

Unifying Comparative and International Theories of Energy Transitions around Credibility*

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Abstract

Why are some countries more successful at advancing the clean energy transition than others? Existing studies focus largely on industrialized democracies and frame domestic and international explanations against each other. Instead, we develop a unifying framework around the idea of credibility to explain clean energy transition outcomes in developed and developing countries and shed light on the prospects for future reform efforts. We elucidate the credibility challenges reformers confront and point to new directions for the comparative and international study of energy transitions necessary to respond to the climate crisis.

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Countries must undergo dramatic transitions away from fossil fuel-based economies for the world to have a chance at averting the worst impacts of global warming. While new inventions will be needed, the technologies already exist to start solving the climate problem (Davis et al., 2018; Pacala and Socolow, 2004). However, politics stand in the way. Governments face stiff political obstacles when it comes to combating the climate crisis (Busby, 2008; Harrison and Sundstrom, 2007; Stokes, 2020). An essential task is to develop theories of climate politics explaining the conditions that enable or impede the clean energy transition.

Theories of climate politics have framed international and domestic explanations against each other (Aklin and Mildenerger, 2020; Colgan, Green, and Hale, 2021), though the two need not be mutually exclusive (Gazmararian and Milner, 2023; Kennard and Schnakenberg, 2023). Scholars inspired by models of global public goods provision saw free riding on the emissions reductions of other countries as a fundamental constraint on mitigation ambition, which implied a set of international solutions including reciprocal cooperation, trade sanctions, and information provision (Barrett, 2003; Keohane and Victor, 2016; Nordhaus, 2015; Ostrom, 1990; Victor, 2011).

Yet, motivated by the emergence of climate policy action despite stalled international progress, scholars have reoriented their focus to domestic distributive conflict as the primary obstacle to the energy transition (Aklin and Mildenerger, 2020; Breetz, Mildenerger, and Stokes, 2018; Colgan, Green, and Hale, 2021). These studies have focused largely on industrialized democracies, documenting the influential role of such factors as business and labor coalitions (Mildenerger, 2020), the strength of green interest groups (Aklin and Urpelainen, 2013; Meckling, 2011), and institutional arrangements (Finnegan, 2022a; Harrison and Sundstrom, 2007, 2010).

Rather than frame international and domestic factors against each other, we establish a framework unified around credibility. We contend that the ability of governments to solve credible commitment problems and of green investments to generate local economic

opportunities will shape the success of decarbonization in developed and developing countries (Gazmararian and Tingley, 2023b). Credible commitment problems refer to the idea that leaders may break their promises in the future as political and economic circumstances change (Kydland and Prescott, 1977; Rodrik, 1989b). Local economic opportunity refers to a more structural idea about credibility, where communities and workers must believe that new investments will make them as well or better off than they were before. Otherwise, they will have incentives to oppose energy transition efforts if they are uncertain about the distribution of costs and benefits.

Credibility helps to explain when countries are able to solve three challenges we identify as central to the clean energy transition: providing compensation, creating allies, and training workers. First, the clean energy transition will create concentrated losses, which gives rise to well-organized political resistance (Olson, 1965). Compensation of communities, workers, and firms may be necessary in some cases to diffuse opposition and ensure a “just” transition (Finnegan et al., 2023; Green and Gambhir, 2020; Meckling and Nahm, 2022). However, the lack of credibility can undermine these political strategies (Jacobs and Matthews, 2017; Patashnik, 2014). Gazmararian and Tingley (2023b) document how those facing dislocation do not find these promises to be credible since political conditions can change in the future and there is a history of broken promises. From the ground-up perspective, compensation, side payments, and transitional assistance are not uncritically accepted as ironclad guarantees.

Second, clean energy transition efforts will be more successful when reforms broaden the political coalition in support of climate action (Aklin and Urpelainen, 2013; Meckling et al., 2022). One way to do this is to strengthen sectoral interests in the green economy (Meckling et al., 2015). This strategy depends partly on firms being willing to make green investments and communities accepting these projects. However, political and economic uncertainty can lead to underinvestment (Dixit and Pindyck, 1994), while worries about the effects of green projects on communities can give rise to local opposition (Stokes, 2016). Creating allies in

the green transition is not automatic.

Third, even with the right policies to encourage clean energy development, workforce shortages threaten to stall decarbonization in developed and developing countries (IRENA, 2021; Larson et al., 2021). While much research focuses on economic incentives, the challenge of encouraging people to train for green jobs is also political. Gazmararian and Tingley (2023b) document how uncertainty about the durability of green investments and the lack of local economic opportunities discourages specialization in industries needed for the clean energy transition. Renewable energy projects can be sited but will not be built without electricians.

In this paper, we identify three factors that vary across countries and affect their ability to create credibility needed to solve the challenges of providing compensation, creating allies, and training workers: institutions, state capacity, and international constraints. We review previous scholarship and develop new ideas about how these factors affect the government's ability to make credible commitments and create local economic opportunities. Our framework aims to lay the foundation for a research agenda studying climate politics. By clearly defining the problems, we hope to lead to more effective solutions.

The first factor is institutions. Countries vary in their domestic institutions such as business-state relations (Meckling et al., 2022; Mildemberger, 2020), labor market policies (Stroud et al., 2014; Thelen, 2004), electoral rules (Finnegan, 2022a), procedures affecting transparency (Holmstrom, 1979), and informal institutions governing common pool resources (Ostrom, 1990). We identify how variation in these different institutional features affects distinct dimensions of credibility.

Second, countries differ in their state capacity, which can affect the ability of governments to implement complex laws necessary to orchestrate the energy transition (Hochstetler, 2020; Meckling and Nahm, 2018a; Skocpol, 1985). This matters for credible commitments to firms making investments in green energy and communities receiving compensation. If political actors do not think the government is capable of delivering on its promises, they will be

more likely to resist reforms.

Lastly, international constraints, such as the availability and credibility of climate finance, will shape the political bargains that can be made in developing countries. Many low-income countries lack the resources needed for decarbonization, so international transfers from the Global North to the South are vital (Gaikwad, Genovese, and Tingley, 2023; Landis and Bernauer, 2012). Domestic credible commitment problems can also spill over internationally since the inability of a donor country to build a climate finance coalition, for example, can complicate the politics behind the energy transition in developing nations (Milner, 1997; Putnam, 1988). Countries also vary in their industrial capabilities, which will affect the strategies reformers have available such as their ability to create local jobs that broaden support and create community buy-in for projects. Developing countries will also find economic opportunities and obstacles depending on their position in global supply chains integral to international decarbonization.

