Do Domestic Climate Rulings Make Climate Commitments More Credible? Evidence from Stock Market Returns

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Abstract

The absence of legal enforcement mechanisms undermines the credibility of climate mitigation commitments. Some domestic courts have held governments accountable for their failures to reduce carbon emissions in accordance with their share of the global responsibility. Can such litigation make mitigation commitments more credible? This paper offers evidence by examining stock market returns in Europe. Consistent with the hypothesis that following court rulings investors update their beliefs about mitigation policies, plaintiff victories have modest but economically significant positive effects on renewable energy stocks and similarly sized negative effects on coal stocks. These effects are stronger for home country firms and for the first ruling in a country. The climate judgments have no significant effect on "green" firms or major oil and gas producers. Plaintiff losses have no significant effect on asset prices. These findings highlight both the potential and limits of domestic climate litigation.

Introduction

Climate mitigation suffers from a well-known credibility problem. Many governments have publicly committed to ambitious long-term emission reduction targets. But governments also have incentives to delay the costly policies that are needed to achieve those targets. The global climate mitigation effort hinges in part on investor beliefs that governments will follow through on their mitigation commitments (e.g. Victor, Lumkowsky, and Dannenberg 2022). The energy transition requires long-term investments in research and development and large scale deployment of renewables that typically have a return on investment that spans several decades. The transition also requires divestment away from fossil fuels, especially coal, which has the largest green house gas impact. If investors believe that governments are committed to long-run regulatory and economic policies that favor renewables over fossil fuels, then they are more likely to make investments that are consistent with climate mitigation goals. Yet, there are few institutionalized mechanisms to hold governments accountable for their climate goals. Doubts about the credibility of climate mitigation goals may result in the relative overvaluation of carbon-intensive assets.

Recently, domestic courts in Germany, France, the Netherlands, Ireland, and elsewhere have invalidated national mitigation policies that fail to reduce carbon emissions in accordance with a country's share of the global responsibility. These rulings typically find that national constitutions and/or international human rights law require governments to reduce emissions and that international commitments specify the appropriate reduction levels. This raises the question whether national level litigation can make the global climate regime legally enforceable in a selective subset of countries and thereby make government commitments to climate mitigation more credible?

This paper examines the effect of judgments regarding national mitigation policies on stock market prices of firms that are sensitive to mitigation policies. The energy transition has large theoretical effects on asset values (e.g. Colgan, Green, and Hale 2021). If governments follow through on their commitments, then we should expect policies that benefit the

profitability of renewable firms and that hurt firms who are heavily invested in fossil fuels, especially coal, which 23 European countries have promised to phase out as part of their climate mitigation commitments. If domestic court rulings about national mitigation targets change investor beliefs about likely mitigation policies, then such rulings should positively affect the returns on renewable stocks and negatively affect fossil fuel stocks.

I examine this hypothesis using an event study on stock market returns from major European firms in the renewables sector, other "green" firms from the Clean200 list, and coal and oil/gas firms listed on the Carbon Underground 200 from 2015-2021. I examine the effects of rulings that are about national mitigation targets rather than litigation that could directly affect the profitability of firms, for example because firms are involved as (indirect) parties. On average, a positive ruling has a modest but statistically significant effect on renewables and a negative effect on coal. Both effects are similarly sized: a pro-climate judgment on average increases/decreases cumulative returns by a little more than .5 percentage points for renewables/coal intensive firms. This effect is larger for firms that are in the judgment's home country, although the effect on coal intensive firms is based on a small sample. Most of this effect is due to the first ruling in a country rather than subsequent appeals. Positive rulings do not, however, have a negative effect on oil and gas stocks nor do they affect "green" firms that are not primarily active in renewable energy. Moreover, court judgments that reject a claim do not move markets, which suggests that, at least in this period, investors expect courts to remain on the sidelines. Thus, overall, the evidence is consistent with a view that investors modestly update their priors over stronger mitigation policies following the first pro-climate judgment in a country. These updated beliefs are primarily about the profitability of firms that produce renewables and that are heavily invested in coal. The findings on renewables are highly robust and appear to be driven by a broad sectoral impact of judgments. The effects on the coal industry are mostly driven by the effects of a few judgments on particular firms that have large fixed investments in countries, such as RWE in Germany and the Netherlands.

The paper first provides background on domestic litigation in Europe that seeks to hold governments accountable for their global mitigation targets. The following section theoretically links domestic court judgments to stock market valuations of assets that are likely affected by mitigation policies. The theory relies on three propositions: that climate mitigation commitments face a credibility problem, that courts could enhance the credibility of government commitments, and that events that shift beliefs over mitigation commitments affect market valuations of climate sensitive assets. A news analysis then shows that pro-climate rulings attract considerable international attention and that these rulings are described in ways that suggests that updating of beliefs about likely policy changes is at least plausible. The next sections introduce data, methods, and the main findings.

The conclusions return to the broader implications of these findings. As far as I am aware, this paper offers the first evidence that high profile climate judgments have significant economic effects. While climate litigation has received ample attention from legal scholars, a recent review concludes that the literature "has not yet engaged deeply with questions about the effectiveness of climate litigation as a governance tool" (Peel and Osofsky 2020, p. 1). That court judgments matter cannot be taken for granted. Even in advanced democracies, governments do not always comply with constitutional court rulings (e.g. Vanberg 2015). The finding that court rulings affect investor appraisals of climate sensitive assets strongly suggests that courts have a role to play in climate mitigation. The size of the effect is modest but in the same order of magnitude as that found in other studies of the effect of policy changes on stock market values of climate sensitive assets.

The findings also point to some limitations. Most notably, the stock market values of major oil and gas firms are not significantly affected by climate litigation. Moreover, while climate litigation is rapidly spreading throughout the world, successful domestic court enforcement of mitigation commitments is likely to remain somewhat limited. This study focuses on European Union countries, which have a unique combination of strong independent courts and a favorable political environment towards climate mitigation. Even in this

favorable environment, court judgments may still help to hold governments to their stated climate ambitions. Yet, it is likely that climate targets will only be legally enforceable in selective regions of the world, which could affect cooperation and conflict over climate policy.

Litigation Holding Governments Accountable for Mitigation Targets

The number of lawsuits that raised issues of law or fact regarding climate change increased sharply after 2015 (for recent reviews, see: Eskander, Fankhauser, and Setzer 2021; Setzer and Vanhala 2019; Setzer and Higham 2021; Peel and Osofsky 2020). This paper focuses on a small but important subset: cases brought against national governments over insufficiently ambitious national mitigation policies. The Grantham Research Institute on Climate Change and the Environment (LSE) and the Sabin Center for Climate Change Law (Columbia University) maintain a database of all known global climate litigation cases and their judgments.[1]

Table 1 lists all judgments that challenge national mitigation plans against national governments in the EU plus Norway, Switzerland, and the UK. This group of countries represent a highly integrated market, commonalities in energy policies (especially in the EU), and many shared legal obligations. Yet, these countries also differ in their legal systems, including the role courts play in reviewing government policy and the extent to which international law is embedded in domestic legal systems (Verdier and Versteeg 2015). Moreover, energy policy continues to have important national dimensions.

