The World Bank's Climate Finance: Limited Global Public Good Provision

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1 Introduction

Climate change-related development assistance – known as "climate finance" – from richer to poorer countries has risen to the foreground in inter-state negotiations and policy discussions, particularly since the 2015 Paris Agreement.[1] Climate finance aims to facilitate the reduction of greenhouse gas emissions, namely mitigation. It also strives to ease adaptation and resilience, i.e. reduced vulnerability to the impacts of climate change. Both of these goals contribute to the global public good of a more stable climate, thereby healthier societies with better resources. Given their development level combined with vulnerability to climate change, poor and developing countries need climate finance the most (Roberts and Weikmans, 2017; Roberts et al., 2021; Toetzke et al., 2022). By one estimate, the annual need for adaptation finance alone in these countries is estimated to be around $200 billion in 2021-2030 (UNEP, 2022). Another recent estimate suggests that these countries, excluding China, need $2.4 trillion annually to meet their climate goals by 2030 (Bhattacharya et al., 2023). In this context, in 2009, richer economies agreed to annually mobilize $100 billion (by 2020) of climate finance to less wealthy countries – a number that been subject to much analysis and controversy (Roberts et al., 2021; Michaelowa and Michaelowa, 2011). Currently, a new climate finance goal is being internationally negotiated under the auspices of the United Nations Framework Convention on Climate Change (UNFCCC) to update the 100 billion goal. Climate finance is, thus, a pressing global policy issue and a key aspect of international cooperation.

[1]While the private sector may also be involved in the provision of climate finance, we focus on public international climate finance, particularly the multilateral kind in this article.

Because of the necessity for international climate finance, a key question has become which multilateral/international organizations (IOs) are best placed to dole out these funds. Policy-makers and key agreements highlight multilateral development banks (MDB) as key actors in channeling climate finance (Miller et al., 2019; Murphy and Parry, 2020). Climate change impedes economic development via various effects, such as floods and droughts, and greenhouse gas emission-intensive growth fuels more climate shifts (Bank, 2010; IPCC, 2022). With expertise in economic development assistance, MDBs are, therefore, well-positioned to play a central role in climate finance (CF).

In this context, in addition to the 2009 call for 100 billion dollars, the watershed 2015 Paris Agreement has also called for increased climate finance with a balance between mitigation and adaptation, highlighting the role of MDBs (Agreement, 2015). For their part, MDBs have engaged in a "massive sales pitch to persuade the ministers and heads of states" to channel climate funds through their organizations at key events such as the Copenhagen summit in 2009 (Schalatek et al., 2010). Since 2011, MDBs have been releasing "joint reports" that provide an aggregate sense of their climate finance to further highlight their contributions in this realm. The project-level data analysis on individual MBD's climate finance, however, remains lagging (Kaya, 2024).[2]

In this study, we use a novel dataset to analyze the largest MDB's, the World Bank's, climate finance. We specifically focus on the Bank's project finance–which projects, where, and to what extent are marked by the WB to include the two climate aims the IO has, mitigation and adaption. Even though the World Bank (WB) is the best-resourced MDB emerging as a leader in multilateral climate finance, we only have a preliminary understanding of the Bank's lending for climate change (Núñez-Mujica et al., 2023; Farr et al., 2022). A better understanding of the WB's climate finance, including its nature and determinants, is important for global public policy making. To give a sense of the Bank's stature in economic development, in 2023, the two main arms of the Bank that provide grants or loans to the developing –the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA) – committed a total of 72 billion dollars in the developing world (Annual Report).

Furthermore, the Bank appears to have responded to calls for it to play a key role in climate finance specifically after Paris. Right after Paris, the Bank released its first climate action plan (covering 2016-2020). This report fully committed the Bank to Paris-alignment. That commitment was augmented with the organization's second climate change action plan for 2021-2025. With this report, the Bank committed the itself to Paris' goal of 50% of climate finance constituting adaptation finance (Bank, n.d.). The Bank's 2022 institutional

[2]Kaya (2024) shows that much of the analysis remains on bilateral climate flows.

trajectory document ("the evolution road map") emphasizes climate change as a key issue for the Bank's mission (Bank, 2022). And, at the end of 2023, at COP28 in Dubai, the Bank's President announced that nearly half of the Bank's portfolio would cover climate-related projects. Since especially Paris, the Bank appears to transform itself to be a central player in CF. A systematic understanding of the Bank's climate finance is, therefore, an empirically important question.

The question of the Bank's climate finance is also theoretically important. The U.S., as the Bank's dominant shareholder, has pushed for the Bank to lend for climate. The U.S. Secretary for the Treasury, Janet Yellen, has singled out its importance, noting that :

> [i]t is precisely because they are so critical that it is right that shareholders have asked the MDBs to evolve to be fit for purpose for the new challenges of the 21st century. And we have made great strides since we first called on the MDBs, starting with the World Bank, to evolve their vision, incentive structures, operational approaches, and financial capacity to better respond to global challenges like climate change...'[3].

Indeed, when the Bank's shareholder countries agreed to increase the organization's capital by 13 billion dollars in 2018, this increase was primarily motivated to enhance the Bank's role in the provision of global public goods, such as a more stable climate (World Bank 2024). Yet, some large emerging economies are not keen on turning the institution into a "green bank", and even for those that agree on the Bank's green mission, there is divergence on how to pursue that outcome (Williams, 2023). For example, some developing countries have called for the Bank to continue to lend for traditional economic development (ibid).[4]

How has the Bank navigated these varied pressures? We argue that the quantity and the nature of the Bank's climate finance particularly in the post-Paris era should be affected both by power dynamics and demand for climate finance (CF) projects, namely the pool of available projects. To begin with, we expect the U.S. pressure to significantly pivot the Bank toward CF. Nonetheless, we do not expect the U.S. influence to be so pervasive that countries politically-economic proximate to the U.S. receive more climate finance projects.

Moreover, we expect two types of dynamics to affect the pool of projects available for the Bank to finance, i.e. the supply side of projects demanding WB project financing. First, the

[3]https://home.treasury.gov/news/press-releases/jy2283

[4]While climate finance in and of itself may not be a public good in the textbook description of non-rival and non-excludable, the intended impact of climate finance is to address climate change. A more stable climate – through both reduced greenhouse gas emissions and increased resilience and reduced climate impacts – is indeed a global public good. Since the World Bank explicitly aims to provide financing this global good, we characterize its dispensing of climate finance as providing a global public good, which is consistent with the general characterization by policy-makers and stakeholders.

Bank's desire to increase CF could easily run into limitations in "finding" the right kind of projects (mitigation or adaptation). The Bank – at least in the short-run – is limited by the demand for climate projects from borrower countries. The World Bank's investment project finance provides loans to projects in borrowing countries, which means that countries need to have projects for which they seek financing.[5] In other words, the projects to be financed for climate aims is limited by the availability of these kinds of projects (again at least in the short-run). As a second constraint on the pool of available projects, namely the supply of projects, we expect the major developing country clients of the Bank, the middle-income countries, to not always seek or desire CF projects as much as (or instead of) traditional development projects, such as infrastructure.

We expect these dynamics impacting the pool/supply of available climate-oriented projects, which we refer to as "supply side constraints" for short, to influence the nature of the Bank's CF such that the WB integrates a climate dimension where it can, when it can. Specifically, instead of a spike in projects that center around mitigation and adaptation, namely "pure" climate projects, we expect the Bank to"mix" climate elements into non-climate-focused projects. For example, an education project can "mix" a climate change purpose, such as by including a dimension that teaches the general population about mitigation or adaptation. Similarly, the Bank could count a project toward climate finance if a project, say, on strengthening public finance accounting integrated a dimension on accounting for climate risks. We expect, then, most of the increase in Bank CF projects to come from a rise in "mixed projects". Furthermore, if the Bank is inserting climate objectives where feasible, then the CF projects may fail to go where they are most needed, such as to the most climate-vulnerable nations or the highest emitters.

In order to analyze how WB's lending has changed after Paris, we use our dataset of 2743 WB projects between 2010-2021 to carry out econometric as well as textual data analysis. Even before delving into inferential statistics, we show that the number of World Bank's CF projects as a percentage of total number of projects increased significantly after Paris (see Figure 1). the descriptive statistics also show that the average annual number of CF projects increases by 675% compared to pre-Paris levels (increase from an annual average of 22 projects to 170.5 projects). While the committed loan fraction has also increased, this increase is not as remarkable.[6]

[5]While the WB staff may develop these projects in conjunction with country officials, ultimately the country is a willing and voluntary recipient, which means their demand for this kind of project financing is important to consider.

[6]To calculate the loan fraction, we multiplied the percentage of adaptation or mitigation component assigned to each project by the project's loan amount and summed the values by year.

[Figure 1 about here.]

Our empirical framework builds on the notion that Paris agreement should mainly affect the number of CF projects and estimates a differences-in-differences type of model. Our findings confirm the primary theoretical expectations. Our theoretical approach expects the number of CF projects to increase due to U.S. pressure combined with staff responsiveness, which is confirmed by our results. As we also expect, however, there is not much evidence of countries politically-economically proximate to the U.S. receiving more CF projects.

