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Specifying the Gap between Nations' Outward-Looking and Domestic Climate Policies: A Call for Measures of Domestic Climate Policy Stringency

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Abstract: As nations fail to meet their climate emission mitigation goals, the ambition gap is widening between international climate policy (enacted by the United Nations) and domestic climate policy (what nations propose and enact). A widely held but little verified conventional wisdom exists that nations over-promise internationally and under-deliver domestically. While little data exist to directly test this hypothesis, we documented this gap by constructing heuristic indexes of domestic and international climate policy performance, showing that nations tend to "lead with the international". We found that nations' domestic policies are not significant in explaining emissions, although their international policies are significant. We concluded that beyond identifying this gap, analysts must devise metrics to assess domestic climate policy across a range of issue areas, as domestic policies are the foundation of any global effort to manage climate change.

Keywords: climate mitigation; climate policy; international climate policy; climate policy stringency; Nationally Determined Contribution; climate ambition; climate policy stringency; climate ambition; Paris Agreement

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1. Introduction

UN Secretary General António Guterres, in November 2022, tried to introduce a tone of desperation to the annual UNFCCC meetings by declaring that the world is on a "highway to climate hell [1]". In September 2021, he declared, upon release of a new report on the lack of ambition by member nations in cutting emissions (UNFCCC 2021), that "the world is on a catastrophic pathway" [2]. The Nobel Prize-winning Intergovernmental Panel on Climate Change had issued increasingly urgent pleas for an immediate scaling up of climate mitigation (2018, 2023), and modelers warn that while UN pledges have dropped warming projections from about 3 degrees Celsius [3] to about 2 degrees Celsius [4,5], this is still a good deal higher than the best case scenario of 1.5 degrees Celsius warming by the end of the 21st Century (measured as average temperature change from 1850 to 2099).

Scholars have also warned that incentives have not been created for international diplomats, national politicians, and local citizens to mitigate climate change [6,7], and analysts have lamented that interests such as business and labor have blocked climate action [8,9]. In short, the hoped-for cooperation between levels of government to resolve the "tragedy of the commons" collective action problem has not materialized. Whatever the reasons, a consensus is growing that if the international community does not "ratchet up" ambitions quickly, it will be too late [10,11].

Against this backdrop, the lack of composite measures of climate policy stringency is well established. Important early efforts to measure composite climate policies such as [12] have not been centered in subsequent research. Later efforts, using a single indicator such as carbon pricing [6,13], are provocative but not definitive, and this article also fails to offer definitive measures of climate policy stringency. Indeed, we offer indexes that omit policy dimensions, offer somewhat idiosyncratic scaling dimensions, and do not offer the most

internally coherent measures. Still, we do offer perhaps the first preliminary measure, using extant empirical indicators for the set of all nations, to validate our claim that climate change policy offers a strong example of the disconnect between a nation's foreign policy and its domestic policy. More broadly, we use two new, albeit imperfect, indexes to quantify the disconnect between a nation's "outward-facing" diplomatic behavior and, more specifically, the aggregation of that behavior into international agreements. We compare this "outward-facing" climate policy (the nation's foreign climate and environmental policies) with its "inward-facing" domestic behavior, as this is where the hard decisions must be made to prioritize domestic spending on climate-related policies.

This shortcoming between nations' international pledges and their domestic policy implementation of these Paris Agreement pledges is one of "the ambition gaps" identified by international analysts. Many have observed, for example [14–16] that United Nations member states' Nationally Defined Contributions (NDCs, which are "domestic" because each nation generates its own and only then pledges it to the international community) are much less ambitious than the Intergovernmental Panel on Climate Change (IPCC) views as necessary [17–20] to keep overall global warming within manageable levels.

Perhaps the best example of the growing gap over the last three decades is the failure of the Kyoto Protocol, which had a stringent "carbon budget" intended to dramatically decrease emissions. However, a few nations (such as the United States) failed to ratify Kyoto because of domestic political and/or public opinion constraints, withdrew from it early (Canada), or failed to submit emissions targets after the initial round (Russia, Japan). This meant that during its later years, the Kyoto Protocol only governed nations responsible for some 15 percent of global GHG emissions, leading it to be widely labeled as a "failure" [21]. Though domestic policy experimentation may in 2022 be more "active" than international policy experimentation, it has generated many pledges but few tangible results, as it has failed to generate lasting emissions reductions worldwide much beyond those caused by the COVID-induced economic slowdown in 2020 [22].

Recent research has shifted the blame for this disjuncture between international and domestic climate policies. Climate change used to be viewed as an international "tragedy of the commons" where nation-states had failed to regulate the global commons (here the atmosphere) because the United Nations was unable to enforce rules to limit emissions by nation-states [23,24]. More recently, the problem has been perceived as being caused by domestic distributive conflicts, which favor the status quo and the fossil fuel economy over renewable energy sources and other interests that promote the decarbonization of national economies [8,9,25,26]. This article adds new evidence to the claim that domestic sources are at the root of international climate agreement shortcomings.

We illustrate our claim about the disjuncture between higher international climate policy ambitions and lower domestic ones by constructing indexes of climate policy for each sphere and then demonstrating that international policy is more ambitious and coherent. We argue that stringent foreign policies (measured as national participation in international environmental treaties) allow nations to show they are addressing climate change, but without undertaking such stringent policies at home where the policies must be implemented. Our research objective is to demonstrate the inconsistencies between nations' foreign and domestic climate policies, show that domestic policy is not significantly tied to emissions reductions, and conclude that means must be found of measuring the stringency of domestic policy (as an end in itself), rather than just assuming that domestic policies succeed if a nation's emissions drop.

With regard to domestic policy, we show that at present, "positive" choices, such as carbon pricing, pledges of net zero emissions by 2050, and the stringency of national pledges to the UN to reduce emissions, are not significant reducers of emissions; however, a "baked in" negative domestic policy, fossil fuel subsidies, is a statistically significant cause of higher emissions by nations. Fossil fuel subsidies, while significant in most of our models, predate climate policy by over a century in some cases, see for example [27], and

hence are not included among the three measures in our domestic climate policy index (although we test them as a separate variable of interest in our equations).

