institutional and economic variables, suggesting that oil prices do not always align with governance quality in the sample. Urbanization and population also

show generally weak correlations with other variables, indicating limited linear association.

ODA is negatively correlated with inflation rate (Spearman $\rho = -0.43$), consistent with inflation being a potential barrier to stable, long-term infrastructure investment. Additionally, it is weakly positively correlated with financial development index (Spearman $\rho = 0.14$), policy and law (Spearman $\rho = 0.23$) and GDP per capita (Spearman $\rho = 0.17$).

Multicollinearity was evaluated by variance inflation factor (VIF), all of which were below 1.89 in all the models, indicating negligible collinearity. The results for the VIF of the different models are included in Supplementary Table 2 in Annex.

II. Econometric strategy

1) System GMM

In this study, the Generalized-Method-of-Moments (GMM) estimator developed for dynamic models of panel data¹¹ is used to observe the relationship between institutional quality indicators and the level of ODA for green energy projects received by developing countries.

Using panel data to study the relationship between development assistance and institutional indicators offers several advantages. The relationship studied is a dynamic process where variables used are highly dependent on their past

¹¹ introduced by Holtz-Eakin, Newey, and Rosen (1990), Arellano and Bond (1991), and Arellano and Bover (1995)

realization. Using panel dataset allows to consider differences between countries that we cannot directly observe. If these were to be ignored, they would end up in the error term and results could be biased. The GMM method helps control for these country-specific effects, making the estimate more accurate and less biased.

This model has been widely used in climate finance literature. It allows for dealing with endogeneity or simultaneity problems, as well as omitted variables bias (which is common when working with developing countries) (Doku et al., 2021; Kushawaha, 2024). Additionally, it is useful for datasets with large cross-sectional dimension (N) and a relatively small time dimension (T), which is the setting in this study (Dinç, 2019; Seti et al., 2025), and addresses issues of heteroscedasticity and serial correlation, that commonly arise in panel data of this nature (Dinç, 2019).

The regression of the model is as follows:

$$y_{i,t} - y_{i,t-1} = \alpha y_{i,t-1} + \beta' X_{i,t} + \eta_i + \varepsilon_{i,t} \quad (1)$$

Where y is the dependent variable (ODA disbursement), X is the set of explanatory variables, η is a time-invariant unobserved country-specific effect, ε is the error term. The subscripts i and t are country and time respectively.

To eliminate the country-specific effect, Arellano and Bond (1991) take the first differences of equation (1). This allows us to compare how much change in the outcome variable (ODA disbursement) between two periods differs from the change in previous period:

$$\begin{aligned}
& (y_{i,t} - y_{i,t-1}) - (y_{i,t-1} - y_{i,t-2}) \\
& = \alpha(y_{i,t-1} - y_{i,t-2}) + \beta'(X_{i,t} - X_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \quad (2)
\end{aligned}$$

However, a new bias results from equation (2), since the new error term $(\varepsilon_{i,t} - \varepsilon_{i,t-1})$ is now correlated with the lagged dependent variable $(y_{i,t-1} - y_{i,t-2})$ due to differencing. This breaks one of the classical regression assumptions (that the error term should not be correlated with the explanatory variables).

To address this issue, instrumental variables are used based on certain assumptions:

1. No serial correlation in the error term, so no future values of the error term affect past ones.
2. Weak exogeneity, because explanatory variables are not influenced by current or past error terms.

Based on these assumptions, two conditions are used to construct valid instruments:

$$E[y_{i,t-s} \cdot (\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \text{ for } s \geq 2; t = 3, \dots, T \quad (3)$$

This means that the values of the outcome variable from two or more periods ago can be used as instruments, because they are not correlated with the current error.

$$E[X_{i,t-s} \cdot (\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \text{ for } s \geq 2; t = 3, \dots, T \quad (4)$$

In the same way, past values of the explanatory variables are assumed to be valid instruments.

These conditions are the foundation of the Arellano-Bond GMM estimator, which is widely used in panel data models with lagged dependent variables.

Building on these moment conditions, Arellano and Bond (1991) developed the two-step GMM estimator to improve the accuracy and dynamic of panel data models. In the first step, it assumes the unexplained parts of the model, the errors, are the same across countries and over time. In the second step, the errors from the first step are used to better estimate the variability in the data. This makes the second-step results more efficient and reliable, especially as the sample size grows (Dinç, 2019).

This method is called difference GMM, although efficient it can run into problems. When explanatory variables change very little over time, they are persistent, using past values as instruments becomes weak. This is relevant in this study because the main variability between explanatory variables is found between countries, not within countries. This leads to higher uncertainty and potential bias in results, especially in small samples (Dinç, 2019).

An improved system was proposed by Arellano and Bover (1995) and Blundell and Bond (1998) to address this issue: the System GMM estimator. This model instead of only using change over time, combines equations in both difference

and levels. So, for the difference equation, it uses past levels as instruments, the same as the difference GMM. But, for the level equation, it uses past changes as instruments. This assumes that these differences are not correlated with country-specific factors. The following assumptions are added:

$$E[(y_{i,t-s} - y_{i,t-s-1}) \cdot (\eta_i - \varepsilon_{i,t})] = 0 \text{ for } s = 1 \text{ (5)}$$

This means the past change in the outcome is not related to unobserved country effects.

$$E[(X_{i,t-s} - X_{i,t-s-1}) \cdot (\eta_i - \varepsilon_{i,t})] = 0 \text{ for } s = 1 \text{ (6)}$$

Meaning the past change in explanatory variables is also not correlated with those effects.

For these reasons, System GMM is preferred over Difference GMM:

1. It captures the time and cross – country variation, instead of focusing only on changes over time.
2. It provides higher efficiency and lower bias (Doku et al., 2021).
3. It improves the signal-to-noise ratio, producing more reliable results.

2) Selecting variables

Interest rate and crude oil prices are not included in the regression model. Interest rate, while influencing private investment, has limited and often

statistically insignificant explanatory power on models focused on ODA allocation (Nkusu & Sayek, 2004). The effect that interest rates may have in the domain of green energy and development finance are more pronounced in firm-level models, not in cross-country analysis (*Higher Interest Rates Impact Energy Transition Investment*, 2024).

The crude oil prices variable is time-variant and identical across all countries in a given year; it does not vary cross-sectionally. Introducing this variable in the GMM model may overlap with year fixed effect, inflating the model without improving within-country or within-panel identification (*The Nexus between Green Investments and Crude Oil Prices Using Linear and Nonlinear Approaches*, 2022).

3) Instrument validity and overidentification tests

Before running the System GMM model, the following tests are run to check the key assumptions; the Hausman test is done to decide whether to use fixed effects (FE) or random effects (RE). These tests are run with a two-way fixed effect and random effects models. Serial autocorrelation is tested since system GMM relies on the absence of second-order autocorrelation in differenced errors for the validity of instruments. Although the presence of first-order autocorrelation in residuals is common and expected, second order is not wanted. Using the Breusch-Pagan test heteroskedasticity is tested. The absence of heteroskedasticity suggests errors are homoskedastic, regardless, system GMM uses robust standard errors to handle heteroskedasticity. Finally, cross-sectional dependence is tested to see whether residuals across countries are correlated in the cross-sectional dimension.

Table 4 Panel data diagnostic test results

Test	Statistic (df)	p-value	Alternative Hypothesis	Conclusion
Hausman Test	$\chi^2 = 54.955$ (df = 14)	8.813e-07	One model is inconsistent	Use Fixed Effects model
Serial Autocorrelation	$\chi^2 = 109.87$ (df = 11)	< 2.2e-16	Serial correlation in idiosyncratic errors	Serial autocorrelation present
Heteroskedasticity (BP)	BP = 18.443 (df = 15)	0.2401	Heteroskedasticity exists	No heteroskedasticity detected
Cross-sectional Dependence (CD)	$z = -1.3944$	0.1632	Cross-sectional dependence exists	No cross-sectional dependence

To assess the stationarity of the variables, unit root tests were performed using the Levin-Lin-Chu method.

Results indicate that all variables, except for Government effectiveness, are stationary at level I(0) (integrated of order 0). Government effectiveness was found to be non-stationary at level but became stationary after first differencing, confirming it is integrated of order I (1) ($z = -13.296$, $p < 0.001$).

