Facing Change: Gender and Climate Change Attitudes Worldwide*

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Abstract

Gender differences in concern about climate change are highly correlated with economic development: when countries are wealthier, a gap emerges whereby women are more likely than men to express concern about our changing climate. These differences stem from cross-national variation in men's attitudes. Men, more than women, tend to be less concerned about climate change when countries are wealthier. This article develops a new theory about the perceived costs and benefits of climate mitigation policy to explain this pattern. At the country level, the perceived benefits of mitigation tend to decrease with economic development, while the perceived costs increase. At the individual level, the perceived costs of mitigation tend to increase with economic development for men more than for women. Evidence from existing surveys from every world region, an original ten-country survey in the Americas and Europe, and focus groups in Peru and the United States support the theory.

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An established finding from industrialized democracies is that women tend to express more concern about climate change than do men (McCright and Dunlap, 2011; Franzen and Vogl, 2013, 1004; Egan and Mullin, 2017, 215). We show that this gender gap in climate concern does not exist in poorer countries. In fact, gender differences in climate concern are highly correlated with gross domestic product per capita (GDPpc): when countries are wealthier, a gap emerges whereby women are more likely than men to express concern about our changing climate. The most prominent explanations of gender gaps in political preferences—which emphasize gender differences in political ideology and education—fail to explain the pattern we identify. We reach this conclusion after analyzing climate attitudes in 60 countries using multiple existing surveys.

We propose a new theory about the perceived costs and benefits of policies designed to mitigate climate change. Our starting point, similar to other studies of climate attitudes, is that mitigating climate change involves both costs and benefits (Bechtel and Scheve, 2013; Bechtel, Genovese and Scheve, 2019). These costs and benefits shape whether individuals support decarbonization and are concerned about climate change. They reflect both objective reality about the adjustments countries and individuals will have to make and also more subjective beliefs, shaped by elite cues.

We posit that when countries are wealthier, citizens will generally perceive fewer benefits and greater costs to mitigation. But there is a key gender difference in terms of how individuals perceive the costs of mitigation that increase with economic development: men tend to perceive them as greater. Due to gender differences in work and consumption, men are more likely than women to perceive material costs from mitigation, both to themselves and to society as a whole. Moreover, both climate change and decarbonization evoke considerable uncertainty about the future. Drawing on theories of loss aversion and identity protection, we posit that because men benefit most from current economic and social hierarchies, they, on average, perceive greater psychological costs to adjusting to change. Putting the pieces

together, our theory predicts that *both* men and women will be less concerned about climate change in wealthier countries than in poorer countries, but that men's concern will decline more rapidly, creating a gender gap in climate concern.

We build our theory inductively based on the patterns we observe in existing survey data. From this theory, we deduce new empirical implications, which we test with original data. These data include a survey of nearly 13,000 citizens across ten countries in the Americas and Western Europe, eight focus groups with theoretically-relevant communities and more extensive follow-up surveys in Peru and the United States. Three findings stand out. First, we replicate our earlier finding: the climate gender gap is highly correlated with economic development. Second, using open-ended survey questions and structural topic models (STMs), we find that men tend to attach greater material costs than women to mitigation in the wealthiest countries in our sample, whereas these differences are not detectable in the lower-income countries. Third, to assess the psychological mechanism, we measure how support for group-based dominance is associated with climate attitudes, finding both that men tend to express more support for group-based dominance than women and that dominance attitudes are increasingly correlated with climate skepticism when countries are wealthier. Qualitative data from our focus groups also suggest that American men, more than American women, tend to associate material and psychological costs with mitigation, whereas we observe no gender differences in Peru, our lower-income case.

Our research bridges scholarship on gender, masculinity, and foreign economic policy preferences to uncover new correlates of public attitudes towards climate change, a topic often marginalized in political science (Green and Hale, 2017). More broadly, our theory and research design offer a new approach to studying how gender shapes individuals' preferences for foreign economic policy. As scholars of international political economy (IPE) increasingly turn towards the study of those preferences, our research demonstrates the value of a comparative lens that can explain both across- and within-country variation and might

be extended to other policies and identities. Our work also advances research on gender and politics. In particular, it contributes to a growing interest in political masculinities, by exploring how masculinity shapes public concern about an important political economy issue.

The Puzzle: Variation in the Climate Gender Gap

To identify the extent of a gender gap in climate concern across countries, we explore data from the 2016/2017 AmericasBarometer and the 2015 Pew Global Attitudes Survey. These surveys have large, high-quality samples, comparable questions about climate change, and cover countries with varying levels of economic development.

Together, the surveys cover 60 unique countries. The AmericasBarometer includes 29 countries in North, Central, and South America and the Caribbean. The Pew survey covers a wider geographic range, including 40 countries across Europe, Africa, Asia, the Pacific, and the Americas. In both surveys, respondents were asked how serious of a problem they thought climate change was and answered using four-point scales (see Appendix A). To facilitate comparison, we standardize the responses across the global sample and examine gender differences by subtracting men's average response from women's average response for each country.[1] Higher values indicate that women, on average, perceive climate change as more serious than men.[2]

A clear pattern emerges in Figure 1: gender gaps in climate concern are highly correlated with economic development, which we operationalize using logged GDPpc. Put differently, mitigating climate change becomes a "women's issue" when countries are wealthier. Although

[1]We standardize this outcome measure such that it compares a respondent's level of concern to the global average across countries (i.e., how many standard deviations a respondent's value is from the sample mean.) This approach allows us to simultaneously compare both gender differences within countries and variation in the relative level of climate concern across countries.

[2]The results that follow replicate if we use the original 4-point scale for each survey.

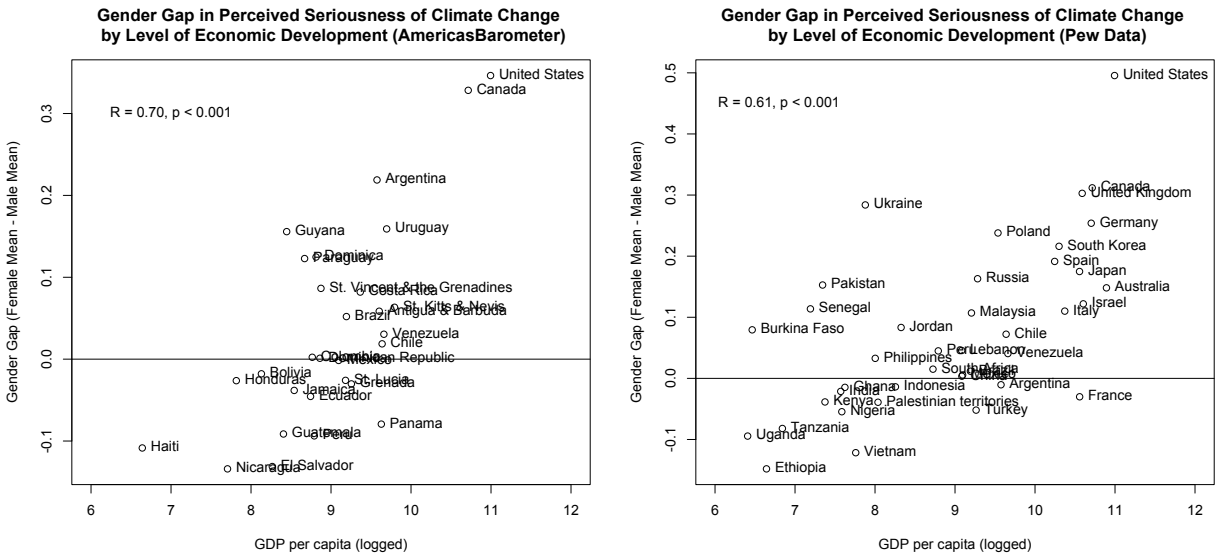


Figure 1: **The gender gap in climate concern by country and level of economic development, 2015-2017**. Data are from the AmericasBarometer (left panel) and Pew (right panel), with climate concern standardized so that the mean value is 0 and the standard deviation is 1. The values are highly correlated for both surveys. AmericasBarometer: $\rho = 0.70$, $p < 0.001$. Pew: $\rho = 0.61$, $p < 0.001$.

the United States has the largest gender gap (about 0.5 standard deviations in the Pew survey and 0.35 standard deviations in the AmericasBarometer), we observe large gaps in many other wealthy countries, including Canada (about 0.3 standard deviations in both surveys), the United Kingdom (about 0.3 standard deviations in the Pew survey), and Germany (about 0.25 standard deviations in the Pew survey). These differences are substantial; for example, the average gender gap in ten advanced democracies in stated support for public jobs—an influential finding in the literature on gender and political preferences—is 0.17 standard deviations (Iversen and Rosenbluth, 2006, 15).

Gender gaps tend to decrease but are still present when countries are less wealthy, as in Argentina and Russia, and, in both surveys, the correlations hold when we exclude the wealthiest countries. In some of the poorest countries, such as Ethiopia and Haiti, the gender gap even appears to reverse, although these differences are small substantively. Our puzzle, thus, is: why is the gender gap in climate concern correlated with country wealth?

Existing Theories and Their Limits

The large literature on gender and political preferences reveals two plausible theories that might explain our empirical puzzle. The first is that as countries become wealthier, women generally move to the left of men politically (Inglehart and Norris, 2000). The dominant explanation of this pattern is that, in an era of high divorce rates and increased labor market opportunities, women support policies that partially socialize family work, thus freeing up their time and enabling them to work outside of the home (Iversen and Rosenbluth, 2006). If climate change is an issue that citizens on the left care more about, then the patterns that we observe in Figure 1 could simply be an extension of well-established gender gaps in ideological preferences in wealthier countries.

