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Summary

Climate policy has entered a new era as public investment increasingly moves to center stage. While essential for decarbonization, public investment is not enough—the carrots of investment need to go hand in hand with regulatory sticks. Public investment in clean technologies and infrastructure does not guarantee decarbonization outcomes. Yet, comprehensive climate policy, particularly high and comprehensive carbon prices, has remained elusive in the United States. Against this backdrop, the public investment push offers a political opportunity of government leverage. Governments can tie climate requirements to public investment as part of a “green bargain.” At the core of these arrangements is reciprocity—linking carrots to sticks—to ensure public investment leads to technological change and emission reductions. Drawing on the experience of late industrializers with “reciprocal control mechanisms,” this report advances our understanding of how to tie climate requirements to public investment. It introduces a typology of different types of green bargains, offers an empirical overview of green bargains, and recommends design choices—relating to government leverage, scope of climate requirements, and accountability—to make green bargains effective policy tools.

1 Introduction

Climate policy has entered a new era as public investment is increasingly moving to center stage (Meckling et al. 2022). Key efforts include the Inflation Reduction Act and the Bipartisan Infrastructure Law in the United States, the European Green Deal, and South Korea's Green New Deal. In many countries, fiscal stimulus in response to the pandemic-induced economic crisis also included varying extents of green spending (Nahm, Miller, and Urpelainen 2022).

Recent studies have underlined the importance of public investment in driving decarbonization of the global economy (OECD 2017; Larson et al. 2020; SDSN 2020; National Academies of Sciences and Medicine 2021). A 2018 Intergovernmental Panel on Climate Change (IPCC) report estimated that approximately \$900 billion per year between 2025 and 2050 would need to be invested to decarbonize the global economy (IPCC 2018). While public investment is key to mobilize private finance and meet this overarching goal, on its own it is not enough (Meckling 2021). To guarantee decarbonization outcomes, the carrots of investment need to go hand in hand with regulatory sticks.

Climate policy “sticks,” particularly high and comprehensive carbon prices, have remained elusive in the United States and other parts of the world. Political opposition from business, labor, and voters has frequently stymied such efforts—either in the legislative process or through litigation. Against this backdrop, the big public-investment push offers a political opportunity of government leverage. Governments around the world have begun to tie climate requirements to public investment as part of what we call a “green bargain.” At the core of these arrangements is reciprocity—linking carrots to sticks—to ensure public investment leads to technological change and emissions reductions. This approach represents a crucial innovation in climate policy.

The Obama administration was an early adopter of this approach to climate policy making: In 2009, it leveraged a suite of investments made in the auto industry to negotiate a significant increase in automobile fuel efficiency standards (Meckling and Nahm 2018). The strategy has become more widespread since. For example, when the French government bailed out national air carrier Air France, it made the bailouts conditional on the airline agreeing to cut its per-passenger-km emissions 50% by 2035, reduce emissions from domestic flights 50% by 2024, and incorporate at least 2% alternative fuels in their fuel blend by 2025 (French Press Secretary 2020). Similarly, Canada's Large Employer Emergency Financing Facility (LEEFF) provides loans to help large businesses survive the COVID-19-induced economic downturn and requires recipients to disclose information about their current and projected greenhouse gas emissions.¹

This report examines the logic and design of green bargains. In doing so, we draw on the experience of late industrializers and the “reciprocal control mechanisms” which were at the heart of their success in developing globally competitive industries. By linking subsidies and other financial supports with tailored, dynamic requirements, late industrializers were able to incentivize innovation without allowing unproductive firms to capture excessive rents. Government officials in these countries disciplined industry to perform, blocking firms from accessing funding if they underperformed (Amsden 2001).

¹ Canada's LEEFF was still issuing new loans as of at least July, 2022 (Travelweek Group 2022).

Similarly, governments today need to tie carrots to sticks in order to ensure that growing investments for decarbonization lead to results.

There is also a growing recognition that regulatory requirements may best be tailored to specific sectors (Victor, Geels, and Sharpe 2019; Cullenward and Victor 2020). Technology characteristics, market structures, and regulatory regimes vary significantly across sectors, calling for targeted policy mixes. In addition, major technological transformations require solving significant coordination problems across firms and between industry and policymakers. Often struck at the sectoral level, green bargains offer policymakers opportunities to address these challenges.

