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Income Inequality and Political Polarization

Abstract

Value issues such as climate policy, immigration, or identity politics are among the most polarizing policy issues in the U.S. and other high-income countries. That polarization has been rising over the last decades. I investigate a novel channel of income inequality and political campaign contributions on party polarization on the value dimension that is independent of changing voter preferences. In a model of two-dimensional party competition, I show analytically how rising income inequality brings parties' economic policies closer together if campaign contributions are an important factor for electoral success. This lets sensitive voter groups switch their party allegiance and pushes parties to try to distinguish themselves by increasingly focusing on value policy dimension. Income growth, a rising salience of the value issue, and low voter turnout exacerbate this polarization channel. The analysis suggests possible ways forward: 1) a stricter regulation of campaign finances and 2) framing climate primarily as an economic policy issue that puts distributional implications (and remedies) front and center.

JEL-Codes: D630, H230, P160, Q520, Q540.

Keywords: political economy, climate policy, polarization, voting, values.

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1 Introduction

The last decades have seen a growing polarization of political parties in the United States and other OECD countries on many cultural and value-related issues, such as the environment, immigration, gun control, or identity politics. Climate change, in particular, is a policy dimension with very large-scale and long-run implications. Increasing party polarization on the climate issue implies policy uncertainty that could delay important policy measures, undermine investments required for a substantial decarbonization of the economy, and raise costs from stranded assets. While the two major U.S. parties were relatively close on environmental issues in the 1970s, they grew much more polarized in the following decades (Shipan and Lowry, 2001; Nelson, 2002), as the scores by the the League of Conservation Voters (LCV) illustrate in Figure 1 (Dunlap et al., 2016). I contribute to explaining the increasing polarization on policy

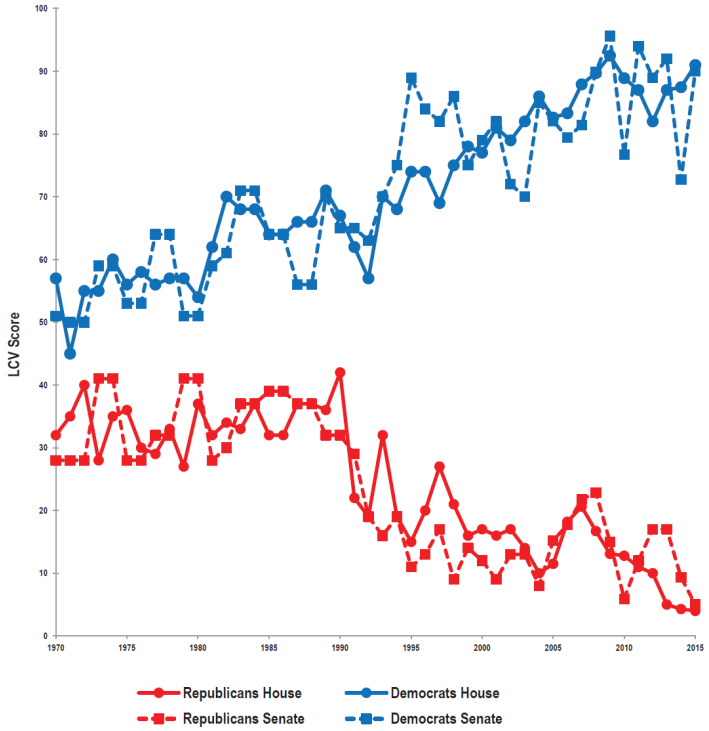

Figure 1: Environmental voting scores for U.S. House of Representatives and Senate since 1970. Source: Dunlap et al. (2016) with data by the League of Conservation Voters.

dimensions that are primarily perceived by voters as value issues, such as climate, by investigating analytically a novel channel on party polarization on the political "supply side" (parties or candidates). Rising income inequality in countries with a prominent role of political campaign contributions leads to voter realignment, converging party positions on classic economic policy, and more diverging positions on the value/climate dimension. This mechanism is not driven by changing voter preferences. Furthermore, income growth does not counteract, but rather adds to party polarization on value policies. The role of donations to political campaigns, predominantly by high-income households, continues to increase in the U.S., as well as the total amount of funds spent in electoral campaigns (cf. Figure 2). Also, the role of private campaign donations is