To investigate this possibility, we return to the AmericasBarometer and Pew data. Table 1 contains the baseline models on which we build. In mixed-effect linear models, we regress climate concern on variables indicating the respondent's gender, the country's logged GDPpc, and their interaction. As Models 1 (AmericasBarometer) and 4 (Pew) show, the cross-level interaction terms are positive and highly statistically significant, as we would expect from Figure 1. Women perceive the threat of climate change to be more serious than men when countries are wealthier. To test whether the gender gaps we observe in wealthier countries are merely an extension of ideological differences, we add a measure of individuals' self-placement on a left–right scale to the regressions in Table 1. Higher values for this variable indicate that the respondent is more right-leaning (see question wording in Appenxi A). As expected, the coefficient estimates for ideology are negative in Models 2 (AmericasBarometer) and 5 (Pew), reflecting that right-leaning respondents view climate change as a less serious problem than left-leaning respondents. Importantly, the cross-level interactions maintain their magnitude and significance with this control.[3]

[3]Although not our focus here, Appendix B provides an initial empirical investigation of the triple interaction between gender, ideology, and GDPpc.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	(AmericasBarometer)				(Pew)	
(Intercept)	0.996*	0.641	0.114	0.858*	3.170*	3.244*
	(0.463)	(0.395)	(0.347)	(0.352)	(1.325)	(1.367)
Women	−0.880***	−0.999***	−0.522***	−0.432***	−0.612*	−0.632*
	(0.095)	(0.102)	(0.141)	(0.061)	(0.279)	(0.282)
GDPpc	−0.108*	−0.045	−0.031	−0.098*	−0.298*	−0.311*
	(0.052)	(0.043)	(0.037)	(0.038)	(0.132)	(0.136)
Women x GDPpc	0.101***	0.114***	0.060***	0.057***	0.080**	0.075**
	(0.011)	(0.011)	(0.016)	(0.007)	(0.028)	(0.028)
Ideology		−0.028***	−0.012***		−0.048***	−0.048***
		(0.002)	(0.002)		(0.006)	(0.006)
Education			0.026***			0.011***
			(0.002)			(0.002)
Household Income			0.006***			0.016
			(0.001)			(0.010)
Log Likelihood	-53871	-43943	-32687	-59789	-11595	-11292
Num. obs.	38780	31628	24619	44099	9202	8982
Num: country	29	22	20	40	12	12

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Table 1: **The individual- and country-level predictors of climate concern**. The results are from mixed-effect linear models. Data are from the AmericasBarometer and Pew, with climate concern standardized so that the mean value is 0 and the standard deviation is 1. GDPpc is logged.

The second plausible explanation is that as countries develop, women come to see climate change as a collective welfare issue. Studies in the U.S. and other wealthy democracies generally attribute gender differences in environmental concern to gendered patterns of socialization that begin in early childhood. Women and girls are socialized to be nurturing and other-regarding, while men and boys are socialized to express dominance (Mohai, 1992; Davidson and Freudenburg, 1996; McCright, 2010). When countries are wealthier, women, on average, may know more about climate change, causing more women to understand it as an issue that affects a society's collective welfare. In this instance, we would expect women to express more concern when countries are wealthier, and to a greater extent than men in their countries.

To address this possibility, we introduce a variable measuring the respondent's educational attainment to the regressions in Table 1. We also control for household wealth, which

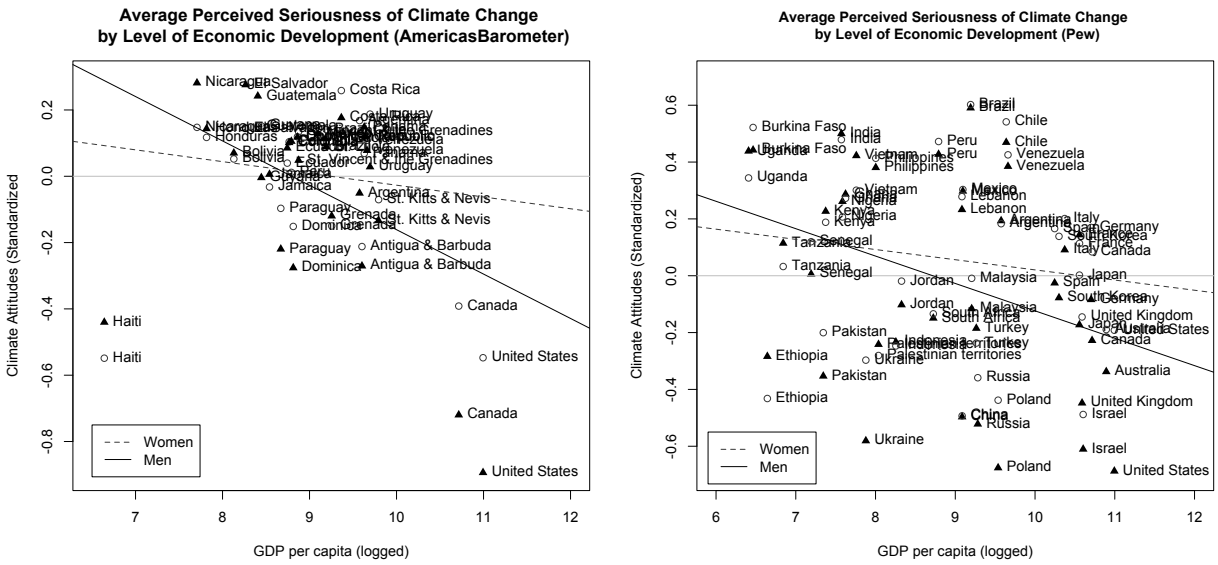


Figure 2: **Men and women's climate concern by country and level of economic development**. Data are from the AmericasBarometer (left panel) and Pew (right panel), with climate concern standardized so that the mean value is 0 and the standard deviation is 1.

is highly correlated with education. As Models 3 (AmericasBarometer) and 6 (Pew) show, better-educated respondents express more climate concern. Yet the cross-level interaction between respondent gender and country GDPpc remains statistically significant and positive.[4] As a further test, Figure 2 uses the surveys to examine men's and women's average levels of concern about climate change across the observed range of GDPpc. On average, women in wealthier countries care *less* about climate change than women in poorer countries (although not to the same extent as men). The evidence is not consistent with women beginning to see climate change as a collective welfare issue when countries are wealthier; rather, the change appears to be driven by sharper differences among men.

We ran six sets of additional tests to establish the robustness of our findings. First, we sought to identify every major cross-national survey over the last decade with questions on

[4]Differences in education likely help explain men's greater concern in very low-income countries. Appendix C shows that the "negative" gender gaps there disappear once we control for education and political sophistication.

climate attitudes to examine whether our core finding holds across other surveys. It does (see Appendix D). Second, we show that the strong correlation between GDPpc and the gender gap in climate concern is robust to excluding the Anglo-American countries with the largest gaps in Figure 1, as well as to excluding the poorest countries in the sample (Appendix E). Third, we show that our results are robust when controlling for additional country-level variables, including gendered occupational segregation, executive ideology, the presence of leftist and green parties, human development, women's status, and oil rents, among others (Appendix F). Fourth, we demonstrate that our results are robust to controlling for additional individual-level variables, including political knowledge, media consumption, marital status, number of children, age, and faith in technology and government, among others (Appendix F).[5] Fifth, we use alternative dependent variables, including support for the Paris Climate Agreement, which is strongly correlated with climate concern, and for which we also observe a widening gender gap in wealthier countries (Appendix G). Sixth, we analyze immigration as a placebo issue, showing that there is not a clear relationship between GDPpc and the gender gap in attitudes on this issue, suggesting our finding is specific to climate (Appendix H). Having conducted these analyses, our conclusion remains unchanged: men express less concern about climate change than women when countries are wealthier. We now turn to developing a new theory to explain the patterns in Figures 1 and 2.

Gender and the Perceived Costs of Climate Action

We assume that individuals' climate preferences are rooted in considerations of both material interests and values. State policies concerning climate change, from carbon taxes to emissions trading schemes to subsidies, involve both costs and benefits and thus create winners and losers (Mildenberger, 2020, 9-10). We develop our theory (summarized in Figure

[5]Pew and the AmericasBarometer did not ask questions that identify individuals working in industries especially affected by climate policy. Appendix F.3 contains a related analysis from our original survey.

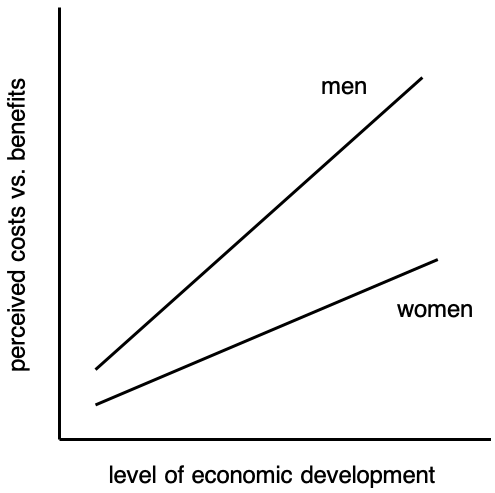


Figure 3: **The perceived costs vs. benefits of climate change mitigation depend on a country's level of economic development and an individual's gender**. As the costs become larger relative to the benefits, individual concern about climate change will decrease.

3) in two steps. First, we argue that the perceived benefits of mitigation decrease with economic development, while the perceived costs increase. We thus expect both men's and women's climate concern to decrease with economic development. Second, how individuals perceive the material and psychological consequences of decarbonization depends on both their gender and their country's level of economic development. We argue that the perceived costs (vs. benefits) of mitigation increase with economic development more for men than for women. Consequently, we expect men's climate concern to decrease faster with economic development than women's, resulting in the gender gap we observe. These patterns will obtain because concern about climate change is correlated with believing that the benefits of mitigating climate change outweigh the costs. We present survey evidence consistent with this assumption in Appendix I.

Country-Level Perceived Costs and Benefits

We first consider *country-level variation* in the perceived costs and benefits of policies mitigating climate change. We expect that, on average, citizens in poorer countries will be more

concerned about climate change than citizens in wealthier countries for three reasons.