Table 5 Levin-Lin-Chu (LLC) panel unit root tests

Variable	z-Statistic	p-value	Stationary
ODA	-9.5272	< 2.2e-16	Yes
Corruption Control	-7.5711	1.851e-14	Yes
Financial Development	-8.4606	< 2.2e-16	Yes
Government Effectiveness	-0.8922	0.1861	No
Government Size	-5.8590	2.328e-09	Yes
Open Markets	-3.7030	0.00011	Yes
Regulatory Efficiency	-17.6010	< 2.2e-16	Yes

Rule of Law	-5.3175	5.259e-08	Yes
GDP per Capita	-3.0453	0.00116	Yes
Inflation Rate	-6.3481	1.09e-10	Yes
Natural Resource Rents	-9.0627	< 2.2e-16	Yes

Regarding the variable Policy Law, the stationarity test could not be applied due to its structure: it primarily contains values of zero and is not continuous in nature. For this reason, it seems that it does not have sufficient variability for the test to detect a unit root.

4) Empirical results

This section provides the empirical results on the direct effect of institutional quality on ODA disbursement for green energy projects. The model was designed following Dube & Horvey's (2023) approach. The authors use System GMM estimation technique to analyze the effect of institutional quality on renewable energy capital flows. They run the regression multiple times to assess the impact of the individual components of the Economic Freedom Index. By doing so, the study aims to identify the specific institutional drivers that significantly influence renewable energy capital flows. Based on this past literature, the model is also run a total of seven times, one with each institutional quality indicator in order to assess the individual impact they can have on the level of ODA disbursement.

Table 6 Impact of institutional quality of ODA disbursement (system GMM estimates)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
L. ODA	0.611*** (0.109)	0.575*** (0.101)	0.627*** (0.092)	0.541*** (0.105)	0.517*** (0.105)	0.540*** (0.109)	0.618*** (0.101)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP	0.049*	-0.076	0.059**	-0.027	-0.040	-0.033	0.061**
	(0.029)	(0.102)	(0.028)	(0.038)	(0.039)	(0.043)	(0.030)
Inflation	0.015	0.012	0.014	-0.005	-0.002	-0.001	0.013
	(0.014)	(0.011)	(0.014)	(0.013)	(0.012)	(0.012)	(0.012)
Natural resource rents	0.005	0.006	0.007	-0.012	-0.016	-0.018	0.009
	(0.021)	(0.017)	(0.017)	(0.016)	(0.019)	(0.020)	(0.016)
Policy & law	0.131*	0.075	0.126*	0.067	0.055	0.066	0.100
	(0.073)	(0.067)	(0.068)	(0.061)	(0.062)	(0.064)	(0.072)
Population	0.032	0.018	0.032	0.021	0.036	0.026	0.038
	(0.032)	(0.022)	(0.027)	(0.033)	(0.024)	(0.030)	(0.024)
Urbanization	0.003	0.000	0.002	0.001	0.000	0.001	0.001
	(0.006)	(0.006)	(0.006)	(0.005)	(0.004)	(0.005)	(0.006)
Corruption control	-0.327						
	(0.274)						
Financial development		3.147*					
		(1.753)					
Government effectiveness			-0.211				
			(0.208)				
Government size				0.013***			
				(0.004)			
Open markets					0.020***		
					(0.005)		
Regulatory efficiency						0.016***	
						(0.005)	
Rule of law							-0.348
							(0.270)
n	42	42	42	42	42	42	42
T	11	11	11	11	11	11	11
Num. obs.	462	462	462	462	462	462	462
Num. obs. used	714	714	714	714	714	714	714
Sargan Test: chisq	19.677	15.773	16.575	13.144	12.474	13.039	15.975
Sargan Test: df	9.000	9.000	9.000	9.000	9.000	9.000	9.000
Sargan Test: p-value	0.020	0.072	0.056	0.156	0.188	0.161	0.067
Wald Test Coefficients: chisq	134.629	240.483	164.724	198.648	225.271	198.660	161.740
Wald Test Coefficients: df	8	8	8	8	8	8	8

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Wald Test Coefficients:	0.000	0.000	0.000	0.000	0.000	0.000	0.000
p-value							
*** p < 0.01; ** p < 0.05; * p < 0.1							

5) Interpretation of coefficients and model diagnostics

The empirical results on the effect of institutional quality on ODA disbursement for renewable energy projects show that the lag of the dependent variable, ODA, is positive and significant, irrespective of the model specification. The past disbursement of ODA strongly predicts its current level, meaning that the levels of ODA received by developing countries are somewhat path dependent. Developing countries that receive high levels of ODA for renewable energy projects are more likely to experience more capital flows in the future.

The empirical evidence further shows a positive relationship between institutional quality and ODA flows, meaning that countries with better institutional quality can attract development assistance more. Efforts that countries put in improving their institutions can be seen rewarded by an increase in development assistance.

Financial development (Model 2) exhibits a positive and moderately significant association with ODA. Government size (Model 4) has a significant and positive relationship with ODA with a value of 0.013. This indicates that governments with a more liberal economic approach, lower tax burden and government spending, attract more ODA disbursement for green energy projects, supporting the idea that aid donors prefer smaller and well managed governments (Goldemberg et al., 2025). Open market (Model 5) is also significant and positively related with

ODA, with a value of 0.02. This suggests that donors prefer countries that have liberalized and opened their markets, and that have investor friendly policies. Regulatory Efficiency (Model 6) has a positive and significant relationship with ODA, with a value of 0.016. This confirms the idea that stronger regulatory and institutional environments can be seen by donors as better aid usage and allocation.

GDP per capita appears to be weakly significant in three models (Model 1, 3, and 7). This can suggest a relationship between ODA and GDP per capita that is context-specific, or non-linear. On the other hand, inflation, natural resource rents, and urbanization remain statistically insignificant across models. This relationship could indicate that the macroeconomic stability and demographic elements are not considered as primary determinants in ODA allocation for renewable energy once institutional quality is accounted for. Finally, policy & law show a positive significant association in some models (Model 1 and 3) and is consistently positive throughout the different models. This could suggest a signalling role to donors, since it represents domestic climate policy activity.

Sargan test generally indicates that the model does not reject the null hypothesis of instrument validity, particularly from Model 2 onwards (p-values > 0.05). This confirms the robustness of the instrument set and supports the use of system GMM. The Wald tests for overall significance are uniformly significant ($p < 0.0001$).

E. Discussion

This study adopts a quantitative approach to identify the factors that influence countries' decisions, particularly DAC countries (individual bilateral donors), to invest in green energy projects in developing countries. Drawing from existing literature, the allocation of development aid has long been the subject of debate. From a law and economics perspective, the principal-agent theory provides a framework to explain this relationship. Drawing on the concept of institutional quality, this study examines if the market failures that come with the principal-agent relationship can be surpassed.

Extensive literature has been dedicated to the study of the principal-agent relationship that forms between donor and aid recipient countries. The main problems regarding asymmetric information between the parties is often addressed through the need of increased monitoring. Chauvet et al., (2015), prove that monitoring can mitigate the market failure in aid effectiveness caused by the divergent donor-recipient interests. Similarly, Bourguignon & Platteau, (2025) develop a theoretical model of aid allocation with optimal monitoring in a principal-agent framework. While it is an approach to make aid more effective, it is also an additional transaction cost between donor-recipient countries. It has already been observed in the literature that countries with good governance attract development aid from donors and receive preferential treatment (Dawson & Swiss, 2020; In'airat, 2014), and within the principal-agent framework, this can be used as an indicator from recipient countries to donor countries in order to bypass the additional costs of monitoring to achieve efficient allocation of ODA.

In this project an econometric analysis is performed using the system GMM model and two-way FE model to observe the relationship of institutional quality variables with the reception of ODA. The results from the system GMM coefficients show a positive and significant relationship of the lag of ODA. This result is expected and logical, reflecting that countries that receive ODA one year are more prone to receive it the next. Maruta & Banerjee (2021), show how projects funded by aid for energy efficiency or new infrastructure need time to be designed, implemented, and fully realized before effects are seen. Beyond the fact that they are funded through ODA, renewable energy projects tend to require a substantial amount of time for development and implementation (Gumber, 2023). This justifies the significance and positive relationship of the lagged ODA, since countries that have invested in renewable energy projects will want to continue the project for as long as necessary to obtain the result and not waste resources, regardless of the institutional changes that may occur.

