Putting Climate at the Core of IMF Governance

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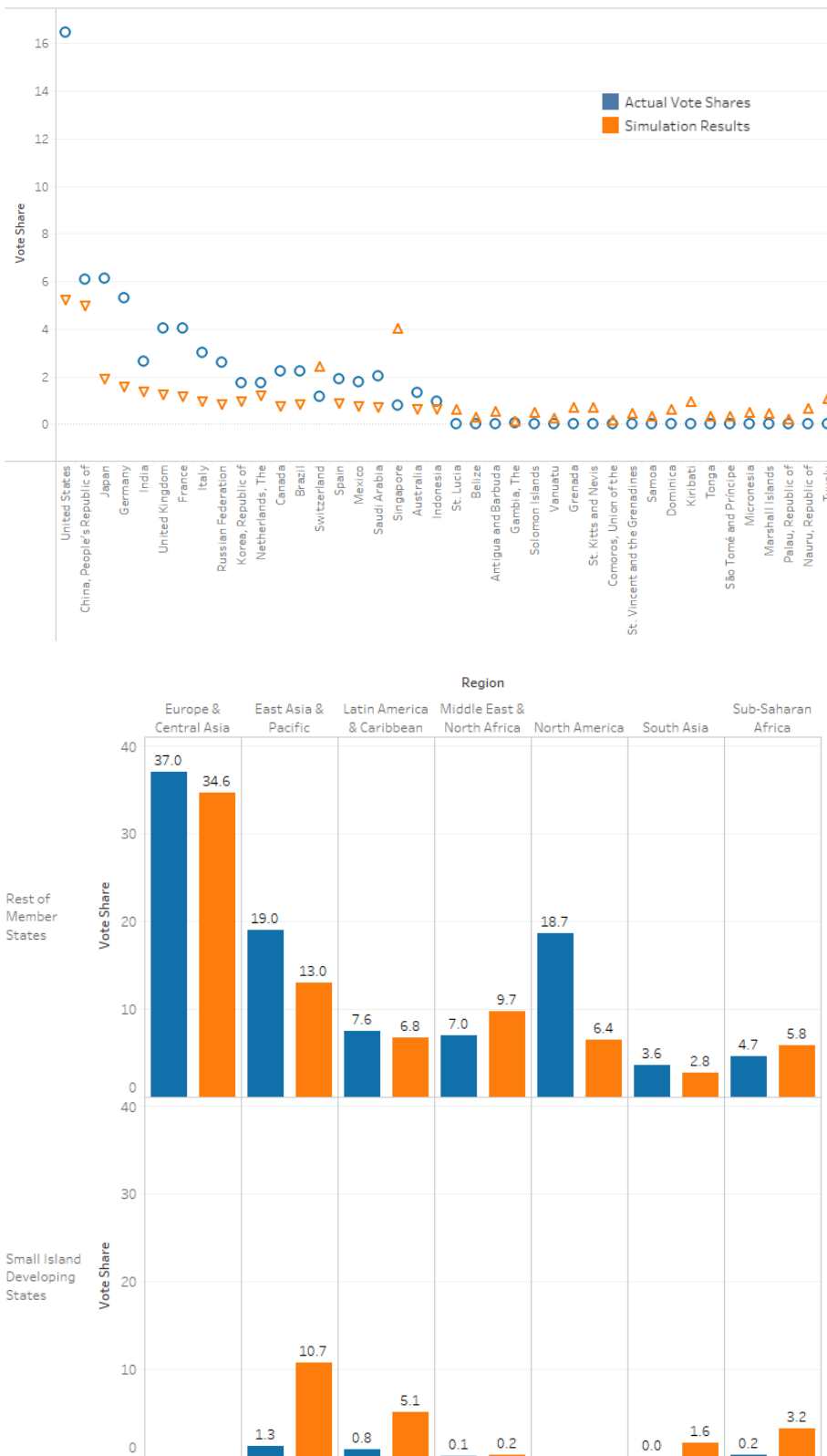
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Executive Summary

The formula used to determine a country's voting power at the International Monetary Fund (IMF) rewards economic size, trade openness, and the accumulation of reserves, but ignores countries' contributions to the climate emergency. The largest global cumulative emitters of carbon dioxide (CO_2) are also the most powerful countries at the IMF in terms of their voting shares. To give more decision-making powers to the countries most impacted by climate change and incentivize all countries to cut emissions, we propose a necessary update to the IMF's voting formula by adding a variable representing member states' shares of cumulative CO_2 emissions since 1944.

The inclusion of our climate variable would significantly reduce the voting shares of the greatest CO_2 emitters, and increase those of lower emitters, located primarily in the Global South.[1] If we assume countries fully adopt our formula proposal (i.e., with no subsequent opaque negotiations), the major winners would be Small Island Developing States (SIDS), which are among the countries most vulnerable to climate change, especially to rising sea levels. The vote share of these countries would increase from approximately 2.5 percent to nearly 21 percent, thereby significantly increasing their decision-making power within the Fund. The US vote share would decrease from 16.5 to 5.64 percent, and China's share would drop from 6.1 to 5.36 percent. Along regional lines, the Global South countries' vote share would increase from 37.0 to 56.4 percent, and, significantly, sub-Saharan African countries' share would expand from 4.9 to 9.0 percent. Advanced economies would see 12 percent of their votes transferred to emerging and developing economies.

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[1] "Global South" refers to Africa, Asia, Latin America, and the Middle East, according to Hickel's (2020) classification. "Global North" refers to Australia, Europe, Canada, Israel, Japan, South Korea, New Zealand, and the USA.

Figure 1
Simulation: Vote Shares by Country (Top and Bottom 20) and Geographic Blocs

Sources: IMF (2021a) and authors' calculations.

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Introduction

"The Articles of Agreement of the WTO and the IMF should abide by COP resolutions and not the other way around."
　　—Colombian president Gustavo Petro at COP27, Egypt, November 7, 2022[2]

Created in the wake of World War II as a Bretton Woods institution tasked with stabilizing fixed exchange rates, the International Monetary Fund (IMF) has evolved into its current role in economic crisis management and is a critical actor within the international monetary and financial system. Although technically accountable to and representative of 190 countries, the organization's decision-making power is concentrated in the hands of so-called advanced economies. Crucially, the United States' voting share, based on its IMF quota, gives it veto power over the most critical decisions, including the decision to redistribute voting power.

The quota formula, which rewards gross domestic product size, trade openness (including the level of exports and imports), and the accumulation of reserves by central banks, has a critical blind spot — it ignores a country's impact on global climate. In the context of rising global inequality and an escalating climate emergency, this is a glaring omission. Though the IMF's Articles of Agreement have a narrow economic mandate, the prevailing forms of national economic development have a direct impact on greenhouse gases in the atmosphere, and climate change poses a macro-critical risk to the global economy.

We propose a necessary update to the IMF's quota formula, and thus to the distribution of voting power, by including member states' shares of cumulative carbon dioxide (CO_2) emissions since 1944.

Context

Global climate considerations were not a priority when country representatives met in 1944 in Bretton Woods, New Hampshire, to discuss a new system of international economic and financial cooperation. At that time, economic growth was synonymous with postwar reconstruction and development. Dozens of now independent countries were then still colonies of Western European nations. Because it had not been bombed, and because its economy and industry had grown at a record pace during the war, the US had vastly increased its manufacturing output to an

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[2] Petro (2022).

astounding 50 percent of global production.[3] When the Bretton Woods Institutions were founded, power was centered in the North Atlantic and the governance of the institutions, therefore, hinged on a "gentleman's agreement" that guaranteed that a US citizen would preside over the World Bank and that a European would preside over the IMF.[4] Climate was not on the agenda in 1944, and was not considered to be either an economic issue or a governance issue.