First, the perceived benefits associated with mitigating climate change are greater for poorer countries, on average, due to their underlying climate vulnerabilities. These benefits have been empirically established, although we are agnostic about the extent to which our theory requires that cross-national differences in perceived costs and benefits be actual as opposed to merely perceived. There are several reasons why poorer countries tend to be more vulnerable to climate change than wealthier countries: agricultural economies depend more on variations in the climate; they tend to be located in regions that are already relatively hot and therefore closer to their climate "ceilings;" and poorer countries are more likely to be poorly governed and have fewer resources to direct towards responding to extreme weather events and rising sea levels (Mendelsohn, Dinar and Williams, 2006). By contrast, wealthy countries tend to be less vulnerable to climate change and have more resources to invest in adaptation. Therefore, the benefits of mitigating climate change (though real) can appear less pressing to citizens in wealthy nations. This observation is supported by the 2015 Pew survey. On average, citizens in wealthier countries are much less concerned about climate change harming them than respondents in poorer countries ($\rho = 0.64$, $p \leq 0.001$).[6]

Second, the perceived costs associated with mitigating climate change tend to be greater in wealthier countries. Developed countries will have to make larger adjustments in absolute terms to meet global emission standards, such as those set by the Paris Climate Agreement. Of course, in relative terms, the costs to developing countries are higher, since they have fewer resources to devote to decarbonization and must accomplish it at the same time as they develop. Nevertheless, we emphasize that mitigation policies in developed countries—for example, various carbon taxes—often run into substantial resistance, contributing to perceptions of cost. The media, politicians, and industrial lobbies have significantly shaped

[6]Respondents' perceptions of how much stopping climate change will harm them and their country are strongly correlated in our original data, as well.

the public's beliefs about the costs of mitigation in wealthy countries, including through disinformation campaigns (Dunlap and McCright, 2011; Tesler, 2018). Their cues stoke particular concerns among the putative losers from mitigation. Efforts to decarbonize thus confront "huge obstacles" because they involves wealthy countries paying present-day costs to yield future benefits, and these costs fall disproportionately on established industries (e.g., coal, oil, and gas producers) (Keohane, 2015, 21). Because citizens in wealthy countries are, on average, more likely to be sensitive to the costs associated with decarbonization, we expect them to also be less concerned about climate change.

Third, countries' specific choices about climate policies reinforce these dynamics. Insofar as international cooperation on climate change involves support for adaptation projects in poorer countries, citizens there may perceive a further benefit, whereas citizens in wealthier countries may perceive a further cost. Moreover, climate policies in poorer countries often involve providing direct and immediate benefits to citizens, such as payments for ecosystems services to reduce deforestation or bringing clean energy to communities that previously were off the grid (e.g., Jayachandran et al., 2017).

To be clear, individuals' perceptions of the costs and benefits of climate policies in our theory derive from national-level factors. Our approach draws on the growing emphasis within IPE on how individual preferences about trade and other economic policy issues are powerfully shaped by beliefs about how those policies affect the country overall (e.g., Mansfield and Mutz, 2009; Guisinger, 2017; Bush and Prather, 2020). According to this research, citizens are often poorly informed about the effects of foreign economic policy. Thus, they turn to mass media, politicians, and other elites to gain understanding. Such cue-givers are generally commenting on *national-level* policies and outcomes. By consuming this information, the public can come to care greatly about the national consequences of policies such as trade or climate change mitigation. Although one could also theorize how wealth *within* countries relates to perceptions of costs and benefits as well as climate concern,

that is not the level at which our theory operates.[7]

The data we examined earlier guided our theory-building on the perceived costs and benefits of mitigation. Consistent with our theory, climate concern tends to be lower in wealthier countries (see Sandvik, 2008). As Figure 2 showed, both men and women in wealthier countries on average express less concern about climate change than their counterparts in poorer countries. This decline is particularly pronounced among men. While our theory was built inductively from patterns identified in existing data, below we deduce and test additional empirical implications of our theory that we test with newly-collected data.

Individual-Level Perceived Costs and Benefits

The second level of our theory considers *individual-level variation* in the perceived costs and benefits of mitigation. We theorize that the perceived costs (vs. benefits) are larger when countries are wealthier, *but for men especially.* Previous studies have also noted how individuals vary in their perceptions of the costs and benefits associated with mitigation (e.g., Bechtel and Scheve, 2013; Stokes, 2016; Bechtel, Genovese and Scheve, 2019; Gaikwad, Genovese and Tingley, 2022). Within a country, for example, the person living in a low-lying coastal community may be more concerned about climate change because she is vulnerable to rising sea levels. Similarly, the person working in the oil industry may be less concerned because of wage considerations if fossil fuel taxes are adopted.

Gender is a less-appreciated facet of how citizens perceive the costs and benefits of mitigating climate change. We propose two ways in which the perceived costs and benefits associated with mitigation are gendered. First, men and women differ in their assessments of the *material* costs, which may reflect personal or collective considerations and are related to patterns of employment and consumption. Second, men and women differ in their assess-

[7]For further discussion, see Appendix J, where we suggest country-level factors shape citizens' perceptions about the costs and benefits of climate action in ways that are theoretically distinct from the effects of personal income.

ments of the *psychological* costs associated with decarbonization. These are the perceived costs that relate to maintaining one's identity. We argue that, on average, men will perceive greater material and psychological costs associated with mitigation than women.

As with country-level perceived costs and benefits, perceptions of individual costs and benefits may reflect both objective reality and also subjective beliefs—shaped by cues from the politicians, media, and industries—about the winners and losers from decarbonization. In addition, in some countries, the emergence of the perceived costs and benefits we theorize may be conditional on partisanship. For example, we argue below that support for group-based dominance becomes more likely to be related to men's climate attitudes in wealthier countries through our psychological mechanism. To the extent that partisan identity is correlated with support for group-based dominance, partisan ideology may moderate the relationship between economic development and the emergence and size of gender gaps. We find evidence of a moderating effect in the United States, as we explain below.[8]

Key to our argument is that men's perceptions of the costs of decarbonization will be particularly high in settings where the overall costs of decarbonization are made salient. As we theorized above, wealthier countries are one such setting. Thus, we expect that in wealthier countries, the gender differences we theorize below will emerge. In poorer countries, where the costs of mitigation are generally perceived as low and the benefits as high, gender gaps will not emerge. In such instances, both men and women will express relatively high levels of concern for climate change and support mitigation policies.

For the purposes of exposition, we consider material and psychological costs separately. Although they are distinct conceptually, we do not claim that they are entirely independent mechanisms either theoretically or empirically. Men may be less concerned about climate change than women in wealthy countries for *both* material and psychological reasons. It is

[8]Although a full exploration of these dynamics is mostly left for future research, Appendix B provides an initial empirical exploration as noted earlier.

also plausible that gender differences in the perceived psychological costs of decarbonization reflect underlying gender differences in patterns of employment and consumption. We leave the question of exactly how material and psychological costs interrelate to future research, while noting that the relevance of both material and values-based considerations in our theory is consistent with other key findings in the literature (e.g., Bechtel, Genovese and Scheve, 2019; Kennard, 2021).

Perceived Material Costs

The perceived material costs of climate change mitigation refer to the expenses—in terms of money, time, or inconvenience—citizens believe they will pay due to a decarbonization policy. For example, if a country adopts a carbon tax, some citizens will be compelled to change their employment and leisure activities. Workers in carbon-intensive industries could face job losses or reduced wages, and even those not employed in these industries would have to pay more for gasoline as consumers.

There are three reasons why we expect men to be more sensitive to these types of costs than women, and we expect this heightened sensitivity will attach to climate attitudes when the perceived country-level costs of mitigation are high. First, men's employment patterns tend to be more carbon-intensive than women's since men are more likely to be employed in extractive sectors such as oil, natural gas, and mining. As a consequence, men are more likely to face material costs from climate change mitigation due to job losses or lower wages. As expected, workers employed in such sectors are less likely to support decarbonization (Bechtel, Genovese and Scheve, 2019).

Second, research from European countries reveals that men's consumption habits tend to be more carbon-intensive than women's (Räty and Carlsson-Kanyama, 2010, 7). To the extent that some men's preferred consumption activities (e.g., driving low-mileage vehicles or eating carbon-intensive foods) depend more than do women's on carbon usage, men, on

average, are more likely to face material costs from policies designed to discourage such activities.

Third, men in wealthier countries are more likely to be sensitive to the *collective* costs of mitigation, whether related to employment or consumption. Even if men do not believe that they will personally face job losses or more expensive leisure activities, they may be more concerned, on average, about the material costs that society as a whole will pay in these regards. Sociotropic concerns powerfully shape preferences for trade and other foreign economic policies (Mansfield and Mutz, 2009; Ahlquist, Clayton and Levi, 2014; Bechtel, Hainmueller and Margalit, 2014). Since the losers from decarbonization are frequently framed in masculine ways—as workers in industries such as coal or steel or as drivers of low-mileage vehicles—we expect men to be more attuned to the associated material costs, even if they do not anticipate having to pay them personally.

We developed our theory to be consistent with what we have already found: on average, men's concern about climate change will decrease relative to women's when countries are wealthier. It also offers several new observable implications. First, we expect that both men and women in higher-income countries will perceive greater material costs to mitigation than citizens in lower-income countries. Second, in higher-income countries, we expect that men will perceive greater material costs to climate action than will women, whereas we should observe no gender gaps in lower-income countries. Third, we expect that men will vary in terms of perceived sociotropic costs; in higher-income countries, men who identify more closely with other men will express less concern about climate change as compared to men without strong gender solidarity, and this pattern will not exist in lower-income countries.

Perceived Psychological Costs

The perceived psychological costs of climate change mitigation refer to *non-material* adjustment costs. As with material costs, psychological costs could be linked to patterns of

employment, consumption, or both. In this case, however, the costs are related to *identity*. In the case of a carbon tax, for example, the changes some individuals will have to make in terms of their jobs and lifestyles might cause them to experience hardship in terms of losing a valued professional identity or form of self-expression.