There is also evidence of supply-side constraints as defined at work. More of the post-Paris increase in CF comes from mixed climate finance projects as opposed to pure climate finance projects. In other words, projects that integrate a mitigation or an adaptation component alongside other goals increase much more than projects focused exclusively on climate goals, i.e. "pure" CF projects. Moreover, middle-income countries (MICs) receive more mixed projects than pure projects. In other words, what the Bank counts as climate finance in these countries includes projects that combine a mitigation or an adaptation component alongside other non-climate aims. Both the rise in mixed projects and MICs' receipt of these projects, as opposed to those that focus solely on climate aims, is line with our theoretical expectations.

Additionally, we find that countries where the "bang for the buck" might be the highest in terms of addressing climate change – those that emit more and are more vulnerable to climate impacts – account for less of the post-Paris increase in the Bank's CF projects. This finding also suggests that the Bank inserts a climate component where it can, when it can. Taken together, these findings not only show the interaction of power dynamics and supply-side constraints that affect the pool of CF projects for WB financing, but they also demonstrate the challenges the Bank faces in boosting CF meaningfully to meet the demand for global public good provision.

To our knowledge, this piece provides the first systematic analysis of WB's climate finance. Moreover, it builds on a rich literature in the political economy of IOs that show if, how, and when power matters (see Section 2). In this case, U.S. pressure, combined with IO responsiveness, appears to have affected the quantity of climate finance. But, the nature of WB climate finance projects is affected by other factors as well. For instance, we show how non-dominant shareholders, in this case MICs as primary clients of the Bank, may nonetheless have positional influence. Further, by showing how an IO reshapes its role in response to an increasingly pressing global issue, we also contribute to the understanding of IO "life cycles" (Gray, 2024). The WB's quest to remain vital, in this instance, is fraught with internal and external challenges.

Our study also has important policy implications – if WB has managed to increase the

quantity and quality of its climate finance, to spur mitigation and to boost adaptation, then scarce funds have been well-allocated toward the intended goal. If, however, the WB has gaps in its allocation of climate finance, such as projects that are of questionable value for tackling climate change, then progress toward collective goals is lagging and vulnerable communities fail to benefit. The kind of detail we unearth in the Bank's provision is necessary for those who wish to effectively utilize the IO or reform it.[7]

The rest of the paper, first, further develops the theoretical terrain to ground our empirical expectations (Section 2). We, then, introduce the dataset (Section 3), followed by regression analysis (Section 4). The Conclusion focuses on the larger implications of the piece.

2 World Bank's Climate Finance

2.1 Powerful Interests in Multilateral Lending

In the study of international financial institutions (IFIs), such as the World Bank or the International Monetary Fund, it is now well-known that both shareholder demands and bureaucratic priorities as well as organizational culture play an important role in key institutional outcomes, such as lending. It is also the case that, especially when it comes to climate change, weaker states may be able to insert their preferences into institutional decisions in IFIs. In this sub-section, we sample from this literature and tie our theoretical expectations to it.

The literature clearly establishes that powerful shareholders, formally and informally, insert their demands into IFIs (Stone, 2011). The examples here abound. Countries whose votes are aligned with the USA at the UNGA get larger IMF and World Bank loans with fewer conditionality (Frey and Schneider, 1986; Thacker, 1999; Barro and Lee, 2005; Andersen et al., 2006). And alignment with the U.S. means less punishment for lack of compliance with loan conditionality (Stone, 2004, 2008; Kilby, 2009). Temporary members of the UNSC are more likely to participate in IMF bailouts and WB loans (Dreher et al., 2009; Vreeland and Dreher, 2014). Here, these temporary UNSC members hold strategic importance for powerful countries that may need them for votes or other decisions on the Security Council. This influence – particularly by the U.S. as the dominant shareholder – can go so far in the

[7]Although due to scope limitations, we do not directly test arguments about the IO's organizational culture or staff's ideational frameworks mattering for outcomes (Weaver, 2008; Weaver and Nelson, 2016), we take its importance as a given and analyze institutional dynamics assuming the importance of those organizational dynamics. For example, (Clark and Zucker, 2023) show that staff experience related to climate change affects IMF's bilateral surveillance products.

WB that U.S. allies may even receive loans more quickly, circumventing the long approval times others face from the WB (Kilby, 2013b).

What are the sources of this influence? Studies show that both formal and informal tools matter (Kilby, 2013a). Formally, for example, the U.S. holds a de facto veto power in the World Bank and the IMF – this dominant status means that decisions that require a special majority need U.S. approval. Even when decisions are not taken by voting, however, the dominant shareholder's consent is essential for all key issues (Kaya, 2015; Graham and Serdaru, 2020). Informal dynamics – such as principals' exerting influence over IO staff also provides a conduit for great power influence in IOs (Stone, 2011, 2013). Commonly, the location of the IO – in the case of the WB, the organization being headquartered in the U.S. capital – as well as ideational factors, such as where the staff's training and their professional inclinations (Nelson, 2014), are also seen as sources of informal influence.

In the political economy of IO literature, it is not just that that powerful states have formal and informal levers, it is also that bureaucratic agents, such as the WB staff, are more responsive to powerful actors due to a number of reasons. This bureaucratic responsiveness can be explained with a principal-agent (P-A) framework, where as the principals the powerful shareholders can hold the staff as agents accountable, thereby affecting their career prospects.[8] The staff responsiveness can also be explained by the fact that the bureaucrats wish to survive or expand their jurisdictions (Gray, 2018). Demonstrating these dynamics well, in the context of WB and green lending specifically, Nielson and Tierney (2003) demonstrate how the U.S. Congress' influence over U.S. capital worked as a lever to increase the Bank's green lending and staff working on environmental issues in 1980-2000. Stone (2011) suggests that, paradoxically, principal control might be highest when delegation to the agent (here, IO staff) is high because in these instances principals can informally influence staff decisions, without seeming too interfering with the IO (which might damage the reputation of the IO). Recent work also suggests that because the staff follow principal wishes without explicit direction from the principals, what we empirically observe as shareholder influence over IO decisions may actually be staff autonomy working to serve the primary shareholder interest, as in the case of WB conditionality being in line with U.S. interests (Clark and Dolan, 2021).

Given principal wishes matter for institutional processes and outcomes, what happens when different shareholders have different demands? Nielson and Tierney (2003) suggest that convergence among the primary principals will make the IO more conducive to reform, though of course existing institutional rules matter too. Copelovitch (2010) argues that when there are conflicts among the G5 countries at the IMF, then there might be greater

[8]For an excellent compendium P-A dynamics in IO, see (Hawkins et al., 2006).

room for "agency slack", namely the staff to exercise autonomy. However, he argues that another possibility is for the main shareholders to engage in deals among themselves. In other words, the outcome is not predetermined. In these cases where multiple principals are involved, therefore, understanding inter-principal dynamics as well as the orientation of agents becomes important.

A parallel literature on bilateral climate finance also shows that "donor interests" (which manifests itself as shareholder influence over IFI outcomes) also affect this kind of development assistance.[9]. Proxying donor interest by political-economic proximity to major donors, such as the U.S. or European countries, different works find evidence that bilateral climate finance is not immune to political considerations. To give select examples, bilateral trade ties with major donors increase the chances a developing country receiving mitigation aid (Halimanjaya, 2016; Peterson and Skovgaard, 2019; Weiler et al., 2018). Political ties, likewise, motivate donors to dole out more climate finance, where such ties can be captured by former colonial relationships or alliances (Hicks et al., 2008; Weiler et al., 2018; Peterson and Skovgaard, 2019). Interestingly, a variable of common interest in the aforementioned literature on the political economy of IFIs – UN voting affinity – does not appear as a significant variable in some of these analyses on bilateral climate finance (Hicks et al., 2008; Weiler et al., 2018). This said, there is generally good evidence that the direction and the size of bilateral climate finance is affected by the political and economic priorities of major donors (Hicks et al., 2008; Holden, 2002; Bättig and Bernauer, 2009; Michaelowa and Michaelowa, 2011; Halimanjaya and Papyrakis, 2015). A question for the literature – one that this study answers – is whether multilateral climate finance demonstrates donor/shareholder influence as well.

Finally, in highlighting the importance of powerful shareholder/donor interests in development assistance, we do not wish to suggest other factors, particularly organizational culture, does not matter. On the contrary, its importance has been shown, with some authors arguing that IOs are autonomous with their own culture, methods, and ritualized way of functioning, which can take over rational task-driven work foreseen by the principal-agent framework (Barnett and Finnemore, 1999; Weaver and Nelson, 2016). Along these lines, Weaver (2008) advances "hypocrisy" as an IO pathology that arises from a conflict between the IO's culture, including norms, and external demands. Our argument and analysis examines how variation in other elements affects outcomes, holding that culture constant.[10]

[9]For works that examine the determinants of bilateral climate finance by major donors, see, e.g.,Dellink et al. (2009); Barr et al. (2010); Haites and Mwape (2013); Weiler et al. (2018); Peterson and Skovgaard (2019); Weiler and Klöck (2021)

[10]This is a reasonable assumption as culture tends to be more static.