Of course, comprehensive national approaches to reduce emissions necessarily involve reducing fossil fuel subsidies. Fossil fuel subsidies were in place long before the climate debate in most nations, we have chosen to focus on pro-climate policies rather than anti-climate policies [12]. While the subsidies themselves can be traced back to the first commercial oil drilling in the US in the 1890s, The International Monetary Fund (IMF) only started publicly releasing country-by-country subsidy estimates in 2015, taking an expansive view of the estimated value of fossil fuel subsidies [28]. In 2020, the IMF estimated fossil fuel subsidies worldwide at USD 5.9 trillion (some 6.8 percent of worldwide GDP), with Parry et al. claiming that "efficient fuel pricing in 2025 would reduce global carbon dioxide emissions 36 percent below baseline levels, which is in line with keeping global warming to 1.5 degrees C, while raising revenues worth 3.8 percent of global GDP and preventing 0.9 million local air pollution deaths" [29].

This article documents this inconsistency and concludes that it may be at the root of the global failure to enact ambitious climate policies enforced by nations to drive down Greenhouse Gas Emissions (GHGs); it seems that nations wishing to appear "serious about climate" participate in international agreements ("leading with the international") knowing that the United Nations will be unable to require compliance or follow up on commitments. Domestic agencies do have the power to require and implement ambitious climate policy but hesitate for a range of reasons, including the informal veto power posed by status quo-preserving domestic interests, see, for example, [6,8,28]. Even climate policy laggard nations attain the appearance of climate policy "window dressing" [7] makes this critique most thoroughly by fully participating in the insufficiently ambitious international climate regime, which is forever sounding more urgent alarms, but while moving at a consistently incremental pace.

In the next section, we address the lack of convergence of nations' inward- and outward-facing climate policies by constructing new international climate policy and domestic climate policy indexes. We then demonstrate, using political variables that are significant in explaining Greenhouse Gas Emissions by nations, that some of these are significant in establishing internationally oriented climate policies, while none are significant in constructing domestic climate policies.

2. Policy Failure and the Divergence between Inward- and Outward-Facing Climate Policies

Most arguments against the sufficiency of the Paris Agreement center on the shortcomings of the NDCs. The failure of critical emitters such as China and India to submit stringent NDCs prior to recent UN meetings resulted in Guterres' "dangerous pathway" and "highway to climate hell" statements. Sachs [16] argues that "states will continue to submit NDCs that reflect their self-interest, but these NDCs will in all likelihood be collectively insufficient to close the emissions gap". Scholars such as Allan have indicted the incrementalism of the Paris Agreement in repackaging "existing rules that have already proven inadequate [16]", and others such as [11] have sought to "ratchet up" policy stringency to make the best of the international agreement. Clearly, the voluntary and unambitious nature of the NDCs is at the center of the critique of the Paris system for emission reduction.

This critique may be fair, and the NDCs may be the lynchpins of United Nations emission reductions, but they are also nationally generated. That is, they are the result of inward-looking climate policy, with its inherent interest group obstacles and national weaknesses, even if they then are aggregated to those of other UN nations to represent emissions reductions at the international level. The problem is that the emphasis is at the international level, where leaders make pledges and compare them with leaders from other nations, whereas at home the same leaders face far less scrutiny and are less accountable for climate policies.

Criticism of the international system's abdication of emissions reductions to domestic policy is growing. Keohane and Victor [30] noted that the Paris Agreement is a weak institutional solution, as it relies on voluntary, bottom–up pledges by nations and a "pledge and review" approach by the UN, which thus far has not scaled up its ambition [30]. (Nations are scaling up their NDCs every several years, but the Paris Agreement is still a "bottom–up" institutional approach, and such an approach is inherently weaker than a "top–down" institution, such as Kyoto and the failed Copenhagen Agreement, which assigned mandated emission reductions to each nation from a central UN carbon budget).

Dimitrov [31] claimed that some global environmental institutions (including the Copenhagen Accord on Climate Change, a place marker for the Paris Agreement) are in fact "empty institutions" created to hide policy failure and to "distract public scrutiny and legitimize collective inaction" [31]. No one really knows how much domestic policy has assumed the leadership vacated by the international system, however, as domestic governments have not yet under the Paris Agreement been held accountable by disclosing emission reductions to the UN. Modelers do update projections periodically (see, for example, [4,5,32] for recent updates), but these offer a scholarly record more than a policymaker baseline for negotiations. At present, the only means of holding governments accountable "in real time" are revised estimates by climate modelers, such as the Climate Action Tracker [33] and Climate Interactive [34], extrapolating revised emissions projections from national leader declarations and pledges at UN meetings.

The international community enters new climate agreements when existing ones expire, and the onerous negotiation and codification of new agreements such as the Rio Agreement creating the UNFCCC (ratified and implemented in 1993), the Kyoto Protocol (ratified in 1997; implemented in 2005) and the Paris Agreement (ratified in 2015; implemented in 2020) are justifiably celebrated as international achievements. The problem with the Paris Agreement, and the UN system of negotiations more broadly, is that "the ambition of the overall [Paris] Agreement is fundamentally rooted in national political realities and within an international system of accountability and periodic international review of domestic actions [35]". While prospects for managing climate change are improving as nations fortify their NDCS, the UN is still poised to fall short of its 1.5 degrees C objective. As authors such as [6,7,13,26,36] point out, political leaders and diplomats often do not have the incentives needed to produce the rapid change called for by scientists and citizens.

Our premise is that coherent (if insufficiently ambitious) international policies are receiving attention and fanfare, whereas domestic policies, the real regulatory cornerstones of climate mitigation, are inadequately conceived and often poorly implemented. Le Quéré et al. [37] argued recently that the displacement of fossil fuels by renewable energy has occurred in some 18 developed economies, but not in the rest. To show this, we construct useful, albeit imperfect, indexes of international and domestic policy stringency. We argue that the utility of the exercise is in showing the "gap" between international and domestic policies, rather than in claiming that either index is comprehensive, ideally scaled, or even fully internally coherent. Rather, given that no such indices presently exist, we consider these indexes as independent variables in assessing emissions levels per capita in 2018 (the last full year before COVID). We then report the correlates of international and domestic climate policy stringency, showing the relevance of international, but not domestic, climate policy. Then, as a validity check on the empirical coherence of the indexes, we break the universe of nations into subsets according to international and domestic policy stringency, finding that again, international policy and fossil fuel subsidies are associated with nations' emissions, but domestic policy stringency is not. We argue that greater progress has not been made in reducing emissions worldwide perhaps because nations freely make ambitious statements at international fora, but that "leading with the international" does not translate into commensurate ambition in the hardscrabble implementation of actual domestic climate policies.