Environmental sustainability and the threat of climate change first came to the fore as a matter that required international state cooperation at the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, Brazil, known as the Rio Earth Summit. In the 30 years since, global cumulative CO_2 emissions have increased by more than 50 percent[5] and environmental degradation and loss of biodiversity have sharply accelerated.[6] Principle 7 of the 1992 Rio Earth Declaration had already identified the importance of countries' shared commitment, and varying degrees of responsibility, stating:

> The States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and the technologies and the financial resources they command.[7]

However, three decades later, Intergovernmental Panel on Climate Change (IPCC) negotiations have revealed that the impasses that prevent international climate goals from moving forward are largely the same stumbling blocks that emerged at the 1992 Earth Summit.[8] In the 27th United Nations Climate Change Conference (COP27) in November 2022 in Egypt, developing countries were still aiming to limit temperature increases. In a statement on behalf of Like-Minded Developing Countries (LMDCs)[9] during COP27, Bolivia expressed, "much of the impacts we are facing today are the effects mainly due to the historical and cumulative emissions of developed countries, who have till today, not rapidly reduced their emissions despite all their promises to do so, and not provided any significant support to developing countries, failing in reaching their commitments under the Convention," and further, "The backdrop of the climate

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3 UN (1949)
4 This did not mean that Europe was predominant at the IMF; the gentleman's agreement still provided for the US to be the overwhelmingly dominant decision-maker at the Fund also, despite the managing director being a European. In addition, the first deputy director of the IMF has always been a US citizen. See Weisbrot and Johnston (2016) and Sanford and Weiss (2004).
5 IEA (2021).
6 UN (2019).
7 UN (1992).
8 Khor (2012) and Kung (2022).
9 LMDCs represent a negotiating group of more than 20 countries from Africa, Asia, Latin America, and the Middle East. Carbon Brief (2015).

crisis is one of deepening climate injustice, since developed countries are attempting systematically to shift the burden to address climate change on to the developing countries and now to the private sector."[10] LMDCs reiterated this analysis in a post-COP statement.[11]

In general, developing countries bear the least responsibility for the climate crisis, yet face the greatest burdens in terms of its impacts. Small Island Developing States (SIDS) are among the most vulnerable[12] of these.[13] They are the first to be affected by rising sea levels and extreme weather events and are deeply impacted by the structural challenges associated with climate change. Despite their negligible role in creating the climate crisis, these countries have little to no say in shaping the economic policies that will determine the global response to the challenges ahead; SIDS together account for approximately 1.5 percent of the IMF quota, and 2.5 percent of votes.[14]

Meanwhile, it is the countries whose carbon emissions exceed their "fair share" based on population[15] that have the greatest say in how the Bretton Woods Institutions are currently governed. Therefore, they have the greatest cumulative power in dictating what sort of support these institutions will provide to those countries most at risk from climate change impacts, including the economic repercussions. In proposing an empirical framework for measuring a country's responsibility for climate damages, economic anthropologist Jason Hickel finds that if each country's contribution to climate change is calculated based on its cumulative carbon emissions, its "fair share" of emissions by population, and its historical record of emissions, 92 percent of countries that "overshoot" their fair share are from the Global North.[16]

To respond to the enormity of this crisis — to both mitigate its harms and adapt to its disruptions — the IMF estimates global climate financing needs to be in the range of $3–4 trillion annually.[17] Adaptation needs alone are estimated to amount to as much as $300 billion per year by 2030.[18] Yet current provisions for climate financing are vastly insufficient.

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10 Third World Network (2022b).
11 Third World Network (2022a).
12 Merling (2022).
13 They are Antigua and Barbuda, Bahamas, Bahrain, Barbados, Belize, Cabo Verde, Comoros, Cuba, Dominica, Dominican Republic, Fiji, Grenada, Guinea–Bissau, Guyana, Haiti, Jamaica, Kiribati, Maldives, Marshall Islands, Federated States of Micronesia, Mauritius, Nauru, Palau, Papua New Guinea, Samoa, São Tomé and Príncipe, Singapore, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Seychelles, Solomon Islands, Suriname, Timor-Leste, Tonga, Trinidad and Tobago, Tuvalu, and Vanuatu. See UN (N.d.).
14 Fresnillo and Crotti (2022), IMF (2022a), and authors' calculations.
15 Hickel (2020).
16 Hickel (2020). In Hickel's analysis, the Global North refers to Australia, Europe, Canada, Israel, Japan, South Korea, New Zealand, and the USA. The Global South refers to Africa, Asia, Latin America, and the Middle East.
17 IMF (2022d).
18 UNEP (2021).

In 2009, rich countries pledged to provide $100 billion per year in climate financing by 2020 (i.e., just a third of the estimated financing needs for climate adaptation only), but even this insufficient commitment has not been met.[19] Additionally, climate-related financing made available through the IMF's recently created Resilience and Sustainability Trust will come in the form of debt that must be repaid, with potentially costly and harmful conditions attached.[20] At COP27, advanced economies signaled willingness to establish a fund for "loss and damage," a core demand of G77 countries at the summit;[21] details are supposed to be finalized during COP28.

During 2021's COP26 Summit in Glasgow, Scotland, the prime minister of Barbados (a Caribbean SIDS), Mia Mottley, put forward a proposal for addressing the historic gap in climate finance: a yearly issuance of IMF Special Drawing Rights (SDRs). Since Mottley popularized this proposal, government officials, lawmakers, and civil society organizations have begun to consider how SDRs could change the landscape of "available" resources to combat climate change.[22] Periodic SDR issuances would provide significant, immediate financial support to countries struggling to respond to climate change.[23] Funding would become available to carry out green transitions, such as through infrastructure or investment projects, and to respond to urgent climate-driven shocks.[24] However, the distribution of current voting power at the IMF means that the decision to issue more SDRs is effectively determined by the largest emitters — the US and other advanced economies — and not by the countries that would actually use and benefit from SDRs to address climate change. As of the publication of this paper, the US and other advanced economies have signaled that they do not support a new SDR allocation, despite repeated calls for an allocation by African governments and hundreds of international civil society organizations.[25]

Figure 2 shows the top 20 countries with the largest cumulative CO_2 emissions. In assessing a nation's contribution to the climate crisis, it is cumulative emissions that matter, since carbon dioxide remains in the atmosphere between 300 and 1,000 years, while most other gases are relatively ephemeral.[26] **Figure 3** shows historical emissions since the inauguration of the IMF and other Bretton Woods Institutions and demonstrates that the primary responsibility for cumulative CO_2 emissions rests with high-income countries.

19 UN (2022).
20 Vasic-Lalovic (2022).
21 Farand (2022).
22 Galant (2022).
23 Montes (2021).
24 Georgieva and Verkooijen (2021).
25 Shalal and Lauder (2022), Latindadd (2021), and UNECA (2022).
26 Buis (2019) and Evans (2021).