The table only includes cases that have at least one judgment before January 31st 2021, thus excluding the landmark ruling in Klimatická žaloba ČR v. Czech Republic (June 15, 2022). It includes admissibility decisions that provide material information about a case's

[1]Climate Change Laws of the World database, Grantham Research Institute on Climate Change and the Environment and Sabin Center for Climate Change Law. Available at climate-laws.org

outcome.[2] Admissibility is a key hurdle in climate litigation. Plaintiffs face challenges demonstrating that they have suffered or are likely to suffer damages from climate change and that a particular country's emissions contribute materially to that harm.

The table excludes two important sets of cases that likely influence asset prices but that are less informative about the perceived credibility of government commitments. First, there are a growing number of cases against private companies. Most notably, in *Mileudefensie v. Shell* a Dutch court held that Royal Dutch Shell should "reduce its emissions in line with the objective of the Paris Agreement."[3] Most analysts would expect that this type of litigation should negatively affect Shell's market valuation and perhaps that of other fossil fuel companies that may share litigation risk. News reports suggest that the ruling influenced Shell's decision to move its headquarters from the Netherlands and to sell 10 billion dollars' worth of fossil fuel holdings (Krauss 2021. This is anecdotal evidence for a court effect on Shell but not on the credibility of climate mitigation.

Second, the analysis excludes lawsuits against governments over permits or specific policies that often directly affect corporations as third parties. NGOs often sue governments for ignoring the climate implications of authorizations for fossil fuel exploration,[4] airport expansions,[5] and corporate bailouts.[6] The outcomes of this litigation directly affect the profitability of specific firms and thus should affect their stock market valuations. Yet, the interest in this paper is not about the direct effects of litigation on corporations but indirect effects through updating of priors that national governments will uphold their mitigation commitments. It is possible that these lawsuits do have a cumulative effect on such beliefs if governments come to anticipate that they must take the climate implications of policy choices more seriously. Yet, this paper focuses on direct attempts to hold national[7] governments

[2]For example, I exclude decisions in Client Earth v Poland that appear to be mostly about which court has jurisdiction.

[3]https://uitspraken.rechtspraak.nl/inziendocument?id=ECLI:NL:RBDHA:2021:5339

[4]E.g. Greenpeace Norway v. Government of Norway regarding arctic oil.

[5]E.g. Plan B v Secretary of State for Transport regarding Heathrow.

[6]E.g. GreenPeace Netherlands v. State of the Netherlands regarding KLM bailout

[7]I also set aside litigation against subnational governments. Again, this litigation can be important but subnational governments are not signatories of the Paris Agreement.

Table 1: Judgments on national mitigation targets

Case	**Date**	**Court**	**Plaintiff Win**[8]
Urgenda v The Netherlands	6/24/2015	Hague district court	Yes
	10/9/2018	Hague Court of Appeal	Yes
	12/20/2019	Supreme Court	Yes
Friends of the Irish Environment v Ireland	9/19/2019	High Court	No
	7/31/2020	Supreme Court	Yes
Family Farmers and Greenpeace v. Germany	10/31/2019	Administrative Court of Berlin	No
Neubauer et al. v. Germany	4/29/2021	Federal Constitutional Court	Yes
group of parliamentarians v. France	8/13/2021	Constitutional Council	No
Notre Affaire à Tous and Others v. France	2/3/2021	Administrative Court Paris	Yes
	10/14/2021	Administrative Court Paris	Yes
Commune de Grande-Synthe v. France	11/19/2020	Constitutional Council	Yes
	7/1/2021	Constitutional Council	Yes
Klimaatzaak v. Belgium	6/17/2021	Brussels Court of First instance	Yes
Plan B Earth and Others v. Prime Minister (UK)	12/21/2021	High Court	No
Plan B Earth and Others v. The Secretary of State for Business, Energy, and Industrial Strategy (UK)	07/20/2018	High Court	No
	01/25/2019	Court of Appeal	No
Greenpeace v. Spain	06/14/2021	Supreme Court	Y (admissibility)
	09/15/2021	Supreme Court	Y (admissibility)
Greenpeace v. Spain 2	07/21/2021	Supreme Court	Y (admissibility)
Association of Swiss Senior Women for Climate Protection v Switzerland	11/27/2018	Federal Administrative Court	No
	5/20/2020	Supreme Court	No

accountable for their mitigation commitments.

The landmark case that inspired much subsequent litigation is *Urgenda v The Netherlands.*[9] In 2015, the Hague District Court ruled that the government's existing mitigation pledges were insufficient to meet UN goals to keep global temperature increases to within two degrees Celsius. The Court ordered the government to limit GHG emissions to 25% below 1990 levels by 2020. The initial ruling was based on international commitments and on the government's duty of care to its own citizens under the Dutch constitution. In 2018, the Court of Appeal not only upheld the decision but also granted Urgenda's appeal that failing to enact stronger mitigation policies violates government obligations under Articles 2 (right

to life) and 8 (right to private and family life) of the European Convention on Human Rights (ECHR). This has legal relevance beyond the Netherlands because all European governments have both implemented the ECHR into national law and have ratified the Paris Agreement. In 2019, the Supreme Court upheld both the verdict and the legal reasoning. The Court cited the Paris Agreement and IPCC reports and is explicit in its role as a domestic enforcer of global commitments:

> "there is a great degree of consensus on the urgent necessity for the Annex I countries to reduce greenhouse gas emissions by at least 25-40% in 2020. The consensus on this target must be taken into consideration when interpreting and applying Articles 2 and 8 ECHR. The urgent necessity for a reduction of 25- 40% in 2020 also applies to the Netherlands on an individual basis."

The Urgenda ruling had a profound impact on Dutch climate policy and the media, which now refers to Dutch climate policy goals as "Urgenda goals" (Wonneberger and Vliegenthart 2021). The Dutch government adopted an ambitious new Climate Act, limited coal power plants to operate at 35 percent capacity, and agreed to phase out coal power plants altogether by 2030 (Minnesma 2020). Subsequent cases were inspired by Urgenda but legal activist NGOs also adjusted to different national legal contexts. For example, *Neubauer et al v Germany* (April 19, 2021) centers on a provision in German Basic Law (art 20a), which requires that "The state, also in its responsibility for future generations, protects the natural foundations of life." The plaintiffs then allege that the Federal Climate Protection Act sets an insufficiently ambitious target and introduces measures too slowly to meet global climate goals.[10] The judgment references the Paris Agreement 38 times and explicitly recognizes the commitment problem that motivates this paper:

> "It is precisely because the state is dependent on international cooperation in order to effectively carry out its obligation to take climate action under Art. 20a

[10] https://www.bundesverfassungsgericht.de/SharedDocs/Pressemitteilungen/EN/2021/bvg21-031.html (April 29, 2021).