These three factors cover much ground, but that is because the clean energy transition is unlike economic transformations before it in both its scope and urgency. Fossil fuels permeate our economic systems so pervasively that the amount of changes required by governments, firms, and consumers can be difficult to appreciate (Unruh, 2000). Some countries are better situated to solve energy transition challenges because of their natural endowments, but even then, politics remains relevant. We hope that by unifying our explanations around credibility, the framework remains parsimonious.

We conclude by sketching a research agenda anchored by the concept of credibility. Our framework aims to productively bring together international and domestic explanations rather than pitting them against each other. In doing so, take up the call from Aklın and Mildemberger (2020) to study international considerations beyond free riding and from Cao et al. (2014) to take seriously both domestic and international factors. Credibility offers a useful starting point to understand the comparative politics of the energy transition.

Existing Clean Energy Transition Explanations

Political Economy of (Mostly) Industrialized Democracies

Much theoretical work on the energy transition is informed by experiences in industrialized democracies. We discuss exceptions below. Here, we provide an incomplete overview of current explanations for why some countries have more successful clean energy transition efforts than others.¹ Some of these ideas we will recast to show the role they play in making credible commitments. The aim of this exposition is to situate the credibility framework that we introduce next, showing how it complements and advances existing energy transition research. Our focus is on the politics of political reform—providing compensation, creating allies, and training workers—which is related to but distinct from efforts to explain how climate politics evolve in response to global warming (Colgan, Green, and Hale, 2021; Gazmararian and Milner, 2023).

A prominent approach begins by identifying the underlying structure of climate change as a collective action problem, which implies that international free-riding is a critical barrier (Barrett, 2003; Keohane and Victor, 2016; Nordhaus, 2015; Ostrom, 2009; Victor, 2011). Thus, to the extent that countries can implement solutions to free-riding, there should be greater clean energy transition success. Yet, others point to the ability of reformers to navigate domestic distributive conflicts as providing more explanatory leverage (Aklin and Mildemberger, 2020). There have also been efforts to bridge the focus on incentives to free ride by emphasizing how these domestic and international factors could be considered within the same model (Gazmararian and Milner, 2023; Kennard and Schnakenberg, 2023).

Comparative politics research on the clean energy transition emphasizes a variety of explanations: the role of business-state relations in striking long-term bargains between industries and the government (Meckling et al., 2022; Mildemberger, 2020); electoral systems for insulating leaders from political backlash (Finnegan, 2022a; Finnegan et al., 2023; Finnegan,

¹The concept of “success” is broad. Given the size of the needed transition, durability is a key component of success. When discussing future research directions, we disaggregate success for tractability.

2022b; Garrett, 1993); the availability of social safety nets (Kono, 2020; MacNeil, 2016); the incentives created by democratic institutions (Bayer and Urpelainen, 2016; Bernauer, 2013); historical legacies (Lipsy and Schipper, 2013); the capacity of states to implement reforms against the opposition of interest groups (Guy, Shears, and Meckling, 2023; Meckling and Nahm, 2018a,b, 2022); shocks to energy markets (Aklin and Urpelainen, 2013, 2018); and the way reformers sequence policies (Meckling, Sterner, and Wagner, 2017; Meckling et al., 2015; Pahle et al., 2018).

There are also rich contextual accounts of the challenges of the energy transition in industrialized democracies such as Germany (Brauers, Herpich, and Oei, 2018; Laird and Stefes, 2009; Oei, Brauers, and Herpich, 2020; Sheldon, Junankar, and De Rosa Pontello, 2018), Australia (MacNeil and Beauman, 2022; Shields and Campbell, 2021), Norway (Normann, 2015), and Ireland (Banerjee and Schuitema, 2022). Yet, the energy transition must occur worldwide, so scholars need theories to explain why some efforts to decarbonize the developing world are more successful than others. We cannot automatically port over these theories without first investigating whether they are applicable.

Decarbonizing the Developing World

The challenges with decarbonization that developed countries confront, such as compensating fossil fuel communities and workers, also exist in developing nations (Busby et al., 2021; Gaikwad, Genovese, and Tingley, 2022). There are rich case studies on aspects of the clean energy transition, such as coal phase-outs. The volume from Jakob and Steckel (2022) documents 15 cases, including Chile, China, India, Turkey, Kenya, the Philippines, Colombia, Indonesia, and South Africa. Just as in scholarship on high-income countries, there are examples of growing interest in what a “just transition” would look like in low-income nations (Jermain et al., 2022). Urpelainen, Aklin, and Bayer (2018) conduct case studies worldwide to understand the political causes of policy failures to address energy poverty. Nongovernmental organizations have also conducted valuable case studies docu-

menting energy transition opportunities and challenges (e.g., Mey et al., 2019). This is the tip of the iceberg of the abundant descriptive material that political scientists can draw on when formulating systematic explanations for clean energy transition outcomes.

Many studies focus on China and India, given the size of their economies, populations, and growth trajectories. For example, Busby and Shidore (2021) consider variation in solar energy development across India, and Aklin, Cheng, and Urpelainen (2021) show how caste inequality can undermine policy implementation of electrification initiatives.² Gong (2024) examines variation in carbon reduction experiments across Chinese cities.³ As in developed countries, transmission infrastructure for renewable energy is a major issue for China (Davidson et al., 2016). Harrison and Kostka (2014) examine how India and China have used policy bundling strategies to pursue mitigation goals, which are approaches also considered in developed nations (Bergquist, Mildemberger, and Stokes, 2020).

Oddly, Indonesia to date has received less attention despite its population growth, energy access challenges, and diverse resource mix. Scholars have fruitfully examined coal transitions in Indonesia in comparison to Vietnam and Colombia (Gao et al., 2021; Ordonez et al., 2021; Wehnert et al., 2019; Yuliani, 2017). Chelminski (2022) contrasts the effectiveness of finance for geothermal projects in Indonesia and the Philippines. Her analysis identifies an intersection between external funding and new renewable opportunities while showing how political will for reforms is crucial in overcoming barriers. Elliott and Setyowati (2020) highlight how inequality in Indonesia exacerbates just transition efforts.