Turning to the institutional quality variables, the analysis reveals notable patterns. Corruption control exhibits a negative non-significant relationship with ODA (-0.32). This result contradicts most of the literature, which indicates that controlling corruption attracts climate finance and ODA and ensures aid effectiveness. Donors prefer to channel resources to countries perceived as more reliable and capable of utilizing funds effectively (In'airat, 2014; Lubinga & Mazenda, 2024). However, the relationship is complex, some studies indicate that corruption may not always be a deterrent or that certain levels are implicitly tolerated in some contexts (Lubinga & Mazenda, 2024). Additionally, the Sargan test for corruption control p-value ($p=0.020$) indicates a rejection of the null hypothesis at the 5 per cent level, which suggests potential invalid instruments,

due to correlation with the error term, misspecification, or weak instrument relevance. For these reasons, and given the non-significance of the coefficient, the negative sign cannot be taken as robust evidence against the conventional view that stronger corruption control attracts more ODA.

The financial development (FD) index exhibits a positive significant relationship with ODA at the 10 per cent level (3.14). This is further supported by the two-way fixed effects models which also shows a positive direction of the relationship of FD and ODA (1.87). It is considered an important indicator since an efficient financial sector can effectively redistribute resources, enable better aid management and enhance its effectiveness and impact. Strong financial systems also provide frameworks for transparent reporting, accountability, and monitoring of funds which is a strong signal to donor countries of security (WTO, 2024).

Government effectiveness captures the quality of public services and policy implementation and design. A positive relationship with ODA was expected; the result obtained in the system GMM model shows a negative non-significant relationship (-0.211). In most literature, government effectiveness is perceived as a key driver for climate finance, and how it can effectively convert it into desirable outcomes in the eyes of the donors. From a “recipient merit” perspective, higher governmental quality signals a recipient is better able to use funds adequately (Doku et al., 2021; Lubinga & Mazenda, 2024; Weiler et al., 2018). However, there is also literature that discusses instances where government effectiveness is found to have a negative effect on certain outcomes. Lubinga & Mazenda (2024) find that government effectiveness negatively affects climate finance flows among Least Developed Countries (LDC), potentially due to confidence issues. Since in

the sample there are LDC, it is possible this could have had an influence. Nonetheless, when considering the Sargan test results ($p=0.055$), it generates slight concern. The results are acceptable at 5 per cent but close to the 10 per cent rejection threshold, so some caution in interpretation is required. This could mean the coefficient is biased and inconsistent and could be unreliable for drawing conclusions. In this model, Policy & Law exhibit a marginally significant association with ODA, as well as GDP. In relation to the principal-agent framework, it suggests that even if a government is perceived to be generally effective, donors may prioritize more specific policy or legal safeguards that reduce risk in the context of aid.

Government size indicator, measuring how much the government intervenes in the economy, has a significant positive relationship with ODA (0.013) at the 1 per cent level. This reflects donor preferences for countries that are perceived to manage public finances efficiently and create an enabling environment for investment. Sargan test results ($p=0.156$) fails to reject the null hypothesis and indicates valid instruments. These results are in line with the literature, where countries with a low government size index are perceived as more agile and responsible, with less bureaucracy and faster decision-making. These governments are seen to increase the effectiveness of renewable energy initiatives and are generally associated with lower risk of corruption (Muse, 2023). They often rely more on market mechanisms and private sector participation, generating an environment where ODA resources can mobilize additional private finance, creating a greater impact (OECD, 2023; WTO, 2024).

On the other hand, it has also been argued that when it comes to the environment, larger governments acting as public agencies, are more inclined to prioritize and preserve public goods; by imposing taxes, they can correct for externalities like pollution. State-owned enterprises, which are an indication of a larger governmental presence in the economy, can be more environmentally responsible and set higher benchmarks for other companies, since it often looks beyond just profit (Graafland, 2019; Kushawaha, 2024). This could mean that although ODA donors may perceive smaller governments more attractive to initiate green energy projects, to have more enabling conditions and reduce risks of resource misallocation or corruption, in the long run it may be preferred for government size to grow. Once the initial projects have been implemented, to ensure the success and maintenance of the energy transition, larger size governments may be more efficient in achieving the desired goals.

Open markets variable shows a significant and positive relationship with ODA (0.019) at the 1 per cent level. Open markets capture the level of openness to trade and investment of a country, it includes trade freedom, investment freedom, and financial freedom. This result is in line with the literature and the initial expected outcome. Open markets are generally viewed as beneficial for environmental performance and the adoption of green technologies; empirical research has shown that trade can significantly enhance energy efficiency (Graafland, 2019). Open markets are perceived as generating environments for private capital mobilization, reduced investment risks, and policy frameworks that are more supportive to project implementation. It can induce private investors to participate, which would help ODA funded projects and reduce the risk for ODA donors, for example by creating blended finance partnerships with public-private

investment (WTO, 2024). OECD (2012) report on public policy and resource allocation, argues that countries with more open market characteristics are more successful in channelling resources and efficiently allocating them. The results highlight how ODA donors may be attracted to countries that generate environments that signal the invested resources will be more efficiently used, overcoming the information asymmetry problem.

When looking at the indicator of regulatory efficiency, which measures the quality of regulatory frameworks in a country (including business freedom, labour freedom, and monetary freedom), a positive and significant relationship is observed with ODA disbursement at the 1 per cent level (0.016). It values how effectively a country implements regulations, a higher value means less regulatory barriers and more predictable and effective policies that promote business operations, flexible labour markets, and stable prices (*Index Of Economic Freedom*, 2023). This is in line with the literature, which also provides substantial evidence of the positive relationship between regulatory efficiency and the reception of ODA. To start with, an efficient business environment and effective regulatory framework generates an ideal situation for renewable energy investments. It is perceived like this because efficient institutions can reduce transaction costs by enforcing contracts and properly protecting property rights, leading to reduced business risks (Dube & Horvey, 2023). Dube & Horvey (2023) find that the efforts made by a country to improve their institutions efficiency are later rewarded with more investor confidence in the renewable energy sector. A parallelism can be drawn here with ODA donors, which can feel more confident in investing in countries with higher regulatory efficiency. This can assure them

that the resources will be used more efficiently and create an attractive environment for the reception of ODA (Satrianto et al., 2024).

The last institutional quality variable observed is rule of law. A positive relationship between rule of law and ODA was expected, but the results show a non-significant negative relationship between them (-0.34). Literature argues that rule of law is considered part of good institutions and policies, which donors consider positively, perceiving countries with high levels of rule of law as more able to adequately use the funds (Weiler et al., 2018). A strong legal framework that adheres strictly to applicable laws in government and business cycles makes it easier to implement and sustain projects, and additionally legal protection generates high trust (Satrianto et al., 2024). Nonetheless, Dawson & Swiss (2020) found a significant negative association between total ODA and measures of the rule of law. They also argued that the cause of this could be the aggregation of all different types of ODA. While in this project the focus is on green energy projects ODA, it is still aggregate for channels of transmission and types of projects. This could be disrupting the results. Additionally, the Sargan test reveals a value of 0.06, failing to reject the null hypothesis at 5 per cent, but close to the 10 per cent rejection threshold. This indicates some caution when interpreting the coefficient.

Regarding the control variables, GDP per capita was expected to have a positive and significant relationship with renewable energy ODA, reflecting donor preferences for countries with greater implementation capacity; the results partially support this expectation: it is positive and statistically significant in models (1), (3), and (7), but negative and non-significant in other specifications.

Inflation rate, natural resource rents, population, and urbanization remain small and statistically insignificant suggesting a limited role in explaining variation in renewable energy ODA. On the other hand, Policy & Law show a positive and marginally significant association in models (1) and (3), indicating that countries passing more climate-relevant legislation may attract higher renewable energy allocations, signalling donors their commitment to climate action.

F. Conclusion

This thesis set out to investigate whether specific institutional and macroeconomic characteristics of developing countries act as credible signals to ODA donors, thereby influencing the allocation of renewable energy financing. Drawing on principal-agent theory, it was argued that donors, faced with information asymmetries and agency risks, may rely on measurable governance and market-related indicators when deciding where to deploy climate-related aid.