> GG that it must avoid creating incentives for other states to undermine this co-operation. Its own activities should serve to strengthen international confidence in the fact that climate action – particularly the pursuit of treaty-based climate targets – can be successful. [..] The Paris Agreement very much relies on mutual trust as a precondition for effectiveness. [..] the Parties agreed on a climate target (well below 2°C and preferably 1.5°C) without committing themselves to any specific reduction measures. In this respect, the Paris Agreement establishes a voluntary mechanism by which the Parties determine their own measures for reaching the agreed temperature target. These measures must, however, be made transparent. The purpose of the transparency provisions is to ensure that all states are able to trust that other states will act in conformity with the target ([...]).This is significant from the constitutional law perspective to the extent that the route signposted by Art. 20a GG towards globally effective climate action is largely directed through this Agreement."[11]

The Constitutional Court holds that the government has a constitutional obligation to fight climate change and that the only way to effectively do so is through international cooperation. Since the national law explicitly implements the Paris targets, the government is not free to design a policy that is inconsistent with those targets. Unlike the *Urgenda* judgment, the *Neubauer* judgment is based on the undue burdens that would fall upon future generations to cut emissions if the government does not act more quickly: "one generation must not be allowed to consume large portions of the CO2 budget while bearing a relatively minor share of the reduction effort, if this would involve leaving subsequent generations with a drastic reduction burden and expose their lives to serious losses of freedom."[12] The new German government, which for the first time included the Green Party, responded quickly and indicated its willingness to adopt a more ambitious climate plan. This is the only

[11] http://climatecasechart.com/wp-content/uploads/sites/16/non-us-case-documents/2021/20210324_11817_order-1.pdf. paragraph 203 (official English translation).

[12] Ibid.

judgment on the merit in which a government has not appealed a plaintiff victory.

Not all litigation in all countries has resulted in rulings that are consistent with climate goals. An Irish court initially rejected a claim by Friends of the Irish Environment that the government's mitigation plan violated Ireland's mitigation and human rights obligations, although the Supreme Court later partially reversed that decision. Like in the Irish case, the Belgian *Klimaatzaak* judgment granted only partial victory to the plaintiff in that the court invalidated existing policies without setting specific new binding targets. In France, an administrative court ordered the State to take immediate and concrete actions to comply with its mitigation commitments but fell short in requiring specific commitments or in demanding financial compensation for delaying action.[13] In a case filed by a local community threatened by climate change (*Commune de Grande-Synthe*), the Constitutional Council similarly ruled that France's mitigation efforts were inadequate but the Court did not specify what the government should do. In the UK and Switzerland, courts have ruled that plaintiffs lacked standing to challenge national mitigation plans.

Domestic Court Enforcement of Climate Mitigation Commitments

The theory that domestic climate rulings affect asset valuations relies on three propositions that are individually well established but rarely connected. First, climate mitigation commitments face a credibility problem. Second, courts can enhance the credibility of government commitments. Third, events that result in an increased credibility of mitigation commitments affect market valuations of climate sensitive assets.

Both government commitments to the Paris Agreement and their more specific NDC and other emission commitments face credibility problems. Mitigation policies generate

[13]This is Notre Affaire à Tous and Others v. France. In France, administrative courts can adjudicate whether the government owes civil damages to plaintiffs.

short-term costs in exchange for uncertain long-term benefits that are conditional on other governments also implementing costly policies. Democracies have difficulties committing to policies based on this type of temporal trade-off as leaders face elections well before the benefits of mitigation policies materialize (Jacobs 2016). Moreover, governments may defect from their mitigation commitments due to fears of free-riding, capture by special interests, shifts in public opinion, domestic or international distributive conflicts, and/or changes in preferences over intertemporal trade-offs (Barrett 2007; Aklin and Mildenberger 2020; Kennard and Schnakenberg 2021). The extent to which governments face credibility problems varies across countries but the issue does not go away completely even in countries with strong domestic pro-compliance forces (Victor, Lumkowsky, and Dannenberg 2022). Thus, external actors, including investors, tend to be skeptical that governments will indeed adopt mitigation policies that will reduce emissions in accordance with their own announced targets.

If market actors lack confidence that governments will follow through on their mitigation commitments, then they will underinvest in carbon reducing technology, overinvest in carbon-intensive assets, and assume a business-as-usual approach until they see evidence to the contrary (e.g. Brunner, Flachsland, and Marschinski 2012). These credibility issues are widely recognized. For example, the report of the high level commission on carbon prices highlights that: "The efficiency of carbon-price signals in changing behaviors and driving investments depends on the long-term credibility and predictability of those signals" (Stiglitz et al. 2017, p. 22). Other studies demonstrate that stock markets do not value climate sensitive assets 'as-if' governments are committed to Paris Agreement goals. For example, a recent study estimates that about 60 per cent of oil and gas and 90 per cent of coal must remain unextracted by 2050 to meet Paris Agreement goals (Welsby et al. 2021). The risk of such stranded assets is barely priced into the valuation of firms whose primary assets are coal, oil, or gas reserves (Shimbar 2021).

Climate mitigation policies include economic and regulatory policies that could affect firm

profitability. Economists often favor policies that set carbon prices through taxes or cap-and-trade schemes. Such policies should incentivize firms to invest in less carbon intensive means of production and favor renewable energy. In practice, industries often pressure governments to keep carbon prices low and some argue that evidence for the effects of price policies on emissions is inconsistent at best Green 2021). The IMF estimates that governments would have to raise fossil fuel prices by about $4.3 trillion a year in order to meet Paris climate goals (Parry, Black, and Vernon 2021). Non-price-based mechanisms include regulation, subsidies for renewable energy, closing of high emission electricity plants, and investments in technology development. For example, regulation to reduce methane emissions during fossil fuel extraction (and transport) could increase cost for some firms and make alternative energy sources more attractive. Thus, in theory, any news that makes such mitigation policies more or less likely could influence the market valuation of carbon intensive industries and renewable energy firms.