Some large-N research has explored the determinants and obstacles of decarbonization. For example, recent work considers variation in gasoline taxes and whether institutions and leadership explain cross-national differences (Mahdavi, Martinez-Alvarez, and Ross, 2022; Martinez-Alvarez et al., 2022a; Ross, Hazlett, and Mahdavi, 2017b). Gazmararian and Milner (2023) explore climate policy adoption across high and low-income countries.

Comparative studies of the energy transition in developing countries also highlight the

²See also Kikon (2019), Lahiri-Dutt (2003), and Tongia, Sehgal, and Kamboj (2020).

³See also Tan et al. (2021) on the role of local governments versus incumbent stakeholders.

crucial role of elites as opposed to voters. For example, Bayulgen (2022) analyzes the renewable energy expansion in Turkey, finding that elite competition and opportunistic behavior are most important for understanding when reforms succeed. Reviewing this book, Aklin (2023, p. 763) notes how “[u]nderstanding elites’ priorities becomes important precisely in cases where we cannot substitute their preferences for those of voters or lobbies. In sum, our models may fit Denmark and Germany quite well, but they do not necessarily travel very far beyond them.” This underscores the need for theories informed by experiences in developing countries.

Some work identifies commonalities across developed and developing countries. For example, Hochstetler and Ricardo Tranjan (2016) document community opposition to renewable energy projects in South America, a phenomenon also observed in the United States and elsewhere.⁴ Steckel and Jakob (2021) show similarities and differences across case studies of 15 national efforts to phase out coal.

While much theory-building has taken inspiration from industrialized democracies, there is a growing body of scholarship on the clean energy transition from developed contexts that points to consequential similarities and differences. Scholars need a unifying framework so the political processes across countries can be compared systematically rather than being studied in isolation.

Defining the Energy Transition Problem: Credibility

The clean energy transition will require communities, workers, and firms to make a leap into an uncertain future. Communities reliant on tax revenue and employment from industries that produce fossil fuels face intense economic disruption. Workers and their families must contemplate the prospect of training and transitioning to new careers, possibly with less pay and fewer benefits, despite promises from companies and politicians. And firms producing and using fossil fuels face existential threats to their business models, whereas others are

⁴See also Dunlap (2019) and Vallejos-Romero et al. (2020).

unsure of whether government commitments to support the green economy will survive beyond a single administration.

These are also realities developed and developing countries face. There are fossil fuel communities in the Appalachian coalfields of the United States as there are in Indian states like Jharkhand. Building green projects in the United States and Western Europe encounters local resistance, just as it does in South America and Asia. Clean energy workforce shortages persist throughout high- and low-income countries.

No matter how well-intentioned government commitments are to compensate those impacted by the move away from fossil fuels and to support green industries, a crucial question is whether these commitments are credible. The clean energy transition will not happen overnight. It will take time, and in that time, economic and political conditions can change, which could lead future leaders to reverse course. New green industries also differ in the extent to which they create local benefits that uplift communities, which affects ground-up support for the clean energy transition.

These observations motivate our recent book, where we ask why the climate impasse has been so hard to break and what can be done. We identify three puzzles, which credibility helps to explain. First, why have communities, workers, and firms often resisted offers of compensation that could otherwise diffuse opposition to the clean energy transition? Second, why do efforts to create allies by giving firms an economic stake in the green economy often struggle? Third, why does the workforce needed for the clean energy transition lag behind, despite the growing demand for skilled labor?

We argue that credibility helps to explain these puzzles. We identify two aspects of credibility: commitment problems and local economic opportunity. First, the policies necessary for the clean energy transition, such as compensation for fossil fuel energy communities and subsidies for clean energy, face commitment problems. Laws implemented today can be unwound in the future because political and economic circumstances change, altering leaders' incentives to keep their commitments (Brunner, Flachsland, and Marschinski, 2012; Kydland

and Prescott, 1977; Ulph and Ulph, 2013).⁵

The second concept we develop is local economic opportunity, which refers to a colloquial understanding of credibility. When local leaders and citizens consider whether they should welcome new industries, one question is whether they will make communities as well or better off than they were before. This involves considerations of whether green industries will provide local jobs that last, rather than being temporary, and offer fair pay and benefits. Local officials will also consider the tax revenue implications of new investments, which are vital to fund public goods like roads, schools, and libraries.

We develop these arguments in greater detail in the book. For the first aspect of credibility, we decompose credible commitment problems into those arising from time inconsistency and incomplete information (Rodrik, 1989a). We also bring in the role of trust and trustworthiness (Anderson, 2017; Levi, 1998; Levi and Stoker, 2000). For the second aspect of credibility, we unpack local economic opportunity into its component parts. Empirically, we document how credibility affects the clean energy transition in interviews, surveys, and archival records of citizens, local leaders, and company executives.

We also identify solutions to these challenges and evaluate their efficacy. Briefly, these strategies for creating credibility include:

- leverage institutional constraints such as legislation, delegation, and insulation of funding (Jacobs and Matthews, 2017; Spence, 1976; Weingast and Marshall, 1988);
- tie hands to make reforms harder to unwind (Elster, 1989; Fearon, 1997);
- build broad coalitions (Patashnik, 2014; Stasavage, 2002);
- lock in support by creating specific benefits with increasing returns (Meckling et al., 2022; Pierson, 2000);
- develop a reputation by providing opportunities for public input and supplying accurate and useful information (Sobel, 1985);
- send costly signals (Fearon, 1997); and,

⁵Studies show how uncertainty about government policy lead to suboptimal investment in clean energy (Blyth et al., 2007; Bosetti and Victor, 2011; Fabrizio, 2013; Noailly, Nowzohour, and Heuvel, 2022).

- provide transparency around policy implementation and benefits (Alt, 2019; Holmström, 1979).

We demonstrate how each of these solutions can alleviate credibility challenges, helping to facilitate the clean energy transition.

In the following section, we show how our credibility framework could help to explain cross-national variation in clean energy transition success. Our book focused on the United States, though we contrast the American experience with the German coal phase-out.⁶ We explain the insights that should travel and also add new considerations of relevance for developing countries, such as the role of international climate finance.