There are two reasons we expect men will be more sensitive to these costs than women when countries are wealthier. First, perhaps due to some of the same gender differences in patterns of work and consumption that we have already noted, eco-friendly behaviors are often perceived as feminine in wealthy countries, whereas some men associate carbon-intensive consumption activities with masculinity (Daggett, 2018; Willer et al., 2013). Thus, individuals in wealthier countries may perceive decarbonization as harming men and constraining some traditional forms of masculine self-expression. We thus expect that men, on average, will be more likely to view decarbonization as psychologically costly than will women. Elite messages that frame climate action as involving personal sacrifices, which men may view as more burdensome on average, likely shape these perceptions (Tesler, 2018).

Second, when the perceived costs of climate action are high (as in many wealthy countries), men may be more likely than women to oppose mitigation policies because doing so implies fundamentally reshaping the economy with unknown consequences. Moreover, decarbonization also means coming to terms with likely-profound societal changes. Because climate change will almost certainly bring "major disruptions to human life" (Keohane, 2015, 19), facing this reality is likely most psychologically costly for people with the highest current levels of societal privilege (McCright and Dunlap, 2011, 1164). This idea has been a prominent theme in scholarship on American climate attitudes (see, e.g., Benegal and Holman, 2021). Because men benefit more than women do on average from current economic and social hierarchies, they tend to "downplay or ignore environmental risks" (Kahan et al., 2007, 474). We extend this scholarship to consider how it applies cross-nationally, positing that men *in wealthy countries in particular* will tend to perceive greater psychological costs

to addressing climate change. This is both because contemplating a world with unabated climate change as well facing the challenges of decarbonization evoke broad and potentially-uncertain social and economic changes. These costs will be less salient when the perceived benefits to such action are high, as they are in poorer economies (Norgaard, 2006; Sandvik, 2008).

Our expectation is that when countries are wealthier, men will be more likely than women to perceive psychological costs associated with climate action. Our theory can be tested by examining variation *among* men based on their commitment to existing group-based hierarchies. In higher-income countries, we expect that men who are more attached to traditional gender hierarchies (or hold group-based dominance attitudes more generally) will be more sensitive to the psychological costs of decarbonization. Because the country-level benefits of climate-action are high, we do not expect variation in dominance attitudes among men to be associated with climate attitudes in lower-income countries.

To sum up, we theorize that citizens will express less concern about climate change as national wealth increases because, at least for some, the perceived costs of climate action will begin to outweigh the benefits. We further expect, on average, this calculation to be starker among men than among women because men tend to attach greater material and psychological costs to climate action when they perceive the benefits as relatively low (as is the case in wealthier countries). By contrast, when the perceived benefits to climate action are relatively high (as in lower-income countries), there will be fewer gender differences in climate attitudes, with both men and women expressing high levels of concern.

Research Design

To test our theory, we adopted a mixed-method research design.[9] First, we surveyed citizens in ten countries in the Americas and Western Europe that exhibit substantial variation in GDPpc, ranging from less than $7,000 (in Colombia and Peru) to over $60,000 (in the U.S.). The survey helps us test our theory's observable implications using large, diverse samples.

Second, we chose two countries as locations for focus groups and a follow-up survey: Peru and the United States. Since focus groups do not involve representative samples, their findings cannot generalize to the populations as a whole. Instead, they help us understand how people think about the costs and benefits associated with climate policies. As Cyr (2017, 1041) notes of the focus group method, "Their social form helps participants to work through more complex or inter-subjective concepts and questions. Consequently, they can be useful for achieving greater measurement validity and for understanding why individuals think as they do." We use the focus group data for both these goals: to test the validity of how we measure the perceived material and psychological costs of decarbonization; and to probe whether the associations in the large-N data correspond with our theory.

Case Selection

Three considerations informed our decision to study publics in the Americas and Western Europe. First, although we restrict our focus to countries in two world regions with strong linguistic and cultural ties (Anglophone, Lusophone, and Hispanophone) and enjoy the benefits of control that come with that, we are also able to study countries at varying levels of economic development. Doing so ensures variation on a key explanatory variable. Second, we can build on our analysis of the AmericasBarometer and Pew surveys, which sample heavily from these regions. Finally, our sample enables us to engage with previous studies while

[9] Appendix K discusses research ethics related to our data collection.

shedding light on less-understood cases. On the one hand, it includes the United States, which has been studied extensively, in part because of its importance for global greenhouse gas emissions. On the other hand, it includes Latin American countries, such as Brazil, that have received more limited scholarly attention, even though they are also significant for global climate policy. Our cases are largely "on the regression line" and appear to be representative of the general trend that we identified in Figure 1. This approach allows us to test the implications of our theory in cases where we think it is most likely to operate.

Data Collection Strategy

Our ten-country survey was conducted in two waves—during the summers of 2019 and 2020—through Netquest, a firm that draws its sample from a diverse online panel of respondents. We sampled approximately 1,300 respondents in each country, which leads to a total sample size of nearly 13,000 respondents. In addition to basic demographic and political attitudes questions, we asked questions about climate concern and how respondents perceived the costs of combating climate change. We also ran a follow-up survey in mid-2021 with 1,300 respondents in both the U.S. and Peru to test additional implications of our theory.

We conducted focus groups in Peru and the United States in late 2019 and early 2020. The focus group moderators asked participants about the costs they thought they or others would incur if their country adopted new policies to mitigate climate change. We stratified the focus groups by participant gender and residence (urban vs. rural), such that we had four focus groups in each country.[10] In Peru, we conducted focus groups in Lima and a rural area outside of Lima. In the United States, we held focus groups in an urban area in central Tennessee and a rural area in southwestern Kentucky. On average, our focus groups had eight participants and lasted about an hour and a half.

We recruited focus group participants through local networks in each setting and sought

[10]Further details, including on recruitment, participants, and questions, can be found in Appendix L.

to include a range of people and perspectives. In the United States, however, our focus groups had an important constraint: we invited respondents who identified as conservative, Republican, or both. Limiting participation in this way allowed us to hold party identification constant, such that differences across our groups did not reflect the growing U.S. gender gap in party identification. We wanted to ensure that differences across groups were not due to general ideological differences and partisan sorting between American men and women, which would be the case, for instance, if our women's focus groups included mostly Democrats and our men's focus groups included mostly Republicans.

Moreover, focusing on conservatives made sense because the U.S. gender gap is driven by Republicans.[11] In the AmericasBarometer, for example, American women who identified as Republican were 0.4 standard deviations more concerned about climate change than Republican men ($p < 0.001$), whereas there was no gender gap among Democrats ($p = 0.84$). Because U.S. gender differences are driven by Republicans, we designed our focus groups to detect these differences. In Peru, neither gender, ideology, nor an interaction between the two is a significant predictor of climate attitudes, and thus we did not restrict recruitment. Finally, the Kentucky focus groups had an interesting feature. Because we recruited participants by connecting with a local Republican group, the men's and women's groups often drew from members of the same household (i.e., spouses). Thus, gender differences there should not reflect participants' different household or family experiences.

To analyze the focus group data, we employed a qualitative research center at one of our universities to develop a coding system based on the focus group protocol and a preliminary review of the anonymized transcripts. The coders identified 64 unique themes that were mentioned across the groups. Next, two research assistants unfamiliar with the project's

[11] Appendix B analyzes ideology as a moderator cross-nationally as noted earlier. Although gender gaps are not always among conservatives, we do observe this pattern in other wealthy democracies, suggesting that the U.S. is not an outlier in this regard. Unfortunately, we cannot use our focus group data to examine whether and why there are partisan differences in gender gaps in the United States due to the design.

aims applied the coding scheme to the transcripts. Each participant statement was treated as a separate quote and could be assigned up to seven codes. Codings of each transcript were compared and any discrepancies resolved to create a single coding for each statement. Across the eight focus groups, we coded close to 2,500 unique statements. Below, we report substantive differences in key themes across the men's and women's groups in both countries and include representative quotes when they are illuminating.

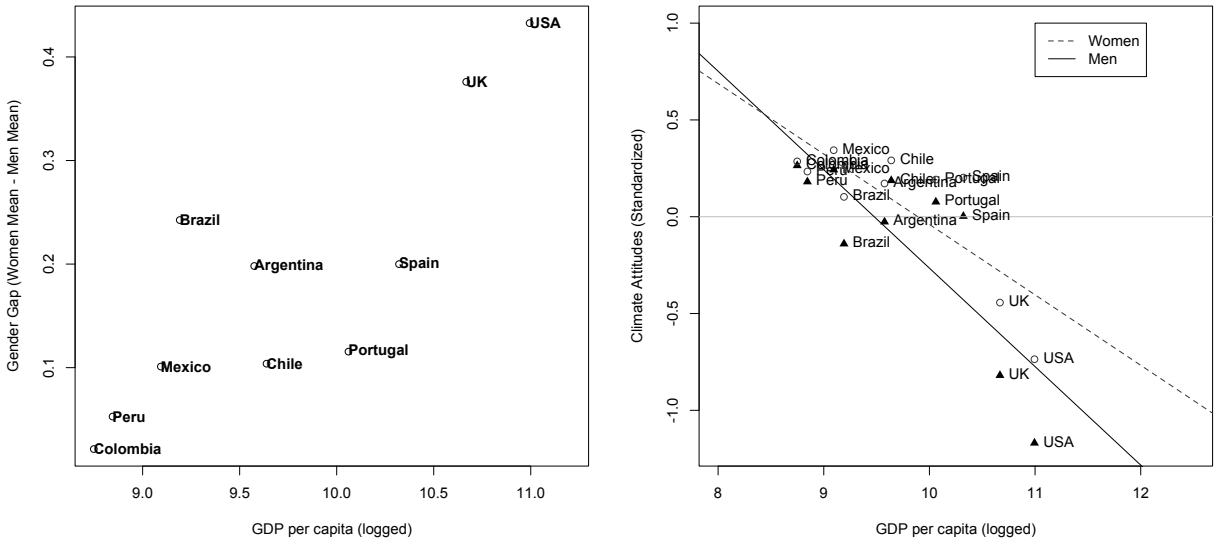
Findings

We test the observable implications from our theory in three steps. First, we examine whether the core findings from existing surveys replicate in our original ten-country survey. Next, we assess cross-national variation in the perceived costs of climate change mitigation. Finally, we assess gender differences in the perceived costs—first material, then psychological—within countries at varying levels of economic development.