In the following, we first examine the historical precedents of green bargains, introduce a typology, and offer an empirical overview. We then offer recommendations for how policymakers can design green bargains to make them effective at advancing technological learning and decarbonization. Green bargains should have sectoral scope rather than being firm-specific, offer ongoing leverage to governments, and aim to build support for deep decarbonization over time. We conclude with thoughts on domestic and international policy fora that can serve as platforms to develop green bargains as public climate investments grow.

2 Varieties of green bargains

2.1.1 Historical precedents

Pairing financial support with conditionalities aimed at inducing technological transformation emerged as a policy approach in the late industrializing nations of Japan, South Korea, Hong Kong, Singapore, Taiwan, India, and Brazil. Governments created so-called “reciprocal control mechanisms” by attaching performance standards and other conditions to financial support (Amsden 2001). These late industrializers successfully forged new comparative advantages by emulating competitive international markets in particular sectors.

Reciprocal control mechanisms served two primary purposes: to induce technological learning and to avoid government failure, i.e., public investments failing to yield productivity gains. Government officials would assess international market conditions to identify the capacities that globally dominant firms possessed, survey local firms to identify the barriers preventing them from competing successfully, and create financial incentives that required firms to learn those skills. These standards were re-evaluated as regulators identified which incentives produced results, and which did not. In order to avoid sponsoring inefficient firms, subsidies were structured to ensure that underperforming firms were cut off from funding.

Today, advanced industrialized countries are facing the challenge of major economic transformations toward decarbonization. The emergence of green bargains suggests that they are using the policy mechanisms of the late industrializers to meet this challenge. Some forms of green bargains, in particular green procurement, emerged in the early 1990s (UNEP 2017). Other forms, such as tying regulatory reform to public investments, emerged more recently in the response to the financial crisis of 2008. In response to the pandemic-induced recession, countries across North America and Europe have begun to impose climate and equity-related requirements on the rescue

packages large firms receive, such as the Dutch government’s requirement that KLM limit carbon emissions and executive pay following its 2020 bailout (Loh 2020). We thus observe a broadening of the types of green bargains as well as increasing focus on climate-related requirements.

2.2 Typology

Green bargains vary along two key dimensions: the extent of government leverage and the type of climate requirement they impose. Variation along those two dimensions results in four general types of green bargains as displayed in table 1.

Table 1: Types of green bargains

		Government Leverage	
		One-Time	On-Going
Type of Climate Requirement	Quid Pro Quo Conditionalities for Firms Receiving Funds	Canada’s Large Employer Emergency Finance Facility (LEEFF)	“Buy Clean” California
	Regulatory Reform	Austrian Airlines Bail-Out + New Aviation Taxes & Standards (both quid pro quo & regulatory reform)	2009 US Auto Bailout + New CAFE Standards

First, government leverage can be limited to a one-time bargain or extend to an ongoing reciprocal relationship with a firm or multiple firms. For example, Canada’s LEEFF program provided loans to large employers that were conditional on those firms disclosing their climate pollution levels and susceptibility to climate change-induced risk (Trudeau 2020). This represents a one-time act of government leverage at the point of granting the loan. Other types of bargains offer governments ongoing leverage, allowing policymakers to ratchet up climate requirements over time. For instance, procurement policies such as California’s “Buy Clean” program can be continually re-assessed. This program requires manufacturers of certain construction materials to demonstrate that their products do not exceed the state’s threshold for the maximum global warming potential, i.e., “embedded emissions.” The program has become a model which other U.S. states and federal lawmakers are now considering (Sierra Club 2020). Policy design, in particular the type of public finance, determines whether governments will be able to exert this leverage once, in a one-time deal, or over time, in ongoing arrangements aimed at generating technological learning and industrial transformation.

Second, green bargains vary in the type of climate requirement they impose. Some are focused on a single firm or a small set of firms, imposing *quid pro quo* conditionalities. This means firms agree to specific terms of an agreement in order to access funds. For example, the French bailout of Air France is tied to a *quid pro quo* firm-level decarbonization plan, requiring the carrier to cut emissions from domestic flights in half by 2024 (Murray 2020). Green bargains can also be broader, covering an entire sector or multiple sectors. In this case, public investments are leveraged to initiate broader

regulatory reforms. For example, the bailout of Austrian Airlines was accompanied by new regulations, including a series of aviation taxes aimed at reducing short distance domestic flights industry wide.²