Using panel data for 42 developing countries between 2013 and 2023 and using system GMM estimation strategy to address endogeneity and dynamic effects, the results provided insightful evidence. Institutional quality does matter, but its influence is uneven across different dimensions.

The strong persistence of past ODA disbursements reflects the role of path dependence, trust-building, and sunk costs in aid relationships, highlighting that once donors commit to a partner country, they are likely to maintain these flows over time regardless of short-term institutional changes. This creates both

opportunities and risks: while stable funding can facilitate long-term projects, it may also reduce donor responsiveness to deteriorating governance conditions.

The institutional variables that show significant association with ODA disbursement show that donors tend to prioritise countries with institutional and economic characteristics that reduce implementation risks and enhance the likelihood of project success. Government size, openness to trade and investment, regulatory efficiency, and financial development all reduce information asymmetry and monitoring costs in the donor-recipient relationship. They function as signals of credibility and capacity, assuring donors that recipients will use funds effectively, mitigate implementation risk, and align with agreed objectives.

These results contribute to the climate finance and development literature by differentiating between governance indicators and quantifying their distinct impacts on renewable energy ODA, rather than treating institutional quality as a single aggregate measure. They also have practical implications for recipient countries seeking to attract green energy investment. These factors jointly create an environment of institutional capacity, lowering perceived agency problems and making countries more attractive for renewable energy ODA.

Future research could expand this analysis by examining variations across donor types (bilateral vs. multilateral), and sectoral subcategories within renewable energy. As the global community moves toward the New Collective Quantified Goal of mobilizing at least US\$ 300 billion annually by 2035, understanding how

institutional features shape donor behaviour will be crucial for aligning development finance with the urgent needs of the green energy transition.

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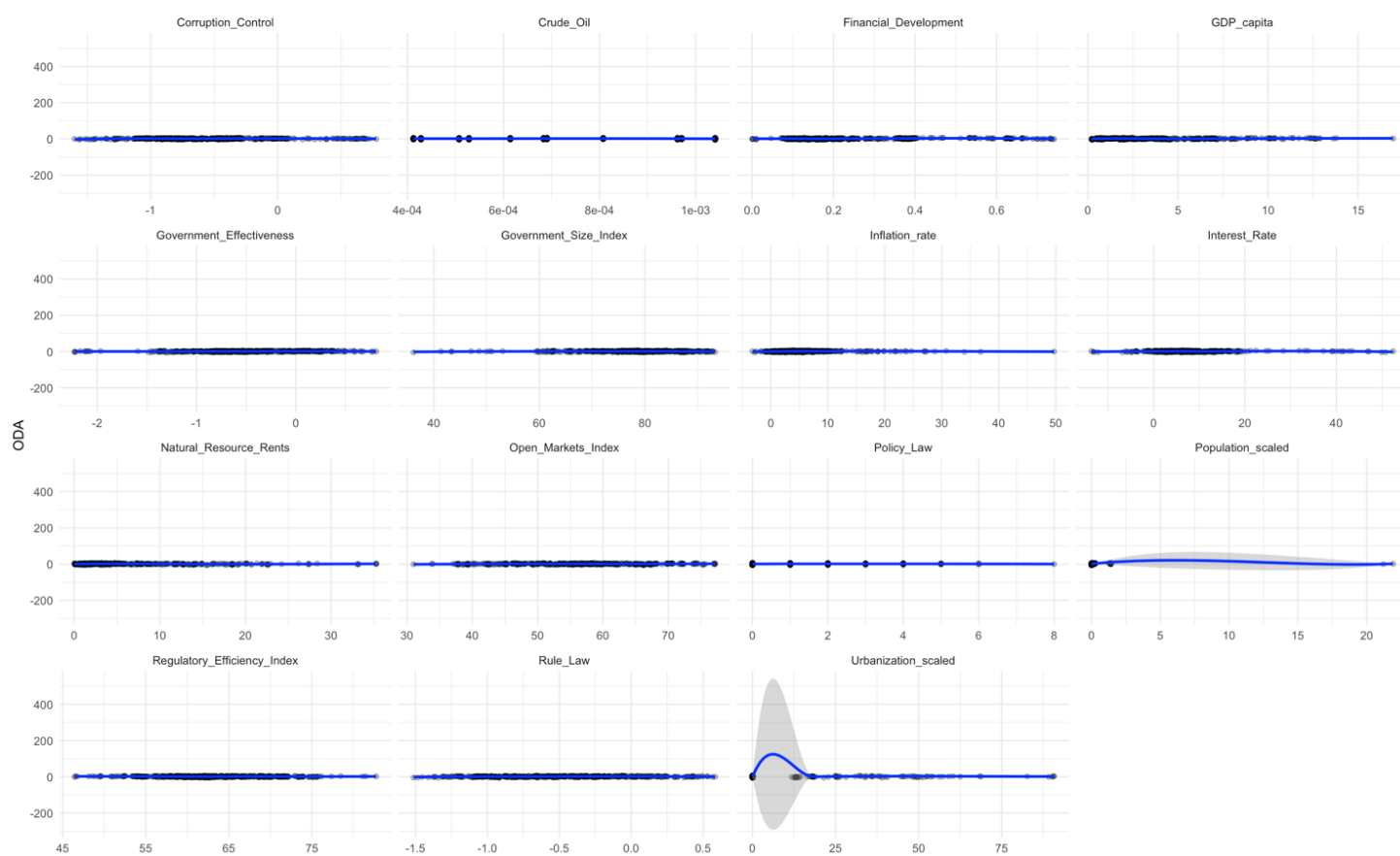
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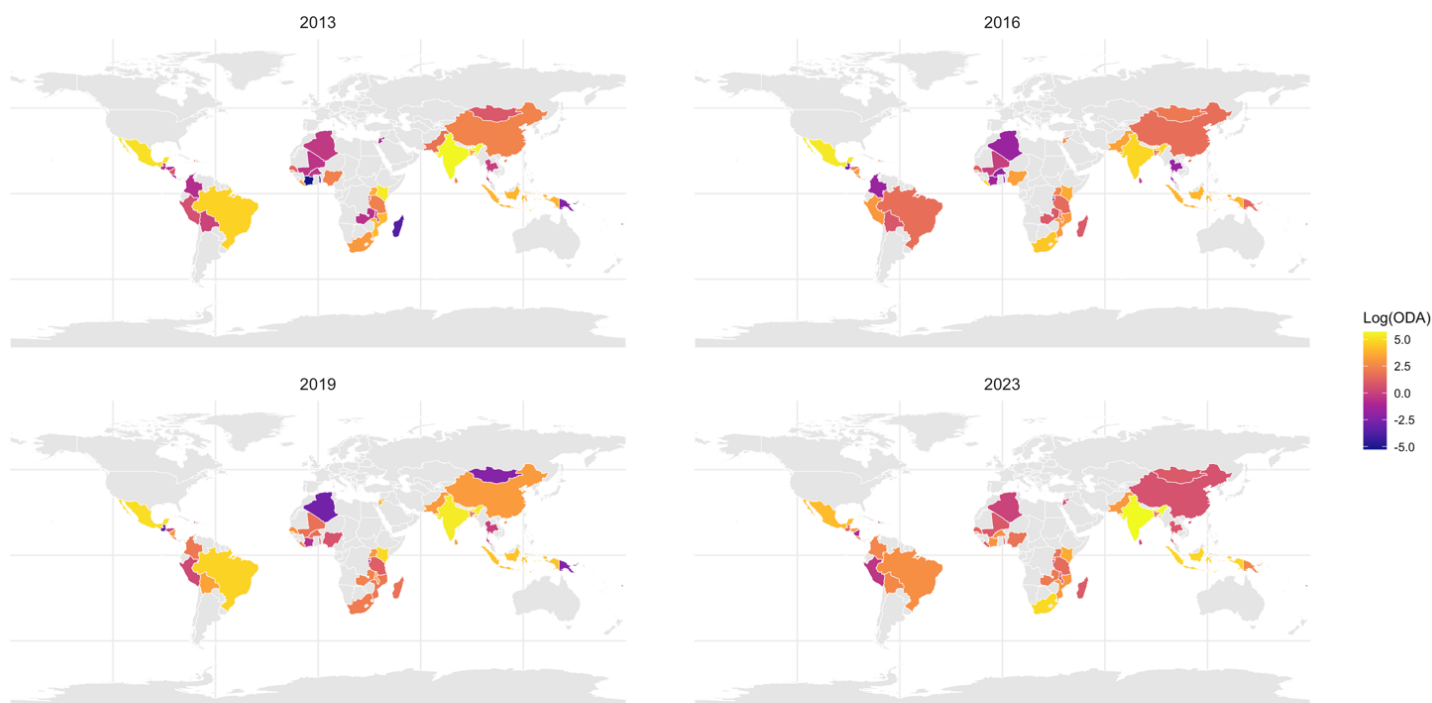
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H. Annex. Supplementary materials