Replicating the Gender Gap

Our survey included a measure of climate concern modeled on the AmericasBarometer: "If nothing is done to reduce climate change in the future, how serious of a problem do you think it will be for [Country]?" As above, we standardize responses across the whole sample.

We replicate our two core findings. Figure 4a shows a widening gender gap in climate concern when countries are wealthier. Figure 4b indicates this gap is driven by men respondents. Men's average concern for climate change decreases at a steeper rate than does average concern among women as a function of increasing GDPpc.



(a) Gender gaps

(b) Average levels

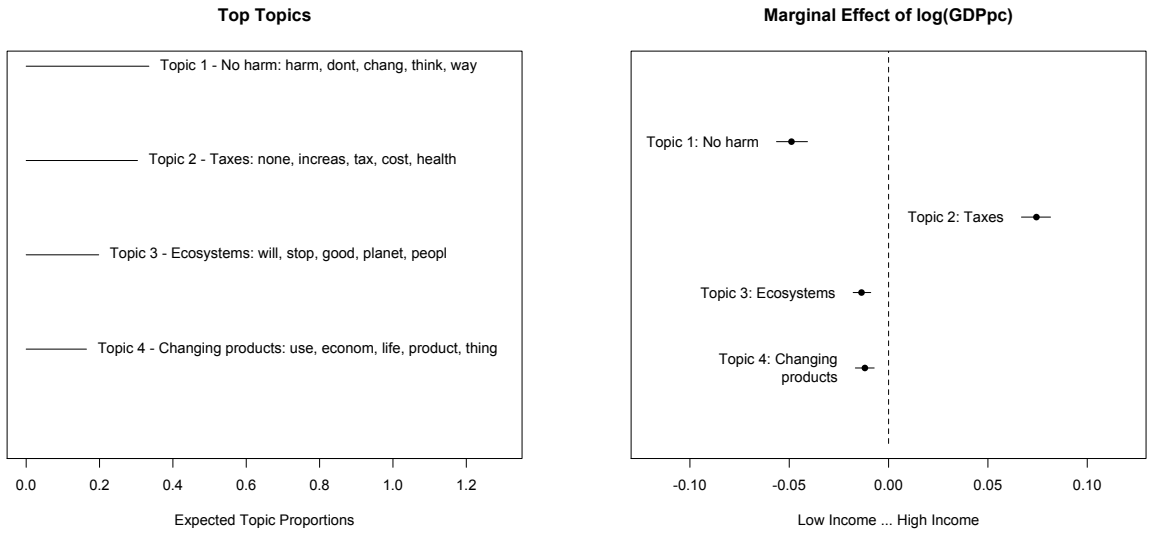
Figure 4: **The gender gap and men's and women's levels in climate concern by country and level of economic development, 2019-2020**. Climate concern is standardized so that the mean value is 0 and the standard deviation is 1. Gender gaps are highly correlated with GDPpc: $\rho = 0.83$, $p = 0.003$.

Differences Across Countries in Perceived Costs

Next, we test our expectation that both men and women in higher-income countries will perceive greater costs to climate change mitigation than citizens of lower-income countries. To assess how respondents perceive the costs of mitigation, we asked an open-ended question:

> Acting to stop global climate change may help some people and it may harm some people. We're interested in your opinion. In what ways do you think acting to stop climate change will harm you personally?

We use structural topic models to analyze whether respondents across countries with varying levels of national wealth answered this question differently. STMs involve a semi-automated form of text analysis that enables researchers to discover key themes within open-ended survey responses (Roberts et al., 2014, 1066). We leverage information at the country level—namely our key independent variable, logged GDPpc—to structure the number and



(a) Cumulative topics

(b) Cross-national differences

Figure 5: **The perceived consequences of acting to stop climate change, ten country sample**. *Left panel*: Words and stems associated with the four "topics" in the open-ended responses. *Right panel*: Marginal effect of log(GDPpc) on topic prevalence. Data are from the STM analysis of open-ended responses from 10 countries ($n = 11,435$).

content of topics. For our cross-national analysis, STM diagnostics suggest that responses maximize semantic coherence when they are grouped into four topics. Figure 5a shows the words or stems most associated with each topic and the prevalence of each topic in our dataset. For ease of interpretation, we also provide a label for each topic, which we created from assessing the most common words/stems and the top representative responses from each topic. The models allow us to measure whether topics systematically differ across low- and high-income countries. Figure 5b shows the marginal effect of a one unit increase in logged GDPpc on the frequency with which each topic is mentioned.[12]

The most-referenced topic, Topic 1, which we label "No harm," is significantly more common in poorer countries and contains the words or stems: "harm," "dont," and "think." The most-representative quotes from this topic have a similar tone and suggest that respondents believe that rather than being harmed from decarbonization, they will benefit from it. For

[12]The results are robust to alternative thresholds of topic number and excluding U.S. respondents.

example, the STM diagnostics indicate that the most representative response is: "I don't think that any measure to curb climate change can harm us, quite the opposite..."[13] By contrast, Topic 2, which we label "Taxes," is significantly more common in wealthier countries and includes the words or stems "increase," "tax," and "cost." The representative responses convey that the respondent believes addressing climate change will come with increased material costs. For example, the most representative response is: "Via the imposition of taxes on fossil fuels would lead to a higher tax burden on me because I do not own an electric car." The other two topics have less pronounced differences, and are slightly more common in lower-income countries. Topic 3, which we label "Ecosystems," is not particularly related to costs, but instead expresses a general sentiment about the inter-connected nature of the earth's ecosystems (e.g. "We live on one planet, whatever damage to it, reverberates on a small or large scale in each one of its inhabitants..."). Finally, Topic 4, which we label "Changing products," captures responses about actions that respondents say that they would take to combat climate change. The most representative response is: "Modifying certain daily habits like eating meat, consuming certain products, or changing the ways we consume them." In sum, the STM results show that respondents in higher-income countries attached greater costs to climate action and are less likely to list lifestyle changes that they would be willing to make to bear those costs than respondents in lower-income countries.

Gender Differences in Perceived Material Costs

We test the observable implications of our theory relating to the perceived material costs of mitigation using both survey and focus group evidence.

[13] Perceiving benefits in poorer countries accords with some policies there that provide citizens with direct benefits (e.g., clean electricity).

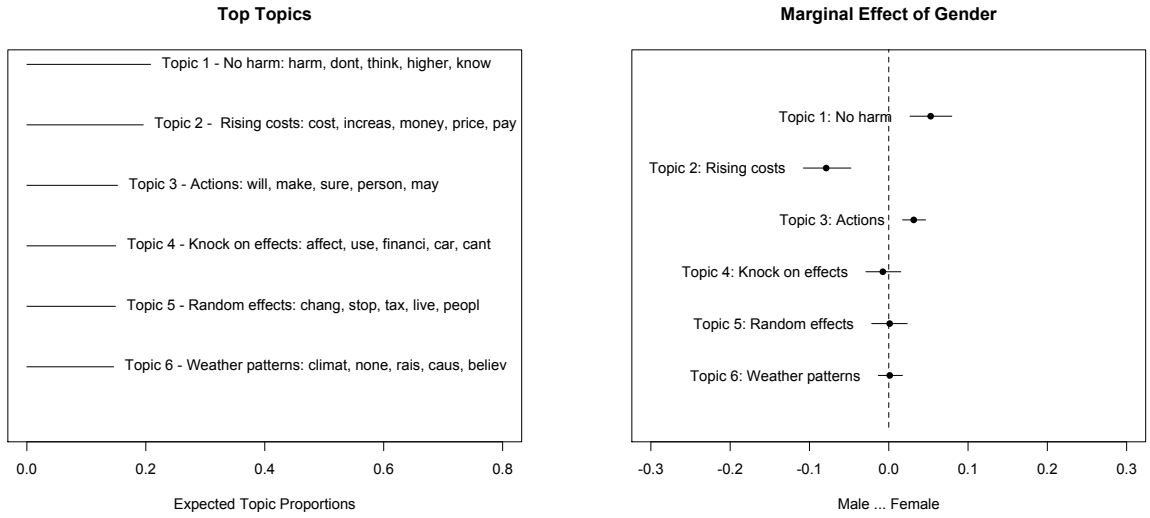
Survey Evidence

We theorized that men will perceive the material costs associated with climate change mitigation more acutely than women when countries are wealthier. We posit that this pattern will obtain because men tend to be more sensitive than women to the costs of climate action that relate to work or consumption. We again use STMs to analyze the open-ended responses about the perceived costs of climate action, this time focusing on how the most-common topics vary by gender within countries. The STMs allow us to leverage information about respondents when structuring the topics. In this case, we use the variables from Table 1: gender, political ideology, education, and household income.

We begin by analyzing responses in the United States, the wealthiest country in our survey. STM diagnostics suggest Americans' responses fell into six topics.[14] Figure 6a shows the words or stems associated with each. Figure 6b shows the marginal effect of respondent gender on the prevalence of each topic. We focus on the two most-frequent topics: Topics 1 and 2. Topic 1 is more prevalent among women ($p \leq 0.001$) and is associated with the following words or stems: "harm," "dont," "think," "higher," and "know." As in our cross-national analysis, we label this topic "No harm." The representative responses convey that the respondent does not think that mitigation policies will harm them (one example is: "I don't think it would be harmful to me at all."). Men were more likely to use language emphasizing Topic 2 words and stems ($p \leq 0.001$), such as "cost," "increas," "money," "price," and "pay." We label this topic "Raising costs." Model diagnostics suggest that the five most representative responses are those highlighted below.[15]

[14] We grouped responses into six topics to maximize semantic coherence. The results are robust to alternative thresholds of topic number.

[15] The STM package in R determines representative responses based on their predicted probability of being in a topic vs. other responses within that topic's corpus (Roberts et al., 2014, 10).