2.3 Case study: French Aero Plan and Air France-KLM bailout

Beginning in 2020, the French government undertook a series of spending programs aimed at rescuing the nation's aerospace industry, which was hit particularly hard by the pandemic-induced recession. The first of these programs, the French Aeronautic Support Plan (Aero Plan), contains two major components: a €7 billion bailout package for Air France and an additional €8 billion in investments aimed at modernizing the industry and creating the world's first commercial carbon-neutral airplane. In exchange for this bailout package, Air France agreed to a series of *quid pro quo* climate conditionalities. The airline agreed to cut CO₂ emissions per passenger-km in half by 2030, to reduce emissions from domestic flights by 50% (particularly those which can take place by rail in fewer than 2.5 hours), and source 2% of its fuel from sustainable sources by 2025 (French Press Secretary 2020). Critics argued that because these conditionalities are not legally binding, and are mostly repackaged prior commitments, they will make little difference compared with a business as usual case (Harvey-Scholes 2020), while proponents have lauded the climate conditionalities as a first of its kind, "set[ting] a high bar" with its "ambitious" emissions reduction goals (Murray 2020).

While the *quid pro quo* conditionalities placed on Air France's initial €7 billion bailout package have received mixed reviews from climate advocates, in principle the broader Aero Plan holds the potential to become an effective strategy for decarbonizing the industry. The package involves an interlocking set of loans, loan guarantees, procurement contracts, grants, and a fund bundling public and private investments to support small and medium sized parts suppliers. €1.5 billion in grant funding is earmarked for R&D aimed at creating the world's first commercially viable hydrogen or hybrid electric-biofuel aircraft by 2035, and millions more are earmarked for plant modernization (French Press Secretary 2020).

The Aero Plan is one example of a federal government successfully tying bailout funds to carbon reduction stipulations. Government officials developed the plan in consultation with the International Air Transport Association, the industry's global trade association, sending a clear signal to markets that France seeks to be the home of the industry's future. This broader plan drew praise from some prominent industry voices that argued the French government's efforts to instigate a sector-wide sustainability transformation were a model for other countries despite—or perhaps because of—these plans being reminiscent of France's *dirigiste* legacy (Legrand 2020).

2.4 Empirical overview of green bargains

We collected data on 26 cases of green bargain policies and proposals. While there are a large number of entities proposing different forms of climate conditionalities, we limited the number of proposals by focusing on those developed by prominent advocacy groups

² We classify government leverage as one-time in this green bargain because the new ticket taxes do not aim to induce a process of technological learning, but rather simply to reduce air travel.

and political parties. Our search was limited to cases where English language reporting on the policy was available.

Of these 26 cases, 14 involve *quid pro quo* conditionalities, while seven involve broader processes that link public investments to regulatory reforms (see Figure 1). Two policies—Austria’s aviation bailout and Washington state’s utility performance reform—and three proposals—most notably House Democrats’ Take Responsibility for Families and Workers Act of March 2020—involve both *quid pro quo* conditionalities and broader regulatory reforms.