2.2 World Bank's Distorted Global Public Good Provision

We argue that both power-dynamics and supply-side constraints, at times in interaction with each other, will affect the quantity and the nature of the WB's climate finance; the IO's global public good provision will, thus, be distorted by these internal and external institutional dynamics. To begin with, we argue that the U.S. pressure – especially in the context of the reviewed history of U.S. influence over the IO – should mean that the Bank staff are responsive to the call for more climate finance (CF). At the same time, we argue another pair of influences should affect the pool of available projects, i.e. supply of projects for WB financing: first, despite its desire to boost CF, the Bank may not necessarily be able to find the right kind of projects. Furthermore, we also expect the preferences of non-dominant but important (NID) shareholders within the Bank – who wish to see a continuation of the Bank's lending for "traditional" development as opposed to sustainable development projects – to affect the nature of lending. In this state of affairs, we expect the Bank to combine climate objectives with other goals in projects, as opposed to be able to pursue projects that are dedicated to climate.

2.2.1 WB Climate Finance Projects: Before and After Paris

We first theorize about the change in climate versus non-climate projects, before and after Paris. Since the literature provides good support for the contention that U.S. affects WB lending, we turn our attention to U.S. emphasis on climate finance for the Bank. With the U.S. Treasury as the lead agency for the U.S. engagement with IFIs, it is important to pay attention to what the Secretary of the Treasury, Janet Yellen, has remarked on this issue. For example, even when dealing with the repercussions of Covid-19, Yellen has stated in no uncertain terms that the World Bank Groups "needs to double its mobilized climate finance by 2025" (Yellen 2021). She has also underscored that the WB, and other MDBs (with only the Bank singled out), "need to be at the forefront of high-impact operations that have a significant effect on reducing country emissions, protecting critical ecosystems, and building resilience against the impacts of climate change" (Yellen October 15, 2021). She has reiterated this point at different junctures, remarking:

> To successfully address the multiple global challenges we face, our multilateral financial architecture must evolve and be strengthened. I encourage the World Bank Group to think well beyond the status quo to address the cross-border risks posed by climate, health, migration, and fragility, while also staying focused on poverty reduction at the country-level.

Indeed, Yellen's capture the essence of what U.S. policy-makers call "MDB evolution" to

address global threats and provide global public goods. It is in this context that the WB released its "evolution roadmap" (World Bank 2022), which was revised after shareholder and stakeholder consultations (World Bank 2023). The roadmap echoes the U.S. focus on the provision of public goods to tackle global crises. Indeed, the Bank states that the "evolution is led by the Board and shareholders".[11] As already discussed, we expect the Bank staff to be responsive to shareholder demands – being responsive bolsters the WB's vitality and thereby increases its legitimacy (Gray, 2018). Hence:

H1: The World Bank's CF projects significantly increase after Paris, relative to non-CF projects.[12]

Nonetheless, we do not expect the U.S. influence to be so intrusive that it affects who receives CF projects. Particularly, we theorize that the necessity to increase CF means limitations to U.S. influence. Since the WB needs to give CF where it can to meet the demand for a central role in CF, we do not expect U.S. influence to be a prominent aspect of who receives Bank's climate finance projects. Additionally, the extant evidence in the literature is consistent with U.S. interference (see above) to please allies or to cater to strategically important countries. In this context, it would be unusual for the U.S. to achieve these purported goals via CF, as opposed to any other type of project. This point becomes particularly important when one considers that the recipient countries may not be pleased with CF projects and may be seeking other types of projects.[13] Thus, we hypothesize that:

H2: Countries politically-economically proximate to the U.S. do not receive more CF projects relative to non-CF projects post-Paris.

2.2.2 Type of WB Climate Finance Projects: Before and After Paris

But, what about the nature of climate projects? What types of CF projects increase or decrease after Paris? Who receives these projects? We argue that two types of influences on the available pool, i.e. supply of, CF projects likely affect which countries account more for the Bank's increase in CF. For ease, we refer to these effects on the availability of projects

[11] https://www.worldbank.org/en/news/statement/2023/01/13/world-bank-group-statement-on-evolution-roadmap?$_gl = 1 * q5ehfv *_g\, cl_au * MTk5NDg2MTkyNS4xNzIxNzQyNjcz$

[12] To be sure, the Europeans were in agreement with the U.S. plan and have channeled Europe-based IFIs like that European Bank for Reconstruction and Development and the European Investment Bank to boost climate finance. However, the focus of our hypothesis suggests that just the U.S. pressure plays a unique role for all the reasons discussed.

[13] As already discussed, the evidence on bilateral climate finance being associated with geostrategic interests is mixed at best, which also supports our theoretical intuitions.

as supply-side constraints.

A first type of "supply-constraint" that impacts the answers to the question of "which countries account for the Bank's increase in CF post-Paris" is for the WB to find suitable climate projects. When it comes to mitigation, shortage of bankable (financially viable) renewable energy projects in the developing world is recognized widely, including by the World Bank (Cornieti and Nicolas, 2023). These projects typically come with high capital costs and a relatively long time horizon with other uncertainties. In addition to traditional financial indicators, such as an attractive rate of return or solid revenue streams, the regulatory environment and the government's ability to upgrade related extant infrastructure, such as the grid system, matters in rendering these projects financially attractive (Mohamadi, 2021). While there are some easier mitigation projects, such as increasing energy efficiency of buildings or building nature infrastructure (such as forests), which doubles as an adaptation project, most mitigation projects that center on a transition to renewables can easily encounter bankability problems.[14] In other words, the financial fundamentals of the project are not consistently there for the Bank (IBRD/IDA) to lend for a project.

Meanwhile, specific adaptation projects – as opposed to general capacity strengthening – tends to be context-specific. Adaptation projects, need to be intertwined with the specific needs, conditions, and priorities of communities to have a chance to be effective (Neef et al., 2018). Therefore, the identification of targeted adaptation projects requires community involvement. There is, thus, necessarily a bottom-up nature to these projects. While we do not wish to suggest the Bank cannot initiate such projects – via country partnerships and other methods – we highlight that well-known barriers in this unique realm can shrink the available supply of projects.

In this context, the Bank is likely to insert mitigation and adaptation components into other types of projects such that these climate goals are "mixed" with other types of projects. Mixed projects combine climate objectives with other goals. To give one example, a public finance strengthening project may have a climate element, if it involves teaching policymakers how to financially account for the impacts of climate change. In contrast to mixed projects, "pure" climate projects center on a climate objective, such as generating renewable energy. Hence:

H3: Post-Paris, mixed climate finance projects increase more than pure climate finance projects relative to non-climate finance projects.

[14]To be sure, unit costs in some renewable energy, such as solar, have declined significantly over time, but geographic location and uncertainties of variability in supply may nonetheless affect these types of projects as well.

A second kind of supply-side constraint as defined is that some countries may simply not want more CF projects. Indeed, to the extent that developing countries want to continue with traditional type of development assistance from the Bank (say, a road or a dam or a bridge) as opposed to sustainable development support, the Bank's ability to channel climate finance to these countries should be limited. To be sure, our argument is not that developing countries do not see climate as an important priority – plenty of evidence suggests that they do. Rather, we suggest that this supply constraint could take hold so long as these borrowers believe the road to sustainable development goes through traditional development, or if they believe the Bank's evolution to a green bank so to speak is not the best means to provide global public goods (GPGs).

Hence, we suggest the supply constraint could happen even if the absence of radical differences between the dominant shareholders and non-dominant but important shareholders, and clients, of the Bank. For instance, India concurs that the Bank should contribute to GPGs, but its representatives have also expressed several times that the the Bank should not undermine its traditional role in middle-income countries (MICs). In one example, regarding the 2018 capital increase for the Bank, the Indian member for the Development Committee, which comprises Board of Governors, at the ministerial-level, from the WB as well as the IMF, notes that:

> We had envisioned the Bank Group as the leading institution on Global Public Goods (GPG) such as gender, climate change, fragility etc. and the Capital package has specific targets on each of these. *However, we find that we are faltering on the twin goals; especially on eradicating extreme poverty, which looks increasingly unlikely to be achieved. The core responsibility of the Bank Group relates to poverty reduction, human development, improved governance and bridging infrastructure gaps in client countries.* (India, April 2019, emphasis added).

Representing Angola, South Africa, and Nigeria, the Nigerian representatives similarly echoes a concern with the Bank's transformation to a green bank, underlining the absence of basic energy in some Sub-Saharan African (SSA) countries and calls for support on fossil fuel based energy projects:

> *Access levels for electricity continue to be very low in SSA to meaningfully support industrial development* and we would like to see more funding, including for renewable energy. *However, we call on the WBG to accommodate gas projects for baseload energy purposes.* Furthermore, many workers and households in some of our countries derive their livelihoods from fossil fuel value chains, such as coal mining. (Nigeria, October 2021, emphasis added).