(a) U.S. topics

(b) U.S. gender differences

Figure 6: **The perceived consequences of acting to stop climate change, United States**. *Left panel*: Words and stems associated with the six "topics" in the open-ended responses. *Right panel*: Marginal effect of respondent gender on topic prevalence, controlling for partisan identification, household income, and education. Data are from a STM analysis of open-ended responses ($n = 915$).

Topic 2 - Raising costs: Representative Responses

1. Increase the cost of fuels, reduce the choices available for energy. Require costly upgrades to my home and auto. Increase environmental impact from other areas.
2. Minimally increased cost of consumer goods and/or taxes. Possible (local) government-imposed penalties for not paying potentially mandatory fees.
3. Increased costs for services, electricity, and other goods. Limitations on behaviors.
4. Increase the cost to pay for utilities, increase gas price, reduce the choice in cars I have, increase cost of groceries, increase cost of shipping, cause me to have to relocate to a city so I will be forced to take public transportation everywhere.
5. Less Money in my bank account to spend on other items like food and bills.

The representative responses highlight the perceived material costs of mitigation, especially as they might relate to carbon pricing policies. They suggest that American men tend to perceive costs as consumers, both in terms of money (having to pay higher prices) and inconvenience (having to take public transportation, "limitations on behaviors"). Yet there is also some evidence of perceived psychological costs. The fourth representative response

in the "raising costs" topic ("I will be *forced* to take public transportation;" emphasis added) might be interpreted as having a psychological dimension. As expected, American men, on average, attached greater costs to fighting climate change than do American women.

We observe similar patterns in the United Kingdom and Spain, the two other wealthiest countries in our sample, which also have significant gender gaps in climate attitudes (see Figures 1 and 4a). The main gender differences in both countries relate to perceived material costs, and the words or stems associated with topics more common among men are similar to those found among American men (e.g., "cost," "increas," "energy," and "tax"). The following responses are representative of the topics that are more common among men:

> "Cost of living going up because stores are forced to use more expensive green stuff, taxes whittling down my useable wage further all due to the cost of green technologies" (UK)

> "It would destroy employment in the community where I live because it has an economy that relies heavily on energy." (Spain)

These sentiments suggest a clear concern with material costs. Yet, similar to the U.S., some of the representative responses in the UK and Spain also hint at more psychological costs.

In the lower-income countries in our sample, we observe some differences in the way that men and women talk about climate action. The differences, however, are largely unrelated to material (or psychological) costs. They are generally less coherent and have more to do with themes related to the costs of *inaction*.

As a final set of quantitative tests on gender differences in perceived material costs, we turn to the follow-up survey that we ran in the United States and Peru. We uncover several findings consistent with our argument that men associate more material costs with climate action than do women in the higher-income case but not in the lower-income case. First, we asked questions about respondents' carbon footprints in two common activities that are relatively easy to measure cross-nationally: meat consumption and driving. In

line with our expectations, we find that across categories, Americans have higher carbon footprints than Peruvians, and, within countries, that men have higher carbon footprints than do women. Next, we calculate whether carbon footprints are associated with climate attitudes. In the United States, meat consumption, owning a vehicle, and daily drive time are all negatively and significantly correlated with climate concern, even when controlling for party identification, political ideology, and the type of area the respondent lives in (urban, suburban, or rural), whereas these activities are unrelated to climate attitudes in Peru.[16]

Second, we test two implications of our argument that material costs can be personal or sociotropic and that men, more than women, will be sensitive to the costs of mitigation experienced by men. The first is that we expect men to report feeling closer to other men than do women. To test this implication, we asked respondents how close they felt to different groups, and told them, "By 'close,' we mean the people who are most like you in their ideas and interests and feelings." In both the U.S. and Peru, men report feeling closer to other men than women report feeling close to men. The second is that we expect that men who feel more gender solidarity will express less concern about climate change than men who identify less with men as a group. We do not expect this pattern to hold for other groups (i.e., American women and Peruvian men and women). We adapted a survey question suggested by Bittner and Goodyear-Grant (2017) to measure gender solidarity. For men respondents, the question read:

> In the previous question, you said that you are a man. How closely do you identify with your gender (i.e., other men)? Using a scale from 0–100 where 0 means not at all close and 100 means extremely close, how closely do you identify with other men?

We asked women respondents the same question about their closeness to other women.

[16] In separate models with men and women respondents, we find that the significant correlations in the United States tend to be driven by men respondents (Appendix M). In Appendix M, we also discuss gender differences in two other types of material costs: the price of consumer goods and job losses due to climate action.

Consistent with our expectations, American men who closely identify with other men express less concern about climate change than men who do not feel a strong connection to other men. Across all other groups (i.e., American women and Peruvian men and women), the correlation coefficients are positive: closely identifying with others of one's gender is associated with *more* concern for climate change (see Appendix M).[17]

Focus Group Evidence

We now turn to the focus group data to consider how participants expressed their beliefs about the material consequences of decarbonization. Starting with the U.S., we find that American men were about twice as likely as women to mention the economic impacts of climate mitigation related to job loss (43 percent of men's statements touched on this theme vs. 22 percent of women's statements). Some men mentioned experiences working in industries such as beef, timber, and steel. By contrast, no women mentioned a personal job experience in response to questions about the consequences of climate action.

Men also expressed sociotropic material concerns related to jobs, such as about industries in which they were not directly employed (e.g., automobiles, manufacturing, coal, and natural gas). In some instances, men worried about workers in specific industries (e.g., "The coal industry is one of the biggest driving forces in the state of Kentucky."). In other instances, men expressed concerns about men's positions as traditional breadwinners (indicating potential psychological costs, as well), as in this exchange:

> *Moderator*: Are there particular groups of people that you think are most likely to face the negative consequences of [climate action]?
>
> *Participant*: Businessmen [...] Anybody that runs any kind of industry, [like] your local farm ... They have the same responsibility to their family.

[17] Appendix M reports several additional tests using these data.

Men and women also perceived consumption costs differently. For instance, 13 percent of men's statements touched on taxation or "the redistribution of wealth" during our discussion of climate change policy (e.g., "If they added a $5 a gallon tax on gasoline, that would impact me") vs. 6 percent of women's statements. The most frequently-mentioned consumer item among men was cars. As one man in rural Kentucky rhetorically asked, "Are they going to force us to get rid of our trucks, get rid of our cars, and start driving electric cars?"

Our focus groups in Peru offer a point of contrast. The largest gender differences in Peru related to job loss. More men than women mentioned this theme when contemplating the costs of climate action (55 percent of men's statements vs. 25 percent of women's statements). Sometimes the concerns men mentioned were personal, as several participants referenced working in affected industries (e.g., motorbike taxi drivers, miners, farmers). In other cases, men brought up the costs to the broader community. As one man in rural Peru put it, "There is a debate about an environmental law that might close some mines and would leave many workers unemployed. And when there is no work, we begin to see crime and despair."

Yet there was equivocation among Peruvian men about how difficult it would be to bear the costs related to job loss or reduced wages. Indeed, and as we touch on below, that was among the largest differences between Peruvians and Americans. 34 percent of Peruvian men's statements expressed a willingness to change or adapt to climate action, as did 41 percent of Peruvian women's statements (e.g., "I'd be willing to look for a new job. It would be a change that I would make"). By contrast, in the United States, only 7 percent of men's statements touched on willingness to adapt their lifestyles, whereas 27 percent of women's statements did so.

Finally, Peruvian participants expressed greater belief in the *benefits* of climate action. This pattern is consistent with our theory, as we expect the perceived benefits (vs. costs) of decarbonization to be greater in poorer countries. Several Peruvian men said how environ-

mental regulations might increase employment in male-dominated industries while noting other benefits (e.g., clean water). For example, one man in a rural area said, "If the mines regulate their pollution, the fishermen would be positively affected because the waters would be purer." The material costs that men perceived, then, were more balanced with material gains. Importantly, and as our theory predicts, this finding is likely related to differences between the two countries in the perceived severity of climate change. Twelve percent of American men's statements (vs. 4 percent of women's statements) expressed the sentiment that climate change is "not as bad as people think." In Peru, no participant expressed this belief.

In short, in both countries, more men than women articulated the material costs of climate action. Yet, Peruvian men (and women) also tended to perceive the benefits of climate action and to be more open to change when weighing the relative costs and benefits associated with mitigating climate change.

Gender Differences in Perceived Psychological Costs

Our theory also posits that in wealthier countries, men will perceive greater psychological costs associated with decarbonization than will women. Some of the preceding discussion has hinted at the perceived psychological costs among men in wealthy countries. We now turn to examining this possibility more systematically.

Survey Evidence

We theorized that men who are more attached to traditional masculine identity and group-based hierarchies will be more sensitive to the psychological costs of decarbonization. Because country-level costs are also high, the relationship between support for group-based dominance and concern for climate change should be more pronounced in wealthier countries. A measure of men's commitment to existing group-based hierarchies is their support

for women's rights. We expect that men's support for women's rights will be more correlated with climate concern when countries are wealthier. In other words, sexism will be more strongly correlated with climate skepticism when countries are wealthier. To test this expectation, our survey asked respondents: "When it comes to giving women equal rights with men, do you think the country has gone too far, has not gone far enough or has been about right?" Higher values indicate more support for women's rights.