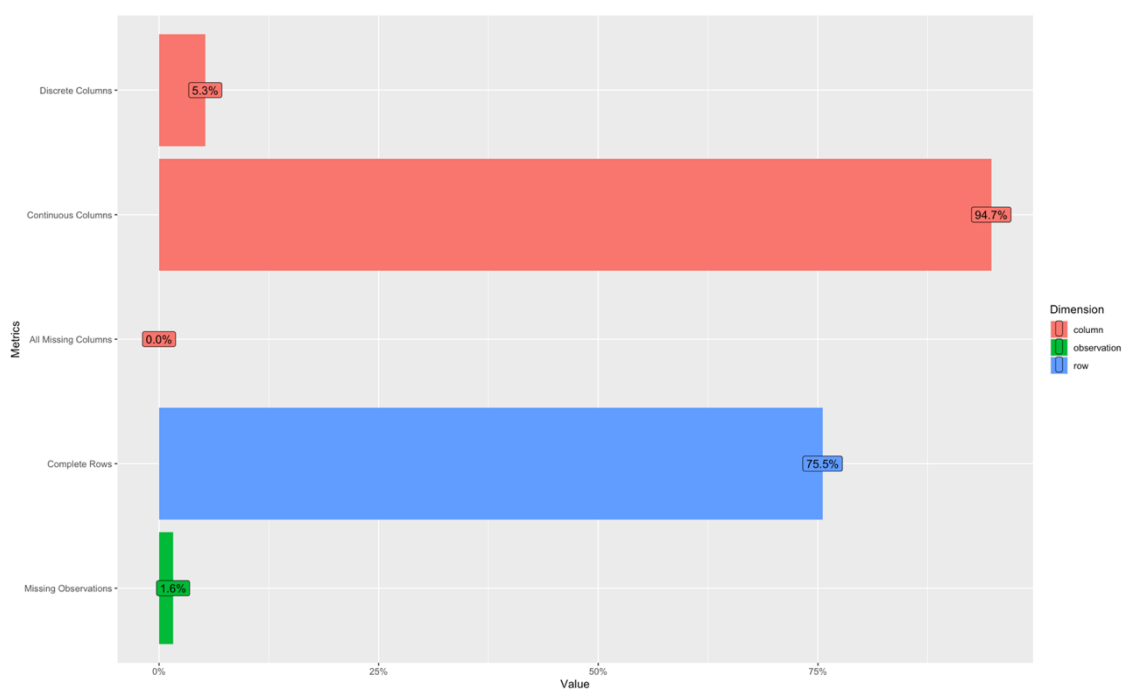
I. Supplementary Figure 1 Bivariate Relationships Between Official Development Assistance (ODA) and Institutional/Macroeconomic Variables, Including Fitted Trends



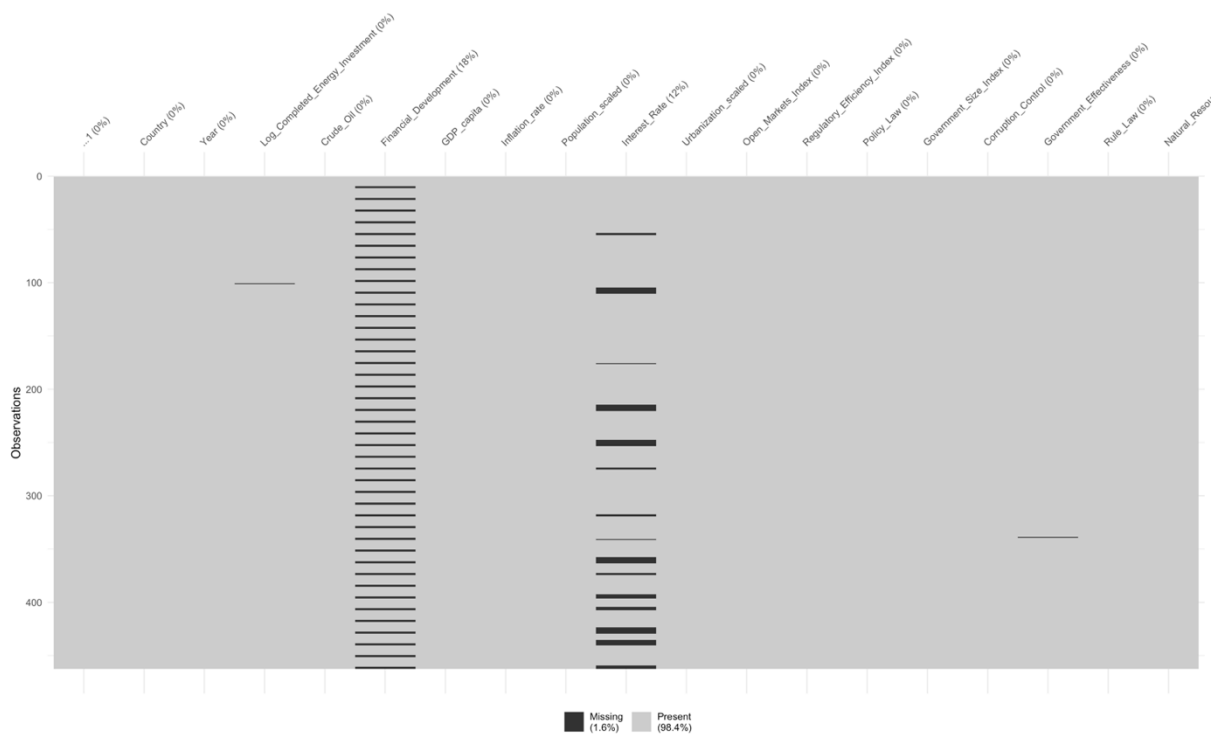
II. **Supplementary Figure 2** Spatial Distribution of Log-Transformed Renewable Energy ODA by Country in Selected Years (2013, 2016, 2019, and 2023)



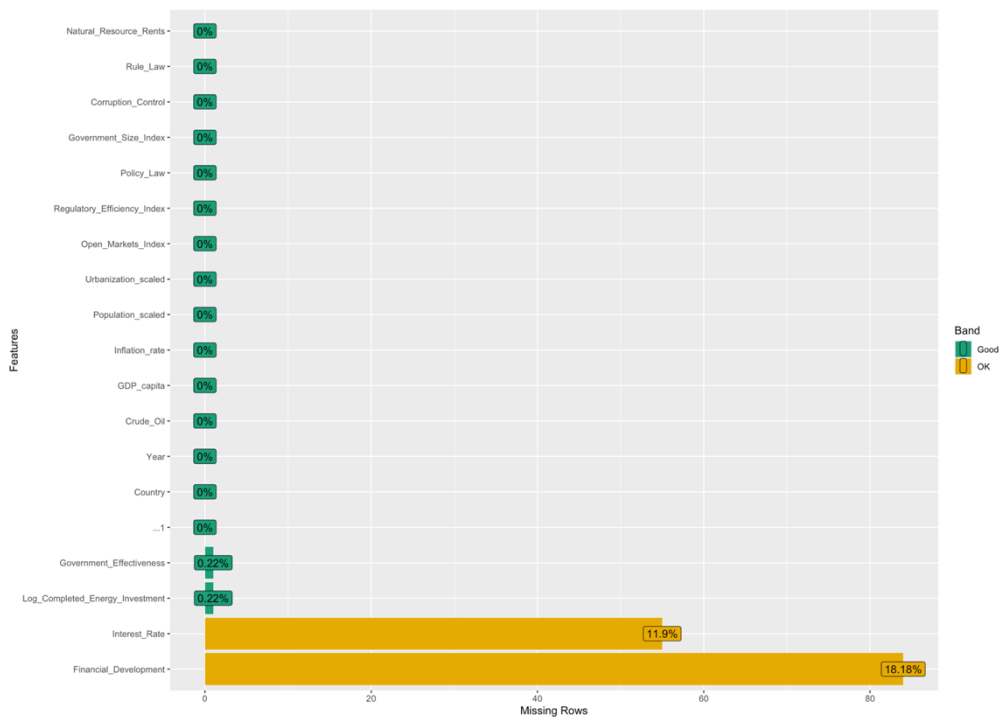
III. **Supplementary Figure 3** Data Completeness and Missingness Summary for the Panel Dataset