Figure 2

Share of Cumulative CO$_2$ Emissions 1944-2019 by Country (Top 20 Countries)
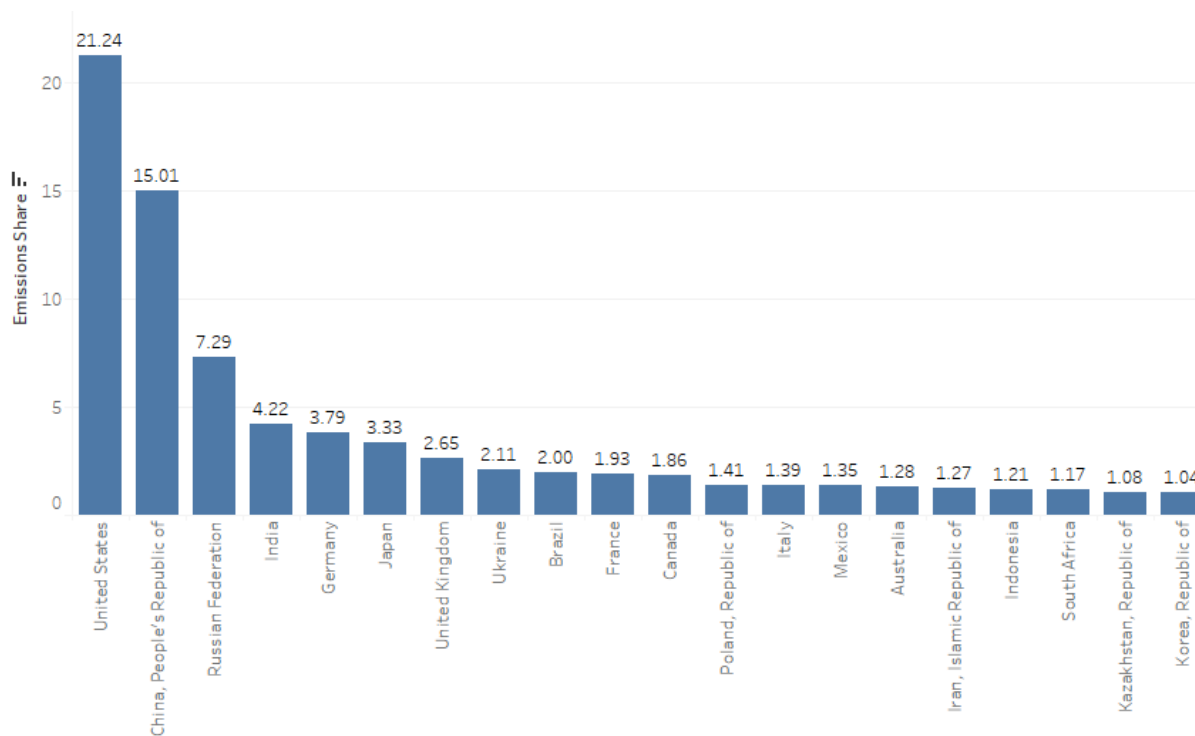
Source: Gütschow, Günther, and Pflüger (2021).

Figure 3

Share of Cumulative CO$_2$ Emissions 1944-2019 by Income Group
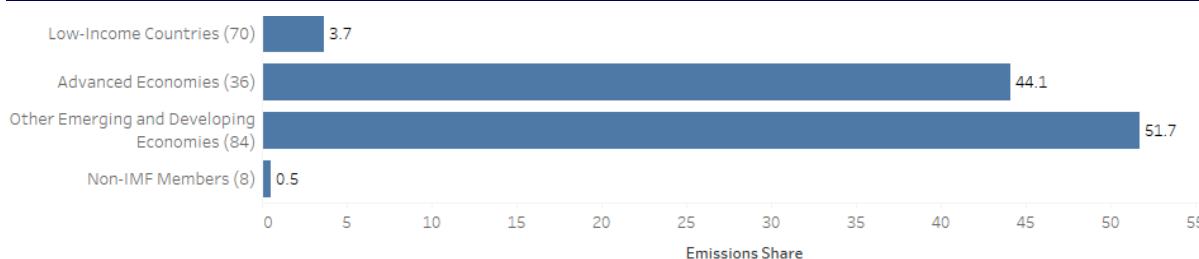
Source and Notes: Gütschow, Günther, and Pflüger (2021). Income categories follow IMF classification, and region categories follow World Bank classification: IMF (2022e) and World Bank (2022). Data for the People's Republic of China includes Hong Kong and Macao. "Non-IMF members" represents Cuba, the Cook Islands, the Holy See (Vatican), Liechtenstein, Monaco, Niue, North Korea, and Taiwan.

The largest global cumulative emitters are also the most powerful member countries at the IMF. The top 20 emitters hold 64 percent of IMF voting power (**Figure 4**).

Figure 4

Voting Power of Largest Emitters 1944–2019 vs. the Rest of IMF Members
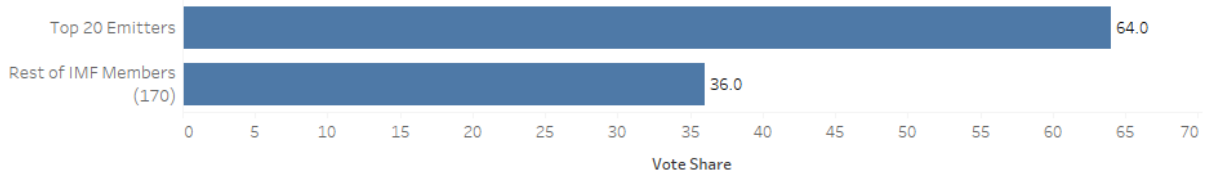
Sources: Gütschow, Günther, and Pflüger (2021) and IMF (2021a).

Figure 5

IMF Voting Power of Top 20 and Bottom 100 CO_2 Emitters 1944–2019

Sources: Gütschow, Günther, and Pflüger (2021) and IMF (2021a).

Decisions at the IMF: Quota Shares and Governance Structure

Our proposal focuses on the formula for distributing quota shares at the IMF. We present a brief overview of how the distribution of IMF quota shares is linked to that of voting power and therefore to the structure of IMF governance itself.