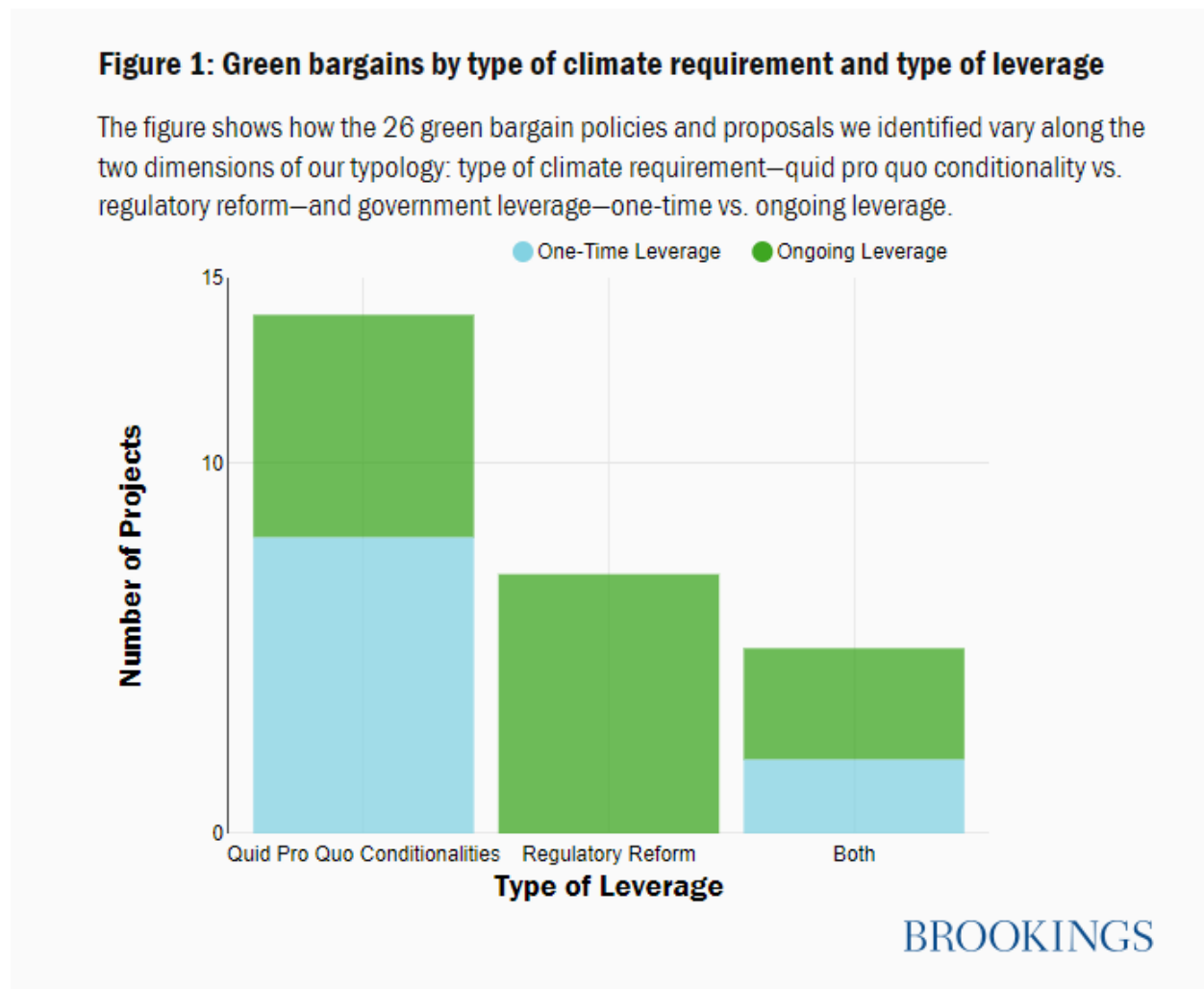
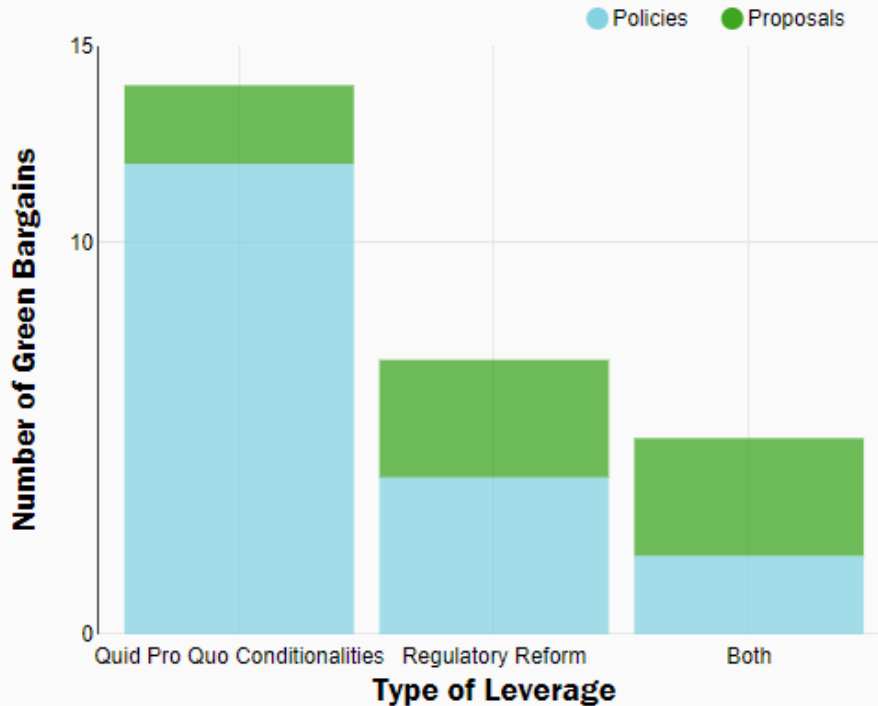


Figure 2, below, breaks down these cases into adopted policies and major proposals by the type of climate requirement imposed.