Commenting on the evolution agenda for the Bank, the Mexican representative also highlights poverty-eradication: "The World Bank must continue its steadfast commitment to combating poverty, promoting economic growth, and advancing human development on a global scale" (Mexico, October 2023). These representative examples support our argument that the Bank's non-dominant but important (NID) shareholders' prioritization of any (as in not necessarily sustainable) development projects, such as, infrastructure, could affect the available pool of CF projects. In this context, the Bank may not be able to "find" or generate climate projects. Instead, the Bank staff would need to craft the existing project supply to integrate climate goals. In short, the NDI desire to maintain the status quo means that these countries have climate change goals added to the existing type of projects they desire:

H4: Non-dominant but important shareholders (NID) of the Bank, which are its large clients, experience a larger increase in "mixed" climate finance projects compared to "pure" climate finance projects post-Paris.

We conceptualize NIDs as middle-income countries. The middle-income country (MIC) lending arm of the Bank – IBRD – has a financial interest in lending to these countries. As in a regular bank, the IBRD makes fees from its investment loans plus the interest rate paid on these loans. Although the Bank loans may be more favorable – for instance, with a longer maturity than what capital markets offer – with global capital mobility and increasing access to private finance, the IBRD competes with private lenders for the creditworthy developing countries. The IBRD's longevity, therefore, depends on having positive relations with these borrowers (Einhorn, 2001). The IBRD's financial success also affects other arms of the World Bank Group – for instance, it transfers funds to the IDA. Beyond financial reasons, the Bank not only relies on MICs to keep the IBRD financially alive, but its reputation as a development agency rests on it maintaining good relations with these countries and learning from their experience (Kaya, 2015). There are, then, both financial and non-financial reasons for the Bank to care about these countries. Little discussed fact is that "development contributions" – which points to borrowers' importance for the Bank – is a variable (albeit a relatively small weighted one) in the Bank's calculation of relative votes in the organization. In this regard, the Bank recognizes the NIDs' contributions to the Bank's mission, even though they may not be the largest shareholders. Although we focus on MICs as NIDs, we try other conceptualizations in robustness checks.

Finally, taken together, the dynamics we have discussed in this sub-section, particularly the supply-side constraints suggest another point about the nature of the distribution of WB's CF projects post-Paris: CF projects may not necessarily go where they can most contribute

to the provision of a global public good. If, at times, the Bank is pursuing climate projects where it can, or if it is inserting climate aims into existing projects where possible, then countries where the greatest impact from financing climate projects to be made, may not be the recipients of these CF projects. Climate projects are most needed where vulnerability to climate change or where emissions are high.[15] From this perspective, we hypothesize that:

H5: Post-Paris, the more climate-vulnerable countries or those with higher emissions do not receive more pure CF projects.

Here, we examine pure CF projects because the logic we just described best attends to this kind of project, which is solely focused on addressing climate change.

2.3 Summary

In terms of a comparison between climate- and non-climate projects, we suggest there should be a significant increase in the Bank's climate finance after Paris due to dominant shareholder, particularly U.S., influence (H1). We, however, do not expect this influence to be so pervasive as to have countries proximate to the U.S. receive more CF projects. The conceptualization behind H3-H5 accounts for a two-way interaction between the Bank and its project recipients– its foresees the Bank being able integrate a climate component into projects to some extent, but it also recognizes that some countries, NIDs, will be able to better advocate for/negotiate for/seek projects that they would like to prioritize. The discussions in this section also suggest that the staff will, to some extent, be scrambling to increase CF – facing mixed shareholder demands plus supply-side constraints impacting the pool of CF projects,[16] This additional dynamic should also support H5.

3 The Data and Its Content

Our dataset of WB project finance is based on the International Aid Transparency Initiative (IATI), and covers 2010-2021, which gives us an equal number of years pre- (2010-2015) and post-Paris (2016-2021). Appendix A details our choice of IATI, which has a rigorous process of quality checks, and our data extraction via Python.

[15] Although from a public goods perspective, if the goal is to reduce emissions by, say, 10 percentage points, the global distribution of that emissions is beside the point, the same renewable energy project will have a greater impact where emissions are higher. Similarly, the same adaptation project will have greater impact where vulnerability to climate is higher.

[16] To recall, these dynamics can be reinforcing.

We follow the Bank's own thematic coding for each project. Often, the World Bank staff assign a single project multiple themes, since a single project may serve multiple purposes. Hence, the two climate change sub-themes (mitigation and adaptation) can intersect with other themes, say social development and protection. The Bank's own documentation notes that "Task teams are required to articulate climate change considerations incorporated in their project design in the project documents" (World Bank n.d, pg.1). Additionally, WB assigns relative percentages to each theme – hypothetically, a project can simultaneously be assigned a 20% mitigation component, a 25% adaptation component, and a 75% social development and protection component, with the total thematic distribution exceeding 100%.

To assess the extent of projects with total classifications that exceed 100%, we calculated the number of projects that have a mitigation or an adaptation component alongside other thematic markings, with the summation of these various themes exceeding 105% (the extra 5 percentage points is to allow for potential rounding differences). We find that, pre-Paris, only about 67% of climate change projects (i.e. mitigation or adaptation) had thematic summations above 105%, whereas the same number post-Paris is 97%, that is nearly all projects with a mitigation or an adaptation component belong to projects where the thematic summation does not permit a neat division to ascertain the precise portion of climate finance. Hence, how much climate finance, in terms of a commitment value, a project contains is a fraught calculation. Yet, the number of projects that have a climate finance component can be counted.

Given projects can contribute to different aims simultaneously, there are different ways to mark projects with a climate finance component. Pure projects are those that have a 100% mitigation or adaptation component. Once these climate aims co-exist with other aims in a project, we designate the project as a mixed project. Non-CF projects, in contrast, have zero CF component, as marked by the WB. Table 1 provides illustrative examples of pure mitigation and pure adaptation projects as well a sampling of mixed projects.[17]

[Table 1 about here.]

Importantly for the analysis at hand, based on the classification of CF and non-CF projects, Figures 2a-2d examine the large patterns in Bank's CF by tracing the number of projects as well as the total committed value for these projects (both as a proportion of the Bank's total lending and with the aforementioned note of caution about the latter). These

[17]In Appendix B, using natural language processing techniques and cosine similarity analysis, we delve deeper into the content of adaptation and mitigation projects. Takeaways from that exercise suggest that pure adaptation and pure mitigation projects, as expected, differ from one another, but differences between non-pure mitigation and adaptation projects decline after Paris.

figures differentiate pure CF projects from the rest of the CF projects. The figures show that that while the Bank's "pure" mitigation or adaptation projects have remained the same from pre-Paris to post-Paris (the averages remain steady around 2% for both type of projects), projects with (any) mitigation or adaptation components have skyrocketed in the post-Paris era. This large pattern holds both for the number of projects, as well as their associated monetary commitments. For example, pre-Paris, only about 20% of Bank projects were combining mitigation or adaptation with other goals, whereas, in 2021, over 80% of Bank's climate finance projects that contains some mitigation or adaptation components alongside other goals (Figure 2b). At the same time, projects that simultaneously pursue adaptation and mitigation went from less than 5% to about 70% of WB projects (Figure 2b). Although very preliminary, these figures support H1 and H3 – H1 predicts an increase in WB's CF after Paris; whereas, H3 expects this increase to be marked by a boost in mixed projects and a decline in pure projects.

[Figure 2 about here.]

Summary

There are some large takeaways from the preceding analysis. First, we descriptively see Paris as a turning point – signed at the end of 2015, starting with 2016, we see the Paris effect. This finding is important to further analyze in regression analysis. Second, as a first cut answer to the question of how the post-Paris increase in CF is distributed, the descriptive analysis shows a marked rise in "mixed projects", where climate objectives co-exist alongside other goals. For example, pre-Paris, only about 20% of Bank projects were combining mitigation or adaptation with other goals, whereas, in 2021, over 80% of Bank's climate finance projects contains some mitigation or adaptation components alongside other goals (Figure 2b). By contrast, we do not see any significant changes in the "pure" climate projects after Paris relative to their pre-Paris levels. These large patterns are important to further probe with inferential statistics. Generally, the question of who and which type of projects account for the increase in WB CF after Paris deserves deeper analysis, which the next section provides.

4 Empirical Strategy and Results

We begin this section by describing our empirical strategy to test H1 and H2, and present the results. In the ensuing subsection, we extend our strategy to estimate H3-H5.

4.1 WB's Climate versus Non-Climate Projects before and after Paris

Our empirical approach relies on the presumption that the Paris agreement affects climate related project financing more significantly than non-climate project financing. To estimate this differential impact of the Paris agreement, we start our analysis at the *project type-recipient country-year* level. Specifically, for each borrowing country, year we specify two observations– the number of climate related projects and the number of non-climate projects. We identify climate finance projects as those with any (i.e., a positive percentage assigned) adaptation or any mitigation components.[18] Accordingly, we estimate the following equation:

$$N_{ijt} = \gamma \mathbf{X_{it}} + \alpha_0 Climate_j + \alpha_1 Climate_j * Paris_t + \omega_i + \tau_t + \epsilon_{ijt}, \tag{1}$$

where N_{ijt} denotes the number WB projects of type j, in country i and year t. As noted above, the project type j can be either climate-related or non-climate related. If there are no projects of type j given to country i in year t, that observation is recorded as zero. Equation (1) includes recipient country fixed effects, ω_i, as well as year fixed effects τ_t, which capture shocks that are common to all countries (e.g., Covid) as well as shocks to the World Bank's general financing, such as a change in the Bank's President.