Credibility as a Unifying Framework

We identify three dimensions along which countries will vary in ways that affect their ability to create credibility: institutions, state capacity, and international constraints. Within each dimension, we describe precise ways that nations differ in how they are able to make credible commitments and generate local economic opportunities from green energy. These dimensions are interrelated. Components of state capacity, for instance, can be thought of as institutions. We hold them apart for analytical clarity, but our proposed research agenda suggests that scholars should study how these factors act as complements or substitutes.

Analyses should also carefully consider the preferences of relevant political actors. One starting point to do this would be to consider how climate policies affect the income, assets, and wealth of societal groups. This may vary with how policies distribute costs across consumers and firms, the available technology, and exposure to the impacts of global warming (Sprinz and Vaahtoranta, 1994). Factors like electoral institutions, business-state relations, and international constraints then moderate how these preferences translate into outcomes.

⁶While many herald Germany's success, we show how they faced similar credibility challenges as in the United States, which persist especially in eastern Germany.

Institutions

The rules, procedures, and norms that constrain interactions—institutions—have a significant impact on the strategies of political reformers (North, 1990; Patashnik, 2000, 2014). Institutions matter most when interest groups or voters have conflicting preferences or there is uncertainty about the future. We identify four institutional features that vary across countries and affect the ability of governments to make credible commitments and create local economic opportunities: the structure of business-state relations, the nature of labor market institutions, rules regarding elections, and procedures affecting the transparency of political decision-making and economic outcomes.⁷

Each of these institutional features raises different aspects of credibility challenges political reformers confront with the clean energy transition. For example, business-state relations are important for credible commitments to compensate fossil fuel workers and their communities as well as to create certainty about the future of green investments for firms that hope to benefit from decarbonization. Institutions that affect the transparency of economic outcomes, such as reporting requirements for local jobs created by investments, speak to our second dimension of credibility, local economic opportunity. These are all institutional features, but they address different aspects of credibility and have greater applicability to certain political actors.

We focus on variation in these four institutional features because they have direct relevance to credibility. There are indirect ways other institutions affect credibility. For example, institutions such as veto points allow political actors to block policy changes, reinforcing the status quo. The existence of veto points may explain why certain reforms endure because they are harder to unwind (Bayulgen and Ladewig, 2017; Busby, 2008; Laird and Stefes, 2009). Federalism can also matter for policy outcomes (Fiorino, 2018; Vogel, 1993). These institutions may indirectly affect the credibility of promises made by the federal government

⁷Also see Guy, Shears, and Meckling (2023) on the importance of examining climate governance institutions in a systematic fashion as they pertain to agenda setting, policy formulation, and policy implementation.

if state leaders can block the implementation of reforms. However, absent a model of the preferences of different levels of government or veto players, it is hard to predict the effects of these types of institutions on clean energy transition outcomes.

Institutional analyses will also need to carefully consider the policy preferences of political actors. Institutions by themselves can explain outcomes only when one has a model of what different societal groups want and their relative influence given the set of rules within which they operate and the available information.

Business-State Relations

Contestation between interest groups shapes the climate policies adopted by governments (Colgan, Green, and Hale, 2021; Genovese, 2019; Kennard, 2021; Meckling, 2011) and their implementation (Stokes, 2020; You, 2017). When interest groups have conflictual policy preferences over the clean energy transition, which is almost universally the case given the distributive stakes involved, the nature of business-state relations can moderate whose voice has the most influence in the climate policymaking processes (Mildenberger, 2020).

In particular, the extent to which relations between interest groups and the government are pluralist or corporatist varies across countries and can affect the ability of the state to make credible commitments. Pluralist systems are those where there are many autonomous groups vying for influence with a less direct role in the government's decision-making. By contrast, corporatist systems are those with more centralized associations representing business and labor interests, which play a more direct role in the policymaking process (Dahl, 1961; Martin and Swank, 2012).

Countries with more corporatist systems should be able to make more credible commitments for several reasons. First, when groups have long-term access to policymaking, they should be less worried about political reversal since they have greater leverage to block future changes to unwind reforms (Meckling et al., 2022). Second, corporatist institutions have more frequent interactions between the government and societal groups, which allows for the

development of reputations, fostering of trust, and creates a shadow of the future enhancing cooperation (Axelrod, 1984).

There are two types of commitments for which the nature of business-state relations are most relevant: compensation and investments. First, carbon-intensive workers and firms that stand to lose could acquiesce to a climate bargain if provided credible compensation (Gazmararian and Tingley, 2023b; Meckling and Nahm, 2022; Meckling et al., 2022). However, in countries with pluralist institutions, there could be greater concern about whether the government will uphold its compensatory bargain, especially since some firms face an existential threat from climate regulations (Colgan, Green, and Hale, 2021). Thus, they may fear their bargaining power will evaporate in the future, which gives rise to hold-up problems (Dixit and Londregan, 1995; Williamson, 1989).

Credible commitments facilitated by corporatist institutions are also relevant to reassure the firms anticipating gains from the green economy that clean energy policies will not be undone. When firms know they will have policymaking influence in the future, they should be less worried about political or economic circumstances changing and unwinding policies intended to create green investments.

More credible commitments to support green investments could also spill over to affect communities' views about the local economic opportunities from clean energy projects. If there is less risk of political pendulum swings, for instance, green projects could be seen as more durable. However, this does not mean that the benefits go to local workers and expand the tax base. So, the most direct way corporatist institutions affect credibility is not through local economic opportunity but through its effects on making credible commitments of compensation and investment in new industries.

The concepts of corporatism have largely been applied to industrialized democracies, including in the climate politics literature (Finnegan, 2022a; Finnegan et al., 2023; Martin and Swank, 2012; Meckling and Nahm, 2018b; Meckling et al., 2022; Mildemberger, 2020). Still, there is some research showing how these institutions are relevant in developing countries

(Hutchful, 2019; Nyang’oro, 2019). For example, there has been special attention paid to South Africa (Pretorius, 1996). Variation in business-state arrangements across China and Brazil may have affected their pace of solar and wind development (Hochstetler and Kostka, 2015). There are undoubtedly more examples. This review merely serves to indicate the promise of examining differences in business-state institutions in both the global North and South.

Labor Market Institutions

Countries also differ in terms of their labor market institutions (Thelen, 2004). This has implications not only for the technical feasibility of the energy transition but also for whether communities witness local job creation as a consequence of new green investments. Labor market institutions refer to the available government programs for skills and workforce development. Vocational training at community colleges is a prominent example, but there exists substantial variation across the developing world (Betcherman, 2012).