3. International and Domestic Climate Policy Stringency: Defining Our Dependent Variables

Consistent with Sachs' (868) "peer pressure proposition" and by "naming and shaming" those who do not embrace international efforts, United Nations agreements are viewed as the centerpiece of international climate policy [16]. As noted by Bernauer et al. [38], much of the social science literature (such as [39–41]) finds that nations seek "lowest common denominator" solutions to international problems and are more willing to solve simple problems than to tackle those requiring greater cooperation and/or technical/scientific solutions [38]. Extending this reasoning, we argue that nations may be more willing to join international agreements after other leading nations have already "gotten out front" as a justification for the timing of a nation's signing and ratification as a component of the index. We use a range of environmental agreements to construct this variable from the 1980s and early 1990s, agreeing with [42] that a nation's foreign policy identity, with a few notable exceptions, changes slowly, even if national governments change more frequently. The Paris Agreement was excluded from our sample for two reasons. First, it added no variance to the sample, as all UN nations approved and implemented it. Second, it presented endogeneity problems as we did not find the logic compelling to test the effects of the Paris Agreement's international ambition on the results of emissions changes under that very same system.

We constructed an index of international policy ambition based on when and whether nations signed three of the most important environment-related treaties of the last 40 years, the Montreal Protocol of 1987, the Rio Treaty of 1992 on biodiversity, and the Kyoto Protocol of 1997 establishing the first UN mitigation framework with firm targets. We did add the Paris Agreement for a four-point index in earlier iterations but did not use it in the statistical analysis as the results were largely the same. When we took out earlier treaties, we lost the robustness of the index. For each of these treaties, we used Mitchell's International Environmental Agreements database [43] and coded a 0 if a nation did not sign the agreement, a 1 if the nation signed it in the first three years after passage, and a 0.5 if a nation ratified any time after the first three years of an agreement's negotiation. This allowed us to measure not only whether a nation signed it, but also whether it led that process or lagged, signing only under "peer pressure" later. The Cronbach's Alpha for this index was 0.574, indicating that the three indicators do form a reasonably coherent pattern. Cronbach's alpha measures the internal consistency of a set of items. A measure above 0.6 is generally considered to convey that the relationship between the data set (here a comparison of indexes) is reliable. We then created a dummy variable where a score above 2 (occurring 60 percent of the time) was assigned a value of "high" and a score of two or below was assigned a value of "low". This dummy variable was only used in the models where international ambition was the dependent variable, and the models showing these results are available in Appendix C.

We recognize that these international agreements were signed in succession rather than simultaneously, and thus the longitudinal index does not entirely coincide temporally with the cross-sectional variables we present in our statistical analysis, although we agree with [43] that international standing is, with a few exceptions such as the US, which withdrew from the Paris Agreement under Trump and rejoined under Biden, mostly consistent over time. We consider this aggregate international policy variable alongside our domestic policy variable, which is weighted more toward the 2015–2018 period. In other words, nations' international treaty behavior is usually consistent over time. Most countries fall within the two-to-three-point range (meaning they implemented most of the three treaties in a timely manner), with the median at 2.5 points. There was only one outlier that scored a zero.

The domestic policy variable also consists of three 0–1 dichotomous variables combined into a three-point index. Using the World Bank's Carbon Dashboard [44], we assessed whether each of the 181 nations placed a cost on carbon (0 if no, 0.5 if yes but with a price below $20 per ton, and 1 if the price is above $20 per ton). We also coded whether each

nation has legislated a "Net Zero Emissions" by 2050 pledge, coding 0 if the nation has no pledge, 0.5 if it has a pledge but no law, and 1.0 if the nation has passed a law requiring Net Zero Emissions (as reported [45]). Finally, we studied the nations' 2015 NDCs to assess mitigation objectives and coded these as 0 if they did not discuss mitigation specifically in their NDC, 0.5 if they mentioned mitigation and offered plans but without specific targets, and 1 if they mentioned specific mitigation targets in their NDC [46]. By merely considering whether a nation had concrete mitigation pledges and/or timelines, we avoid the problem [47] lucidly identified, i.e., that nations' Paris pledges are difficult to compare because nations tend to make grandiose claims that may in practice not be comparably executed. We understand that our index is based on procedural categories rather than substantive ones but hope that future work will have a means of measuring policy stringency more substantively. Note that the 2015 NDCs were the ones in effect in 2018, the year of our data cross-section. For this index, most countries fell within the lower half of the index, between 0 and 2, with only three countries reaching the seven-point score. The median for the domestic policy index is at 1 point, with the mean slightly higher at 1.486.

In the next section, we use these indexes as independent variables in an OLS regression on a cross-sectional sample using GHG emissions per capita during 2018, the last year before COVID-19 for which we had complete data. Non-linearity was investigated, and alternative methods. such as quadratic and cubic transformations, performed worse than simple OLS regressions with greater mean-squared errors. Visualizations of the dependent variable and the independent variables also did not show a clear non-linear relationship. Note that, consistent with our argument about the lack of coherence of domestic mitigation policies, these indicators did not correlate very strongly. The Cronbach's Alpha was only 0.373; roughly half the value of a strongly coherent set of data. Given that the Domestic Policy Index is not particularly strong, why bother constructing such an index? Having surveyed the extant few measures of domestic climate policy such as the opaque Germanwatch Climate Policy Index of sixty countries [47]. According to [48], "The data for the category "Climate Policy" is assessed annually in a comprehensive research study. Its basis is the performance rating by climate and energy policy experts from non-governmental organizations, universities and think tanks within the countries that are evaluated. In a questionnaire, they give a rating on a scale from one ("weak") to five ("strong") on the most important measures of their government". No further information is given on climate policy, which is split into domestic and international (each of which counts 10 percent to the overall Germanwatch Climate Policy Index of sixty nations).

According to a promising but nascent effort at the University of Berne to study the gap between international and domestic climate ambition (see for example [49]), it is apparent that stronger baseline measures are needed. Finnegan [6,13] offered probably the most important contribution to date and addressed a few dozen of the world's largest emitters, using carbon pricing as a proxy for climate policy stringency. Carbon pricing is important and Finnegan found it to be significant for his cases, the leading emitters of the OECD. We substituted our domestic policy index for what [6] and others consider the single most important domestic policy variable, whether a nation prices carbon and if so at what level. Our carbon price results were similar to those with all three indicators in a single index, so we left the index, as it is more comprehensive. Prior studies did question the effectiveness of carbon taxes as measures of effectiveness in reducing emissions [50–52] and we here seek a more multi-faceted measure. We also sought to understand the behavior of a broader sample of nations across a broader range of areas, and argue that, as an initial exploration into quantifying the "stringency gap", our indexes performed adequately. The next section conveys the important data patterns these indexes revealed.