To capture the differences in the number of climate and non-climate projects, we include two terms: $Climate_j$ and $Climate_j * Paris_t$. The coefficient α_0 on the indicator variable for climate projects, $Climate_j$, captures the average difference between the number of these two types of projects prior to Paris. The interaction term $Climate_j * Paris_t$, where $Paris_t$ is a dummy variable that takes on a value one starting in 2016, measures how much the number of climate projects change post-Paris.[19] For example, a negative estimate of α_0 suggests that pre-Paris, the number of climate projects are smaller than the number of non-climate projects, and a positive estimate of α_1, the coefficient on $Climate_j * Paris_t$, shows that the number of climate projects increases after Paris. Note that because we are including year effects τ_t, we are not able to identify the impact of Paris on the non-climate projects separately. However, we can estimate the change in the number of climate finance projects and compare the difference between the two types of projects before and after Paris.

Equation (1) additionally includes country specific covariates (gathered in vector X_{it}) that are common in the literature (for a recent work, see Kilby and McWhirter, 2022). In particular, we control for GDP per capita (deflated, in logs), population (in logs), voting

[18] This definition of a climate project follows the WB's classification and avoids an arbitrary judgement on our part.

[19] Since Paris was signed at the end of 2015, this approach is reasonable.

affinity with the U.S. at the UNGA (see Section 2), temporary membership to the UNSC (Section 2), and regulatory quality, which proxies the country's strength of governance.[20] The literature finds that more populous countries and those that are relatively poorer but also better governed tend to receive more WB funds. As reviewed in Section 2, the literature also finds evidence consistent with U.S. influence in that countries aligned with the U.S. receive more WB funds. H2, however, anticipates this kind of an alignment to not necessarily affect countries' receipt of CF projects.

We estimate our count model using a Poisson Pseudo-Maximum Likelihood model (Silva and Tenreyro, 2010) with multi-way fixed effects employing the methodology in Correia et al. (2020). This algorithm for estimating Poisson regressions with high dimensional fixed effects is robust to convergence issues, which are typical in count regressions that involve many observations with zeroes. We show the robustness of the baseline results using a negative binomial model, as well as OLS. In all specifications, we estimate standard errors that are robust to heteroskedasticity and are clustered at the country level to account for the possibility of serial correlation in the number of WB projects received within a country over time.

Results

Table 2 presents the baseline results from estimation equation (1). In column 1, we begin by showing the estimates obtained using OLS. Columns 2 and 3 repeat the same but, respectively, use a negative binomial model and a Poisson pseudo-maximum likelihood (PPML) model, which is our preferred model for estimations. All three columns reveal that more populous countries receive more WB projects, in keeping with previous findings, and also countries that are better governed – proxied by regulatory quality – also receive more projects, which is also expected based on the literature. While GDP per capita is not significant, the negative coefficient suggests, unsurprisingly, that poorer countries receive more WB projects. Neither voting proximity with the U.S. at the United Nations General Assembly (UNGA) nor having a temporary seat at the United Nations Security Council (UNSC) are significant.[21]

[Table 2 about here.]

Column 4 integrates the indicator variable for climate projects and shows that on the number of climate projects lag non-climate projects by 11% on average throughout the

[20]The UNGA variable is based on Bailey et al. (2016) and measures ideal point difference with the United States at the Assembly. The UNSC data is updated based on Dreher et al. (2009). The regulatory quality is from the The Worldwide Governance Indicators and is highly correlated with two other variables, the rule of law and the control of corruption, but has fewer missing variables.

[21]We also note, however, the low variation in these variables.

sample period (2010-2021). The difference becomes starker when we include the interaction term between the climate indicator and the Paris dummy. The estimates show that the number of climate projects was 72% smaller than the number of non-climate projects before Paris.[22]. By contrast, post-Paris, the number of climate projects exceeds the non-climate ones by 120%.[23] CF projects, thus, show a marked increase after Paris, confirming H1, which conjectures this outcome would come from a mixture of U.S. pressure as the dominant shareholder and staff responsiveness to this demand.

Before analyzing the change in the number of projects by type of recipients, in Figure 1, we present the dynamic effects of Paris on the increase in the climate projects. To do so, instead of including one interaction term between $Climate_i$ and $Paris_j$ (to recall, a dummy variable that takes on a value one starting in 2016 and onwards), we include a series of interaction terms between $Climate_i$ and year indicators for each year before and after Paris. The omitted year indicator is 2016. Hence, the coefficients we obtain shows the gap between the number of climate and non-climate projects relative to the year Paris agreement was signed. The estimates show that there is no discernible difference in the gap between 2016 and a couple of years prior (i.e., there is no pre-trend). Starting in 2017, the number of climate projects start to progressively increase, with the exception of Covid (4 years after 2016).

[Figure 3 about here.]

In Table **??**, we explore the increase in climate projects post-Paris by delving more into the type of recipients. To that end, we augment equation (1) with interaction terms between recipient-specific variables and our Climate and Paris variables. To recall, we had hypothesized that there would be limitations to U.S. influence showing up in the CF projects (H2): while trying to ramp up CF quickly, it would be implausible to expect the Bank to dole out more CF to U.S. allies only. Perhaps more importantly, U.S. influence for its allies to get more CF projects (as opposed to just more projects in general) seems implausible (Section 2). Table 3 Columns 2, 3, 4 focus on these questions: Column 2 examines the differential change in the CF project pre- to post-Paris for *UNGA* countries; Column 3 and 4 do the same for recipients with large trade ties to the U.S.[24] We calculate indicators for

[22]Since we are estimating a Poisson model with indicator variables that take on a value of zero or one, the coefficient of -1.274 on Climate should be evaluated as exp(-1.274)-1=-0.72

[23]Estimated as exp(-1.274+2.062)-1= 1.199)

[24]We estimated a specification where we included the continuous trade variables (total trade with the U.S. and total trade with the rest of the world) in addition to Climate and Paris interactions with the U.S. trade variable. We obtain very similar results to the ones we present in column 3, where none of the Paris related terms are significant. Because it is easier to interpret the interactions with dummy variables, we opted to present only the results with the U.S. trade indicators.

having larger trader ties with U.S. as follows. For each country and year, we calculate the total trade with U.S. as a fraction of the country's trade with all their partners (i.e., we calculate (exports of country i to U.S.+ imports of country i from U.S.)/(total exports of country i + total imports of country i)). Then we calculate the average of this ratio in our sample. We set the U.S. trade dummy to be one if the trade ratio is greater than the sample average, and zero otherwise. We calculate the U.S. exporter dummy in the same way, using only exports in the ratios.

[Table 3 about here.]

In support of H2, the results in Table 3 – on the interaction terms – are insignificant. Focusing on these coefficients, we see that post-Paris, countries with higher voting similarity with the U.S. ($UNGA$) do not receive more CF projects: while the post-Paris increase for the entire sample is about 2.3-fold, for these countries it is approximately 2.2-fold, i.e. a negligible difference that is not statistically significant. In terms of trade ties, the only significant coefficient we obtain is the one for the interaction between U.S trade dummy and Climate, indicating that countries with larger trade ties with the U.S. on average receive more CF projects compared to the other countries. However, we do not find statistically significant evidence that this difference changes after Paris since the triple interaction term ($Z_{it} * Climate_j * Paris_t$) is not significant. The results are similar if we use the U.S. export ties dummy. Hence, Table 3, lends good support for H2 suggesting countries politically-economically proximate to the U.S. do not receive more CF projects post-Paris.

4.2 World Bank's Changing Climate Finance Projects

Next, we turn to analyzing H3-H5, which explore in greater detail the distribution of the increase in WB climate projects post-Paris. To analyze the type of projects in greater detail, we disaggreggate the climate projects into two categories (see Section 3): pure climate finance projects and mixed climate finance projects. The pure CF projects are identified as sole mitigation or sole adaptation projects (i.e., projects where the sectoral allocation is 100% adaptation or 100%mitigation), and the mixed CF projects are with a non-zero adaptation or mitigation component, as previously discussed. With this categorization, we obtain three observations for each country i and year t: number of pure CF projects, number of mixed CF projects, and non-climate projects. Our empirical model is expanded as follows:

$$\begin{aligned} N_{ijt} = {} & \alpha_0 Pure_j + \alpha_1 Pure_j * Paris_t + \alpha_2 Pure_j * Z_{it} + \alpha_3 Pure_j * Z_{it} * Paris_t + \\ & \beta_0 Mixed_j + \beta_1 Mixed_j * Paris_t + \beta_2 Mixed_j * Z_{it} + \beta_3 Mixed_j * Z_{it} * Paris_t + \\ & \eta_0 Z_i t + \eta_1 Z_i t * Paris_t + \gamma \mathbf{X_{it}} + \omega_i + \tau_t + \epsilon_{ijt}. \end{aligned} \tag{2}$$

In equation (2), we replace the project type fixed effect $Climate_j$ with two indicators $Pure_j$ and $Mixed_j$ and augment the set of covariates and fixed effects in equation (1) with interaction terms between these project category indicators and $Paris_t$ as well some country trait indicators Z_{it} that help us test Hypotheses 3-5.