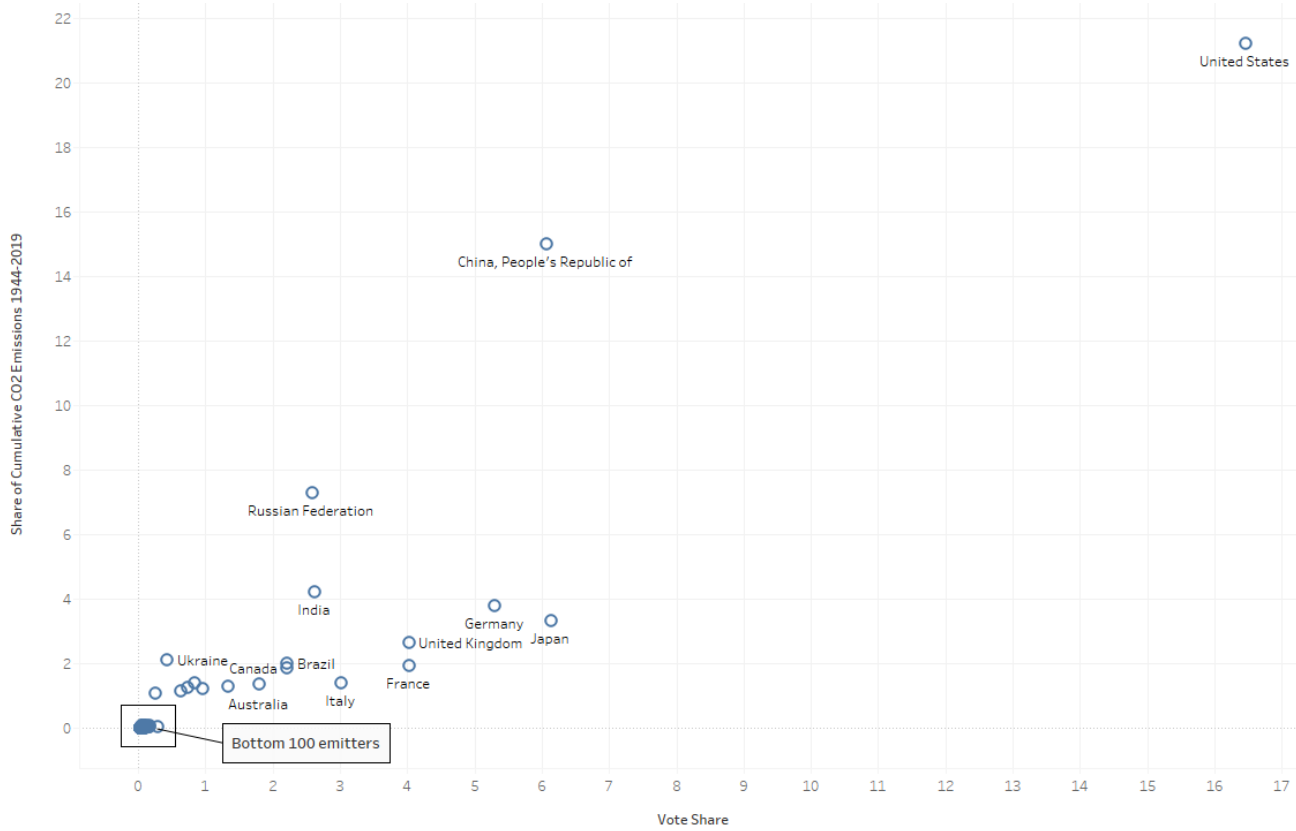At the IMF, most major decisions are determined by two main bodies. The first is the IMF's Executive Board, a group of 24 permanent "executive directors" each representing one country, or a group of countries. This group conducts most of the IMF's day-to-day operations and is chaired by the managing director. The Executive Board's power, however, is delegated by the IMF's highest decision-making body, the Board of Governors, which consists of one governor and one alternate governor from each of the IMF's 190 countries. In this body, country representatives are typically ministers of finance or central bank governors — not ministers of the environment. Most importantly, any change to the IMF's governance structure has to be approved with an 85 percent majority at the Board of Governors.[27] Important decisions related to IMF finances, such as loan exchange rates, and the valuation of SDRs, require 70 percent of the vote.[28] Most other decisions at the Fund can be made with a simple vote majority, but in practice, voting rarely takes place as the managing director is expected to "read the room" instead.[29]

A country's quota share is a key first step in determining a country's final voting share at the IMF governing bodies. Each member country's quota share also determines its maximum financial commitment to the IMF, its access to funding, and its SDR allocation in the event of an issuance.[30]

A key limitation of the quota system is its reinforcement of "structures in which the United States exercises its leadership position," according to the US Treasury. Given that the US has over 16 percent of voting shares, it has effective veto power over major decisions at the Fund. The 2010 reforms to the Fund's Articles of Agreement — not ratified until 2016 — once again ensured

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27 For decisions that require an 85 percent majority, see IMF (2020), 121–122.
28 For decisions that require a 70 percent majority, see IMF (2020), 121.
29 "At any meeting the Chairman may ascertain the sense of the meeting in lieu of a formal vote but he shall require a formal vote upon the request of any Governor," and "The Chairman shall ordinarily ascertain the sense of the meeting in lieu of a formal vote. Any Executive Director may require a formal vote to be taken … There shall be no formal voting in committees and subcommittees. The Chairman of the committee or subcommittee shall determine the sense of the meeting (including alternative points of view) which shall be reported." See Section 11 and articles C-10 and C-11, IMF (2021b).
30 For a history of the IMF quota, see Mohan and Kapur (2015).

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that, as the US Treasury argued, "the U.S. would remain the IMF's largest shareholder and the only country in the world with veto authority over major decisions at the IMF."[31] In practice, the US's decision-making power at the IMF has been much greater than as determined by its voting share: the high-income countries have almost always reached agreement among themselves, and when there have been differences (e.g., between the US and Europe, which has a larger cumulative voting share than the US) a consensus has generally been reached that accepts the US position.[32]

As explained in **Figure 6** below, distribution of voting power begins with a "calculated quota share" (CQS) determined by the IMF's formula, which incorporates particular economic variables from each country.[33] However, the "actual quota share" (AQS) is determined by complex negotiations between member states during a General Review of Quotas.[34] Shares are then converted to an absolute number and added to a basic number of votes per country (set at 5.502 percent of total votes), which translates into that country's number of votes at IMF governing bodies.

Quota and Voting Shares
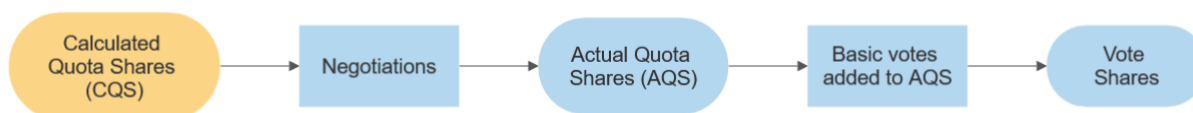
Sources: IMF (2010) and IMF (2016).

Negotiations at the stage between CQS and AQS are not transparent.[35] For example, negotiations in the Fourteenth General Review of Quotas,[36] resulted in an increase in the US's quota share from 16.99 to 17.40 percent and a dilution of China's quota share from 7.92 to 6.39 percent.[37]

Changes to the initial quota formula-determined distribution of votes face several checks within the IMF governance system. As mentioned above, any changes in the distributed actual quota

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31 Wyeth Earnest (2014).
32 Weisbrot and Johnston (2016).
33 The current quota formula was agreed to by the IMF Executive Board in 2008. Mohan (2020).
34 The IMF Articles of Agreement mandate that a review of quotas be held at least every five years. Current quota shares are a result of the Fourteenth General Review of Quotas, approved in 2010 and implemented in 2016. Mohan (2020).
35 "Other considerations outside of the formula, such as members' ability or willingness to contribute to the Fund's liquidity and protection of the poorest, have also been taken into account". IMF (2016).
36 The Fourteenth General Review of Quotas was approved in 2010, but only implemented in 2016. See Mohan (2020).
37 IMF (2012).

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share requires an 85 percent majority, and a country's quota cannot be changed without the country's consent. Countries may request an ad hoc quota adjustment outside of general reviews of the quota, which occur every five years. While there have been sustained efforts to alter the formula and quota shares, such calls for reform have been pushed aside.[38] Nor have these reform proposals taken into account the challenges of addressing climate change. With the climate crisis now a first-order priority at the global level, a fresh revisitation of the IMF quota system for determining vote shares is in order.

Data and Methodology

We use data through 2019 published by the IMF following the 14th quota reform, and updated in 2021.[39] The IMF quota formula contains the following variables and weights:

Quota = (0.50*GDP + 0.30*Openness + 0.15*Variability + 0.05*Reserves)^K

The variables are defined as follows:

GDP = 60% market GDP and 40% PPP GDP; average over three years

Openness = annual average of the sum of current payments and current receipts (goods, services, income, and transfers) over a five-year period

Variability = variability of current receipts and net capital flows (standard deviation from the centered average over three years, over a period of 13 years)

Reserves = official gold and currency reserves (monthly average over a recent year)

K = compression factor equal to 0.95

To note: each of the variables faces methodological questions around official sources, periods of relevancy, conversion factors, and time lags. We will not delve into these issues or into what these variables would look like today.