4. Measuring the Importance of International (but Not Domestic Policy) for Emissions

We first tested the indexes as correlates of national emissions (Table 1) and then used the domestic policy index (Table 2) and international policy index (Appendix B). We tested these indexes of international and domestic policy stringency with fossil fuel subsidies [53]

and a measure of government discretion [54], with descriptives for all variables given in Appendix A. While authorities disagree about how to measure fossil fuel subsidies [28,55], we know that they range from hundreds of billions of dollars annually to as much as USD 5 trillion [56]. We used conservative estimates, but even so, these subsidies can be quite large. The United States, for example, spent USD 25.31 billion in fossil fuel subsidies in 2017, according to the IMF, and China spent USD 15.52 billion. Russia had the highest subsidies at USD 138.1 billion in 2017. The Varieties of Democracy Clientelism Index [54] is included as we sought to assess each government's discretion outside of formal institutions. We felt such a measure important given that the regimes we are addressing span the continuum from consolidated democracies, to weak and failed states, to monolithic authoritarian regimes.

Control variables, including more traditional correlates of GHG emissions, such as GDP per capita, oil revenue as a percentage of GDP, measure of government discretion, and a clientelism measure were also included (the Varieties of Democracy Clientelism measure). Data on oil revenue and the measure of government discretion from the World Bank [57,58] and the clientelism measure came from VDEM [54], and all were from 2019. We consider the cumulative change in emissions in a reduced sample, the top 55 emitters (those responsible for emissions of 0.23 percent or higher of worldwide emissions in 2018), which together comprised 87.4 percent of the world's emissions in 2018. We also considered the full sample, the universe of 181 countries for which emissions data were available. We constructed the following hypotheses:

H1: ***Domestic Ambition****—A higher domestic climate policy index (measured in variables assessed over the last five years) would yield lower GHG emissions. This hypothesis is not confirmed. Based on our earlier discussion, our theory implies that this hypothesis will not be significant.*

H2: ***International Ambition****—A higher international policy index (measured as when and whether nations participated in the three main environmental agreements between 1987 and 1997) would yield lower GHG emissions in 2018. This hypothesis is confirmed in all three models. The difference in significance between H1 and H2 confirms our broader theory regarding the divergence between domestic and international ambition.*

H3: ***Fossil Fuel Subsidies*** *(in Billions)—For the IMF estimate of explicit subsidies [53], higher subsidies should be associated with higher greenhouse gas emissions. The hypothesis is confirmed for some models, confirming also our broader theory that the role of fossil fuel interests in a nation's economy impacts both emissions (Table 1) and domestic climate policy formation (Table 2).*

H4: ***Clientelism****—The presence of discretion in policymaking may be linked to higher emissions (Table 1) and also to less ambitious climate policy (Table 2). If nations are not forced, with transparency and accountability, to exercise stringency, their emissions will likely be on the high side. This hypothesis, based on the Varieties of Democracy clientelism measure [54] is confirmed in some models. We originally also tested VDEM accountability and rule of law indexes, substituting these and Clientelism into the equation (but using no more than one of these as they covaried). The three had similar effects on the models, and hence we decided to leave "clientelism" which in our view was the most encompassing of the three.*

Table 1 shows the correlates of GHG emissions from 181 nations (N = 126 due to omitted data) and the 52 top emitters (N = 40 due to omitted data). Note that in addition to the variables represented in the hypotheses, we add two economic measures of "state capacity" as control variables (GDP per capita and size of government budget as a percent of GDP) and a measure of a nation's fossil fuel dependence (oil imports as a percent of merchandise imports).

Table 1. Correlates of GHG Emissions Per Capita in 2018.

	Dependent Variable: **2018 GHG Emissions**		
	Basic Model (1)	**Full Sample (2)**	**Top Emitters Model (3)**
GDP per Capita	0.004	0.006	0.023
	(0.005)	(0.004)	(0.017)
Domestic Ambition	10.501	1.657	−58.245
	(65.649)	(61.606)	(193.060)
International Ambition	−53.197	−208.170	−490.030
	(149.051)	(144.731)	(422.004)
Explicit Fossil Fuel Subsidies (in Billions)	11.076 *	13.922 ***	14.608 *
	(5.778)	(4.294)	(7.829)
VDem's Clientelism		−269.415	−384.226
		(427.952)	(1422.318)
Population (Logged)	150.383 ***	62.514	32.264
	(45.615)	(41.965)	(115.005)
Government Budget Size		−11.243	−8.984
		(8.070)	(22.029)
Fossil Fuel Imports (% of Merchandise)		11.321	55.432 *
		(10.134)	(28.093)
Constant	−2121.511 ***	−190.838	522.373
	(750.889)	(870.081)	(2485.297)
Observations	171	105	36
R^2	0.127	0.224	0.347
Adjusted R^2	0.100	0.159	0.153
Residual Std. Error	993.747 (df = 165)	644.877 (df = 96)	994.323 (df = 27)
F Statistic	4.789 *** (df = 5, 165)	3.448 *** (df = 8, 96)	1.792 (df = 8, 27)

Note: Asterisks denote statistical significance at various levels. One asterisk (*) refers to $p < 0.01$, and three asterisks (***) refers to $p < 0.001$.

Table 2. Correlates of Domestic Policy Stringency.