In the first column of Table 4 we look at a benchmark case where we do not incorporate any country traits (i.e., setting $Z_{it} = 0$).[25] The coefficients on $Pure_j$ and $Mixed_j$ in Columns 1 and 2 of Table 4 , show that both pure and mixed CF projects, prior to Paris, were fewer than post-Paris projects. Furthermore, their interactions with $Paris_t$ in Column 2 show that the number of these projects significantly increase post Paris: the increase in these projects exceeds the change in non-climate projects. Quantitatively, these terms suggest that the gap between pure CF projects and non-CF projects was 95% pre-Paris and this gap shrank to 88% post-Paris. Pre-Paris, the number of mixed projects was smaller than non-CF projects by 77%, but post-Paris mixed projects surpass non-CF projects by 108%.[26] These results directly support Hypothesis 3.

[Table 4 about here.]

In order to test Hypothesis 4, we distinguish the pre- to post-Paris changes in the project type distribution in middle income countries from the average (sample) change. To do so, we set $Z_{it} = 1$ if a country is classified as MIC in a given year ($Z_{it} = 0$ otherwise) and estimate equation (2) with the full set of interaction terms. Given the large number of interaction terms, instead of discussing coefficients individually, here we provide the pre- and post-Paris comparison for the full sample and specifically for MICs.[27] The results in column 3 of Table 4 shows that on average the gap between the number of pure CF projects and non-CF projects for shrinks from 99% to 93%. For MICs, this gap decreases from 92% to 86%. We get starker changes when we look at the number of mixed projects. While on average, pre-Paris, the number of mixed CF projects were fewer than the number of non-CF projects (a gap of 83%),

[25] All columns in Table 4 include the recipient covariates presented in Table 2, recipient fixed effects, and year effects. To omit the estimates of the covariates to make the table more legible.

[26] These qualitative differences were obtained using the coefficients in Column 2 of Table 4 as follows. Pre-Paris pure CF difference: exp(-2.952)-1=-0.95; Post-Paris pure CF difference: exp(-2.952+0.854)-1=-0.88; Pre-Paris mixed CF difference: exp(-1.471)-1=-0.77; Post-Paris mixed CF difference: exp(-1.471+2.202)-1=1.08

[27] Based on the notation in equation (2), we calculate the pre- and post-Paris comparisons as follows. Pre-Paris difference between the number of pure CF and non-CF project for the full set of countries: $exp(\alpha_0) - 1$; Post-Paris difference between the number of pure CF and non-CF project for the full set of countries: $exp(\alpha_0 + \alpha_1) - 1$; Pre-Paris difference between the number of pure CF and non-CF project for country type Z (e.g., MICs): $exp(\alpha_0 + \alpha_2 + \eta_0) - 1$; Post-Paris difference between the number of pure CF and non-CF project for country type Z (e.g., MICs): $exp(\alpha_0 + \alpha_1 + \alpha_2 + \alpha_3 + \eta_0 + \eta_1) - 1$. To calculate the differences for mixed projects, replace the α coefficients with the β coefficients.

they exceed the non-CF projects by 85% post-Paris. For MICs, the number of mixed CF projects exceeds the non-CF projects by 103% post-Paris. In other words, MICs experience a disproportionate increase in mixed CF projects in the post-Paris period, which supports H4.

Finally, we examine H5 in the last two columns of Table 4. Recall, that based on the supply-side constraints discussed, we hypothesized that the Bank's *pure* CF projects may not always go where they can have the greatest impact – to the most climate-vulnerable countries and to the larger CO_2 emitters. Pure projects focus on climate goals exclusively and, therefore, can be presumed to be most needed in these locations. To test these predictions, we construct an indicator variable for more climate countries by calculating the average number disasters in our sample and defining a country as more vulnerable if the number of disasters they experience in a year is greater than the sample average.[28] Similarly, we construct a large emitter indicator by comparing a country's emissions in a given year to the sample average. We include the interaction terms between these indicators and $Climate_j$ and $Paris_t$ in Columns (4) and (5), respectively.

The results confirm H4. Specifically, for more climate vulnerable countries, we find a negligible decline in the gap between pure CF projects and non-CF projects pre- to post-Paris (pure projects lag non-CF by 94% pre-Paris and 88% post-Paris). But, the gap is significantly reversed in mixed CF projects: pre-Paris, the gap between mixed CF projects and non-CF projects is -72%, but this same gap turns to a positive 96% post-Paris. In other words, the mixed projects that the more vulnerable countries receive skyrockets after Paris. What about the large emitters? A similar pattern holds in that the change in pure CF projects (relative to non-CF projects) is negligible from pre- to post-Paris. The gap also reverses impressively for the large emitters for mixed projects. The gap between mixed CF projects and non-CF projects goes from being -47% to 138%. The change between pure CF versus non-CF from pre- to post-Paris is muted, but the spectacular change between mixed CF and non-CF in the same period, suggests again that the Bank appears to insert climate aims into projects when it can. Our results provide evidence showing climate projects do not go where their potential impact is the greatest.

[28]We proxy vulnerability with the number of disasters in the country, since the alternative variables from the ND-GAIN vulnerability index are missing for many developing countries. The disasters included in our totals are droughts, floods, wildfires, and extreme temperature, which makes this variable particularly suited to climate analyses. The data are from the IMF. Our emissions data are from the World Development Indicators.

5 Conclusion

TBD.

Appendices

A Data Collection

Our main objective in data collection was to compile the World Bank's project finance data from 2010 to 2021, i.e. the years in our sample. Specifically, we wanted detailed project information that indicated variables such as but not limited to commitment dates, amounts, financing institution, recipient nation, and related sectors. Although the World Bank's project information is publicly available on their website, the downloadable version has many missing values and often does not provide all of the variables of interest. In our pursuit for extensive project-level information, we identified the International Aid Transparency Initiative (IATI)'s database, which is consulted by others working on the World Bank (e.g., Kerstin and Kilby 2021).

IATI Overview IATI is a global initiative that aims to foster transparency of development and humanitarian resource distribution and the results of such resource flows for addressing poverty and crises. IATI cultivates development and humanitarian data from a variety of sources ranging from governments to international financial organizations, to UN agencies, to non-governmental organizations, foundations, and to private sector organizations. Such organizations format the data to match the IATI standard and publish their data to the IATI database, at which point the information goes through a validation process through the IATI Registry and, upon approval, it is made public. This quality check was also an important consideration in our choice of obtaining the WB projects data from the IATI. IATI has three means of accessing their data—d-portal, datastore, and IATI Datastore v3 API. We opted to utilize IATI Datastore v3 API, instead of the first two front-end search engines, as we had more freedom with constructing search queries through our own API, along with more detailed project data that was downloadable.

Datastore API Using a Python code that calls on the API, we were able to search published projects in the IATI database by isolating projects that have been published by the World Bank. That is, we filtered for projects with the publishing organization reference code of "44000" for the World Bank. Moreover, as we were not concerned with all variables that publishers made public to the IATI, we strictly filtered for pertinent variables such as the ones mentioned at the top. When possible, we have opted to use identifying variables in their code form, rather than their narrative form, as we have noticed occasional discrepancies when juxtaposed with d-portal (IATI's public facing descriptive database) project pages. These efforts yielded our dataset of 2745 projects financed by the World Bank in 2010-2021. Appendix B: Textual Analysis of Project Descriptions

In order to compare the content of mitigation and adaptation projects more systematically, we applied natural language processing techniques to all project descriptions in our dataset using Python. Since our primary goal was to compare the content of pure (100 percent mitigation or 100 percent adaptation) versus mixed projects we applied cosine similarity analysis on these word frequencies. We expected the similarity between the pure mitigation and adaptation projects to be low, but we were empirically agnostic as to how "mixed projects" (Figure 3 and Table 1 of the main text) appeared content-wise. Substantively, if mixed projects are essentially one kind of project (say, mitigation) with putative additional value in terms of the other climate change goal (say, adaptation), then the true climate change promise of these projects should be further scrutinized.