If the green energy transition is to create local economic opportunities, where community members receive jobs as opposed to outside crews of laborers, there will need to be a trained local workforce. Unfortunately, most countries lag behind in skills development for the clean energy transition. Markets might eventually adjust if a prolonged shortage increases high wages, but the International Renewable Energy Agency (IRENA) assessed that the energy transition “...will require more vocational training, stronger curricula and greater training of trainers” (IRENA, 2021, p. 3). The International Labor Office, in a study of 32 countries, puts the gap in starker terms: “the transition to environmentally sustainable and inclusive economies and societies cannot take place if the skills demanded by new jobs are not available in the labour market” (Strietska–Ilina and Mahmud, 2019, p. 25). The report highlights how developing countries are the farthest behind in required skill sets.

We expect that in places where there are more robust labor market institutions, it should be easier to create local economic opportunities in new green industries. A corollary of this

hypothesis is that there could also be less community-based resistance in the places where there is a skilled local labor pool that could benefit from the projects being built in their area.

The types of labor market institutions vary across countries. The strength of labor as a political actor also differs. In many global South countries, labor is an abundant factor, meaning that the cost of hiring workers is lower on average. This could be an advantage in some respects because there could be weaker pressures to automate the development and maintenance of green energy projects (at least in the short run). Thus, workers might expect their jobs to be more durable, one of the dimensions of local economic opportunity developed in our book.

The types of problems that labor market institutions have to address also differ cross-nationally. In fossil fuel-rich industrialized countries, the “re-skilling” aspect of the energy transition looms large for workers in carbon-intensive industries who will be displaced from their jobs (Gazmararian and Tingley, 2023b; Lim, Aklin, and Frank, 2023; Tomer, Kane, and George, 2021). In developing countries with fossil fuel endowments like the coalfields of India and Indonesia, similar institutions will also be relevant for miners.

However, differences in demands for labor market institutions could emerge depending on how mobile workers are, which will vary across and within countries. In the United States, workers have exhibited remarkably low mobility in the face of economic shocks (Autor, Dorn, and Hanson, 2013). Part of this may be due to group-based attachments to coal country (Bell and York, 2010; Gaikwad, Genovese, and Tingley, 2022; Gazmararian, 2023, 2024). Similar patterns also exist in developing countries, but it is also possible that other fossil fuel regions have workers with greater mobility and different attachments to the industry. For example, Blankenship et al. (2022) measure preferences over jobs in a coal-producing region of India and find that distance to a new job was not a deterrent.

The possibility of “brain drain” also complicates the politics of labor market institutions in developing countries (Docquier and Rapoport, 2012). Training people might equip them

with the skills to earn more money abroad, which may create benefits if it is remitted back. However, simply creating institutions to develop skills for green industries does not guarantee that a local supply of labor will emerge. The effectiveness of labor market institutions in developing contexts may also depend on the incentives governments can provide to retain workers.

Elections

The rules governing whether and how states hold elections affect the ability of governments to make credible commitments. Just as with business-state relations, these institutions affect the first dimension of credibility: credible commitments. This matters for the compensation of fossil fuel communities and workers and the creation of durable benefits for firms that hope to benefit from the clean energy transition.

Electoral institutions can matter by shaping the incentives of political leaders to invest in costly, long-term reforms (Jacobs, 2011, 2016). A political challenge with climate policy is that it could give rise to electoral opposition because it will raise costs for consumers, create job loss in fossil fuel areas, and disrupt communities with new green energy projects (Colantone et al., 2023; Gazmararian, 2023; Stokes, 2016; Voeten, 2022). Even in places that could receive economic benefits, such as new investment in electric vehicles, there has been backlash (Gazmararian and Krashinsky, 2023). If leaders face electoral consequences, their promises to compensate workers and firms harmed by the energy transition or to sustain incentives for green energy projects may lack credibility. A future leader, or even the very same politician who made a political reform, may roll back the law to stay in office.

Scholars should study variations in electoral institutions to understand when commitments will be more credible because leaders face less of an electoral threat in the future from their decisions today. For example, research shows that institutional arrangements like proportional representation (PR) systems can affect the time horizons of leaders (Finnegan,

2022a; Finnegan, 2020, 2022b; Lockwood, 2021).⁸ Likewise, Iversen and Soskice (2006) argue that PR systems where multiple parties form coalition governments could make promises to groups represented by a party in the coalition more credible.⁹

However, we should be careful not to overstate the insulating effect of electoral institutions. Recent empirical work calls into question the power of leaders to affect the level of fossil fuel taxes (Martinez-Alvarez et al., 2022b). So, it is uncertain that even if leaders faced different electoral rules, they could implement more ambitious policies. The fact that leaders are not able to move the needle may indicate they face obstacles from interest groups or lack commitment to the clean energy transition, a problem electoral rules may not always alleviate. There are also instances when ruling parties could be more vulnerable to defeat in PR systems because marginal shifts in support can have larger consequences for coalitional dynamics, more so than in majoritarian systems when the dominant party has a solid advantage. Political scientists have long debated these nuances, and there is exciting work to be done in the climate context.

Beyond differences in electoral rules, whether states hold elections in the first place affects the government’s ability to make credible commitments. There is a long literature about the linkage between democracy and environmental outcomes because of the greater opportunities to hold elected leaders accountable (Bättig and Bernauer, 2009; von Stein, 2020). Democracy could also be crucial to encourage firms to make substantial green investments, knowing that there is often legal recourse in democracies if governments attempt to expropriate investments. Indeed, Aklin (2021) shows how democracies with strong property rights are more successful at developing off-grid renewable power, which we revisit.

Regime type could also matter for the credibility of government commitments to sustain reforms. There is a large literature about how democracies make more credible commitments because leaders face accountability if they break promises (Fearon, 1994, 1997). Of course,

⁸PR systems also matter for the creation of green parties, which could affect climate policymaking (Conevska and Mutlu, 2023; Harrison and Sundstrom, 2010).

⁹Electoral rules can also affect whether producers or consumers have more voice (Rogowski and Kayser, 2002).

this is contingent on the preferences of citizens, which might change in the future. More recent work has also explicated differences in autocratic systems that also enable them to make credible commitments (Fang and Owen, 2011; Gandhi and Lust-Okar, 2009; Weiss, 2013). These institutional features that create opportunities for accountability should help to explain when leaders' promises to sustain reforms last.