Figure 2: Policies and proposals by type of climate requirement

The figure shows by type of climate requirement—quid pro quo vs. regulatory reform—how many of the 26 policies and proposals are actually implemented policies vs. proposals for green bargains to be implemented in the future.



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Across the cases, broad performance targets are the most common type of standard. Interestingly, however, this trend is much less pronounced within the cases of implemented policies. Of the 18 policy cases, six contain performance standards, including broad commitments to reduce emissions firm-wide, while seven contain product standards of various kinds and one includes a transparency standard.

Six of the eight proposals in our dataset include both environmental and social conditionalities. Particularly in the context of bailouts, these social conditionalities often revolve around curbing dividends, stock buybacks, and executive bonuses and limiting layoffs and changes in collective bargaining agreements. In some cases, such as the Coronavirus Aid, Relief and Economic Security (CARES) Act in the United States, limitations on layoffs remained in the agreement ultimately negotiated with the airline industry (Grunwald 2020), but environmental conditionalities did not. More broadly, social and economic conditionalities appear to be more prevalent features of recent bailout packages than environmental ones.

3 Designing green bargains

Policymakers may want to consider three criteria when designing green bargains: that the bargains 1) have sectoral scope rather than being firm-specific, 2) offer ongoing leverage to government, and 3) aim to build support for deep decarbonization over time.

First, decarbonization challenges vary across sectors, which has led to growing recognition that policies and strategies are best designed at the level of individual sectors (Victor, Geels, and Sharpe 2019; Cullenward and Victor 2020). Green bargains with one or a few firms can offer entry points, though broadening those to sector-wide bargains should be a goal.

Second, decarbonization is a multi-decade process of economic and technological change. Government policy is central to guiding this process toward progressively deeper emission cuts by ratcheting up climate requirements over time. As such, policymakers may want to design green bargains that afford them with ongoing leverage to allow for regulatory ratcheting up. A key design feature that impacts the extent of government leverage is the type of investment mechanism used to provide public financial support.

Third, climate regulation has faced significant political opposition from industry (Brulle 2018), as well as segments of organized labor (Mildenberger 2020). This suggests that green bargains should focus on building continuous political support among these key constituencies for deep decarbonization to avoid backlash from both regulated firms and voters. Firms may have competitiveness concerns if climate requirements do not apply to competitors, and voters may be concerned about the prudent use of public funds.

3.1 Broadening the scope of bargains

Governments can use several strategies to broaden *quid pro quo* conditionalities placed on individual firms to sectoral bargains with ongoing leverage. First, they can copy the requirements of *quid pro quo* conditionalities attached to bailout packages and apply them as standard requirements of firms receiving public monies. For example, Canada could expand the requirement that recipients of its LEEFF funds disclose their greenhouse gas emissions and plans to decarbonize to cover all firms benefiting from government contracts or receiving public subsidies.

Second, governments can expand firm-specific conditionalities to become sector-wide regulatory reforms. For example, in July 2021, the European Commission adopted an EU-wide regulation mirroring the sustainable aviation fuel blending mandate the French government had imposed as a condition of its bailout of Air France-KLM (EUROCONTROL 2021). It can sometimes be challenging, however, to leverage investments that only directly benefit a few firms to reform broader regulations. In order to build political support for these measures, policymakers may need to redirect some investments to provide sector-wide benefits in the form of network infrastructure. The U.S. auto bail-out and Corporate Average Fuel Economy vehicle emissions standards (CAFE standards) reform of 2008/2009, for instance, combined a large array of investments, including in the battery supply chain and for retooling manufacturing facilities. These investments in the broader transformation of the U.S. auto industry helped bring automakers to the table for a deal on CAFE standards (Meckling and Nahm 2018).

Third, in moving from firm-specific crisis bargains to broader ongoing bargains, policymakers can convert *post-hoc* requirements into *ex-ante* requirements, making them pre-requisites for receiving public support. For example, several governments required

bailed out firms to present plans to meet emissions reduction targets within specified timelines after receiving funding. These *post-hoc* requirements could be converted to *ex-ante* requirements that firms demonstrate significant progress toward those goals to be eligible for future funding.