Several studies have investigated whether asset prices are responsive to new information about likely mitigation policies, yielding mixed findings (for a review, see Venturini 2022). For example, one study found that after the Paris Agreement, the systemic risk for low-carbon indices decreases while the weight of low carbon indices in portfolios increases but there is only a mild reaction for most carbon-intensive indices (Monasterolo and De Luca 2020). The unexpected success of the first Global Climate Strike on March 15, 2019 caused a decrease in stock prices of carbon intensive firms in Europe (Ramelli, Ossola, and Rancan 2021). Announcements about the outcome of global climate negotiations had modest effects on the stock prices of green firms until the Paris Agreement but have also affected brown (carbon intensive) firms since (Schuetze, Aleksovski, and Mozetic 2020). Announcements related to the Paris Agreement negatively affected polluting industries in the German stock market (Pham et al. 2019). Another study found that investor assessments of major German electricity producers was affected by news about climate legislation but that investors also priced in the likelihood for compensation (Sen and Schickfus 2020). Negative news may also

matter. The 2016 election of President Trump and the subsequent U.S. withdrawal from the Paris Agreement appears to have benefited the stock market returns of carbon intensive firms (the 2020 election had the reverse effects) (Alessi, Kvedaras, and Battiston 2021; Ramelli, Ossola, and Rancan 2021).

This literature has not yet considered litigation over mitigation targets as a source of belief updating. The theoretical idea that independent courts can lock-in government policies is foundational in the study of both domestic and international courts in democratic politics (e.g. North and Weingast 1989 Moravcsik 2000). Scholars have also long recognized the centrality of domestic courts in implementing international human rights treaties (e.g. Simmons 2009) and international legal obligations more generally (Verdier and Versteeg 2015). Thus, although the role of domestic courts in enforcing global mitigation targets is relatively new, the role of domestic courts in enforcing international legal commitments is reasonably well recognized.

I do not assume that domestic court judgments will necessarily be implemented by governments. Even governments in advanced democracies sometime sidestep or minimally implement domestic court rulings (Vanberg 2015. Moreover, as discussed above, some of the court rulings are very vague in what is required from governments, which may relieve pressure on governments to implement costly policies (Staton and Vanberg 2008). It is theoretically plausible that investors alter their beliefs about future policies after a court ruling but the extent to which this is so remains an empirical question.

Moreover, it is not obvious that domestic courts will be a strong pro-compliance force on climate issues. Climate litigation is a two-way street (Peel and Osofsky 2020; Savaresi and Setzer 2021). Energy markets, especially in natural gas and coal, often operate with long-term contracts due to large up front investments. Policies that affect the value of such contracts are subject to litigation. Property rights are strongly protected in international human rights and investment law as well as in many constitutions. People and communities regularly challenge large scale wind or solar farms based on procedural issues, indigenous

rights, or other legal claims (Savaresi and Setzer 2021). Courts may hold the government accountable for mitigation promises but they can also limit policy options and protect firms from the negative consequences of such policies. For example, the German (coal) utility giant RWE filed an investment arbitration disputed based on the Energy Charter following the Dutch government's decision to phase out coal (Setzer and Higham 2021). The stock market implications of climate rulings could be dampened by investor expectations that firms will be compensated for new regulations that limit their profitability (Sen and Schickfus 2020).

This paper does not analyze whether (or which) courts are likely to come down with strong pro-climate judgments. Instead, the question is whether mitigation targets become more credible following such a ruling. In liberal democracies with strong independent courts we typically expect that governments will implement court judgments. Yet, there may still be some doubts about the effectiveness of these rulings. Courts may well be reluctant to overstep their authority and order relatively vague remedies. For example, in the *Klimaatzaak* case the Belgian Court of First Instance found that the government's unambitious mitigation policies had breached its duty of care but it also left specific targets to legislative and executive bodies. Even if courts adopt specific targets, as in Urgenda, GHG emissions fluctuate based on numerous non-policy related factors, such as economic cycles. Holding governments accountable for meeting these targets likely requires subsequent costly and slow legal proceedings.

Moreover, not all climate rulings should be expected to have the same effect. First, some judgments could update investor beliefs about mitigation policies more than others. The aforementioned positive rulings were largely surprises. This was most obviously true of the first *Urgenda* judgment. But even Luisa Neubauer, the plaintiff in the 2021 German case, called the ruling "so, so unexpected" (Kottasova 2021). It would not seem unreasonable to think that most investors would expect courts to stay deferential to governments on an issue that is highly consequential and on which governments have deliberately negotiated an international treaty with commitments that are not justiciable. This implies that updating

of prior beliefs should be stronger following positive climate rulings than negative ones. Moreover, the strongest updating should take place following the first ruling in a country as investors may expect that appeals courts tend to uphold prior rulings. An exception may be if a negative ruling overrules an initial positive ruling but we have not (yet) witnessed this.

Second, not all firms should be equally affected by court rulings. The effect of mitigation policies on renewable energy producers is the most straightforward: these firms are direct beneficiaries of subsidies and indirect beneficiaries of carbon pricing. Thus, we should expect that stock prices of renewable firms go up as investors come to believe that mitigation policies will be stronger than they previously expected. The effect on brown firms is more complicated. Strong mitigation policies may most clearly affect European firms that are heavily invested in coal. Burning coal leads to the largest GHG emissions. As a result, 23 European governments have committed to phasing out coal. By contrast, natural gas is widely seen as a key transitory fossil fuel and has received a "green" designation by the EU for at least the coming decade. European governments do have plans to reduce the extraction of of and dependence on oil. Yet, oil companies operate in a global market. Court rulings could lead to greater shares of fossil fuel assets controlled by private firms or firms headquartered in countries with looser domestic regimes (as illustrated by the Shell examples mentioned earlier).

The literature also often evaluates firms that have received favorable investment recommendations from NGOs. Most prominently, the Clean200 is a list of companies that " are leading the way by putting sustainability at the heart of their products, services, business models, and investments, helping to move the world onto a more sustainable trajectory." [14] Such firms could benefit from stronger mitigation policies that are pushed by court rulings. For example, Jan Michael Mrosik, the CEO of a major German manufacturer of brake systems for rail and commercial vehicles (Knorr-Bremse), stated in an earnings call a few weeks after the *Neubauer* ruling that: "The climate push has just been again emphasized by the

[14] https://www.corporateknights.com/clean-technology/2022-carbon-clean200/

German highest court, and there will be legislation in place in due course. And all of this will lead us inevitably into a situation where public mass transport is going to be further emphasized and traffic is going to be pushed on to these systems." However, the link between mitigation policies and profitability for this broader set of "green firms" is much less clear than for firms that specialize directly in renewable energy.

A third question concerns geographic bounds. The EFTA and EU countries are highly integrated markets. Yet, it may still be that investors expect firms headquartered in the country of litigation to benefit more from an increased commitment. Not all firms (can) operate in all countries. For example, coal-intensive electricity producers mostly sell their product on a local market whereas wind and solar farms could theoretically be sold in multiple markets. Court rulings could alter beliefs not just about mitigation policies in a specific country but they may also raise expectations that other courts will follow suit, as discussed in the Urgenda example. Thus, whether these litigation outcomes affect asset prices in just home country firms or also other European firms is an empirical question worth testing.