Transparency

The laws countries have that affect the transparency of political processes and economic outcomes will also influence of the government's ability to make credible commitments generally and convince communities of local economic opportunities from green energy.¹⁰ There is a vast literature on transparency motivated by a principal-agent model where greater information about the agent's actions constrains its incentives to shirk responsibilities (Alt, 2019; Heald, 2006; Holmstrom, 1979). The logic of transparency is that by shining a light on an organization, the threat of accountability can lead firms and leaders to behave in the public's interest.

Our interest is in whether countries have laws that make the consequences of green investments more transparent. This differs from previous work that focuses on whether democracies are more transparent than other regime types (Hollyer and Rosendorff, 2011). Instead, our focus is on questions of local economic development.

The clean energy transition will require that companies make large, new investments in uncertain industries. National and subnational governments often dole out large tax credits to attract new industries, then claim credit for the ensuing jobs (Jensen and Malesky, 2018; Jensen and Thrall, 2021). However, without transparency, it can be difficult to determine if companies deliver on their commitments, which leads politicians and firms off the hook.

In Gazmararian and Tingley (2023b), we show in that transparency provisions in the

¹⁰This paper focuses on transparency in the context of local economic development. However, transparency could also complement other commitment devices by helping to define what constitutes a broken promise and subsequently identify infractions.

United States around the hiring of local workers can enhance perceptions that the green transition will create local economic opportunities. However, we also highlight the essential role of accountability, which is not automatic even when there is sunlight; enforcement is key (Alt, 2019; Bartik, 2019; Hood and Heald, 2006; Thrall and Jensen, 2022).

Informal Institutions

The presence of informal institutions to provide public goods also varies across and within countries (Helmke and Levitsky, 2004). Beyond top-down state regulations and decentralized market approaches, a key insight from Ostrom (1990, 2010) is that groups can also govern common pool resources. To the extent that there are local institutions that facilitate trust, strategies of reciprocity, and sanctioning, localities may be able to make progress on the clean energy transition. These ground-up approaches to renewable energy development hold great promise (Gazmararian and Tingley, 2023a). Likewise, Korppoo, Stensdal, and Korsnes (2020) present a series of case studies across the world on the role of informal institutions and implementation of climate policies.

We expect that local economic opportunity should be most affected by the presence of informal institutions that could be used to ensure that new energy developments deliver benefits to communities. Consider electric power generation. There is a functional need for communities to have electricity. Yet, there are different approaches that communities and states can take to provide electric power, with varied implications for the extent to which communities have access to clean, affordable energy. Distributed renewable energy, for example, provides one pathway for communities to receive more of the benefits from power generation.

The ability of communities to invest in off-grid energy can depend on both informal institutions, but also more macro institutions like electoral rules and property rights (Aklin, 2021). These intersections demonstrate how institutions do not operate in isolation but can reinforce or alleviate challenges with the provision of local economic opportunities as part of

the clean energy transition.

State Capacity

State capacity refers to the government's ability to implement policies, which depends on whether it can raise revenue and overcome opposition from societal groups. Scholars of state capacity break it into different dimensions, such as control over coercive power, bureaucratic capacity, and extractive capacity to raise revenue (Cingolani, 2013; Migdal, 1988). Some existing work in developing country contexts links together state capacity and climate politics (Meckling and Nahm, 2018a) and identifies variation in types of state capacity (Meckling and Nahm, 2022). Reviews of the literature on state capacity show how it relates to a variety of consequential political and economic outcomes (Alik-Lagrange et al., 2021; Berwick and Christia, 2018).

At the most basic level, bureaucracies must have funding to implement clean energy transition programs. This means resources to hire people to monitor program implementation so it is not captured by interest groups, and also the resources to make large investments such as in infrastructure for electricity transmission and retraining programs. While in high-income countries, such resources may be easier to come by, this is not always the case in the global South. States vary in their capacity to raise revenue (Levi, 1988), which will serve as a hard material constraint on government actions.

Property Rights

The ability of states to enforce property rights is one mechanism by which state capacity affects credibility. While in developed countries, property rights can be taken for granted, in places with less secure property rights, firms facing expropriation risks of green energy investments could be reluctant to invest. Outright expropriation is rare today but occurs through more subtle ways like unequal regulations or intellectual property theft. Green energy capital investments are not much different from other capital expenditures in countries

without the ability to enforce property rights. Studies show how the perceived effectiveness of state institutions to enforce property rights can lead firms to make greater investments (Frye, 2004). Similar arguments extend to investments in innovation (Weiss, 1998).

Similar challenges confront the fossil fuel sector. Property rights concerns could even be larger given the more point-source nature of extractive energy industries, though green energy projects are also highly specific assets that can give rise to hold-up problems (Williamson, 1989). That said, with burgeoning needs for a range of inputs into things like batteries, wind turbines, and solar panels that are located in developing country contexts, expropriation risks could exacerbate credibility concerns in these markets as well. Fossil fuel companies also have decades of experience with protecting themselves from expropriation risks, having built up finances and connections with regimes around the world, a capacity that might take time for renewable energy to build.

Bureaucratic Capacity

Another relevant dimension of state capacity is the ability of the government to implement goals despite opposition from societal groups (Skocpol, 1985).¹¹ This capacity is crucial for the institutionalization and duration of reforms (Skocpol and Finegold, 1982). In developed country contexts, this might be *less* of an issue; enacted laws have clearly defined and capable bureaucracies that can implement laws even if there will be legal fights over implementation with interest groups vying to render laws toothless (Stokes, 2020; You, 2017).

The challenges can be even greater in developing countries. Low bureaucratic capacity can create credible commitment problems because enacted laws facilitating an energy transition may lack the resources needed for enforcement. The lack of staff to roll out, monitor and improve transitional programs can undermine expectations by communities, workers, and firms that the transition will succeed. The lack of bureaucratic autonomy can be particularly salient (Cingolani, Thomsson, and De Crombrughe, 2015). Special interests and

¹¹Miller (2000) argues that in second-best worlds, bureaucracies credibly reduce particularistic rent-seeking that can undermine public good provision.

competing bureaucratic units can block policies. For example, in South Africa, a common complaint has been that administrative units for renewable energy generation and transmission had little autonomy and were overseen by bureaucratic units with a vested interest in a coal-based economy.¹² Evans (1995) argues that a combination of bureaucracies that are autonomous yet embedded in ways to connect with industrial sectors of the economy is key for development outcomes. This could, for example, bolster firm-level confidence—including international firms—in making investments in clean energy.