Broadening coverage of green bargains to entire sectors may also be an important strategy to mitigate backlash due to competitiveness concerns. When all firms within a given sector are subject to the same rules (domestically, at least) the playing field is more even, thus weakening one argument against such requirements. Therefore, paradoxically, sector-wide requirements may be easier to ratchet up over time than requirements that only apply to single firms.

3.2 Investment mechanisms and ongoing leverage

The investment mechanism(s) governments use can influence whether their leverage is one-time or ongoing. Some investment mechanisms, such as equity stakes and government contracts, provide opportunities for governments to exert ongoing leverage, while others, such as loans, are more likely to involve a one-time bargain.

Purchasing equity provides the most direct route for governments to influence the investments and operations decisions of firms over time. The logic of this approach is most evident in the French government's use of equity to restructure corporate networks in the aeronautics industry, as well as proposals by the UK's Labour Party (Labour Party (UK) 2019) and California advocates and legislators (Wiener 2020; Reclaim Our Power 2022) for governments to purchase investor-owned utilities and implement state-led decarbonization plans. Even without controlling equity, government representatives on corporate boards can also help regulators understand the barriers holding back firm- and sector-specific decarbonization processes.

Direct ownership, however, is not a prerequisite for governments to impose climate requirements on firms or sectors, nor is it always necessarily desirable. Governments can also direct investment through grants. Grants can include "earmarked" funds, which require recipients to use them to finance specific activities aimed at overcoming sector-specific barriers to decarbonization. Grants may also decrease political resistance as they help firms and industries to transition by de-risking technology development through public finance. For example, Germany's 2020 auto industry recovery package included grants for auto makers to modernize facilities, subsidies for electric vehicles and investments in EV charging infrastructure, de-risking investments in low and zero-emission vehicles, and making new taxes on high emissions vehicles more politically feasible (Taylor 2020).

Governments can also require recipients of tax credits and public contracts to meet certain *quid pro quo* conditionalities aimed at inducing technological learning. California's "Buy Clean" program offers an excellent example, wherein the state requires certain construction materials it purchases to comply with embedded emission standards. A 2020 bill introduced by California Assembly member Phil Tang during the state's negotiations with the Trump administration over fuel economy standards similarly sought to limit the state's electric vehicle tax rebates to automakers that agreed to meet the more stringent mandates (Rosenhall and Becker 2019). The fact that these financial relationships are ongoing offers policymakers opportunities to ratchet up the climate requirements attached to them over time.

In comparison with equity, grants, contracts, and tax credits, loans are more limited in the ways governments can use them to promote decarbonization. While loans can include *quid pro quo* conditionalities, it is difficult to adjust these requirements over time. That said, if governments decide to authorize additional loans, as France recently did in its second bailout of Air France-KLM, they can take the opportunity to consider ratcheting up conditionalities. Alternatively, governments can purposely break up the time period of loans into smaller increments to provide them with pre-determined opportunities to adjust requirements and exert ongoing leverage.

3.3 Accountability and political support

A key lesson from industrial policy is that while public investment is central to major technological change, it can prop up unproductive firms. In the case of public investment for decarbonization, this risk is twofold: supporting unproductive firms and firms that fail to cut emissions. To avoid these pitfalls, businesses must be held accountable to appropriate targets, and policymakers must be held accountable to ensure the programs they design meet public interest goals (Rodrik 2009; 2014). Toward those ends, clear accountability measures are critical. These include specific criteria that recipients of public funds will be evaluated against, as well as clear processes for determining when policymakers will stop funding firms that underperform.

Reporting and monitoring are important foundational tools for policymakers to acquire the information needed to craft effective green bargains. Without accurate monitoring and reporting of emissions data, it is impossible to determine whether firms are abiding by agreements or not. Reporting that is verified by an independent organization gives policymakers added certainty that the information they receive is accurate. This data can be made available to the public in its full form or in more limited summary versions. Details on the enforcement activities of regulators can similarly be more or less transparent (Mattera et al. 2012). When governments have representatives on corporate boards, they can use these positions as a way of monitoring compliance with agreements, as the Austrian government began doing after its bailout of Austrian Airlines (Grull 2020).