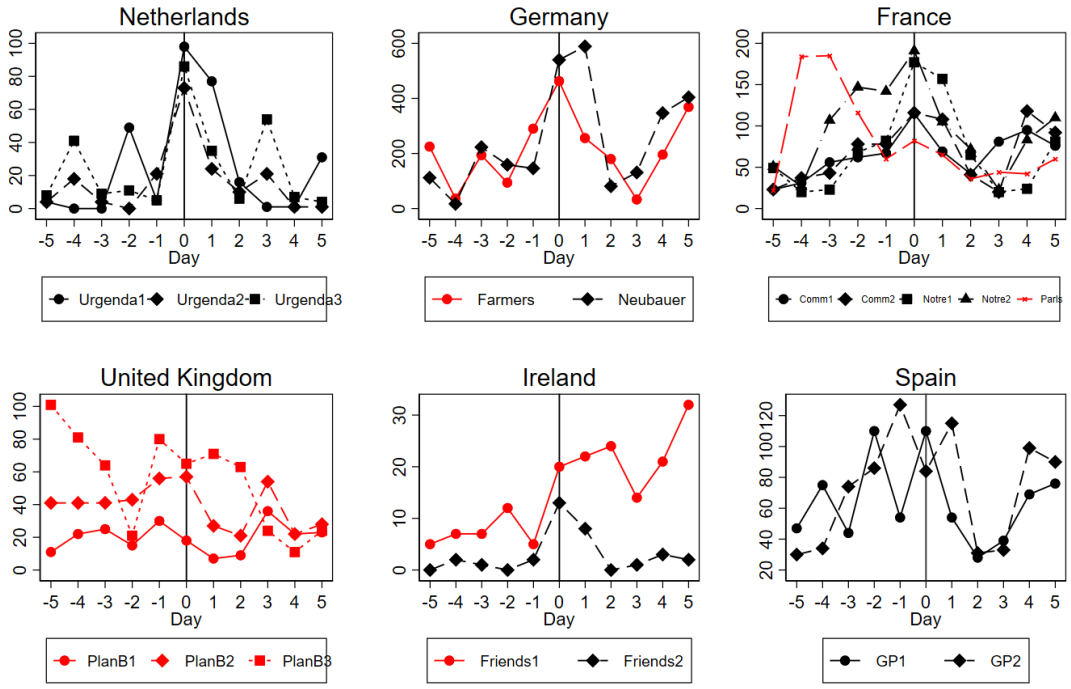
News about Climate and Climate Litigation

The news analysis in this section serves as a preliminary assessment of the plausibility of the theory and the event design. The theory suggests that court judgments can update investor beliefs on whether governments will strengthen their mitigation commitments. This is only plausible if litigation outcomes provide new evidence on the day of their announcements. If investors anticipate a ruling with great certainty, then they should have already priced in the ruling before the public announcement. Moreover, if court judgments are sufficiently significant events to move stock market prices, then they should get a fair bit of attention, including in outlets that investors care about. Finally, a news analysis can help reveal if other relevant events could be responsible for moving markets on any given day. That is:

court judgments could happen to fall on a day that there is other climate related news that moves markets away from coal and towards renewables.

I collected Factiva news stories about climate change concerning the country of the ruling five days before and after each judgment.[15] This search helps establish whether the ruling increases reporting on climate change and whether there were other simultaneous stories about climate change that could affect the relative valuation of renewable and fossil fuel stocks. A supplemental search looked for mentions of the judgment and combinations of the terms "climate" and "court." I also read news stories about judgments in major news sources widely read by investors, such as the *Financial Times*, for indications of whether the judgment could be seen as a surprising event.

Figure 1: Factiva News Stories about Climate Change in Days Before and After Climate Judgments



Note:Red lines are plaintiff losses

Figure 1 plots daily counts of news stories about climate in six countries with multiple

[15]Based on Factiva's subject category for climate change.

rulings. As expected, the canonical Urgenda rulings (the Netherlands) received considerable attention on the day of each ruling (day 0) and the day thereafter. There were about ten times as many climate change stories about the Netherlands on Urgenda day rulings compared to other days in the same year. This attention was international. On the day of the 2015 ruling, Dutch was only the fourth common language of a Factiva news story (after English, Spanish, and French, equal with German). Many news stories use adjectives like "historic" or "landmark" to describe the ruling and mention that it opens the door to similar lawsuits in other countries (e.g. Robinson and Clark 2015). The appeals rulings in 2018 and 2019 also attracted international attention but the news stories did not express the same sense of a seismic shift. Reporting on the Belgian *Klimaatzaak* judgment (not plotted) showed a similar pattern although it received less attention than the Urgenda judgments.

European news sources also reported extensively on the *Neubauer* judgment, again using terms like "groundbreaking" and "historic" to describe its potential impact (e.g. Chazan 2021. The vertical axis reflects that there are more stories about Germany in the Factiva database but the relative increase is comparable to the Netherlands. There are also upticks in news stories about climate change on the days of pro-climate rulings in France, with English language stories outnumbering French ones. For example, *The New York Times* labels the first *Notre Affaire à Tous* ruling "pivotal" (Méheut 2021). There was less attention for the follow-up judgments. The *Friends of the Irish Environment* judgment mostly drew attention in Ireland and the United Kingdom where it was considered a major event. As Colm Keena put it in the *Irish Times*: "Those within the Government pressing for legally binding specifics to be included in a new statutory plan, can now argue that further international embarrassment, and the Four Courts, await any failure to adequately do so" (Keena 2020).

There are a handful of news reports that anticipate a ruling's timing but I found none that made any prediction regarding the outcome of a case. The 2019 *Family Farmers and Greenpeace v Germany* judgment is the only negative ruling to attract considerable media attention, although mostly in Germany. The *Associated Press* and *Agence France Press*

picked up the story but few newspapers outside of Germany did so. The red lines in figure 1 show that other negative rulings do not result in major increases in reporting about climate; suggesting that these are not (yet) seen as major events by journalists. There was some domestic reporting on the *Plan B* judgments in the UK and very few stories on the Swiss rulings (the latter are not plotted). The negative judgment on the first *Friends of the Irish Environment* ruling coincides with reporting about the upcoming 2019 UN Climate summit, which is responsible for the temporary increase in news reports about climate.

The main conclusion from the media analysis is that the pro-climate rulings on the merits attract considerable international attention and that these rulings are described with adjectives that suggests that updating of beliefs about likely policy changes is at least plausible. The evidence is consistent with a view that negative rulings were not seen as major news events, at least by the media.