International Constraints

International forces shape the ability of governments to make credible commitments and create local economic opportunities from the clean energy transition. We focus on three ways that international forces affect credibility. First, countries vary in their reliance on international finance and global value chains to manufacture the components necessary for the clean energy transition, which affects their ability to create local economic opportunities from green projects. Second, domestic commitment problems in global North countries can spillover over to freeze funds needed to finance the clean energy transition in the global South, which can undermine the government’s ability to make credible commitments to firms that it will be able to support the clean energy transition in the future.¹³ Third, international regimes and organizations will affect the resources available to developing countries as well as the information environment which can affect the credibility of commitments by altering expectations of accountability for broken promises.

Industrial Capabilities

Countries differ in their domestic industrial capacity, which means some nations are better able to create local economic opportunities in the green transition than others. When

¹²Author interviews.

¹³The international context can also matter for domestic distributive conflict through firm exposure to trade (Genovese, 2019; Kennard, 2020).

countries lack industrial capabilities, they become more reliant on global markets for capital, technology, and labor. The supply chains that go into producing components necessary for the clean energy transition, like batteries for electric vehicles, are long, complex, and evolving. Some countries might have access to rare earth minerals but lack the capacity for refinement or battery construction. Others may lack key inputs but have experience with manufacturing complex, large equipment like offshore wind turbines. The industrial capability of nations vary depending on the government’s capacity to intervene and shape the economy (Cingolani, 2013), as well as industrial legacies and positions in global value chains (Nahm, 2017).

We already see how industrial capacity and resource endowments are shaping the strategies of governments with respect to the clean energy transition (Lebdioui, 2022). Chile has announced plans to nationalize its lithium mining industry, which can be viewed as a move to create local economic opportunities (Villegas, Scheyder, and Scheyder, 2023). There are also efforts like South Africa’s “Localisation Support Fund” to secure the domestic manufacturing capability for the parts used in electricity transmission, which demonstrates how developing countries are working to make sure they benefit from the clean energy transition (Riaz Vajeth and Phineas Tlhatlhetji, 2023). Despite these efforts, South Africa has imported almost \$2.5 billion in solar panels during the first two quarters of 2023, which indicates that local industrialization initiatives still face barriers (Gaylor Montmasson-Clair, 2023).

However, there is tension between approaches to create local benefits like nationalization and efforts to create a stable investment environment. Some multinational corporations (MNCs) might hesitate to invest in the country if they anticipate that nationalization will threaten their assets. Yet, these MNCs possess technology and experience needed for implementing energy transition policies. Solutions to one credibility challenge, local economic opportunity, can complicate the ability of the government to make credible commitments to respect property rights.

Climate Finance

The lack of stable international finance, for example, could undermine the ability of governments to convince companies that the benefits from green energy, and the surrounding policies, will last because firms may worry that funding will be cut off in the future—or worse, is not sufficient in the first place. The availability of international climate finance will matter for the viability of many green projects (Landis and Bernauer, 2012). Yet, global North countries lag far behind their pledged commitments (Timperley, 2021). Domestic politics in donor countries contribute to this impasse; leaders can make pledges for climate finance but domestic political actors can hold back funding (Gaikwad, Genovese, and Tingley, 2023). There are also geopolitical concerns. For instance, the Inflation Reduction Act (IRA) passed in the United States creates incentives for using supply chains in allied countries, which has led to debates over whether nations like Indonesia, with a considerable nickel industry but ties with China, should be eligible (Goodman and Ifansasti, 2023).

The inability of donor countries in the global North to build domestic constituencies around international climate finance can cause commitment problems to spill over to the developing world. This dynamic of commitment problem spill-overs relates to models of two-level games where domestic politics affect bargaining at the international level (Milner, 1997; Putnam, 1988). The idea also complicates previous literature that focuses on international agreements as commitment devices to help developing countries achieve their policy goals (Büthe and Milner, 2008). This line of theorizing assumes that parties to these international agreements are motivated to enforce them, which is reasonable for trade agreements. Yet, in the new context of global warming, domestic interest groups often obstruct the enforcement of climate commitments. This helps to explain why climate finance pledges are seen as less binding from the perspective of developing countries, impeding their decarbonization efforts which need international support.

However, these commitment problems are not insurmountable. Scholars could examine variation in how countries structure their climate aid, which may affect the credibility of these

commitments, and, consequently, the political strategies available to reformers in developing countries. For example, Gaikwad, Genovese, and Tingley (2023) show that climate finance that involves donor country firms working in partnership with recipient country actors could build public support in the donor country, potentially making commitments more credible.

International Organizations

Lastly, international regimes and organizations also influence credibility through several channels: trade regimes, development banks, and information provision. First, the international trade regime is coming under pressure as countries pursue green industrial policies that subsidize domestic industries but potentially run afoul of World Trade Organization rules (Davies, 2022; Rappeport, Swanson, and Kanno-Youngs, 2022). Decarbonization policies that countries adopt to create local economic benefits from the clean energy transition and lock-in support by expanding the green coalition could run up against other foreign policy priorities in the trade realm. Policymakers designed these same trade agreements so that countries could credibly commit to open trade despite domestic opposition (Maggi and Rodriguez-Clare, 2007), but now, energy transition policies to enhance credibility at home clash with institutions to strengthen commitments abroad. How countries navigate these trade-offs will depend on factors such as their reliance on international trade.

International organizations, such as development banks, also play a role in financing the clean energy transition in developing countries. When these organizations make capital available, it could help facilitate the ability of governments to make credible commitments to provide a stable investment environment for firms investing in green industries. For example, the World Bank has been financing green energy projects in developing countries, such as the Scaling Solar 2 Project in Uzbekistan (World Bank, 2023); it has also been withdrawing aid for fossil fuel-intensive projects (O'Brien-Udry, 2023). Of course, these banks have to have ways to get countries to pursue green policies. This can lead to enforcement challenges, and the credibility of these threats can be undermined by geopolitical relationships (Stone,

2012; Vreeland, 2003).