	Dependent Variable: **Domestic Ambition**		
	Basic Model (1)	**Full Sample (2)**	**Top Emitters Model (3)**
GDP per Capita		0.00003 ***	0.00002
		(0.00001)	(0.00002)
International Ambition	0.965 ***	0.209	0.488
	(0.240)	(0.238)	(0.403)
Government Budget Size		0.012	−0.012
		(0.013)	(0.021)
Fossil Fuel Imports (% of Merchandise)	−0.034 **	−0.034 **	−0.015
	(0.016)	(0.016)	(0.027)
Explicit Fossil Fuel Subsidies (in Billions)		−0.016 **	−0.015 **
		(0.007)	(0.007)
VDem's Clientelism		−2.573 **	−2.381 *
		(0.655)	(1.318)
Population (Logged)	0.046	0.045	0.139
	(0.067)	(0.069)	(0.109)
Constant	−0.907	−1.468	−1.072
	(1.196)	(1.426)	(2.424)
Observations	149	105	36
R^2	0.125	0.615	0.659
Adjusted R^2	0.107	0.588	0.574
Residual Std. Error	1.484 (df = 145)	1.063 (df = 97)	0.973 (df = 28)
F Statistic	6.887 *** (df = 3, 145)	22.167 *** (df = 7, 97)	7.745 *** (df = 7, 28)

Note: Asterisks denote statistical significance at various levels. One asterisk (*) refers to $p < 0.01$, two asterisks (**) refers to $p < 0.05$, and three asterisks (***) refers to $p < 0.001$.

While the coefficients were small, the models above confirm the fossil fuel subsidies hypothesis. For all three samples, a rise in subsidies is associated with higher 2018 GHG emissions. The association is statistically significant across all models, including the model

run with the full sample and the one restricted to just top emitters (those who emitted at least 0.23 percent). The models above also show strong associations between fossil fuel imports and the 2018 GHG emissions in the same direction, though the association between these and GHG emissions was only statistically significant in the model run with the top emitters. The other finding relevant to our hypotheses is that, as expected, domestic ambition *is not* significant. There is also not enough evidence to suggest that greater international ambition is associated with GHG emissions. That is, fossil fuel subsidies do explain part of the variation in GHG emissions in 2018, but domestic and international policy does not. The other measures, indicators of state capacity (GDP per capita and size of government budget), were also not significant. A range of other factors may affect emissions, such as the nation's "sunk costs" on fossil fuel infrastructure [59] and particularly its use of coal-burning plants) and domestic prices of renewables [60] may be a few of these causes. However, our main objective was to test international and domestic ambition and as with all statistical analysis, we had to make decisions about variable inclusion and address the trade-off between parsimony and completeness.

5. Disaggregating Causes of International and Domestic Climate Policies

Having established the importance of international policy (but not domestic policy) in explaining GHG emissions by nation, we tested the correlates of international and domestic climate policy, expecting there to be little overlap. Broadly speaking, we expect the correlates of a high domestic policy index to follow the same causes we assessed as correlates of emissions in the last section; mainly, we expect international ambition (expeditious "leader-fast" ratification of all international treaties) to be significant.

In these equations, international ambition was highly significant in the basic model, but this level of significance diminished when the other covariates were included. In the full sample model (N = 127), only clientelism and GDP per capita were significant at the 0.01 level (with government budget size significant at the 0.1 level). In the high emitters model (N = 40), clientelism was still highly significant, and international ambition was also significant (only at the 0.1 level). Interestingly, oil revenue and explicit fossil fuel subsidies became highly significant as correlates of domestic climate policy, but with opposite relationships. In other words, the few oil-producing nations among the 40 largest emitters (the industrial nations of the global North with a majority in Europe) had more stringent domestic policies, as did those with lower fossil fuel subsidies.

Table 2 shows that in models with domestic ambition as the dependent variable, several independent variables were significant among the full sample. A key relationship identified by this model provides evidence for the idea that greater clientelism is associated with less stringent domestic climate policy. As clientelism increased, domestic policy ambition decreased. Similarly, fossil fuel imports and fossil fuel subsidies were also statistically significant at high levels for the full sample, indicating that higher fossil fuel imports and subsidies are associated with the diminishment of domestic policy ambition. International ambition, however, was highly significant (at the 0.01 level) only when a few other variables were considered (such as in the Basic Model). The Top Emitter Model, where the sample was restricted to nations that emitted at least 0.23 percent, did not provide evidence for these relationships seen among countries in the full sample.

Broadly speaking, clientelism, fossil fuel subsidies, oil imports, and international ambition correlate with LOWER levels of domestic ambition for the full sample but are not relevant to the ambition levels of domestic climate policy for the top emitters group. The most novel finding here is that nations with a higher degree of clientelism (i.e., lower accountability) generated less stringent domestic climate policies. International policy ("treaty behavior") also impacts domestic policy stringency, but only when a low number of the other variables are tested in the same equation (i.e., in The Basic Model). These findings, presented in Table 2, are consistent with our broader claims. Note that we also evaluated the correlates of international policy ambition, which can be found in Appendix C, although those findings did not add much to our argument.

6. Discussion and Subsample Analysis

A clear pattern exists in the policy outcomes; fossil fuel subsidies and international policy stringency (for the full model) determine nations' domestic climate behavior. Domestic climate policy does not. The former is no surprise, as up to 11 percent of total climate emissions have been attributed to the subsidies on fossil fuels [61] totaling some USD 5 trillion annually. In China alone, this amount was as high as USD 1.7 trillion (12.9 percent of GDP) in 2017 and USD 2.2 trillion (15.2 percent of GDP) in 2019 [62]. The importance of oil revenue in national economies was also evident in the Domestic Policy Index dependent variable models. Oil revenue had a less strong but positive and significant relationship in the domestic policy top emitter group, and international policy and clientelism were also significant among the high-emitter sample. In other words, while higher international stringency and lower fossil fuel subsidies drove down emissions, the relationships between the two policy stringency indexes were less uniform, and the Domestic Policy Index was not significant as a factor in a nation's change in emissions.

To better understand the policy outcomes within subsets of cases with high and low levels of international and domestic policy stringency, we broke the sample of all nations into four sub-samples, presented below. Earlier work sought to break international treaty participants into "leaders and laggards [63]", and to theorize that ambitious mitigators join international implementation groups more readily [64]. We undertake that empirical exercise below, seeking to understand the correlates of leadership in each of the policy areas.

We broke the 181 nations in our sample into four groups based on high and low levels of international policy stringency on one axis, and high and low levels of domestic policy stringency on the other (Table 3 below). While we do not wish to make too much of the conclusions drawn from the statistical analysis that follows, we do believe that the "clean" classification of nations into each ideal type offers a robustness check on the validity of our policy indexes. More importantly, the well-defined behaviors of CELL A, CELL B, and CELL D (with CELL C representing the "outliers" including Canada and the United States with low international stringency and high domestic stringency) demonstrate the importance of continuing to classify nations into these cells (Table 4 below). Such classification allows researchers to better measure baseline domestic policies (our endeavor here), compare policies across nations [64,65], and understand "gaps" between international and domestic policies, and the motivations for these [49].