To calculate votes, the IMF assigns one vote per 100,000 SDRs according to each country's quota.
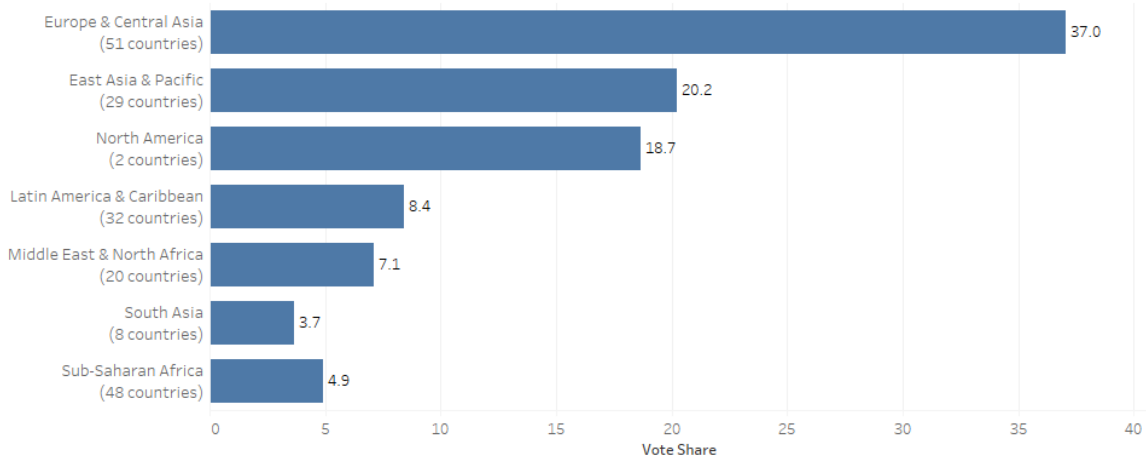
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38 Blomberg and Broz (2013).
39 IMF (2021a). For a discussion of the IMF formula variables, see IMF (2016) and (2022b).

Then, a number of basic votes, calculated as 5.502 percent of total votes, is added equally to each country's existing number.[40]

Figure 7
Voting Power at the IMF

Share of Votes by Region

Region	Vote Share
Europe & Central Asia (51 countries)	37.0
East Asia & Pacific (29 countries)	20.2
North America (2 countries)	18.7
Latin America & Caribbean (32 countries)	8.4
Middle East & North Africa (20 countries)	7.1
South Asia (8 countries)	3.7
Sub-Saharan Africa (48 countries)	4.9

Share of Votes by Income Group

Income Group	Vote Share
Low-Income Countries (70 countries)	5.2
Other Emerging and Developing Economies (84 countries)	35.9
Advanced Economies (36 countries)	59.0
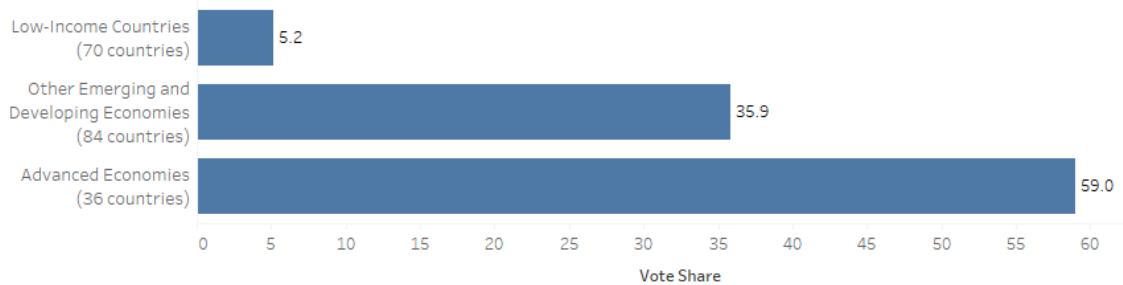
Share of Votes between North and South

	Vote Share
Global North (49 countries)	63.0
Global South (141 countries)	37.0
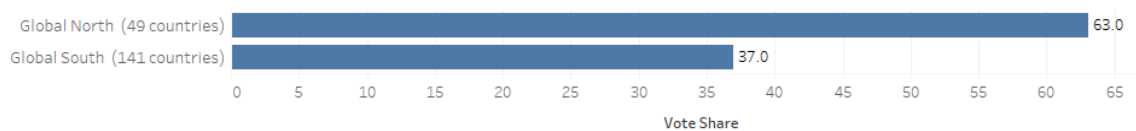
Source and Notes: IMF (2021a). Income categories follow IMF classification, regional categories follow World Bank classification, and Global North and South follow Hickel's (2020) classifications. See the Notes of Figure 3 for more on the IMF and World Bank classifications. Numbers represent voting shares using AQS, from IMF data updated through 2019.

For our climate variable, we use cumulative CO_2 emissions over time. It is the most appropriate scientific measurement of national responsibility regarding climate change, as carbon dioxide remains in the atmosphere between 300 and 1,000 years. Although yearly CO_2 emissions data from 1990 is readily available, we use a country-by-country cumulative CO_2 series going back to

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[40] IMF (2010) and (2022c).

1750. A full explanation of the characteristics of the data set used is in Appendix 1. We matched and interpolated the country data from the Potsdam Institute for Global Climate Research, the most consistent and relevant data set, to the IMF's current member countries.

We ran a simulation of an IMF voting share recalculation with the incorporated data. We used the available data of the cumulative CO_2 emissions per country since 1944, updated through 2019, calculated the share per country, and normalized the results. We make the assumption that our formula output is binding, and would not be amended through negotiations.

We divided countries' share of the Openness variable in the quota formula by their share of cumulative CO_2 emissions, and then rescaled the results to sum up to 100 percent. We chose to divide the Openness variable as it represents countries' trade flows in goods, which are associated with CO_2 emissions.

Our adjusted quota formula that factors in emissions share is as follows:

$$QuotaEm = (0.50*GDP + 0.30*Openness/CumulEm + 0.15*Variability + 0.05*Reserves)^K$$

Where:

$CumulEm$ = share of cumulative CO_2 emissions (MtCO2e) from 1944 to 2019

Results

Vote shares calculated according to our climate-weighted formula show reductions for the US and China. The US's share would decrease from 16.5 to 5.64 percent, and China's share would drop from 6.1 to 5.36 percent. Other high-income countries, like Japan and Germany, would also see their shares decrease, while the least powerful nations at the IMF would gain votes.