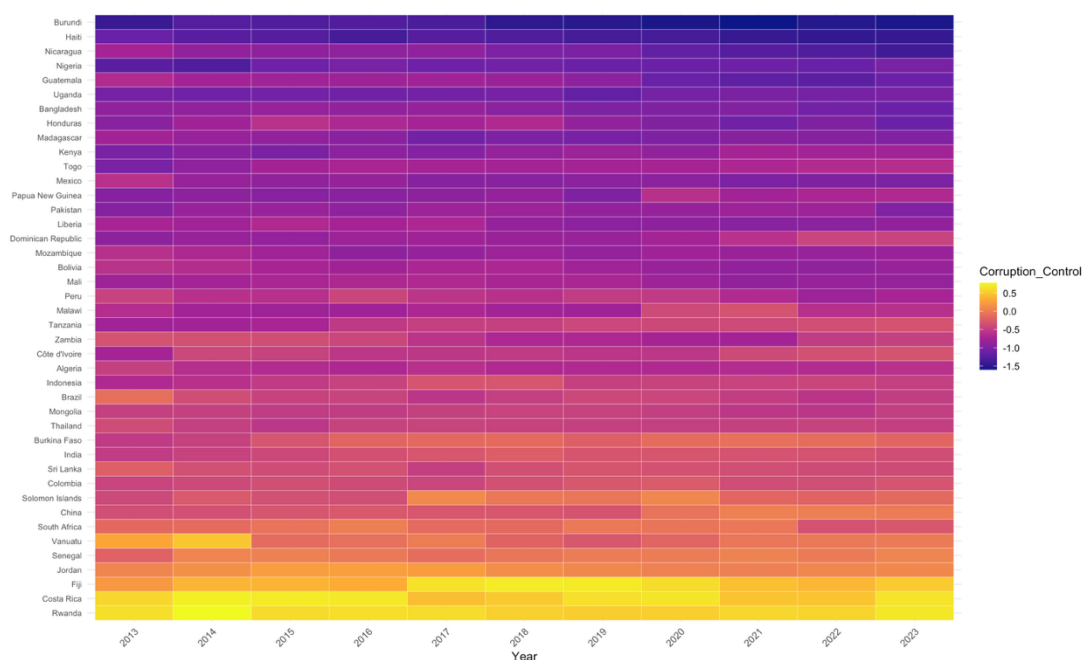
IV. **Supplementary Figure 4** Variable-Level Missing Data Pattern in the Panel Dataset



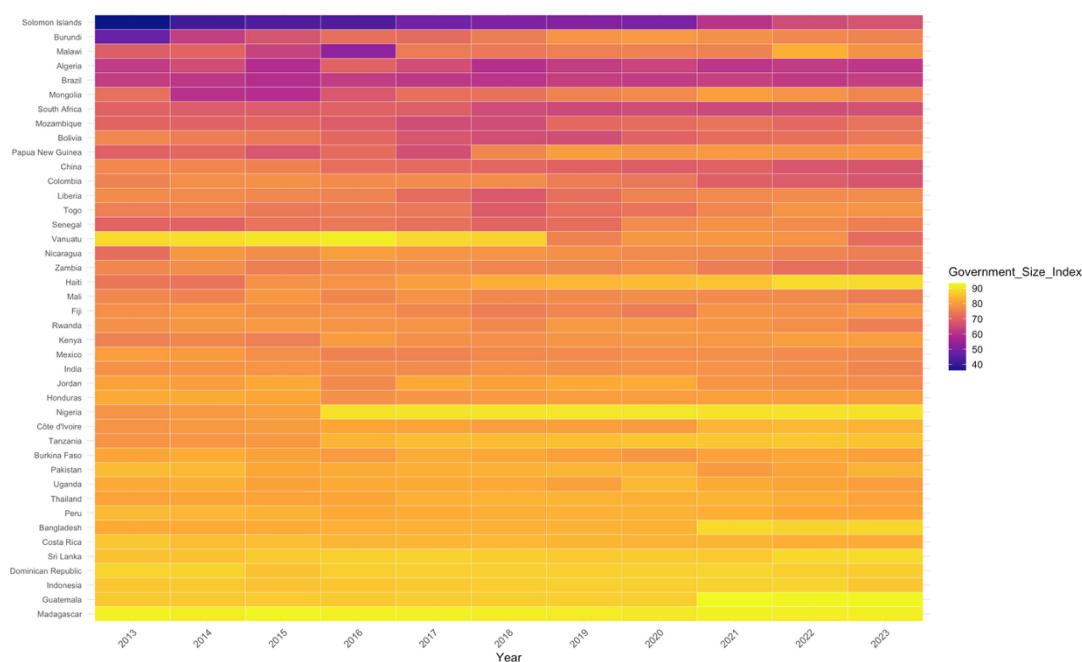
V. **Supplementary Figure 5** Percentage of Missing Values by Variable in the Panel Dataset



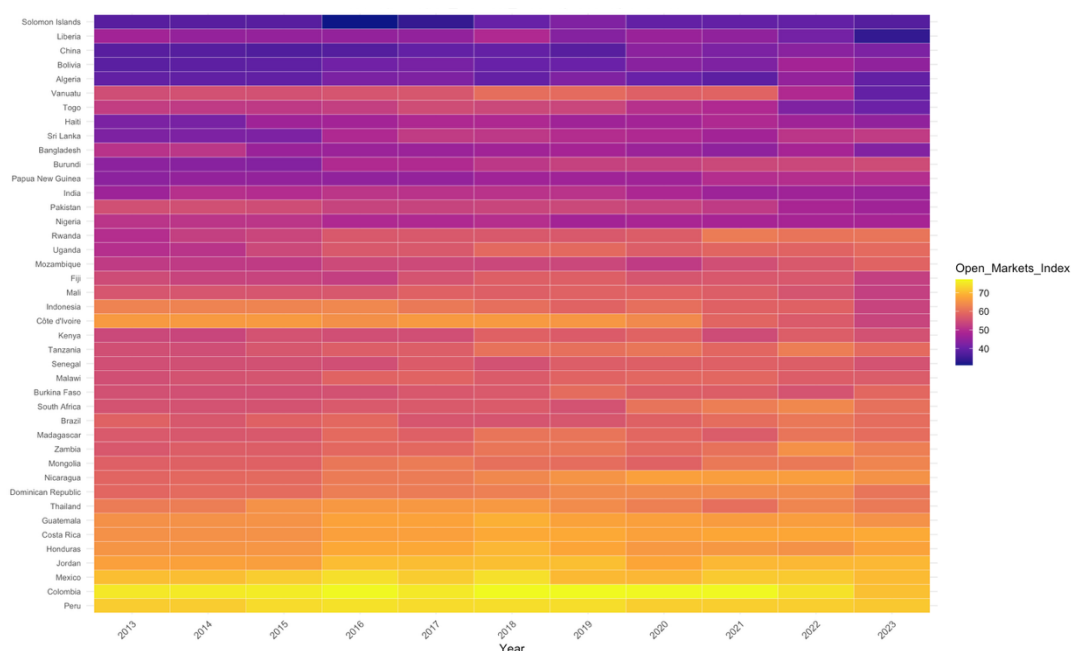
VI. **Supplementary Figure 6** Heatmap of Corruption Control Scores by Country and Year for ODA Recipients (2013–2023)