To conduct the analysis, we created four vectors of word frequencies using the cosine similarity package from sklearn.metrics.pairwise in Python for the following sets of projects: pure mitigation, pure adaptation, pre-Paris majority adaptation, Pre-Paris majority mitigation, post-Paris majority mitigation, and post-Paris majority adaptation. We then, calculated the cosine similarity scores between these vectors, which essentially measure the angle between any two of the four vectors. If the vector of words in the two sets of projects (e.g., pure mitigation and pure adaptation) are completely orthogonal with no shared words, the angle between them will be 90-degrees and its cosine will be 0. If the vector of words in the two sets of projects are identical, the angle between them will be 0 with a cosine of 1. Hence, the more similar the content, i.e. the language in the description of two sets of projects, the higher the value of the cosine similarity measure in the range of 0 to 1. Our textual analysis finds that WB's pure mitigation and adaptation projects (pre- and post-Paris) are, indeed, quite different, with a cosine value of 0.31. The dissimilarity also holds when we compare pre-Paris majority mitigation projects to pure adaptation projects (cosine=0.32). In contrast, post-Paris, majority mitigation and majority adaptation projects display a striking similarity (cosine=0.61). Moreover, post-Paris, majority mitigation projects are reasonably similar (cosine=0.49) to pure adaptation projects (across both periods). Hence, as expected, pure mitigation and pure adaptation projects are very dissimilar content-wise, and pre-Paris, majority mitigation and adaptation projects also have divergent content. But, post-Paris, the content of majority mitigation and majority adaptation projects converge. What explains this shift in the content of projects? One plausible answer is that, under pressure to lend more for climate change and especially for adaptation, the Bank is trying hard to account for varied impacts of its projects, such as the mitigation value of a predominantly adaptation project. The sudden spike in cosine similarity between adaptation and mitigation project contents makes this explanation reasonable. In turn, this possibility lends itself to the question of whether such a mixed project actually promises that additional value. An-

other plausible answer – which the main text explores – is that WB is getting increasingly good at utilizing synergies between mitigation and adaptation projects, but the evidence presented in the main text raises questions about whether synergy is primary explanation behind the increase in content similarity between mitigation and adaptation project. It is more likely that in order to highlight "adaptation co-benefits" (World Bank n.d), Bank project descriptions are referring to adaptation contribution of projects. To elaborate, the Bank's own documentation notes that "Task teams are required to articulate climate change considerations incorporated in their project design in the project documents" (World Bank n.d, pg.1). However, whether the projects truly have the potential (let alone the impact) to contribute to the purported climate change goals remains questionable, as our main text analysis suggests.

Kersting, Erasmus, and Christopher Kilby. 2021. "Do domestic politics shape U.S. influence in the World Bank?" Review of International Organizations 16(1):29-58. World Bank, n.d. "Reference Guide on Adaptation Co-Benefits." World Bank Climate Change Group.

B Content Analysis of World Bank's Climate Finance Projects

In order to compare the content of mitigation and adaptation projects more systematically, we applied natural language processing techniques to all project descriptions in our dataset using Python. Since our primary goal was to compare the content of pure (100% mitigation or 100% adaptation) versus mixed projects we applied cosine similarity analysis on these word frequencies. We expected the similarity between the pure mitigation and adaptation projects to be low, but we were empirically agnostic as to how "mixed projects" (Table 1 of the main text) appeared content-wise.

To conduct the analysis, we created four vectors of word frequencies using the cosine similarity package from sklearn.metrics.pairwise in Python for the following sets of projects: pure mitigation, pure adaptation, pre-Paris majority adaptation, Pre-Paris majority mitigation, post-Paris majority mitigation, and post-Paris majority adaptation. We then, calculated the cosine similarity scores between these vectors, which essentially measure the angle between any two of the four vectors. If the vector of words in the two sets of projects (e.g., pure mitigation and pure adaptation) are completely orthogonal with no shared words, the angle between them will be 90-degrees and its cosine will be 0. If the vector of words in the two sets of projects are identical, the angle between them will be 0 with a cosine of 1. Hence,

the more similar the content, i.e. the language in the description of two sets of projects, the higher the value of the cosine similarity measure in the range of 0 to 1. We relied on "majority" as opposed to "any" mitigation or adaptation component because the variance in content for projects with "any" mitigation and adaptation component will be quite wide, making any contextual analysis less meaningful. At the same time, differences between pure and majority climate finance projects can be more surprising than finding differences between pure climate finance projects and those that are only majority climate finance.

Our textual analysis finds that WB's pure mitigation and adaptation projects (pre- and post-Paris) are, indeed, quite different, with a cosine value of 0.31. The dissimilarity also holds when we compare pre-Paris majority mitigation projects to pure adaptation projects (cosine=0.32). In contrast, post-Paris, majority mitigation and majority adaptation projects display a striking similarity (cosine=0.61). Moreover, post-Paris, majority mitigation projects are reasonably similar (cosine=0.49) to pure adaptation projects (across both periods). Hence, as expected, pure mitigation and pure adaptation projects are very dissimilar content-wise, and pre-Paris, majority mitigation and adaptation projects also have divergent content. But, post-Paris, the content of majority mitigation and majority adaptation projects converge.

What explains this shift in the content of projects? One plausible answer is that, under pressure to lend more for climate change and especially for adaptation, the Bank is trying hard to account for varied impacts of its projects, such as the mitigation value of a predominantly adaptation project. The sudden spike in cosine similarity between adaptation and mitigation project contents makes this explanation reasonable. In turn, this possibility lends itself to the question of whether such a mixed project actually promises that additional value. Alternatively, the Bank is "mainstreaming" CF such that the dissimilarity between different types of CF projects decline over time.

A third plausible answer is that WB is getting increasingly good at utilizing synergies between mitigation and adaptation projects. Generally, mitigation and adaptation/resilience projects tend to have very different foci. Transitioning industries to produce more cleanly, building renewable energy sources, increasing energy efficiency (all of which fall under mitigation), for example, require different projects than helping increase the resilience of vulnerable coastal populations against flooding, ensuring communities have water or food security despite the effects of climate change (all which fall under adaptation/resilience). But, because "healthy ecosystems are an important natural sink", adaptation and mitigation can sometimes go together (OECD 2021, pg.3). For instance, a forest can increase the resilience of a locality, while also reducing greenhouse gas emissions. Sectors that are particularly concerned with synergy are "forestry, agriculture and land management, water management

and urban planning" (OECD 2021, pg.3). Following the WB's own sectoral classifications, Figure C1 shows that pre-Paris, nearly half of all mixed projects belong to "agriculture, fishing, and forestry." But, post-Paris, the portion of these projects is less than one-fifths of all mixed projects. Similarly, "water, sanitation, and waste management" projects have declined from around 9% of all mixed projects to less than 5% across this period. In contrast, sectors where synergies may be harder to draw out – "education", "energy and extractives", "industry, trade and services", and "public administration" – have all increased in share of these mixed projects. Also, some of these sectors, such as education, pertain to generic capacity-building, so how they precisely contribute to climate change goals demands explanation. More certainly, the rise in mixed projects do not seem to be in sectors where a combined mitigation-adaptation contribution is easily found. Future research should, thus, focus on the synergy question more, since how project content is evolving beyond the scope of this study except for the rise in mixed projects, which clearly show variance. In this light, this Appendix amplifies the main text's finding of the rise in mixed projects in the sense of the content of climate change projects being quite varied as well.

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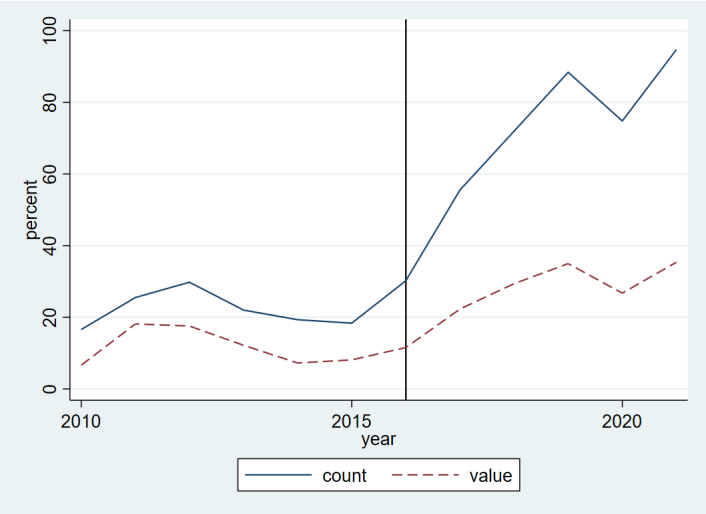
Figure 1: Climate Projects as a Fraction of Total World Bank Projects

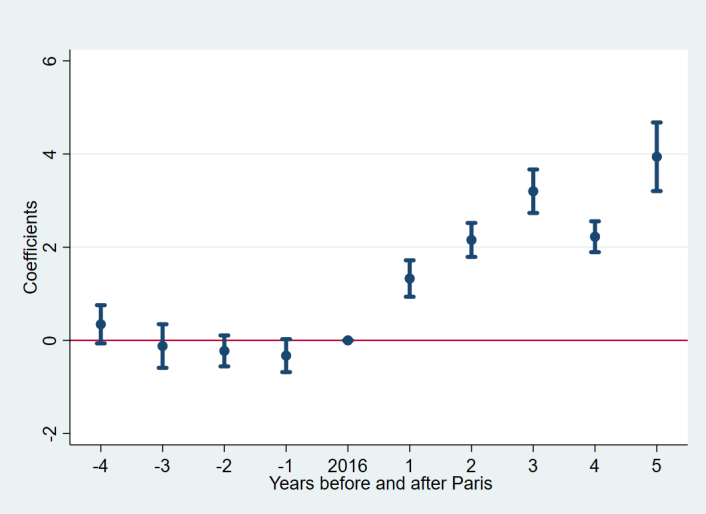


The figure plots the number and the value of climate projects as a fraction of the total number and committed value of World Bank projects. The vertical line is located at 2016, the year of the Paris Agreement.