Simulation: Vote Shares by Country (Top and Bottom 20)
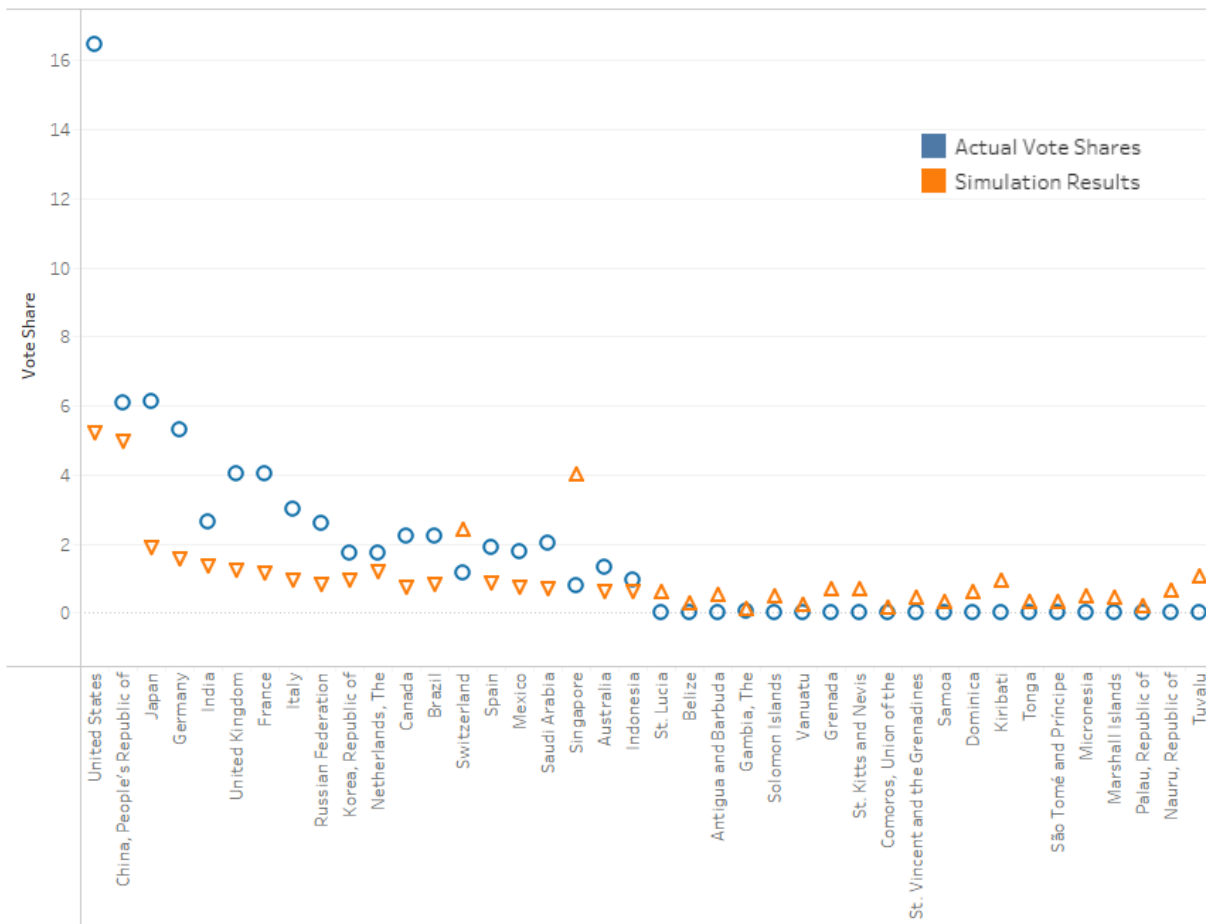
By income grouping, the voting share of advanced economies would decrease from 59 to 47 percent, representing a transfer of 12 percent of votes to emerging and developing economies. Low-income countries, specifically, would increase their vote share from 5.2 to 18 percent of votes.

Figure 9

Simulation: Voting Power by Income Grouping and by Geographic Blocs

Region

	Actual Vote Shares	Simulation Results
Europe & Central Asia (51)	37.0	34.6
East Asia & Pacific (29)	20.2	23.7
Latin America & Caribbean (32)	8.4	11.9
Middle East & North Africa (20)	7.1	10.0
North America (2)	18.7	6.4
South Asia (8)	3.7	4.4
Sub-Saharan Africa (48)	4.9	9.0

Vote Share

Income Group

	Actual Vote Shares	Simulation Results
Low-Income Countries (70)	5.2	18.0
Other Emerging and Developing Economies (84)	35.9	35.1
Advanced Economies (36)	59.0	47.0

Vote Share

	Actual Vote Shares	Simulation Results
Global North (49)	63.0	43.6
Global South (141)	37.0	56.4

Vote Share

Sources and Notes: IMF (2021a) and authors' calculations. Income categories follow IMF classification, regional categories follow World Bank classification, and Global North and South follow Hickel's (2020) classifications. See the Notes of Figure 3 for more on the IMF and World Bank classifications.

Along regional lines, Global South countries would increase their vote share from 37.0 to 56.4 percent, and, in particular, sub-Saharan African countries' would expand from 4.9 to 9.0 percent.

The major winners under this recalculation would be SIDS; their vote share would increase from approximately 2.5 to nearly 21 percent, which adequately reflects the fact that they are highly vulnerable to climate change, especially rising sea levels.

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Limitations

Several high-income secrecy jurisdictions such as Switzerland, Luxembourg, and Singapore, which function as corporate tax havens and offshore banking centers, also would come out as winners in our simulation. This is because they have less relative trade in goods and their economies are highly oriented toward cross-border capital movements. This issue could be addressed by including an additional variable found in the Tax Justice Network's Corporate Tax Haven Index[41] to the IMF's "Variability" variable, which considers a country's capital flows.

Another limitation of our proposal is that it does not consider population as a variable in the formula. Emerging and developing countries, historically, have requested the inclusion of population, which would increase their relative position in the IMF. The IMF's response, on record, is that it deals with monetary issues, which are unrelated to population.[42]

Conclusions

The climate crisis requires substantial mobilization of international resources in order to sufficiently address a challenge of this scale. Yet a country's power in the global financial system is not tied to, and is in fact inversely related to, its share of responsibility for the climate crisis and its vulnerability to it. Advanced economies — 36 high-income countries as categorized by the IMF — are responsible for approximately 44 percent of cumulative global CO_2 emissions since 1944. For the IMF to adequately provide climate financing solutions, its governance structure needs to take into account member countries' differentiated responsibilities and vulnerabilities in the climate crisis.

Our proposal for IMF governance reform would require dominant state stakeholders to concede large portions of their current voting shares and reallocate their decision-making powers; as such, a structural reform of this magnitude is unlikely to proceed through the IMF's current governance processes. However, we believe that calls for this sort of reform, which stem from the "common but differentiated responsibility" principle ostensibly adopted by the international community, are critical in our climate emergency. With each country's cumulative emissions

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41 Tax Justice Network (2021).
42 Van Houtven (2002). Some economists argue that populations have significant impacts on monetary issues; specifically, that the creation of money, and therefore the money supply, is driven by a population's demand for credit. See Pettifor (2017).

taken into account under our adjusted formula, decision-making power would shift to countries most impacted by climate change, and all countries would be incentivized to cut emissions.

At the 2020 Annual Meeting of the IMF Board of Governors, IMF Managing Director Kristalina Georgieva described the economic challenges facing our current world — including the pandemic, climate change, and global economic pressures — and ended with a call to action: "Today we face a new Bretton Woods '**moment**.'" Just as the architects of Bretton Woods faced postwar economic destruction in 1944 with an imperative to rebuild, so must we act to address the climate crisis threatening our twenty-first century global economy and our planet. We must understand such an emergency as not only a crisis, but an opportunity to remake and update our global governance structures to be equitable and representative of their full membership. As Georgieva says, "Just as the pandemic has shown that we can no longer ignore health precautions, we can no longer afford to ignore *climate change* … We focus on climate change because it is *macro-critical*, posing profound threats to growth and prosperity. It is also *people-critical* and *planet-critical*."[43] *[Emphasis in the original.]*

A new Bretton Woods moment, therefore, must uphold a new distribution of power, breaking with, in the words of Kevin Gallagher and Richard Kozul-Wright, the "powerful vested interests that have woven strong political alliances around support for footloose capital, rent-seeking corporations, and a carbonized economy."[44] As was necessary for effective postwar reconstruction, today's international financial and monetary institutions must allow for new configurations of decision-making organized around climate financing as an urgent priority. By highlighting the gap between international commitments to resolving the climate crisis and the governance structures of institutions tasked with addressing it, actors within the multilateral system can begin to propose such reforms. If the climate emergency is to be taken seriously as a "macro-critical" risk to the global economy, major change is urgently needed in global economic governance. The IMF is a good place to start.