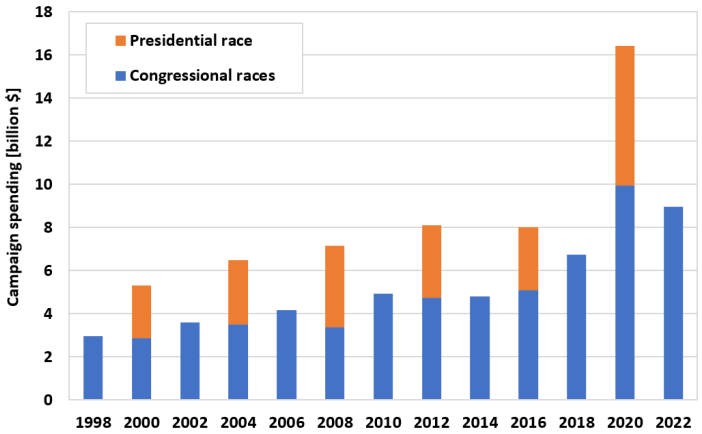

Figure 2: Rising electoral campaign spending in the U.S. (Data: OpenSecrets (2024).

much more prominent in the U.S. than in other majoritarian OECD democracies, such as Canada or the U.K. (cf. Figure 3). My analytical results reflect the importance of this development. By contrast, previous work mostly focuses on the political "demand

Figure 3: Electoral campaign spending in the U.S., Canada, and the U.K. (OpenSecrets, 2024).

side" and examines the changing role of (social) media (Allcott and Gentzkow, 2017; Allcott et al., 2019; Bail et al., 2018; Tucker et al., 2018) and the impacts of expanding college education (Gethin et al., 2022) and of rising economic inequality (Buisseret and Van Weelden, 2022; Buisseret and Van Weelden, 2020) on voter views, the latter including in the context of climate policy (McCright and Dunlap, 2011). On the political "supply side," explanations have focused on ever more sophisticated gerrymandering and other party tactics (McCarty et al., 2009) without accounting for the mentioned economic forces.

I develop a theoretical model of two-dimensional voting over an economic policy (proportional income tax funding a public good) and a "non-economic" value policy between 0 and 1. The voters are heterogeneous in income (log-normal distribution) and in their value/climate preference (uniform between 0 and 1). Following the logic of two-dimensional political competition of Roemer (2006), each of the two parties has two party factions which solve a Nash bargaining game, while the parties form an additional Nash equilibrium: the "Opportunists" cater to the swing voters to maximize the probability of winning, while the "Guardians" maximize the welfare of their respective party supporters. This latter element enables the divergence of party platforms and allows me to analyze the channel of income inequality and growth on party polarization through voter realignment. [2]

A rise in income inequality and campaign contributions by the most affluent voters on the one hand and in income levels on the other hand changes the division of the multidimensional voter space by tilting the set of swing voters: a set of rich socially-liberal

[2] A conventional probabilistic-voting approach could allow for multidimensional political competition, but is not a feasible alternative here as it would entail identical party positions preventing the study of polarization. It may be possible to extend a probabilistic-voting setup to allow for platform divergence. However, the element driving divergence would have to react to an increase in inequality and/or campaign contributions to enable the channel which I examine here, while still accounting for the role of swing voters for the parties' winning probabilities. The present approach fulfills all that in a consistent way.

(pro-climate) voters switch to supporting the more socially-liberal (environmentalist) party, while a set of low-income socially-conservatives (voters with a low climate preference) switches to the more socially-conservative (less environmentalist) party. As a result, the value politics cleavage gains in weight and party divergence on values/climate is reinforced. I show analytically how rising income inequality with effective campaign contributions and economic growth drive this pivot from the economic to the non-economic dimension of political conflict. However, without or with only barely effective campaign contributions, rising income inequality leads to the opposite result: to growing polarization on the economic dimension and decreasing polarization on the value/climate dimension. This underlines the importance of how effective campaign funds are in swaying the electoral outcome in a country. I therefore leverage data by the Project (2024) to find that the analytical results are indeed consistent with empirical facts. Countries with relatively high political campaign spending (U.S., Australia), exhibit stronger party polarization on environmental and value issues in times of rising income inequality than countries with low campaign spending (U.K., Canada, Sweden), e.g. due to strict regulatory limits.

My results also suggest that party polarization on climate policy should not increase if the policies are cast and perceived by the voters in primarily economic or industrial policy terms emphasizing job creation instead of the moral obligation to protect the climate for future generations. The recent successful passing of the Inflation Reduction Act in the U.S., that is the largest climate policy package in U.S. history and puts its economic implications into the spotlight (even in its title) is very consistent with this logic. Emphasizing climate as an economic policy issue also brings to the fore distributional aspects of climate policy, such as compensatory measures for carbon prices, and the potential for compromise. Moreover, I find that a rising salience of the climate issue relative to the economic dimension, as well as a stronger demand-side polarization of voters' views on climate and low voter all reinforce the described channel

of voter realignment that drives party polarization on the value/climate issue.

I first introduce the formal political economy model in Section 2, before showing how it can be used to explain increased polarization (Section 3). I then examine the model results in light of empirical evidence in Section 4, before suggesting possible ways forward for research and policy alike.