Another central role of international organizations is to provide information (Keohane, 1984), which could help facilitate transparency that enhances the credibility of government commitments to pursue clean energy transition policies (Florini, 2007; Grigorescu, 2003). As described above, transparency makes it easier to monitor whether promises are being carried out, which allows for sanctions by the domestic public or international audiences when leaders break commitments such as implementing carbon pricing or fairly allocating subsidies. Variation over time in the availability and types of information provided by international organizations could moderate the ability of governments to make credible commitments to carry out green transition policies.

A Credibility-Centered Comparative and International Research Agenda

The previous section outlined how institutions, state capacity, and international constraints can affect the credibility of the government's commitments and the local economic opportunities from the clean energy transition. Variation in these factors opens new lines of inquiry into how the government's (in)ability to create credibility affects the success of the clean energy transition. Research could examine these factors independently. They could also explore potential complementarities and substitutabilities. For example, a country may have pluralist business-state relations, but it could have strong bureaucratic capacity and property rights, offsetting potential challenges arising from fragmented, conflicting interest groups.

While we discuss the success of the clean energy transition as an overall outcome, scholars in practice will need to break this into component parts to make analysis tractable. One outcome of great relevance is the deployment of renewable energy. For example, Aklin (2021) shows how governments that can better solve credible commitment problems are able to deploy more renewable energy. Extensions of this work could explore how other mechanisms

for enhancing credibility could affect the development of renewable energy. Different ways of operationalizing renewable energy deployment will also be valuable. For example, not only does the share of green electricity generated matter, but the time it takes to permit and build a new project and the duration of the jobs created also play significant roles.

Researchers should also study how the ability of governments to create credibility affects the passage of climate laws. Here, too, there is value in further disaggregation. Business-state relations might be more important for compensation policies, while electoral institutions might be more salient for climate policies that affect consumers. Measuring policymaking is challenging, but there are valuable efforts scholars can leverage and build on like the Grantham Institute’s Climate Change Laws of the World and newly collected data on gasoline taxes and subsidies from Ross, Hazlett, and Mahdavi (2017a). The climate policymaking outcome researchers use should be guided by the specific research question.

Public opinion about the energy transition will also be central (Egan and Mullin, 2017; Gazmararian, Mildemberger, and Tingley, 2023). Not only should there be efforts to document citizen perceptions of local economic opportunities from green investments and the credibility of government commitments, but studies should also examine how these attitudes *change*. For example, attitudes may change in response to policy implementation, a feedback effect that could be important for the durability of coalitions supporting the clean energy transition. The role of broad public attitudes will differ across electoral contexts; in some places, elites will be the more important actor to analyze (Bayulgen, 2022).

Beyond these outcomes, there should be careful attention to causal mechanisms linking institutions, state capacity, and international constraints to the beliefs of leaders, firms, and citizens. Scholars should document how different political actors think about credibility and the effects on their behavior. This ground-up approach is what we attempt in Gazmararian and Tingley (2023b) and are encouraged to see others employing (Daniel Raimi and Zachary Whitlock, 2023). The approach could be fruitfully explored beyond the American setting.

Scholars should look to cross-national variation in laws that enhance or undermine the

transparency of green investments. Measurement will be a challenge to this line of inquiry. While there are measures of how transparent national governments are with respect to the disclosure of salient economic data (Hollyer, Rosendorff, and Vreeland, 2014), we are unaware of similar indices for investment transparency. However, the same methodology in Hollyer, Rosendorff, and Vreeland (2014) could be applied to a set of World Bank indicators that proxy for transparency regarding investments. This is a promising avenue for research.

Future research could also study other economic transformations to glean insights into the clean energy transition. There are imperfect analogues from in and outside of industrialized countries such as agricultural modernization or trade liberalization. Scholars should identify similarities and differences between these analogs and the clean energy transition.

Conclusion

The transition away from fossil fuels confronts formidable political barriers. Firms with carbon-intensive business models face an existential crisis if global decarbonization accelerates. This leads them to hold up the transition, so they can continue to profit from business as usual (Colgan, Green, and Hale, 2021). The costs of the clean energy transition could prevent ambitious policy in the first place and tempt leaders to renege on commitments, even if the long-term benefits of a safer climate outweigh the short-term costs of action. This political uncertainty can also lead firms to under-invest in the clean energy future (Brunner, Flachsland, and Marschinski, 2012).

We show how the concept of credibility can be extended to developing countries while unifying comparative and international relations climate politics scholarship. Our efforts build on the idea that credible commitment problems are central to the energy transition (Brunner, Flachsland, and Marschinski, 2012; Gazmararian and Tingley, 2023b; Hovi, Sprinz, and Underdal, 2009), and political reforms in general (Jacobs and Matthews, 2017; Patashnik, 2014; Rodrik, 1989a). We provide an analytical framework that clarifies the incentives of

leaders, firms, and citizens, which can pinpoint sources of opposition to the clean energy transition while identifying strategies to build support.

Our framework also invites new lines of research to explain cross-national variation in clean energy transition success. We provide a foundation upon which to theorize additional factors that affect the clean energy transition beyond credibility. Decarbonization is a complicated phenomenon that inevitably will have aspects not well-explained by credible commitment problems and local economic opportunity. We welcome complementary approaches (e.g., Jakob et al., 2020).

Credibility should also be useful in explaining political outcomes in other climate and sustainability domains. The management of water resources, for example, confronts a related set of constraints. As in the energy transition, societal groups such as agricultural firms and citizens have conflicting preferences over who gets to use water. Agreements to share resources, including side payments, face credible commitment problems as new governments might renege on old agreements or environmental circumstances might change. For example, just as there is uncertainty about government transitional assistance for energy communities, transfers to provide compensation to refrain from water consumption, as is being done in the US Southwest, face similar problems.

In centering credibility, our framework brings together domestic and international explanations of climate politics. While there has been a debate over whether domestic distributive politics or international collective action is the more productive lens to understand the clean energy transition (Aklin and Mildemberger, 2020), we highlight how there are international concerns beyond free-riding, such as climate finance, that are salient in developing countries. Our holistic approach that includes domestic and international factors is necessary if we are to understand the opportunities and challenges that both the global North and South face in combating the climate crisis.

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