Data and Method

Data on Firms and Stock Prices

A first important data issue concerns the selection of firms. The Carbon Underground 200 is a list of the top 100 coal and top 100 oil and gas companies worldwide, ranked by the carbon emissions content of their reported reserves. I select all firms that are headquartered in Europe (here defined as EFTA/EU/UK countries) or firms listed on a European stock exchange. For example, Gazprom and Tata Steel are not incorporated in EFTA countries but they do have considerable economic activity there and are thus listed on the London/Frankfurt stock exchange. This yields 19 Oil and Gas firms, and 14 Coal firms; reflecting that this region is not a global center of activity for the fossil fuel industry. The list of green companies comes from the *Clean200*, which is intended as the clean energy inverse of the Carbon Underground 200 (Heaps 2018). It includes firms with a market capitalization of at least 1 billion and a minimum of 10% in green revenue. Some of the major renewable energy firms like Nordex

and Vestas are also included on the Green list, but the Green list includes many firms that are not primarily about renewable energy, like Philips and Akzo/Nobel. Excluding the firms whose main business purpose is renewable energy, this yields 60 firms, reflecting that Europe is a hotbed for “green" firms. Both the *Clean 200* and the *Carbon Underground 200* lists are widely used in event studies of stock market prices (e.g. Dordi and Weber 2019 Schuetze, Aleksovski, and Mozetic 2020).

There is no similarly widely used list of firms that specialize in the production and deployment of renewable energy. I searched the S&P business description of all European incorporated firms with a market valuation over 1 billion dollars for terms related to solar, wind, and biofuels. I only included firms whose main business activity is renewable energy firms, thus excluding many energy firms who produce some solar or wind energy as part of their activities. I also consulted the WilderHill New Energy Global Innovation Index, which was established in 2006. This is an index comprised of companies who focus on generation and use of cleaner energy, conservation, efficiency and advancing renewable energy. This yielded a total of 43 European renewable energy firms. The appendix lists all firms included in the analysis.

Daily stock prices come from Compustat, Capital IQ global (via Wharton Research Data Services) from January 1, 2015 until December 31 2021. The core dependent variable in this study $R_{it}$is the return (percentage increase) of daily close price of stock i on day t adjusted for stock splits (AJEXDI) and the current total return factor (TRFD), which help adjust daily stock prices dividends, and cash equivalent distributions.

Table 2 provides the summary statistics. The average daily returns for renewable firms is higher (.08 percentage points) than for green (.06), oil (.05) and especially coal firms (.02). This reflects well known overall trends that renewable stocks have outperformed fossil fuel stocks during this period. The analysis asks to what extent days where plaintiffs win litigation challenging national mitigation targets offer unusually high returns for renewables stocks, thus contributing to the overall market adjustments. The summary stats also show

that the fossil fuel firms in this analysis are on average larger and attract a higher daily trading volume. The analysis will assess the robustness of the results for only including the largest renewable firms.

Table 2: Summary statistics of Firms in the Sample

	Renewables mean	Green mean	Oil/Gas mean	Coal mean
Daily Returns	0.08	0.06	0.05	0.02
Market Value	1.3e+10	7.0e+10	7.2e+11	1.6e+12
Daily Trading Volume	9.4e+05	2.1e+06	4.9e+06	2.8e+07
Frankfurt	0.18	0.22	0.05	0.07
London	0.11	0.10	0.53	0.57
Paris	0.05	0.22	0.05	0.00
Amsterdam	0.08	0.13	0.05	0.00

There are also notable geographical differences. The fossil fuel firms are more likely to be traded on the London Stock Exchange whereas renewable energy and Green firms are more likely registered on the Frankfurt Stock Exchange. This is especially important to keep in mind when evaluating whether home country firms are more affected by court judgments.

Event Studies Method

Event studies are well-established in the finance literature, including studies that examine the effects of corporate litigation outcomes on market valuations (Bhagat and Romano 2002). The typical approach is to compare the actual returns (daily percentage increase) of a firm during the event window to the expected returns. The abnormal returns can then be ascribed to the event and statistical inference can reveal how unusual these abnormal returns are. The simplest event studies examine the influence of one event, such as an adverse litigation outcome, on the market valuation of one firm.

This paper asks a more complicated question about the effect of a series of events (court judgments) on the stock prices of a portfolio of firms (renewables, green, oil and gas firms,

and coal). I use the following basic estimating equation, where R_{it} is the return (percentage increase) of stock i on day t.:

$$R_{it} = \alpha_i + \beta 1_i RM_t + \beta 2_i SMB_t + \beta 3_i HML_t + \beta 4_i BRENT_t + \partial 1 Win_t + \partial 2 Loss_t + \varepsilon_{it} (1)$$

The first part of the equation estimates expected returns. α_i is the average daily rate of return for a stock. The simplest model for expected returns is the capital asset pricing model, which estimates expected returns based overall market returns. The Fama-French 3-factor model more adequately estimates expected returns (Fama and French 1993). This model expands on the capital asset pricing model by accounting for the excess risk that value and small-cap stocks face as a result of their higher cost of capital and greater business risk. The Fama/French European 3 Factors [Daily] come from Kenneth French website.[16] RM_t is the market rate of return, SMB_t is the size premium (small vs big), HML_t is the value premium (high minus low).

Energy stock prices may be influenced by fluctuations in crude oil prices. Event studies do not always include these prices because the events that influence the valuations of oil companies may also shape price fluctuations. This could suppress the estimation of event effects. Litigation is unlikely to have this type of effect so I estimate the model both with and without crude oil prices. The rate of return on European crude oil prices $BRENT_t$ come from the St Louis Federal Reserve.[17]

The β parameters are estimated separately for each stock, allowing each stock to have a different responsiveness to market and oil price fluctuations. Thus: for each stock the model estimates five parameters to establish expected returns: the average return (α), the stock return's responsiveness to the market, the size premium, the value premium, and crude oil prices. In robustness checks, the average return and the firm specific market responsiveness are allowed to vary by year. The standard errors ε_{it} are clustered on stocks (firms).

The ∂ parameters are the coefficients of interest. Win_t equals 1 on the day of a court

[16] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html#International
[17] https://fred.stlouisfed.org/series/DCOILBRENTEU

ruling in favor of a plaintiff and the day after. Two days seems about the length of the media attention in the previous section. The appendix includes results with shorter and larger event windows as well as tests for the pre-period. The expectation is that $\partial 1$ is positive for renewable stocks and $\partial 2$ for fossil fuel stocks. The resulting coefficients are averages per industry but we can also examine heterogeneity by ruling and company. In addition, I estimate separate ∂ parameters for companies that are headquartered in the country in which the litigation takes place and listed on the stock market.