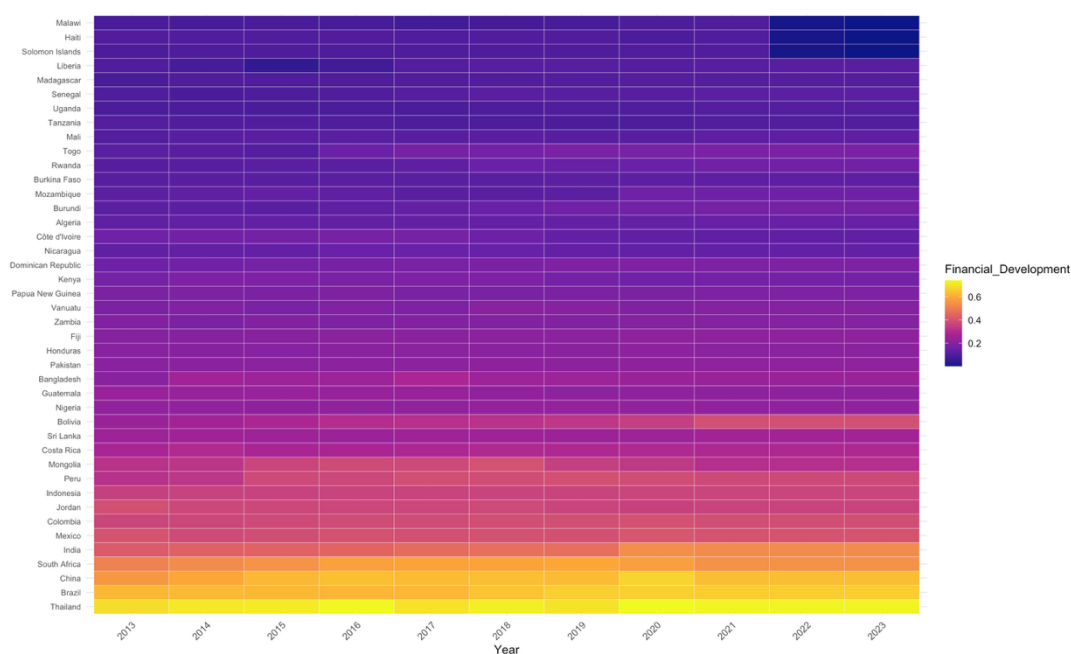
VII. **Supplementary Figure 7** Heatmap of Government Size Scores by Country and Year for ODA Recipients (2013–2023)



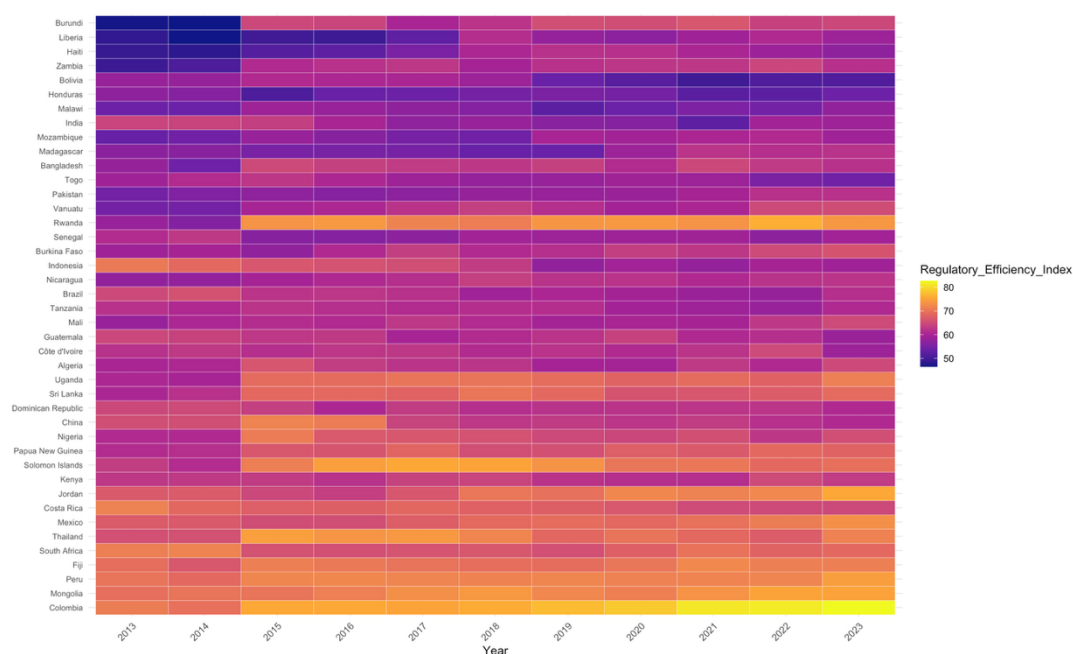
VIII. Supplementary Figure 8 Heatmap of Open Markets Index by Country and Year for ODA Recipients (2013–2023)



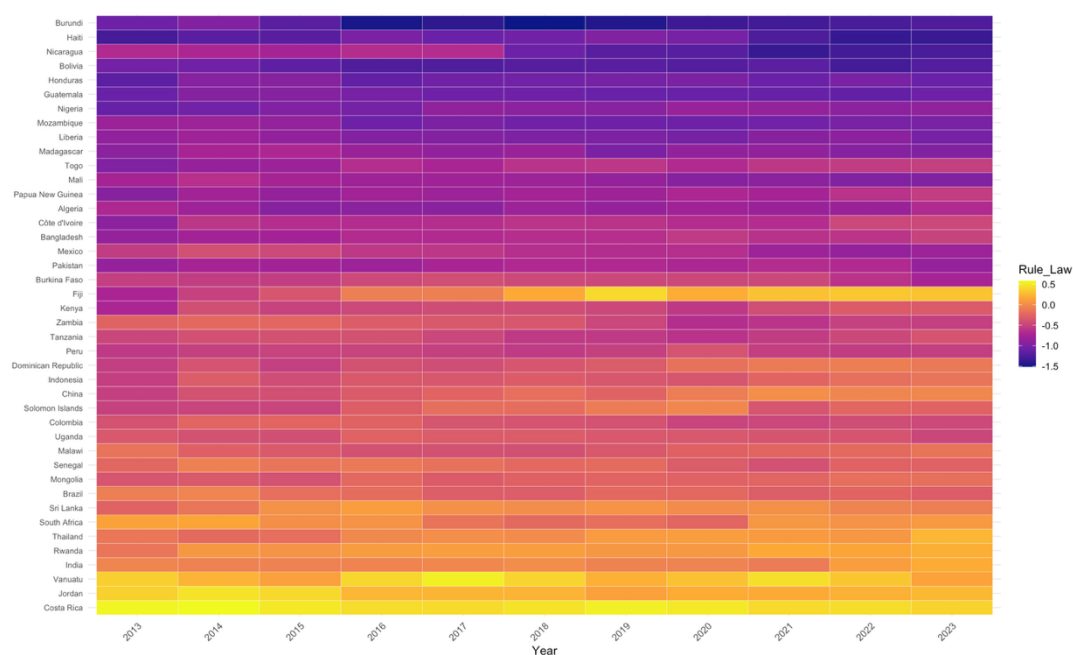
IX. Supplementary Figure 9 Heatmap of Financial Development Scores by Country and Year for ODA Recipients (2013–2023)