43 Georgieva (2020).
44 Gallagher and Kozul-Wright (2021).

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Appendix A: CO_2 Emissions Data

For this analysis, we use the PRIMAPHIST database of cumulative greenhouse gas emissions from the Potsdam Institute for Climate Impact Research (PIK).[45] PRIMAPHIST contains data for each United Nations Framework Convention on Climate Change (UNFCCC) country for all greenhouse gases and main emission categories. It includes data from 1750 to 2019, though data for all countries, gases, and emissions categories are not available for the entire period. Our analysis covers the years 1944–2019, which captures data for most countries. We chose 1944, the founding year of the IMF, as a start date; as the adjusted formula is to be used in calculating a country's voting share at the IMF, a country's cumulative emissions since 1944 would represent a country's contributions to global emissions for the duration of the IMF's existence.

We accessed the PIK data through the Climate Watch data platform[46] by setting the data source as "PIK," the calculation as "cumulative across available years," and adjusting the slider to the start date, "1944." We chose PIK as a data source over others due to the greater breadth of information available per country per year. Other alternative authoritative sources include the UNFCCC, the Global Carbon Project, the Emissions Database for Atmospheric Research, and the Intergovernmental Panel on Climate Change.

To calculate the share of cumulative CO_2 per country in this analysis, we divided each IMF member state's share by the cumulative CO_2 emissions of all UNFCCC countries. We include one share for the sum of all non-IMF members (approximately 0.5 percent).

We made some adjustments to country emissions data. The PRIMAPHIST database does not include data for Kosovo, a member of the IMF. This is likely due to a lack of available reporting. To account for this, we used the share of Serbia's cumulative emissions corresponding to Kosovo's population, and subtracted it from Serbia's total. The database also separately measures the emissions of China, Hong Kong, Macau, and Taiwan; we combined the first three. We also combined the emissions of the respective overseas territories of the United Kingdom and the Netherlands with these countries.

As previously noted, voting power at the IMF is based on quota shares, which are calculated from the nonbinding formula and then renegotiated between member states. Our simulation operates under the assumption that our revised formula output would be binding.

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[45] Gütschow, Günther, and Pflüger (2021).
[46] Climate Watch (N.d.).

Appendix B: Formulas and Country-by-Country Tables for Simulation Methodology

We used a simple linear regression to test if Openness significantly predicted cumulative emissions (CumulEm). We ran the regression using absolute values for Openness denominated in Special Drawing Rights, as published by the IMF.[47] For cumulative emissions, we used absolute values for CO_2 expressed in MtCO2e. The fitted regression model was: $y = 0.0619x$. The correlation was positive and significant ($R^2 = 0.8098$).

Figure B1

Cumulative Emissions (MtCO₂e) versus Openness
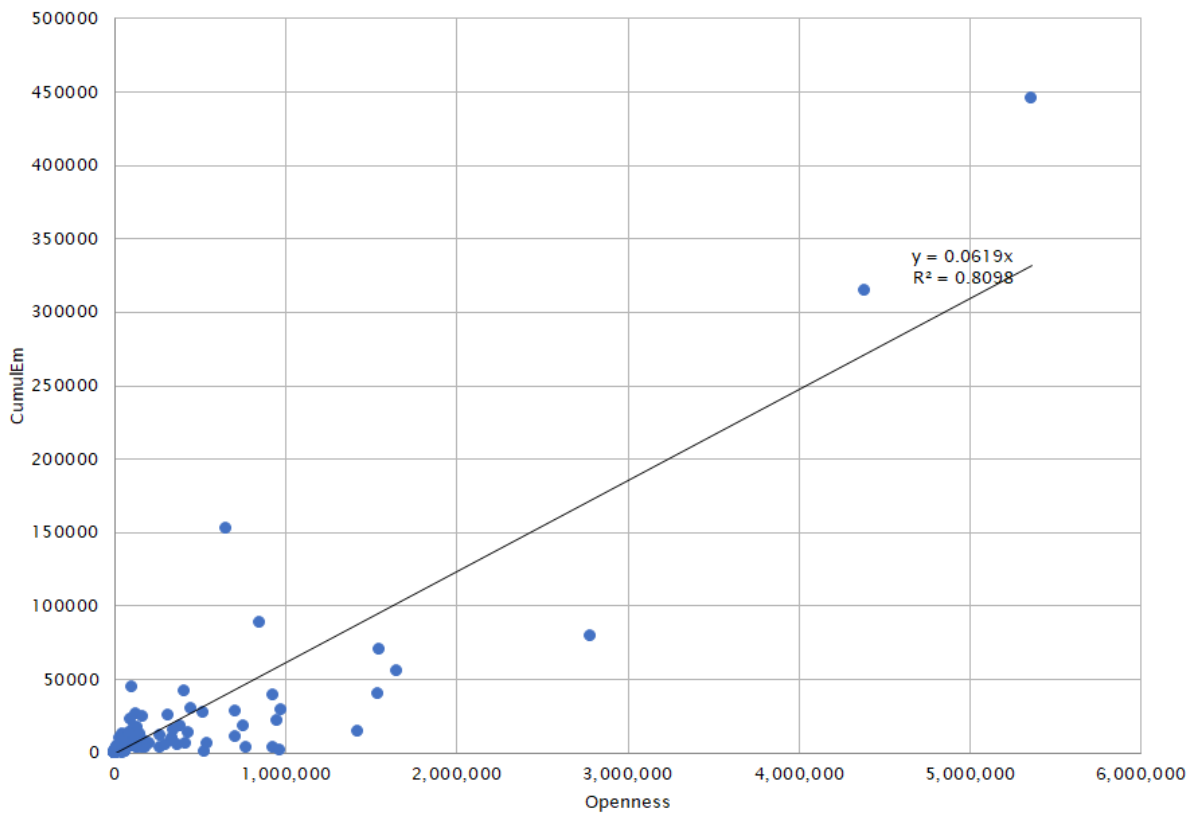
Sources: Gütschow, Günther, and Pflüger (2021), IMF (2021a), and authors' calculations.

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[47] IMF (2021a).

Simulation

We divided countries' share of the Openness variable in the quota formula by their shares of cumulative CO_2 emissions, and then renormalized the results to sum up to 100 percent. We calculated voting shares using the revised quota formula with basic votes included.