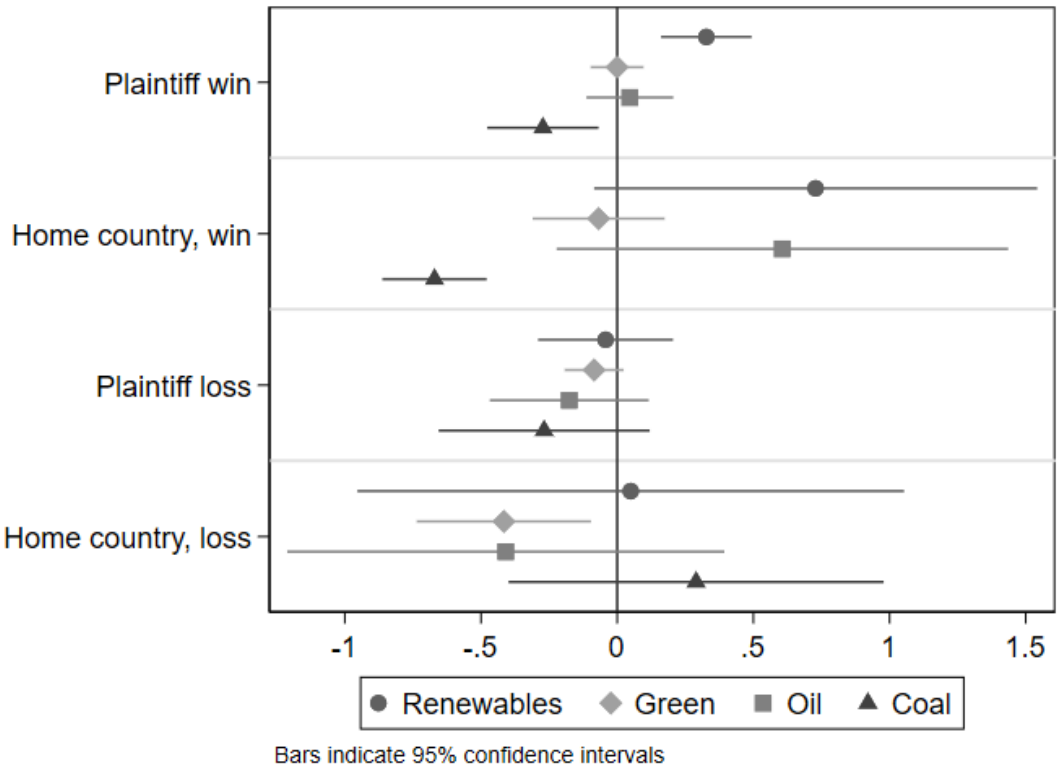
Regression Findings

Figure 2 shows the findings from a model that aggregates all positive judgments and negative judgments. Moreover, the model includes an additional parameter for when a ruling occurs in the country where the firm is incorporated.

The figure only shows the event coefficients, thus eliminating the many coefficients that help estimate expected returns. A plaintiff win has a significant positive effect on the returns of renewables. The average effect is .27 percentage points, which is considerable given that the average daily returns are .08 percentage points. Over the two day event window, a positive ruling thus contributes to a little more than half a percentage point unusual returns for renewables. There is an additional positive effects on renewable firms with headquarters in the country where the litigation took place. The effect is very large (.69) but imprecisely estimated (although significant at the 10 percent level).

The negative effect on coal stocks mirrors the positive effect on renewables (-.27 significant at the .01 level). Moreover, there is a very large negative effect on coal stocks when the ruling is in a company's home country: a daily decline of 3.3 percentage points! However, this effect is entirely driven by the German firm RWE following the Neubauer ruling. The Association of Ethical Shareholders Germany invited Luisa-Marie Neubauer to speak at the shareholder meeting following the court ruling, where she claimed that "No other company in Europe

Figure 2: Average Effect of Climate Litigation Outcomes on Stock Market Returns of European Renewable, Green, Oil/Gas, and Coal Firms



bears more responsibility for the climate crisis than RWE." RWE is also being sued in other countries, including in Latin America and the firm is suing the Dutch government for its decision to phase out coal (Moloney 2021) .[18]. While it is thus credible that this firm's market valuation is sensitive to climate litigation, it would not be prudent to draw generalizable conclusions from this observation. However, the coal-intensive German electricity producers included in a different study (Sen and Schickfus 2020) (EnBW AG, not in the Carbon Underground list) also suffered stock market losses in the two days following Neubauer.

There are no significant effects of the litigation on the pricing of "green" or oil and gas stocks, although the coefficients are signed in the expected directions. This may reflect that especially the Green category of firms is quite heterogeneous in terms of how stronger miti-

[18]In its half year 2022 earnings call, RWE's CEO reported that: "In the Netherlands, our 1.6 gigawatt Eemshaven biomass co-firing hard coal plant is back in full operations. This is a result of the Dutch government's lifting of restrictions from the Urgenda ruling at the end of June."

gation policies would affect profitability. Moreover, as explained earlier, the EU designated natural gas as a green energy source so the impact of mitigation on profitability is unclear.

Plaintiff losses did not have significant effects on the stock market returns of any group of firms. This is consistent with the notion that the market anticipates that courts will, for the most part, defer to legislatures and executives on mitigation targets. Nevertheless this finding matters for activist NGOs as it means that when a court throws out a climate suit, then investors do not significantly update their beliefs about the credibility of mitigation targets.

Figure 3: Effect of Individual Litigation Outcomes on Stock Market Returns of European Renewable Firms