2 Model

2.1 Voters

There is a continuum of voters i who can vote for two political parties $m \in \{A, B\}$ and differ along two dimensions: their exogenous income $h_i \in [0, \infty[$, which follows a log-normal distribution ($h_i \sim Lognormal(\mu, \sigma^2)$ with the mean μ and the variance σ^2 of the underlying normal distribution), and in their otherwise stable preferences for the non-economic value dimension $a_i \in [0, 1]$, with the value 0 assumed as representing the socially-conservative pole and 1 the socially-liberal counterpart. Voters derive indirect utility $u_i(\tau, \kappa)$ for a set of policies (τ, κ), such that:

$$u_i(\tau, \kappa) = h_i(1 - \tau) + P(\bar{h}\tau) - \phi(\kappa - a_i)^2, \tag{1}$$

where τ represents income tax rates, κ policy preferences along the non-economic dimension, and $\bar{h}$ mean income.

The voters' consumption utility is linear. The economic policy, a proportional income tax τ, funds a public good that yields the same concave utility $P(\bar{h}\tau)$ with $P'(\bar{h}\tau)$ and $P''(\bar{h}\tau) < 0$ for all voters. Hence, low-income voters prefer a bigger government with higher τ, while high-income voters prefer a less interventionist government with lower τ. Without loss of generality, we assume that no household prefers a tax ≥ 1, limiting $\tau < 1$.

The non-economic policy dimension enters as a quadratic disutility term. Voters suffer more the further the implemented policy κ is from their individual bliss point a_i. The relative salience of the non-economic value issue, represented by ϕ, is the same across all voters. In addition to deriving utility from consumption, the public good, and the value issue, voters can contribute to their preferred candidate's electoral campaigns to raise their probability of winning, as explained below in Section 2.3.

2.2 Parties

The two political parties $m \in \{A, B\}$ compete in a majoritarian electoral system. Voter i prefers the platform of party D to that of party R *iff* it promises a higher utility:

$$u_i(\tau_A, \kappa_A) > u_i(\tau_B, \kappa_B).$$

The set of swing voters who are indifferent between the two parties is characterized by $u_i(\tau_A, \kappa_A) = u_i(\tau_B, \kappa_B)$. This yields a straight line dividing the voter space (a_i, h_i):

$$\hat{a}(h_i) = \frac{h_i \Delta\tau - \left[P(\bar{h}\tau_A) - P(\bar{h}\tau_B)\right]}{2\phi\Delta\kappa} + \frac{\kappa_A + \kappa_B}{2}, \tag{2}$$

with parties distinguishing each other on the economic dimension via different income tax policies: $\Delta\tau = \tau_A - \tau_B$ and along the non-economic, value dimension: $\Delta\kappa = \kappa_A - \kappa_B$. This allows me to write the slope of the swing-voter line as:

$$\frac{\Delta\tau}{2\phi\Delta\kappa} \tag{3}$$

We further assume $\tau_A \geq \tau_B$, so that the voters above this line vote for party A and below for party B (Figure 4). The distribution of voters along the two dimensions h_i and a_i defines the set of swing voters via its influence on the equilibrium party platforms.

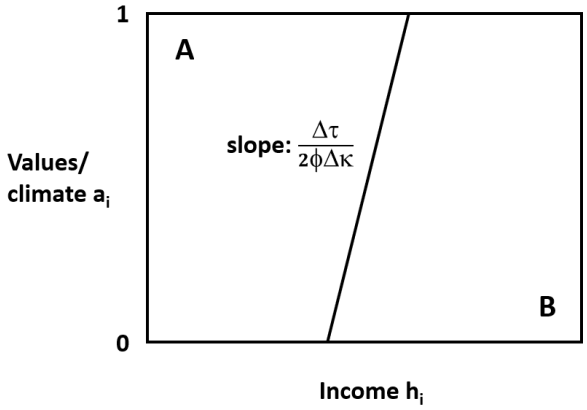

Figure 4: Linear set of swing voters separating the voter space (a_i, h_i)

2.3 Party factions and political competition

The two political parties compete in a two-dimensional policy space $T \subset R^2$. Analyzing party polarization requires divergence of party platforms $t_A, t_B \in T$, going counter to a Downsian median-voter model on the one hand or a standard probabilistic voting model on the other (Grofman, 2004). Both would lead to converging party platforms and fail to explain any polarization.