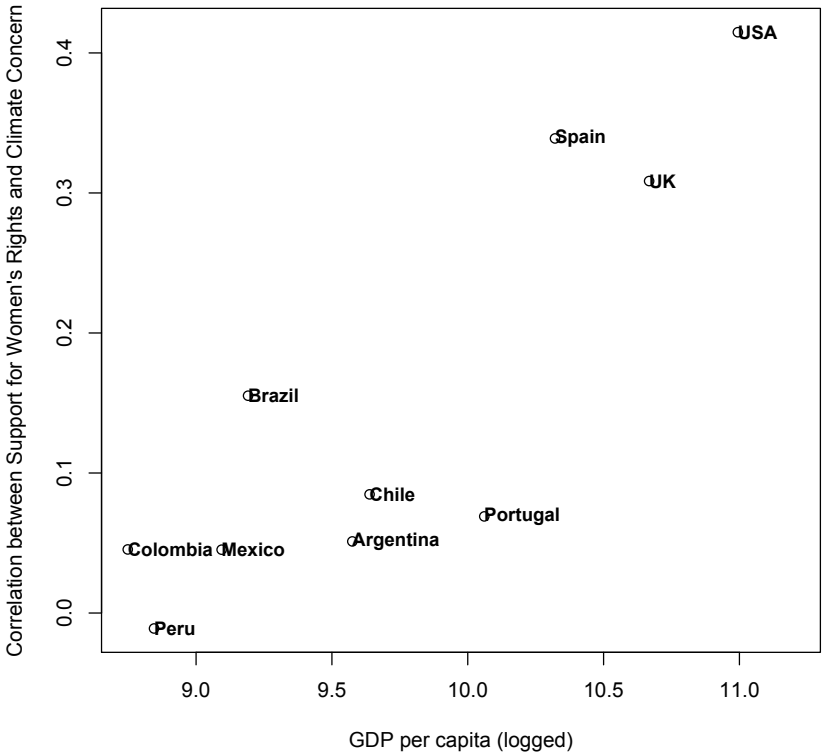


Figure 7: **The relationship between men's attitudes towards women's rights and climate change concern by country and level of economic development.** This figure plots the correlation coefficients, which are highly correlated with country GDPpc: $\rho = 0.87$, $p = 0.001$.

Figure 7 plots the correlation between men's support for women's rights and climate concern by economic development. We find that antagonism towards women's rights and indifference towards climate change are more closely correlated in wealthier countries than

in poorer countries. The correlation between the country-level correlation coefficients and logged GDPpc is high and statistically significant ($\rho = 0.87$, $p = 0.001$). Moreover, in all three of the highest-income countries (the U.S., the U.K., and Spain), the significant association between antagonism towards towards women's rights and climate skepticism holds when we control for respondent party and ideological self-placement.

In our follow-up surveys in the U.S. and Peru, we find similar results using an alternative measure of group-based dominance. We asked respondents to indicate their agreement with the statement: "It is probably a good thing that certain groups are at the top and others are at the bottom." Support for group-based dominance is significantly and negatively correlated with climate concern among American men, controlling of party identification and ideology; $p = 0.05$), but not among Peruvian men ($p = 0.35$). These results support our expectation that men perceive higher psychological costs to combating climate change (and thus are less concerned about it) when countries are wealthier.[18]

Focus Group Evidence

We also examined our focus group transcripts for the connections respondents made between decarbonization and psychological costs. We are particularly interested in any comments men made that related to identity, masculinity, and self-expression. We find that American men expressed more concern than did women that climate action would prevent them from living as they wished. As noted above, American men expressed less willingness to adapt their behaviors in light of climate change (7 percent of men's statements vs. 27 percent of women's statements). Men's statements of resistance to change often referenced words including liberty, choice, regulation, and freedom when talking about climate policy. A

[18] Across countries, we observe a similar pattern among women respondents, although it is not as strong as among men. This pattern is consistent with our argument: women who support existing gender hierarchies and group-based dominance are less concerned about climate change (see Benegal and Holman, 2021). Across countries, men tend to support for group-based dominance more.

representative response was, "I'm more worried about the loss of liberty frankly, and the ability to make those decisions for myself."

For their part, women participants often expressed the sentiment that men would have a harder time adapting to decarbonization. The reasons they gave went beyond purely material considerations. A comment from one woman in rural Kentucky was representative: "I think women are more receptive to change. If they believe in the concept, they're more receptive to change the process. Whereas men are just more stubborn."

In addition, several men discussed the broader social changes that decarbonization might bring, which they framed as negative. One man in rural Kentucky told us, "But that's kind of the real concern. Anytime when you get into something this massive it's [going to cause] a whole lot of unintended consequences." Some men even explicitly connected climate policy to traditional conceptions of gender identity. For instance, in response to a question about the likely consequences of climate policies (i.e., without any prior prompt related to gender), one man in rural Kentucky noted:

> "My great uncle in the 1950s moved to Kentucky, yet he couldn't read or write. My grandfather couldn't either. They cut timber all their lives. I've got a cousin probably got more money than all of us and he's got a sixth-grade education, but he's got enough sense to cut the old timber and let the seedlings grow... [T]hey say science says it's finished... We have the facts, there's no discussion left. Well these are the same people that tell you that there's more than just two genders. And I'm sorry, there's males and there's females. That's it."

His comment hints at both material and psychological concerns in its linkage between climate issues and men's work. Similarly, a man in urban Tennessee noted how he saw climate policy as being tied to wider social change in response to a similar prompt:

> "And half of that bill [the Green New Deal] is really about social justice... So I'm not opposed to [all] environmental regulation; it's just at what cost and, you know, no social justice stuff... I think in general the policies that she [Ocasio-Cortez] was proposing would do a lot to basically tear at the social fabric of this country, when you start giving groups things as opposed to other groups."

When asked later to reflect on how men and women would respond differently to climate action, a man in urban Tennessee reflected on the costs associated with the decline of the male-breadwinner model, noting, "When men don't have jobs, women don't marry them. And when women make more than men, women don't marry them. So, [climate policies] will affect [men] the most." Similarly, one man in rural Kentucky responded, "I'm supposed to be able to provide for my family. You take that right away from me where I can't provide for my family. You've taken my identity." In sum, the U.S. focus groups suggest that psychological costs are an important component of the drawbacks that some American men associate with climate change mitigation.

Turning to the Peru focus groups, we find no evidence that men (or women) perceived decarbonization to have costs relating to their identity or self-expression. One of the ways that psychological costs came up in the U.S. focus groups was through men's comments about how it would impinge upon their freedom. This was not a concern that Peruvians expressed. In fact, most men in Peru saw climate change mitigation as helping workers at the expense of multinational firms. The following quote is representative:

> "The resources are running out now.... The whole history of Peru has been like that. There was guano, then all the guano ran out, they exploited it; there was rubber, the same thing; now there is gas, oil, until they dry up... And in the end, this causes climate change [and] environmental pollution. We are already dying little by little, because of who? From the most powerful."

Thus, broader concerns about maintaining Peru's way of life pushed some men in our Peru focus groups to be *more* concerned about addressing climate change by seeing benefits, whereas the opposite was more often true in the United States.

The other way that psychological costs were brought up by some men in the U.S. focus groups was in their comments that linked decarbonization to broader social changes, including in gender roles. After reviewing the focus group transcripts in Peru, we found that *no* participant connected their opposition to climate change policies using language that indi-

cated their resistance to wider social change. Instead, their opposition was framed in terms of the material costs discussed in the preceding section. If anything, as we have discussed, many Peruvian participants, both men and women, expressed openness to social change as part of addressing climate change (34 percent of men's statements and 41 percent of women's statements). For instance, as one man noted:

> "I don't think it would affect us that much... If we think ahead, it would be worse if we didn't make changes. We have always adapted to change. You adapt, you adapt to a change... The biggest problem is if we don't do anything. I don't think [policies to combat climate change] would personally affect me that much."

In summary, our analysis of the survey data and focus group transcripts suggests that men's attachment to traditional gender hierarchies is more closely linked to their climate concern in wealthier countries. Similarly, men are more attentive to the psychological costs of decarbonization in wealthier countries, as we saw in the U.S. focus groups. Although it is difficult to separate perceived material and psychological costs, we found evidence suggesting that men in wealthier countries are more sensitive to both types of costs.

Conclusion

This paper identified a striking trend: the gender gap in climate concern is strongly correlated with economic development. Although both men and women tend to express less concern about climate change in wealthier countries than in poorer countries, the decline is sharper among men. We developed a new theory to explain the climate gender gap that emphasizes variation within and across countries in beliefs about the costs and benefits of mitigating climate change. Using original quantitative and qualitative data, we found evidence that citizens perceive higher costs to climate action when countries are wealthier, and that this trend is particularly pronounced among men.

This study suggests several promising areas for further research. We highlight two. First,

we did not fully theorize the origins of individuals' perceptions about the costs of mitigating climate change, although we noted that both real-world gender differences in work and consumption patterns as well as elite cues likely play a part. Related to material costs, a survey experiment in a wealthy country might attempt to change perceptions about which groups pay the costs of climate change and examine whether the gender gap shrinks accordingly. On elite cues, we know from previous work in the U.S. that how people form beliefs about the consequences of decarbonization is deeply political (McCright and Dunlap, 2011; Tesler, 2018). To understand when and how mitigation becomes politicized, scholars might examine elite positioning on climate change in countries with varying levels of economic development through a comparative examination of party manifestos. Future research might also examine cases "off the regression line," such as France (where GDPpc predicts a larger gender gap) or Ukraine (where GDPpc predicts a smaller gender gap) to see if our purported causal mechanisms function differently (or not at all) in these contexts.

Second, we tested our theory by examining variation in economic development *across* countries. A different approach would be to study variation within countries *over time*; our theory predicts that a gender gap will emerge as countries become wealthier. As part of our research, we looked for over-time data on climate attitudes from fast-developing countries such as China and India and were unable to identify suitable data over a sufficiently long time period. We anticipate, however, that such opportunities will become available in the future given that climate questions are now commonly asked on major global surveys.

Our work bridges scholarship on IPE and gender politics. For IPE scholars, our findings demonstrate the value of looking more *comparatively* at preferences over foreign economic policy. For instance, scholars have found that in wealthy countries, women are more protectionist than men (e.g., Mansfield and Mutz, 2009, 444; Mansfield, Mutz and Silver, 2015; Guisinger, 2016). Yet the gender gap in trade preferences does not appear to hold in middle-income countries (e.g., Jamal and Milner, 2019, 565). Thus, some explanations of the U.S.

gender gap in trade attitudes—such as gender differences in attitudes about competition or the willingness to relocate for jobs—may be insufficient for explaining why it exists in some countries but not others. For gender scholars, our work contributes to a shift from a traditional focus on the causes and consequences of women's under-representation to a growing interest in political masculinities. Much of the research to-date in this vein focuses on classic comparative politics questions, such as political representation (e.g., Bjarnegård and Murray, 2018) or, for IR scholars, how masculinity shapes international security (Sjoberg, Kadera and Thies, 2018, 850-853). Our study extends this research agenda to IPE and suggests additional promising avenues for inquiry therein.