Table 3. Subsamples Coded by Policy Stringency.

	International Low (< or =2)	**International High (>2)**
Domestic Low (<=2)	CELL A: Internal Conflict and/or Low Income N = 59; 11.13 percent of global emissions GDP per capita USD 5114 Emissions increased more than two-fold Cases include Congo, Myanmar, South Sudan, and Yemen (low-income and conflict-ridden nations, with over 40 percent in Africa)	CELL B: Politically Recalcitrant High Emitters N = 75; 54.32 percent of global emissions GDP per capita USD 8179 Emissions increased more than seven-fold Cases include all the important Kyoto Non-Annex I emitters, China and India, as well as other politically obstructed major emitters such as Australia, Russia, Venezuela
Domestic High (>2)	CELL C: Outliers N = 10; 14.90 percent of global emissions GDP per capita USD 15,002 Emissions increased more than two-fold Cases include a range of outliers including Canada and the US (which did not fully adhere to Kyoto) and other random nations such as Kazakhstan, Laos and Nepal	CELL D: Emission Reducers N = 33; 15.65 percent of global emissions GDP per capita USD 37,756 Emissions increased slightly (13 percent) Cases include European Union members and a few other "climate conscientious" nations such as Japan, South Korea, and South Africa

Table 4. Subsets of Observations Sorted by Domestic and International Policy Stringency.

	Dependent Variable: **2018 GHG Emissions**		
	Cell D (1)	**Cell A (2)**	**Cell B (3)**
GDP per Capita	0.005	−0.004	0.013
	(0.006)	(0.003)	(0.010)
Domestic Ambition	−60.134 *	−84.283	144.261
	(30.426)	(74.002)	(110.538)
International Ambition	114.041	511.982 **	527.699
	(82.394)	(22.985)	(338.124)
Population (Logged)	28.213 *	51.973	−104.461 **
	(15.491)	(50.318)	(49.343)
Government Budget Size	−3.487	−4.178	−20.740
	(4.004)	(8.437)	(12.674)
Fossil Fuel Imports (% of Merchandise)	−1.344	−6.865	20.595 *
	(4.004)	(10.476)	(10.588)
Explicit Fossil Fuel Subsidies (in Billions)	5.429 ***	12.227	21.834 ***
	(1.747)	(13.407)	(4.299)
VDem's Clientelism	−46.708	−59.125	752.769
	(131.304)	(508.915)	(692.919)
Constant	−441.259	−1365.683	0.882
	(298.657)	(1058.780)	(1392.763)
Observations	24	29	46
R^2	0.764	0.477	0.450
Adjusted R^2	0.638	0.268	0.331
Residual Std. Error	93.567 (df = 15)	268.317 (df = 20)	495.564 (df = 37)
F Statistic	6.072 *** (df = 8, 15)	2.279 * (df = 8, 20)	3.784 *** (df = 8, 37)

Note: Asterisks denote statistical significance at various levels. One asterisk (*) refers to $p < 0.01$, two asterisks (**) refers to $p < 0.05$, and three asterisks (***) refers to $p < 0.001$.

International negotiations increasingly demand policy stringency as the United Nations issues warnings that are seemingly direr each year, but only CELL D, consisting mostly of European Union members, with high stringency in both the domestic and international areas, heeds scientist warnings that worldwide emissions need to be near "Net Zero" by 2050. While most of the nations in this exemplary cell have declining emissions, a few still have increasing emissions, meaning that emissions still increased overall (by about 13 percent) between 1995 and 2018. Cell D only accounts for about 15.6 percent of global emissions. Most emissions come from Cell B, developing nations that have retained a nationalist insistence on economic development unimpeded by emissions restrictions under the Kyoto Protocol, and other coal-dependent nations such as Australia, oil-dependent nations such as Venezuela, and gas-dependent nations such as Russia. Emissions increased seven-fold in this group of nations over the two-decade period studied. The other group with low domestic stringency and low international stringency included many of the world's poorest nations (per capita GDP was one seventh that of the "Net Zero Champions" in Cell D), mostly in Africa, and other conflictive ones such as Myanmar and Yemen. Cell C is a small group of outliers, including the US (which did not ratify the Kyoto Protocol at all, dropping its international stringency) and Canada (which left the Kyoto Protocol).

The robust pattern evident here is the significance of fossil fuel subsidies across different categories of policy stringency. Fossil fuel subsidies were strongly significant (though with a smaller coefficient) on GHG emissions for those within Cell D and Cell B. The determinants of policy stringency were less uniform, as international ambition was only statistically significant within Cell A and domestic ambition was slightly significant at 0.1 for Cell D. This is no doubt due in part to the lack of variance, as the nation-state observations were sorted into categories based on their values for these variables. The lack of significance (within the categories) may be partly due to the loose fit of the policy

indexes constructed (particularly that for domestic policy). This lack of significance may further prove our point that domestic policy stringency is less relevant; nations cannot even seem to establish strong domestic policy consistency. Overall, the cells patterned well into coherent groups, with the exception of CELL B, the "outlier" nations (the US, Canada, and eight other nations with low international stringency but high domestic stringency).

The poor parallel between domestic and international policies, as depicted in our indexes, corresponds to broader searches for external validity among domestic climate policy measures. While international agreement ratification is widely recognized as the best indicator of a nation's international environmental policy stringency [38,42,66], there is no such consensus, even in the NDCs of nations, of what constitutes a stringent domestic climate policy. Economists have highlighted the importance of a carbon tax or emissions trading system [67] and the centrality of "Green New Deal" government spending (see for example [68] on US and [69] on Europe). Others focus on curbing the role of fossil fuels and their obstruction of the debate about climate change [9,25,28,70]. However, some do focus more broadly on how nations can leverage policy to "decarbonize" expeditiously [71,72], and others address the direct link to the international system, the NDCs, and their fortification but as "domestic policy" variables, as the Paris system is based on nationally generated NDCs [73]. The debate over how best to mitigate climate change has been underway in earnest for at least 30 years, but no precise policy mix exists as a recipe for diminishing the effects of climate change. Hence, we constructed an index combining three of these.