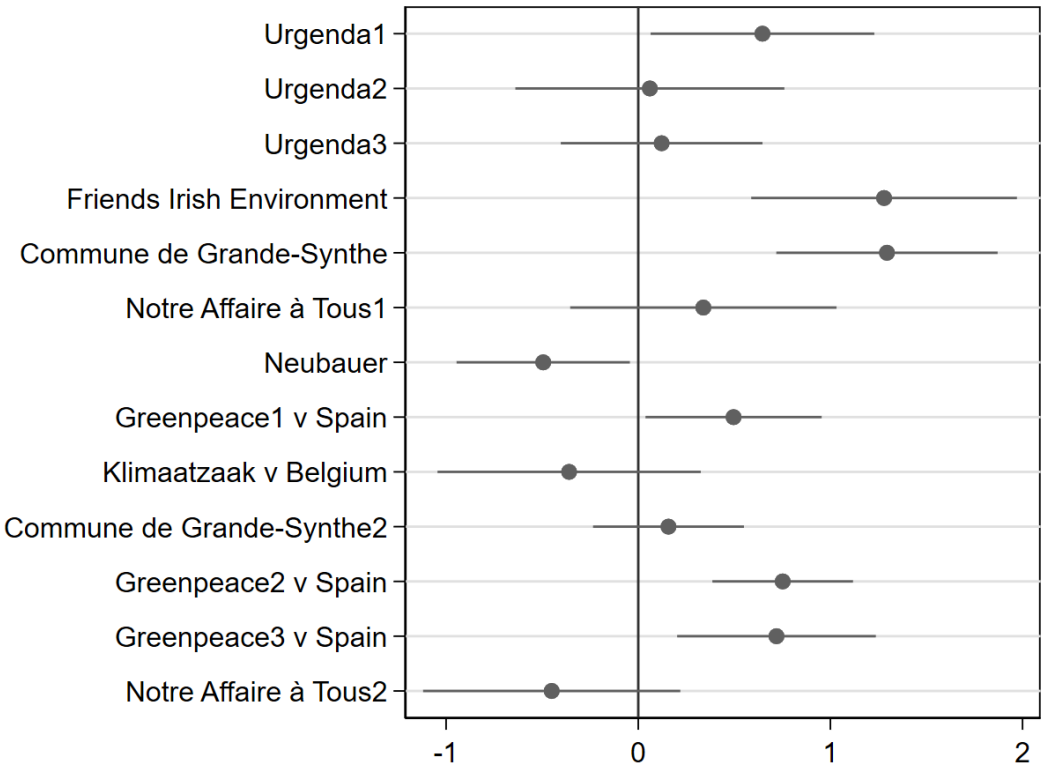


Figure 3 plots the effect of individual positive rulings on renewables. The first positive ruling in each country typically has the largest positive effects on daily returns for renewable firms. This is consistent with an updating of priors mechanism. That is: the first Urgenda ruling had a strong positive effect on renewables returns but the upholding of that ruling

on appeal did not move the markets much, presumably because it was more expected. The main anomaly is that renewable firms did not have higher returns on the days following the Neubauer ruling. This was driven by large losses among the major renewable companies, like Ørsted, Siemens Gamesa, and Powercell. Danish giant Ørsted's losses are likely due to a company announcement on April 30 (the day after Neubauer) regarding severe damage to seabed cables for its offshore UK windfarms, which led to a 6 percentage point drop in stock prices. The sensitivity of the findings to individual stocks warrants further scrutiny.

The findings are robust to alternative model specifications (see appendix), such as including lags for returns, excluding the crude oil prices, excluding the two additional Fama/French factors, allowing interactions between fixed firm effects and market factors to vary by year, estimating the model only with renewable firms with a market value over 1 billion dollar, estimating the model on the post 2018 period (when most rulings occur), and estimating the model on only EU firms. In addition, I estimatde models that control for individual company announcements that could affect company specific returns on a day. The Compustat Capital IQ "Key Developments" data offers the dates of company announcements that could potentially affect stock market returns. These include announcements about company specific litigation but not the general litigation examined here that does not target individual companies. In this sample, there are almost 34,000 announcements (15 percent of company days). Including all these announcements into equation 1 massively expands the number of coefficients that need to be estimated. The appendix presents regressions that include dummies for company announcements on the day of and the day before judgments.

None of these alternative specifications alter the main results but the effects on coal firms are less stable than the effects on renewables. This may well be due to the smaller sample. Most notably, the negative effect of climate judgments on coal stocks is no longer significant after controlling for corporate announcements, which may well be because a few large firms had announcements on the day of rulings even if these were not about the rulings. This again suggests that the coal effect is driven by a few firms whose stock prices were heavily

affected by rulings. By contrast, the effects on renewables are stable across specifications. In some models the positive effect of judgments on home country renewables is significant at the 5 percent level. Otherwise, both size and coefficients are very stable across model specifications and estimation periods.

Conclusion

The findings in this study are consistent with the idea that domestic court judgments that hold governments accountable for their contribution to global mitigation goals increase beliefs among investors that governments will adopt policies that favorably affect the profitability of renewables and adversely affect coal-intensive firms. The effects are modest in size but economically significant: about a .5 percentage point abnormal returns following a positive judgment. There are no effects on green firms and oil/gas firms, who are less directly affected by a shift in mitigation policies. Moreover, there is no evidence that investors update their beliefs following a ruling that defers to the government, which is consistent with the idea that prior beliefs do not expect domestic court interventionism.

These findings suggest that domestic court rulings can make climate mitigation commitments more credible. The size of these effects is roughly similar to other event studies that examine the financial effects of climate policy announcements. Thus, the findings should not be interpreted as meaning that climate litigation is the only or the most important driver of the valuation of climate sensitive assets but rather that litigation outcomes are one set of events that give investors significant information about how climate sensitive assets are likely affected by future policies and regulations.

The results also point to some limitations of the effects of climate litigation. The effects on renewables are largely driven by the first ruling in a country, suggesting that there is a limit to how much court cases can move investor beliefs. Or, rather, at some point an accumulation of court rulings and legislative actions may create firmer investor beliefs about

mitigation policies that are less susceptible to news about a new court ruling. Investors may start to price in their beliefs that courts in some countries will enforce emission reduction targets, in which case negative court rulings could come as a surprise that would update beliefs.

Climate litigation is a rapidly developing area of law with large potential social, economic, and political implications. Yet, there has thus far been very little attention to this trend among social scientists. Future studies can examine how these rulings affect public opinion or whether climate judgments had similar effects on investors in other parts of the world. Studies can also expand the scope to different types of climate litigation, including litigation that directly or indirectly includes firms. Such research should pay ample attention to the use of litigation by those who have interests to frustrate the energy transition. For example, there is noteworthy corporate litigation based on anti-trust law and investment law that aims to counter policy and social initiatives that encourage against usage of and investment in fossil fuels. There are also numerous lawsuits across the world that seek to halt the deployment of renewable energy for environmental or property rights reasons. The overall role of law and courts in climate policy is far from clear.

The evidence in this paper matters because the judgments studied should not affect stock prices other than through the effects they have on investor beliefs about future mitigation policies. Given the centrality of asset valuation in climate politics (Colgan, Green, and Hale 2021), this is an important finding. The overall effect of climate litigation on mitigation will depend on whether domestic courts in other countries will follow the Western European courts studied here. If so, then there will be an increasing number of countries where governments are constrained by their own courts when they design mitigation policies. As the Bundesverfassungsgericht alluded to in the Neubauer judgment, trust that other governments will meet their mitigation targets is essential for effective mitigation policies. Within Europe, the European Court of Human Rights could eventually apply consensus analysis to effectively pull up laggard countries. Whether courts will indeed go this route is an open question. There

are now cases in many European countries as well as countries in other continents and it is much too early to detect a uniform trend in either direction.

An alternative possibility is that the global climate regime may set targets that are enforceable in some countries but not in others. This may create new sources of political and economic conflict. For instance, governments for whom global mitigation targets have become enforceable may start to hold other governments accountable if they fail to reduce in accordance with their share of the global responsibility. Thus, domestic legal enforcement could contribute to international enforcement politics.

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