Finally, our findings are relevant for policy debates about climate change. Our study identifies the material and psychological sources of men's resistance to decarbonization in wealthy countries. Because men are over-represented in elected political positions in almost every country, it is important to understand the origins and maintenance of their climate beliefs (see, e.g., Bromley-Trujillo, Holman and Sandoval, 2019). Since men are more likely to perceive climate change mitigation as having material costs in wealthy countries, compensatory mechanisms might help generate support for decarbonization (Gaikwad, Genovese and Tingley, 2022), similar to their role in generating support for free trade (Margalit, 2011). This solution is likely more suitable, however, for addressing perceived material costs than perceived psychological costs.

At the same time, women's representation in national legislatures is on the rise globally. In 2019, the United Nations passed a resolution advocating for women's increased role in climate governance. Given the gender gap in climate concern in higher-income countries, women's greater role in climate policy may lead to more decisive climate action. However, our finding that *both* men and women in lower-income countries report significantly more concern about climate change than their counterparts in wealthy countries suggests that equitable climate policy also needs to adequately include the voices and perspectives of men

and women from the Global South.

Ethical Standards: The authors declare the human subjects research in this article was reviewed and approved by Vanderbilt and Yale Universities and certificate numbers are provided in the appendix. The authors affirm that this article adheres to the APSA's Principles and Guidance on Human Subject Research. The authors declare no ethical issues or conflicts of interest in this research.

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References

Ahlquist, John S., Amanda B. Clayton and Margaret Levi. 2014. "Provoking Preferences: Unionization, Trade Policy, and the ILWU Puzzle." *International Organization* 68(1):33–75.

Bechtel, Michael M., Federica Genovese and Kenneth F. Scheve. 2019. "Interests, Norms and Support for the Provision of Global Public Goods: The Case of Climate Co-operation." *British Journal of Political Science* 49(4):1333–1355.

Bechtel, Michael M., Jens Hainmueller and Yotam Margalit. 2014. "Preferences for International Redistribution: The Divide over the Eurozone Bailouts." *American Journal of Political Science* 58(4):835–856.

Bechtel, Michael M. and Kenneth F. Scheve. 2013. "Mass Support for Global Climate Agreements Depends on Institutional Design." *Proceedings of the National Academy of Sciences* 110(30):13763–13768.

Benegal, Salil and Mirya R Holman. 2021. "Understanding the Importance of Sexism in Shaping Climate Denial and Policy Opposition." *Climatic Change* 167(3):1–19.

Bittner, Amanda and Elizabeth Goodyear-Grant. 2017. "Sex Isn't Gender: Reforming Concepts and Measurements in the Study of Public Opinion." *Political Behavior* 39(4):1019–1041.

Bjarnegård, Elin and Rainbow Murray. 2018. "Revisiting Forms of Representation by Critically Examining Men." *Politics & Gender* 14(2):265–270.

Bromley-Trujillo, Rebecca, Mirya Holman and Andres Sandoval. 2019. "Hot Districts, Cool Legislation: Evaluating Agenda Setting in Climate Change Bill Sponsorship in US States." *State Politics & Policy Quarterly* 19(3):375–395.

Bush, Sarah Sunn and Lauren Prather. 2020. "Political Side-taking by Outside Powers and Mass Attitudes Towards International Economic Engagement." *International Organization* 74(3):584–609.

Cyr, Jennifer. 2017. "The Unique Utility of Focus Groups for Mixed-Methods Research." *PS: Political Science & Politics* 50(4):1038–1042.

Daggett, Cara. 2018. "Petro-masculinity: Fossil Fuels and Authoritarian Desire." *Millennium* 47(1):25–44.

Davidson, Debra J. and Wiluam R. Freudenburg. 1996. "Gender and Environmental Risk Concerns: A Review and Analysis of Available Research." *Environment and Behavior* 28(3):302–339.

Dunlap, Riley E. and Aaron M. McCright. 2011. Organized Climate Change Denial. In *The Oxford Handbook of Climate Change and Society*, ed. John S. Dryzek, Richard B. Norgaard and David Schlosberg. Oxford: Oxford University Press pp. 144–160.

Egan, Patrick J. and Megan Mullin. 2017. "Climate Change: US Public Opinion." *Annual Review of Political Science* 20:209–227.

Franzen, Axel and Dominikus Vogl. 2013. "Two Decades of Measuring Environmental Attitudes: A Comparative Analysis of 33 Countries." *Global Environmental Change* 23(5):1001–1008.

Gaikwad, Nikhar, Federica Genovese and Dustin Tingley. 2022. "Creating Climate Coalitions: Mass Preferences for Compensating Vulnerability in the World's Two Largest Democracies." *American Political Science Review* pp. 1–19, doi:10.1017/S0003055422000223.

Green, Jessica F. and Thomas N. Hale. 2017. "Reversing the Marginalization of Global Environmental Politics in International Relations: An Opportunity for the Discipline." *PS: Political Science & Politics* 50(2):473–479.

Guisinger, Alexandra. 2016. "Information, Gender, and Differences in Individual Preferences for Trade." *Journal of Women, Politics & Policy* 37(4):538–561.

Guisinger, Alexandra. 2017. *American Opinion on Trade: Preferences without Politics*. Oxford: Oxford University Press.

Inglehart, Ronald and Pippa Norris. 2000. "The Developmental Theory of the Gender Gap: Women's and Men's Voting Behavior in Global Perspective." *International Political Science Review* 21(4):441–463.

Iversen, Torben and Frances Rosenbluth. 2006. "The Political Economy of Gender: Explaining Cross-National Variation in the Gender Division of Labor and the Gender Voting Gap." *American Journal of Political Science* 50(1):1–19.

Jamal, Amaney and Helen V. Milner. 2019. "Economic Self-Interest, Information, and Trade Policy Preferences: Evidence from an Experiment in Tunisia." *Review of International Political Economy* 26(4):545–572.

Jayachandran, Seema, Joost De Laat, Eric F. Lambin, Charlotte Y. Stanton, Robin Audy and Nancy E. Thomas. 2017. "Cash for Carbon: A Randomized Trial of Payments for Ecosystem Services to Reduce Deforestation." *Science* 357(6348):267–273.

Kahan, Dan M., Donald Braman, John Gastil, Paul Slovic and C. K. Mertz. 2007. "Culture and Identity-Protective Cognition: Explaining the White-Male Effect in Risk Perception." *Journal of Empirical Legal Studies* 4(3):465–505.

Kennard, Amanda. 2021. "My Brother's Keeper: Other-regarding Preferences and Concern for Global Climate Change." *The Review of International Organizations* 16(2):345–376.

Keohane, Robert O. 2015. "The Global Politics of Climate Change: Challenge for Political Science." *PS: Politics Science & Politics* 48(1):19–26.

Mansfield, Edward D. and Diana C. Mutz. 2009. "Support for Free Trade: Self-interest, Sociotropic Politics, and Out-Group Anxiety." *International Organization* 63(3):425–57.

Mansfield, Edward D., Diana C. Mutz and Laura R. Silver. 2015. "Men, Women, Trade, and Free Markets." *International Studies Quarterly* 59(2):303–315.

Margalit, Yotam. 2011. "Costly Jobs: Trade-Related Layoffs, Government Compensation, and Voting in U.S. Elections." *American Political Science Review* 105(1):166–188.

McCright, Aaron M. 2010. "The Effects of Gender on Climate Change Knowledge and Concern in the American Public." *Population and Environment* 32(1):66–87.

McCright, Aaron M. and Riley E. Dunlap. 2011. "Cool Dudes: The Denial of Climate Change among Conservative White Males in the United States." *Global Environmental Change* 24(4):1163–1172.

Mendelsohn, Robert, Ariel Dinar and Larry Williams. 2006. "The Distributional Impact of Climate Change on Rich and Poor Countries." *Environment and Development Economics* 11(2):159–178.

Mildenberger, Matto. 2020. *Carbon Captured: How Business and Labor Control Climate Politics*. Cambridge, MA: MIT Press.

Mohai, Paul. 1992. "Men, Women, and the Environment: An Examination of the Gender Gap in Environmental Concern and Activism." *Society & Natural Resources* 5(1):1–19.

Norgaard, Kari Marie. 2006. ""We Don't Really Want to Know": Environmental Justice and Socially Organized Denial of Global Warming in Norway." *Organization & Environment* 19(3):347–370.

Räty, Riitta and Annika Carlsson-Kanyama. 2010. "Energy Consumption by Gender in Some European Countries." *Energy Policy* 38(1):646–649.

Roberts, Margaret E., Brandon M. Stewart, Dustin Tingley, Christopher Lucas, Jetson Leder-Luis, Shana Kushner Gadarian, Bethany Albertson and David G. Rand. 2014. "Structural Topic Models for Open-Ended Survey Responses." *American Journal of Political Science* 58(4):1064–1082.

Sandvik, Hanno. 2008. "Public concern over global warming correlates negatively with national wealth." *Climatic Change* 90(3):333–341.

Sjoberg, Laura, Kelly Kadera and Cameron Thies. 2018. "Reevaluating Gender and IR Scholarship: Moving beyond Reiter's Dichotomies toward Effective Synergies." *Journal of Conflict Resolution* 62(4):848–870.

Stokes, Leah C. 2016. "Electoral Backlash Against Climate Policy: A Natural Experiment on Retrospective Voting and Local Resistance to Public Policy." *American Journal of Political Science* 60(4):958–974.

Tesler, Michael. 2018. "Elite Domination of Public Doubts About Climate Change (Not Evolution)." *Political Communication* 35(2):306–326.

Willer, Robb, Christabel L. Rogalin, Bridget Conlon and Michael T. Wojnowicz. 2013. "Overdoing Gender: A Test of the Masculine Overcompensation Thesis." *American Journal of Sociology* 118(4):980–1022.