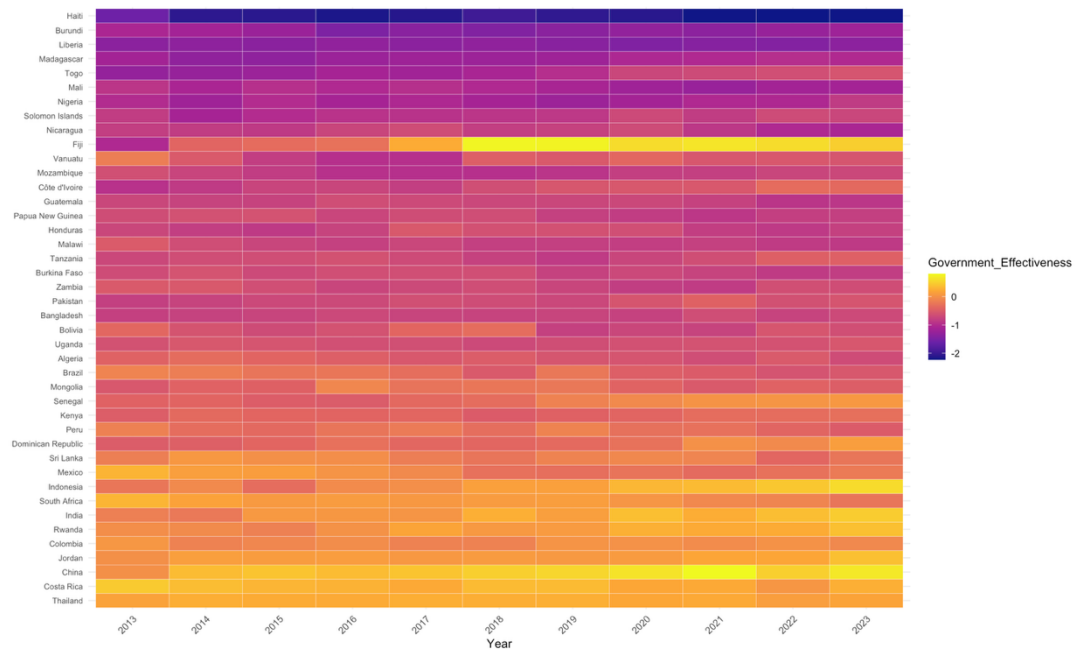
X. **Supplementary Figure 10** Heatmap of Regulatory Efficiency Scores by Country and Year for ODA Recipients (2013–2023)



XI. **Supplementary Figure 11** Heatmap of Rule of Law Scores by Country and Year for ODA Recipients (2013–2023)

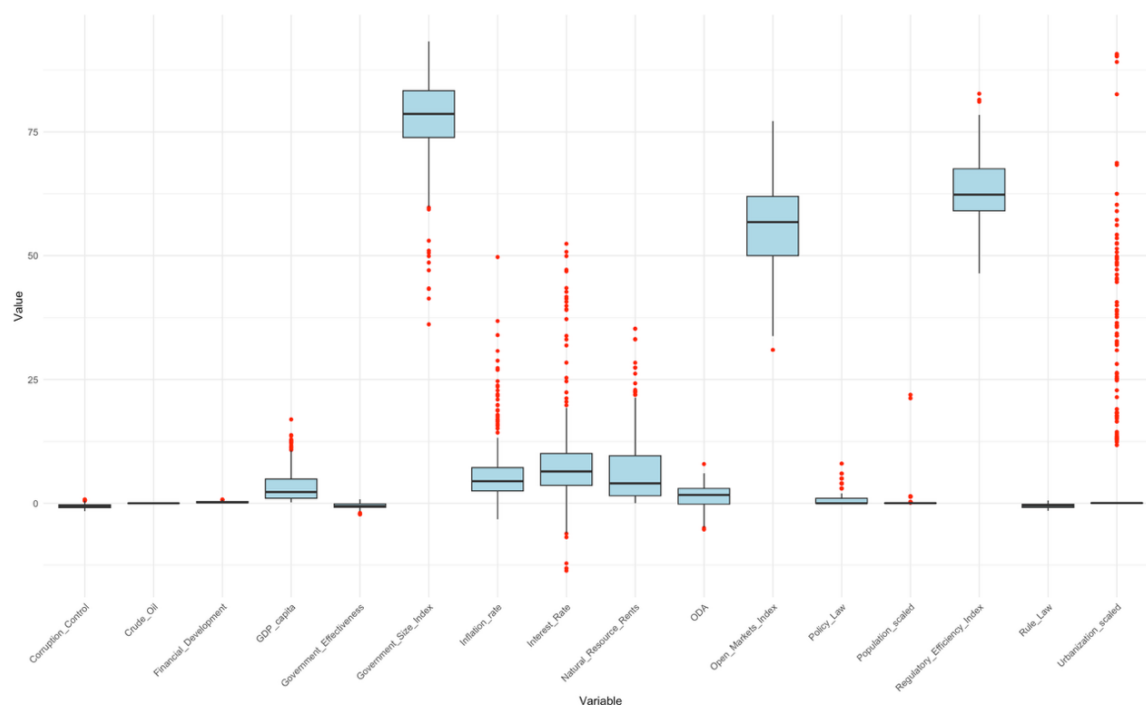


XII. **Supplementary Figure 12** Heatmap of Government Effectiveness Scores by Country and Year for ODA Recipients (2013–2023)



In all variables we observe that most variation happens between countries. This is expected when working with institutional data. Institutions are shaped over centuries by formative events (by colonial periods, legal origins, wars, revolutions) that will have lasting effects and are typically shared nationally. This leads to cross-country differences but low within-country variation. Additionally, there are legal and political frameworks, geographical elements, international integration, and a series of elements that are particular to each country and can perpetuate certain forms of institutions.

XIII. **Supplementary Figure 13** Distribution and Outliers of Key Variables Used in the Analysis



XIV. **Supplementary Table 1** Two-way fixed effects regression

	FE (1)	FE (2)	FE (3)	FE (4)	FE (5)	FE (6)	FE (7)
L. ODA	0.416*** (0.046)	0.419*** (0.046)	0.407*** (0.048)	0.415*** (0.046)	0.418*** (0.046)	0.426*** (0.046)	0.421*** (0.046)
GDP	0.057 (0.129)	0.107 (0.129)	0.073 (0.129)	0.071 (0.129)	0.102 (0.129)	0.090 (0.130)	0.069 (0.131)
Inflation	-0.005 (0.018)	-0.006 (0.018)	-0.008 (0.018)	-0.011 (0.018)	-0.010 (0.018)	-0.009 (0.018)	-0.008 (0.018)
Natural resource rents	0.003 (0.025)	0.006 (0.025)	0.011 (0.025)	0.003 (0.025)	0.007 (0.025)	0.004 (0.025)	0.005 (0.025)
Policy & law	-0.019 (0.072)	-0.027 (0.072)	-0.028 (0.072)	-0.028 (0.072)	-0.024 (0.072)	-0.021 (0.073)	-0.025 (0.072)
Population	0.012 (0.052)	0.016 (0.052)	0.009 (0.052)	0.013 (0.052)	0.013 (0.052)	0.013 (0.052)	0.011 (0.052)

	FE (1)	FE (2)	FE (3)	FE (4)	FE (5)	FE (6)	FE (7)
Urbanisation	0.001 (0.005)	0.000 (0.005)	0.001 (0.005)	0.001 (0.005)	0.001 (0.005)	0.001 (0.005)	0.001 (0.005)
Corruption control	1.672** (0.652)						
Financial development		5.357 (4.078)					
Government effectiveness			0.772 (0.511)				
Government size				-0.038* (0.022)			
Open markets					-0.042 (0.029)		
Regulatory efficiency						-0.010 (0.026)	
Rule of law							0.724 (0.618)
Adj. R ²	0.083	0.071	0.072	0.075	0.072	0.067	0.070
Num. obs.	420	420	420	420	420	420	420
***p < 0.01; **p < 0.05; *p < 0.1							

This baseline regression with all the disaggregated institutional quality variables shows the positive significant relationship of corruption control with ODA disbursement, and the negative significant relationship with government size index.

XV. Supplementary Table 2 Variance Inflation Factors
(VIF) for Models 1–7

Variable	Model 1: Corrupti on Control	Model 2: Financial Developmen t	Model 3: Government Effectiveness	Model 4: Government Size	Model 5: Open Markets	Model 6: Regulato ry Efficienc y	Model 7: Rule of Law
Main							
Institutional	1.2213	1.8687	1.7782	1.2809	1.2386	1.2264	1.2792
Var.							
GDP per	1.2713	1.8896	1.6241	1.2016	1.2350	1.3753	1.3240
capita							
Inflation rate	1.1320	1.0710	1.1390	1.0770	1.0726	1.0690	1.0807
Natural							
resource rents	1.1179	1.1307	1.1607	1.4140	1.1742	1.1344	1.1462
Policy law	1.0604	1.0627	1.0594	1.0627	1.0774	1.0715	1.0594
Population	1.0129	1.0187	1.0243	1.0131	1.0357	1.0134	1.0197
Urbanization	1.0101	1.0112	1.0084	1.0086	1.0115	1.0084	1.0090