To be sure, analysts and policymakers do have an ever-improving grasp of policy choices from modeling their impacts, especially sector by sector (see for example [74]). Net Zero targets are increasingly being incorporated as law in a range of nations. As the US Securities and Exchange Commission seeks to verify corporate claims regarding emissions reductions and the European Union's Carbon Border Adjustment Mechanism starts measuring carbon costs of products entering the EU, more precise measurement and accountability may be required of companies seeking to trade on Wall Street and trade in the EU market. This may eventually force national governments to answer more concretely for their emissions reduction pledges, as they have not had to do since the Kyoto Protocol. However, the conclusion of this article must be that the inconsistency we found between nations' outward-facing and inward-facing mitigation policies needs to be measured, adjusted, and ratcheted up.

This imprecision in the most important determinants of domestic climate policy is reflected in the imperfect composition of our domestic climate policy stringency scale even among the three components we test. Still, we did address the three main dimensions debated in the literature: carbon prices, national pledges (versus legislation) to achieve net zero emissions, and the varying specificity of NDCs (see Appendix B on construction of the indexes). Ko et al. [75] reaffirmed that NDCs are erratic as nations fear taking long-term risks by betting too decisively on their NDCs. Hence, "governments will either not pledge or will create a pledge with lots of loopholes" [75]. Separate from the index (as it predates the climate debate by decades and in some nations, centuries), our proxy for the degree of fossil fuel capture of a nation's economy is the size of fossil fuel subsidies, which were highly significant and roundly criticized by analysts for decades [28,61], and, finally, by the United Nations climate negotiators in 2021 [76]. According to the United Nations' own press release, COP26 President Alok Sharma was fighting tears after China and India softened draft language on "the phase-out of unabated coal power and of inefficient subsidies for fossil fuels" simply to a "phase down" coal use. Sharma publicly lamented "the way the process has unfolded" and added that some nations would be "deeply disappointed" about the weakening of the language [76]. The short-lived fossil fuel subsidy mention was seemingly the first such public attribution of fossil fuel subsidies to emissions ever in UNFCCC documents (even in draft form).

More uniformly comparable measures of climate policy stringency, especially at the domestic level, may be forthcoming if the United Nations determines how to best measure such policies concretely and begins to measure those. These standards may "trickle up"

from companies trading on Wall Street or importing into the European Union. Whatever the case, the explanatory power of our two makeshift indices, of international and domestic policy ambition, point to the need for stronger indicators of such policies, at the national and subnational levels, and across dozens of areas.

In the meantime, GHG emissions, a concrete and universally accepted measure of policy outputs, will have to continue to serve as a policy outcome-dependent variable (but with many covariant causes) even if its multicausal complexity is too great for this outcome variable to also serve as the intermediary output between policies and emissions. Strong measures are needed for the direct effects of policies themselves on mitigation. To date, analysts have had to make do with inferring the success (and also failure) of domestic policies based on how national leader claims at UN meetings and in their NDCs, and how emissions levels change over time in that nation.

In addition to highlighting the need for a more direct assessment of the impacts of mitigation policies on outcomes, we show, for the first time in a large N study, the centrality of fossil fuel subsidies (and the fossil fuel companies behind them) in explaining emissions. We also show that the propensity of nations to expeditiously adopt international climate agreements does shape emissions, albeit incrementally and at a pace that is much too slow for activists, and, increasingly, for scientists and diplomats as well [17,18].

Future studies will hopefully be able to measure the effects of fossil fuel subsidies with "country-year unit" longitudinal data rather than our cross-sectional data centered on the first year for which detailed IMF fossil fuel subsidies were available (2017), but with an international policy stringency index which lagged some twenty years (the cumulative behavior of each nation vis-à-vis the three important international climate agreements before the Paris Agreement, which all nations signed expeditiously, meaning it offered no variation). The domestic policy stringency index was based on 2018 data, while the control variables were also included from within two years prior to 2019. While comprehensive data existed at this time only for a cross-sectional analysis by nation, the fact that several variables were still significant, even given such small samples, gives us confidence in our results. Moreover, our finding that an index could be constructed of international, but not domestic, policy stringency and coherence and the association of this stringency with emissions, helps us understand the logic of "leading with the international" as a means for nations to appear to be acting on climate change in international fora, even as they neglect to implement such changes at home.

7. Conclusions: The Need to Lead with Domestic and International Climate Policies

In an influential 20th Century article, Peter Gourevitch [77] formally described the long-emerging, but little-discussed pattern whereby international causes (such as The Great Depression as experienced worldwide) could impact domestic politics. By century's end, globalization and technological improvements had diminished the impacts of national borders, and the ripple effects of the Fall of the Berlin Wall and the Asian Financial Crisis (to name a few), seemed to render the article somewhat anachronistic, if extremely prescient in its moment, as the domestic effects of global causes became self-evident. Climate change policy may epitomize the domestic "blowback" from international policy decisions in the 21st Century, although this characterization may miss the bigger point. Rather than diminishing national sovereignty as technological changes, economic flows, and pandemics may do, the climate negotiations seem to have increased domestic authority by increasing the gap between outward-facing and inward-facing climate policies.

Unlike Gourevitch's "second image reversed", which traced the meaningful reverberations of international policies through the nation-state polities that subscribed to them, it seems that in the climate area, outward-facing international agreement-signing and pledges do not necessarily correspond to domestic policy stringency. We have seen this with statistical models and through qualitative analysis demonstrating that while 108 of 177 nations classified have high international climate policy stringency and thus are "leading with the international", the majority of these (such as Cell B, accounting for the

majority of the earth's GHG emissions) are not associated with domestic policy. "Outward-looking" climate policy may be the ultimate domestic policy, as it represents the projection of nation-states' desired policy reputations to the international community.

However, as others have hypothesized and we have empirically shown, international policy, as pledged by nations at UNFCCC meetings without follow-up accountability, is costless to nations because, in many cases, it is not meaningful. Pledged emissions reductions are not verified, and governments can get away with "cheap talk". Domestic climate policy claims may be more likely to require verification and accountability. Such claims are much less ambitious and can allow nations with high international policy stringency to claim the credit without also having to make more carefully followed claims at the domestic level.

"Leading with the international" may allow nations to showcase the relatively more stringent components of their climate policies, but even their prized "outward-looking" policies are widely considered inadequate in seeking to keep climate change within manageable levels (see for example [7,14,16]). Indeed, Harris stated that dutiful diplomats meet every year seeking to move incrementally toward a solution to the tension between defending their nations' self-interests and the collective action problem presented by climate change. Still, he wrote, "there is a case to be made that the very process of governing climate change internationally has been intended, at least by some countries, to prevent more aggressive action [7]".