Figure 2: World Bank's Pure and Mixed Climate Finance Projects Over Time

Panels (a) and (c) show the number and the value of pure mitigation and adaptation projects in WB's portfolio as a percentage of the total number and total value of World Bank projects in each year, respectively. Panels (b) and (d) show the percentage of projects with any mitigation or adaptation component. Panel (b) additionally contains the number of projects that simultaneously contain mitigation as well as adaptation components according to WB classification, as a percentage of the total number of WB projects.

Figure 3: The Dynamic Change in the Number of Climate Projects



The figure plots the estimates of the difference between the number of climate and non-climate project in year before and after Paris. The omitted year is 2016.

Table 1: Examples of Pure and Mixed Climate Finance Projects

	Project Descriptions (as given)
Pure Mitigation Projects	
P122028	"The development objective of the Project is to support the Borrower (the Moroccan Solar Agency MASEN) in the development of the 500Megawatt Ouarzazate solar power plant by financing the first phase (160 Megawatt gross) through a public private partnership (PPP),to increase power generation from solar power and mitigate greenhouse gas emissions and
P162149	"The objective of the proposed Project is to help: a) diversify the domestic power generation mix in Dominica by integrating clean, renewable geothermal energy; and b) demonstrate the potential of larger development of the geothermal resource."
P160379	"The Project Development Objectives (PDO) are to demonstrate the operational and economic feasibility of utility-scale innovative renewable energy technologies and battery energy storage solutions, and to strengthen institutional capacity to facilitate scale-up of such technologies on a commercial basis in India."
Pure Adapation Projects	
P125999	"The project‟s main objective is to improve productivity of water use in irrigated agriculture. This will be achieved through improved physical delivery efficiency and irrigation practices, crop diversification and effective application of inputs that will translate into greater agricultural output per unit of water used. The project‟s objectives would contribute to increased agricultural production, employment and incomes, higher living standards and positive environmental outcomes."
P146965	"The Project Development Objective is to enhance Jamaica's resilience to disaster and climate risk."
P167382	"To improve the climate resilience of the Recipient's road network, with emphasis on the selected project road, and in the event of an Eligible Crisis or Emergency, to provide an immediate response to the Eligible Crisis or Emergency."
Mixed Projects	
P176447	"The Development Objective of the proposed operation is to strengthen the capability of the state and national governments in India to respond to the needs of informal workers through a resilient and coordinated social protection system."
P125999	"The project‟s main objective is to improve productivity of water use in irrigated agriculture. This will be achieved through improved physical delivery efficiency and irrigation practices, crop diversification and effective application of inputs that will translate into greater agricultural output per unit of water used. The project‟s objectives would contribute to increased agricultural production, employment and incomes, higher living standards and positive environmental outcomes."
P173982	"The program's development objectives are to (i) strengthen the regulatory and institutional framework to build back better and greener and (ii) enhance systems and regulations to protect the most vulnerable and support sustainable business growth."

Table 2: World Banks Climate Finance Before and After Paris

Dependent variable:	Number of World Bank Projects (N_{ijt})				
Estimation method	OLS	N-Binomial	PPML	PPML	PPML
	(1)	(2)	(3)	(4)	(5)
Ln(GDP per capita)$_{it}$	-0.017	-0.367	-0.439	-0.439	-0.439
	(0.405)	(0.397)	(0.424)	(0.424)	(0.424)
Ln(Population)$_{it}$	1.741***	1.853***	2.156***	2.156***	2.156***
	(0.454)	(0.718)	(0.774)	(0.774)	(0.774)
UNGA$_{it}$	0.014	0.092	0.049	0.049	0.049
	(0.140)	(0.144)	(0.142)	(0.142)	(0.142)
UNSC$_{it}$	-0.172	-0.108	-0.103	-0.103	-0.103
	(0.124)	(0.110)	(0.101)	(0.101)	(0.101)
Regulatory quality$_{it}$	0.314**	0.498***	0.506***	0.506***	0.506***
	(0.139)	(0.183)	(0.194)	(0.194)	(0.194)
Climate$_j$				-0.113**	-1.274***
				(0.047)	(0.127)
Climate$_j * Paris_t$					2.062***
					(0.129)
Observations	3,072	3,072	3,052	3,052	3,052

The dependent variable N_{ijt} is the number of WB projects of type j (CF or non-CF) in country i and year t. Standard errors are clustered at the recipient country level. *, **, *** respectively denote significance at the 10%, 5%, and 1% levels.

Table 3: World Banks Climate Finance Before and After Paris, Recipient Effects

Dependent variable:	Number of World Bank Projects (N_{ijt})			
Recipient trait=Z_{it} :		UNGA	U.S. Trade Partner Dummy	U.S. Export Dummy
	(1)	(2)	(3)	(4)
Ln(GDP per capita)$_{it}$	-0.439	-0.421	-0.451	-0.385
	(0.424)	(0.420)	(0.432)	(0.417)
Ln(Population)$_{it}$	2.156***	2.281***	2.261***	2.223***
	(0.774)	(0.857)	(0.756)	(0.755)
UNGA$_{it}$	0.049	0.078	0.079	0.049
	(0.142)	(0.153)	(0.142)	(0.146)
UNSC$_{it}$	-0.103	-0.101	-0.101	-0.104
	(0.101)	(0.100)	(0.100)	(0.102)
Regulatory quality$_{it}$	0.506***	0.504***	0.503**	0.519***
	(0.194)	(0.191)	(0.196)	(0.191)
Climate$_j$	-1.274***	-1.078**	-1.547***	-1.336***
	(0.127)	(0.482)	(0.144)	(0.163)
Climate$_j * Paris_t$	2.062***	2.275***	2.276***	2.069***
	(0.129)	(0.645)	(0.158)	(0.164)
Z_{it}			-0.154	-0.067
			(0.115)	(0.133)
$Z_{it} * Climate_j$		-0.064	0.445**	0.268
		(0.162)	(0.214)	(0.227)
$Z_{it} * Paris_t$		0.033	0.148	-0.057
		(0.149)	(0.129)	(0.215)
$Z_{it} * Climate_j * Paris_t$		-0.071	-0.340	-0.004
		(0.210)	(0.228)	(0.256)
Observations	3,052	3,052	3,052	3,052

The dependent variable N_{ijt} is the number of WB projects of type j (CF or non-CF) in country i and year t. All specifications are estimated using PPML. In column 2, we are looking at the differential effects for UNGA countries (country trait Z=UNGA). In column 3, the country trait is whether the recipient is an important trade partner for the U.S. (Z=U.S. trade partner dummy) In column 4, the country trait is whether the recipient is an important exporter to the U.S. (Z=U.S. export partner, see the text for more detailed definitions of these dummy variables). Standard errors are clustered at the recipient country level. *, **, *** respectively denote significance at the 10%, 5%, and 1% levels.

Table 4: Pure vs Mixed Climate Finance Before and After Paris

Dependent variable:	Number of World Bank Projects (N_{ijt})				
Recipient trait=Z_{it} :			Middle Income	More Vulnerable	Large Emitter
	(1)	(2)	(3)	(4)	(5)
$Pure_j$	-2.593***	-2.952***	-4.582***	-3.052***	-3.263***
	(0.174)	(0.283)	(0.580)	(0.235)	(0.226)
$Mixed_j$	-0.198***	-1.471***	-1.768***	-1.641***	-1.638***
	(0.045)	(0.111)	(0.189)	(0.129)	(0.113)
$Pure_j * Paris_t$		0.854***	1.866***	0.854***	1.073***
		(0.274)	(0.673)	(0.328)	(0.275)
$Mixed_j * Paris_t$		2.202***	2.381***	2.314***	2.060***
		(0.112)	(0.161)	(0.149)	(0.123)
Z_{it}			0.101	0.073	0.474***
			(0.129)	(0.090)	(0.145)
$Paris_t * Z_{it}$			-0.174	-0.180	-0.672***
			(0.135)	(0.135)	(0.167)
$Pure_j * Z_{it}$			1.949***	0.177	0.873
			(0.647)	(0.494)	(0.550)
$Pure_j * Paris_t * Z_{it}$			-1.140	0.005	-0.659
			(0.712)	(0.517)	(0.545)
$Mixed_j * Z_{it}$			0.410*	0.294	0.527***
			(0.224)	(0.189)	(0.197)
$Mixed_j * Paris_t * Z_{it}$			-0.243	-0.187	0.117
			(0.208)	(0.207)	(0.208)
Observations	4,578	4,578	4,578	4,578	4,578

The dependent variable N_{ijt} is the number of WB projects of type j (pure CF, mixed CF or non-CF) in country i and year t. All specifications are estimated using PPML and include recipient covariates and fixed effects as well as year fixed effects. The covariates are not tabulated in the Table for brevity. In column 3, we are looking at the differential effects for middle income countries. In column 4, country trait Z is whether the recipient is an relatively more vulnerable to climate events. In column 5, country trait Z is whether the recipient is large emitter. Standard errors are clustered at the recipient country level. *, **, *** respectively denote significance at the 10%, 5%, and 1% levels.