Our adjusted quota formula is as follows:

$$QuotaEm = (0.50*GDP + 0.30*Openness/CumulEm + 0.15*Variability + 0.05*Reserves)^K$$

Where:

CumulEm = share of cumulative CO_2 emissions (MtCO2e) from 1944 to 2019

Table B1

Actual and Simulated Vote Shares at the IMF, for Each Member Country		
	Vote Shares (in percent)	
Country	**According to Actual Quota Shares**	**Simulation**
Afghanistan, Islamic Republic of	0.09	0.12
Albania	0.06	0.24
Algeria	0.42	0.24
Andorra, Principality of	0.05	0.96
Angola	0.18	0.21
Antigua and Barbuda	0.03	0.56
Argentina	0.66	0.33
Armenia, Republic of	0.05	0.13
Australia	1.33	0.64
Austria	0.81	0.78
Azerbaijan, Republic of	0.11	0.15
Bahamas, The	0.07	0.37
Bahrain, Kingdom of	0.11	0.24
Bangladesh	0.24	0.31
Barbados	0.05	0.16
Belarus, Republic of	0.16	0.15
Belgium	1.30	0.81

Country	Vote Shares (in percent)	
	According to Actual Quota Shares	Simulation
Belize	0.03	0.29
Benin	0.05	0.15
Bhutan	0.03	0.19
Bolivia	0.08	0.12
Bosnia and Herzegovina	0.08	0.13
Botswana	0.07	0.20
Brazil	2.22	0.88
Brunei Darussalam	0.09	0.21
Bulgaria	0.21	0.18
Burkina Faso	0.05	0.10
Burundi	0.06	0.09
Cabo Verde	0.03	0.62
Cambodia	0.06	0.22
Cameroon	0.08	0.12
Canada	2.21	0.81
Central African Republic	0.05	0.04
Chad	0.06	0.07
Chile	0.37	0.46
China, People's Republic of	6.07	5.36
Colombia	0.43	0.31
Comoros, Union of the	0.03	0.19
Congo, Democratic Republic of	0.24	0.12
Congo, Republic of	0.06	0.07
Costa Rica	0.10	0.50
Côte d'Ivoire	0.16	0.23
Croatia, Republic of	0.17	0.32
Cyprus	0.09	1.32
Czech Republic	0.46	0.40
Denmark	0.71	0.66
Djibouti	0.04	0.74
Dominica	0.03	0.66
Dominican Republic	0.12	0.36
Ecuador	0.17	0.22
Egypt	0.43	0.31
El Salvador	0.09	0.32
Equatorial Guinea, Republic of	0.06	0.22
Eritrea, The State of	0.04	0.06
Estonia, Republic of	0.08	0.19
Eswatini, Kingdom of	0.04	0.25
Ethiopia, The Federal Democratic Republic of	0.09	0.12
Fiji, Republic of	0.05	0.34

Country	Vote Shares (in percent)	
	According to Actual Quota Shares	Simulation
Finland	0.51	0.48
France	4.02	1.25
Gabon	0.07	0.13
Gambia, The	0.04	0.12
Georgia	0.07	0.11
Germany	5.30	1.68
Ghana	0.18	0.38
Greece	0.51	0.32
Grenada	0.03	0.75
Guatemala	0.11	0.30
Guinea	0.07	0.11
Guinea-Bissau	0.03	0.08
Guyana	0.06	0.16
Haiti	0.06	0.16
Honduras	0.08	0.27
Hungary	0.41	0.43
Iceland	0.09	0.64
India	2.63	1.47
Indonesia	0.95	0.65
Iran, Islamic Republic of	0.74	0.28
Iraq	0.36	0.25
Ireland	0.71	1.87
Israel	0.41	0.58
Italy	3.01	1.03
Jamaica	0.10	0.17
Japan	6.13	2.05
Jordan	0.10	0.35
Kazakhstan, Republic of	0.26	0.18
Kenya	0.14	0.16
Kiribati	0.03	1.03
Korea, Republic of	1.73	1.03
Kosovo, Republic of	0.05	0.08
Kuwait	0.41	0.31
Kyrgyz Republic	0.06	0.09
Lao People's Democratic Republic	0.05	0.18
Latvia, Republic of	0.09	0.28
Lebanon	0.15	0.49
Lesotho, Kingdom of	0.04	0.17
Liberia	0.08	0.18
Libya	0.34	0.16
Lithuania, Republic of	0.12	0.29

Country	Vote Shares (in percent)	
	According to Actual Quota Shares	Simulation
Luxembourg	0.29	4.44
Madagascar, Republic of	0.08	0.08
Malawi	0.06	0.13
Malaysia	0.75	0.58
Maldives	0.03	1.61
Mali	0.07	0.09
Malta	0.06	2.66
Marshall Islands	0.03	0.49
Mauritania, Islamic Republic of	0.05	0.13
Mauritius	0.06	0.88
Mexico	1.79	0.80
Micronesia	0.03	0.54
Moldova, Republic of	0.06	0.08
Mongolia	0.04	0.11
Montenegro	0.04	0.16
Morocco	0.21	0.29
Mozambique, Republic of	0.07	0.11
Myanmar	0.13	0.17
Namibia	0.07	0.15
Nauru, Republic of	0.03	0.69
Nepal	0.06	0.13
Netherlands, The	1.76	1.29
New Zealand	0.28	0.29
Nicaragua	0.08	0.17
Niger	0.06	0.09
Nigeria	0.52	0.31
North Macedonia, Republic of	0.06	0.18
Norway	0.77	0.81
Oman	0.14	0.31
Pakistan	0.43	0.24
Palau, Republic of	0.03	0.22
Panama	0.10	0.68
Papua New Guinea	0.08	0.21
Paraguay	0.07	0.15
Peru	0.29	0.31
Philippines	0.43	0.40
Poland, Republic of	0.84	0.45
Portugal	0.44	0.52
Qatar	0.17	0.44
Romania	0.39	0.27
Russian Federation	2.58	0.90

Country	Vote Shares (in percent)	
	According to Actual Quota Shares	Simulation
Rwanda	0.06	0.19
Samoa	0.03	0.35
San Marino, Republic of	0.04	2.47
São Tomé and Príncipe	0.03	0.36
Saudi Arabia	2.01	0.77
Senegal	0.09	0.15
Serbia, Republic of	0.16	0.18
Seychelles	0.03	1.06
Sierra Leone	0.07	0.09
Singapore	0.80	4.32
Slovak Republic	0.23	0.38
Slovenia, Republic of	0.15	0.52
Solomon Islands	0.03	0.55
Somalia	0.06	0.07
South Africa	0.63	0.25
South Sudan, Republic of	0.08	0.06
Spain	1.92	0.91
Sri Lanka	0.14	0.33
St. Kitts and Nevis	0.03	0.75
St. Lucia	0.03	0.64
St. Vincent and the Grenadines	0.03	0.47
Sudan	0.15	0.10
Suriname	0.05	0.18
Sweden	0.91	0.86
Switzerland	1.17	2.59
Syria	0.25	0.18
Tajikistan, Republic of	0.06	0.08
Tanzania, United Republic of	0.11	0.10
Thailand	0.67	0.61
Timor-Leste, Democratic Republic of	0.03	0.19
Togo	0.06	0.12
Tonga	0.03	0.37
Trinidad and Tobago	0.12	0.12
Tunisia	0.14	0.24
Turkey, Republic of	0.95	0.65
Turkmenistan	0.08	0.11
Tuvalu	0.03	1.16
Uganda	0.10	0.12
Ukraine	0.43	0.19
United Arab Emirates	0.49	0.98
United Kingdom	4.02	1.30

| Country | Vote Shares (in percent) | |
	According to Actual Quota Shares	Simulation
United States	16.47	5.64
Uruguay	0.11	0.16
Uzbekistan, Republic of	0.14	0.10
Vanuatu	0.03	0.27
Venezuela, República Bolivariana de	0.77	0.15
Vietnam	0.26	0.49
Yemen	0.13	0.14
Zambia	0.22	0.11
Zimbabwe	0.17	0.09

Sources and Notes: IMF (2021a), IMF (2022a), and authors' calculations. Represents data updated through 2019. Some figures may differ slightly from the IMF's published data, due to rounding.