Effective reporting and monitoring are also essential to mobilize support from environmental groups for green bargains. Otherwise, green bargains may quickly be perceived as corporate capture and greenwashing. For example, while the British government stated that its bailout of Celsa Steel included “commitments to protect jobs, climate change, and net zero targets” (Department for Business, Energy and Industrial Strategy 2020), neglecting to disclose the specifics of those commitments prevents environmental advocates from applying public pressure to ensure they are achieved.

The other key component of accountability is ensuring enforcement. Most of the green bargains in our dataset with *quid pro quo* conditionalities lack meaningful enforcement mechanisms for the requirements placed on the receipt of public financial assistance. In one clear example, German officials told *Fortune* that their bailout of Lufthansa airlines comes with “clear environmental requirements,” including commitments to renew its fleet with lower-emissions aircraft and spend more on research and development of alternative fuels. These agreements, however, do not include any specific targets and have no legal backing, leading many to conclude that the agreement

contains no “green strings” (Meyer 2020). The enforceability of many other conditionalities placed on bailout packages is similarly unclear.

Local economic development policies in the United States offer useful lessons for policymakers to consider when designing the conditions placed on subsidies and other public investment programs. Municipalities and states throughout the United States enforce the conditions they place on local economic development subsidies in three major ways: by recapturing (or “clawback”) of funds awarded, recalibrating ongoing investments and subsidies, converting loans to equity or grants to loans, and by terminating agreements. Our dataset does not include any policy cases that contain these accountability mechanisms, but a handful of policy proposals do contain these mechanisms.

Clawback mechanisms require recipients of public subsidies to give them back if they do not abide by the conditions to which they had agreed. Recalibration clauses allow ongoing investments to be adjusted to offer lower levels of support when firms fail to meet obligations. When financial assistance is ongoing, it can also simply be terminated. Penalties can be automatic or discretionary and provide opportunities for the government to waive those penalties. These types of penalties can also be combined (Mattera et al. 2012). For example, similar to many states and cities in the U.S., the state of Vermont offers subsidies to businesses looking to establish or expand production in the state with the condition that firms receiving funds create high-quality jobs. Companies must report job creation and new investment figures annually to continue to receive funding. That reporting is then verified by an independent entity. If firms do not meet their obligations under the agreement, there are multiple penalties which are automatically initiated. Enforcement activities are also reported publicly (Mattera et al. 2012).

Though green bargains have yet to employ these more sophisticated enforcement mechanisms, some governments have converted bailout funds from one investment type to another. In the United States, for example, former Treasury Secretary Steve Mnuchin required airlines to repay 30% of the bailout funds Congress authorized as grants and issue stock warrants allowing the government to purchase equity at a pre-determined price (Shepardson and Rucinski 2020). Similarly, the French government converted €3 billion in loans it provided to Air France into perpetual bonds, which can later be converted into equity (The Local 2021). Conversion provisions can also be integrated with climate policy goals. The International Institute for Sustainable Development recommended that the Canadian government convert loans to equity and grants to loans if firms failed to comply with the requirements of their economic relief (Corkal, Gass, and Cosbey 2020), thus providing governments with ongoing leverage to ensure firms abide by the conditions placed on them.

4 Advancing the agenda for green bargains

The passage of the Inflation Reduction Act in the United States has opened a large political window to pursue green bargains. Public investment in climate mitigation will scale up by orders of magnitude over the next ten years. It raises the question of which institutional fora and bodies should develop and manage green bargains. As they scale public investment, governments globally are experimenting with new agencies to channel public funds for decarbonization. The EU, for instance, created the [European Climate](#),

[Environment, and Infrastructure Executive Agency](#) and leverages the European Investment Bank. In the United States, the Inflation Reduction Act specifically provides funding for non-profit “green banks” through the [Greenhouse Gas Reduction Fund](#). This will likely lead to the establishment of the first national green bank in the United States. Green banks could make access to loans or equity investments contingent on meeting climate-related obligations. These could be substantive decarbonization goals or procedural requirements, such as publicly disclosing lobbying activities on climate policy (Lyon et al. 2018). Beyond green banks, other U.S. government agencies administering climate and clean energy funds such as the Department of Energy can develop climate requirements as part of their efforts to make and monitor public investments in clean technology and infrastructure. Various government bodies experimenting with green bargains should engage in information exchange to develop best practices around green bargains.

The new era of public investment in decarbonization is both a historical opportunity for a clean energy transition and a policy challenge. Green bargains are an important tool for making sure that the big spending push on climate does not lead to a dead end but actually delivers on its promise of decarbonization.

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