In principle, "leading with the international" should also ratchet up domestic policy stringency. The 194 signatories of the Paris Agreement recognized this by tying progress in climate change mitigation to the domestically driven Nationally Determined Contributions (NDCs). For the first time, at the 2021 Glasgow meeting of the UNFCCC, the body formally recognized the need to eliminate fossil fuel subsidies, perhaps the biggest single obstacle to the formulation of more stringent domestic climate policies. This article argues for continuing to shift attention from the international Tragedy of the Commons approach to climate policy to a recognition that the lack of climate policy ambition is better explained by the fossil fuel industry's capture of domestic politics. Unable or unwilling to rachet up domestic policies, nation-states have increasingly used the international policy arena to claim credit for real, or exaggerated, climate ambitions.

If the interest group "capture", which occurs in the form of fossil fuel subsidies worldwide, is called out and addressed, then it may be possible for nations to lead with more ambitious international climate policy, but which filters down to nation-state domestic policies. At that level, nations less obstructed by fossil fuel interest permeation may be more able to ratchet up their NDCs. In other words, if reducing fossil fuel subsidies does become a vital part of domestic policy ambitions, that variable will not "bleach out" other domestic policies in future models, and other domestic policies, such as the ones in our index, might then emerge as statistically significant and normatively meaningful.

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Appendix A. Descriptives of Variables Used

Variable Name	Descriptive Statistics	N
Explicit Fossil Fuel Subsidies (in Billions) Note we used explicit subsidies; total subsidies are double or triple the IMF values we used (for example Russia's total subsidy is the highest at 35 percent of GDP per year	Min: 0, Med: 0.1593, Max: 138.1062, Mean: 4.3024	176
GDP Per Capita Range from $261 per year (Burundi) to USD 114,685 (Luxembourg)	Min: 261.2, Med: 6011.8, Max: 114,685.2, Mean: 14,197.9	176
Oil Revenue (% of GDP) Range from zero (many nations with no oil production to 44 percent (Congo)	Min: 0, Med: 0.015, Max: 43.8, Mean: 3.02	169
Clientelism (VDEM) Min was The Netherlands; Max was Burundi	Min: 0.018, Med: 0.2165, Max: 0.904, Mean: 0.4652	171
Government Budget Size (% of GDP)	Min: 0.00018, Med: 24.91804, Max: 71.99674, Mean: 25.98484	133
International Ambition (Scale from 0–3)	Min: 0, Med: 2.5, Max: 3, Mean: 2.315	181
International Ambition: High (Score > 2)	Frequency: 109	
International Ambition: Low (Score $\leq$ 2)	Frequency: 72	
Domestic Ambition (Scale from 0–6)	Min: 0, Med: 1, Max: 6, Mean: 1.486	177
Domestic Ambition: High (Score > 2)	Frequency: 47	
Domestic Ambition: Low (Score $\leq$ 2)	Frequency: 138	
Greenhouse Gas Emissions in 2018 (Metric Ton per Capita) Min is tiny small island nations with negligible emissions; Max is China (30 percent of global emissions)	Min: 0.11, Med: 47.84, Max: 11,705.81, Mean: 265.46	181
Population	Min: 17,911, Med: 9,952,546, Max: 1,402,760,000, Mean: 42,444,905	178
Population (Logged)	Min: 9.79, Med: 14.874, Max: 21.062, Mean: 15.964	178

Appendix B. Construction of the International and Domestic Climate Policy Indexes

Domestic Ambition [ambition_dom] (Scaled 0–6) includes:

Indicator	Coding	Source
Carbon Pricing	>USD 20 per metric ton: 2, <$20 per metric ton: 1, no price: 0	World Bank's Carbon Dashboard.
Net-Zero Status	Law/Policy: 2, Pledge only: 1, no target: 0	WRI's Climate Watch.
NDC Rating	Absolute target: 2, Intensity Target or Indirect target: 1, No target: 0	Deutsches Institut fur Entwicklungspolitik (DIE)'s NDC Explorer

International Ambition [intl_amb] (Scaled 0–3) includes:

Year	Treaty	Coding	Source
1987	Montreal Protocol	Ratified before 1991: 1, Post-1991: 0.5, Never: 0	International Environmental Agreements Database Project
1992	Convention on Biological Diversity	Ratified before 1996: 1, Post-1996: 0.5, Never: 0	International Environmental Agreements Database Project
1997	Kyoto Protocol	Ratified before 2003: 1, Post-2003: 0.5, Never: 0	United Nations Framework Convention on Climate Change

Treaty	0—Did Not Sign	0.5—Signed Late	1—Signed
Montreal Protocol	2	91	88
Convention on Biological Diversity	5	50	126
Kyoto Protocol	5	83	93
Paris Agreement	7	7	167

Appendix C. Correlates of International Policy Stringency

	Dependent Variable: International Ambition		
	Basic—Full Sample (1)	**Full Sample (2)**	**Top Emitters (3)**
GDP per Capita		0.00000	−0.00001
		(0.00000)	(0.00001)
Domestic Ambition	0.067 ***	−0.014	0.009
	(0.024)	(0.040)	(0.080)
Government Budget Size		0.010 *	0.022 **
		(0.005)	(0.009)
Fossil Fuel Imports (% of Merchandise)	0.011 **	0.012 *	0.014
	(0.005)	(0.007)	(0.012)
Explicit Fossil Fuel Subsidies (in Billions)		−0.002	−0.001
		(0.003)	(0.003)
VDem's Clientelism		−0.282	−0.133
		(0.280)	(0.603)
Population (Logged)	0.035 *	0.045	−0.013
	(0.021)	(0.027)	(0.048)
Constant	−0.181	−0.356	0.372
	(0.342)	(0.556)	(0.895)
Observations	149	105	36
R^2	0.091	0.186	0.300
Adjusted R^2	0.072	0.127	0.125
Residual Std. Error	0.461 (df = 145)	0.424 (df = 97)	0.425 (df = 28)
F Statistic	4.825 *** (df = 3, 145)	3.160 *** (df = 7, 97)	1.713 (df = 7, 28)

Note: Asterisks denote statistical significance at various levels. One asterisk (*) refers to $p < 0.01$, two asterisks (**) refers to $p < 0.05$, and three asterisks (***) refers to $p < 0.001$.

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