I here instead assume that each party has two factions: The 'Opportunists' want to maximize the probability of their party winning elections, while the 'Guardians' strive to maximize the average welfare of current party supporters. Each pair of party factions engages in a Nash bargaining game within their own party over the party's platform, while taking the set of policies by the respective other party as given. The equilibrium electoral platforms are then determined in a pure-strategy Nash equilibrium across both parties, on top of the Nash bargaining games between factions within each party. In such a "party unanimity Nash equilibrium" ("PUNE", Roemer 2006), no faction can deviate from the resulting platform without triggering a detrimental adjustment by the other party. The equilibrium platforms diverge because the Guardians within each party represent different sets of voters $H_m, m \in \{A, B\}$. These sets are separated by the swing voter line $\hat{a}(h_i)$ from Equation 2) and contain close to half of the electorate

each. The set of party A supporters is:

$$H_A(t_A, t_B) = \{(a_i, h_i) | u_i(t_A) > u_i(t_B)\}.$$

Conversely, $u_i(t_A) < u_i(t_B)$ holds true for supporters of party B. The resulting aggregate welfare of all supporters of party m, if the policy vector t is realized, is:

$$W^A(t) = \int_{(a_i,h_i)\in H^A} u(t; a_i, h_i)\, d\mathbf{F}(a_i, h_i) = \int_0^\infty \int_{\hat{a}}^1 u(t; a_i, h_i)\, d\mathbf{F}(a_i)\, d\mathbf{F}(h_i) \qquad (4)$$

$$W^B(t) = \int_{(a_i,h_i)\in H^B} u(t; a_i, h_i)\, d\mathbf{F}(a_i, h_i) = \int_0^\infty \int_0^{\hat{a}} u(t; a_i, h_i)\, d\mathbf{F}(a_i)\, d\mathbf{F}(h_i) \qquad (5)$$

for the two parties. The share of party A supporters in the electorate, that is, the probability measure $\mathbf{F}(H_A(t_A, t_B))$ is a discrete number depending on the probability distribution $\mathbf{F}$.

There is party uncertainty about actual voter behavior. When the parties announce their policy platforms at the beginning of an election campaign, the parties believe that the share of voters who prefer t_A to t_B lies in a range of $[-\epsilon, +\epsilon]$ around $\mathbf{F}(H_A(t_A, t_B))$ with a uniform probability distribution within that range. Without this uncertainty, the winner would be known from the start, or the chances of each party to win would be exactly $\frac{1}{2}$. In either case, spending money on election campaigns to try to convince voters would be pointless. The expected probability of party A to win with platform t_A, if party B plays platform t_B, then is:

$$\pi(t_A, t_B) = \frac{\int_{(a_i,h_i)\in H_A} d\mathbf{F}(a_i, h_i) + \epsilon - \frac{1}{2}}{2\epsilon} + \rho\,(C_A - C_B) \qquad (6)$$

with aggregate campaign contributions C_A and C_B (cf. Equations (7) below), respectively, and the effectiveness of campaign financing ρ. The winning probability of party B is $(1 - \pi)$. Building on the logic of Persson and Tabellini (2002, Sec. 3.5), a party's probability to win increases with its advantage in aggregate campaign money and with

the effectiveness of these finances in the campaign.

To determine the contribution $c_{i,m} \geq 0$ of an individual household i to party A or B, it maximizes its expected utility given the party positions:

$$\max_{c_{i,m}} \quad \pi(c_{i,m})u_{i,A} + (1 - \pi(c_{i,m}))u_{i,B} - \frac{\bar{h}}{2h_i}(c_{i,A}^2 + c_{i,B}^2)$$

with a quadratic disutility from contributing $c_{i,m}$ that decreases with household income $\frac{h_i}{\bar{h}}$. The quadratic increase in utility costs implies a saturation of household willingness to contribute.[3] Naturally, this saturation sets in at higher amounts for richer households. The first-order condition for household i's campaign contributions yields

$$c_{i,A} = Max\left[0, \rho(u_{i,A} - u_{i,B})\frac{h_i}{\bar{h}}\right] \quad \text{and} \quad c_{i,B} = Max\left[0, \rho(u_{i,B} - u_{i,A})\frac{h_i}{\bar{h}}\right]$$

using $\frac{\partial \pi(c_{i,A})}{\partial c_{i,A}} = -\frac{\partial \pi(c_{i,B})}{\partial c_{i,B}} = \rho$ from deriving (6) w.r.t. $c_{i,A}$ and $c_{i,B}$. Households donate more when they face a larger utility difference between the two party platforms, if they have a higher income h_i relative to the mean income $\bar{h}$, and if campaign money is more effective (high ρ). Campaign contributions are assumed to be non-negative. As a result, each voter can only contribute to the one party they prefer. Integrating the individual contributions over the respective sets of party supporters yields aggregate campaign contributions that influence the probability to win (6):

$$C_A = \int_{(a_i,h_i)\in H_A} c_{i,A}\, d\mathbf{F}(a_i, h_i) \qquad \text{and} \qquad C_B = \int_{(a_i,h_i)\in H_B} c_{i,B}\, d\mathbf{F}(a_i, h_i) \qquad (7)$$

[3] Including the utility cost of campaign contributions directly into the utility function would be equivalent to the current formulation.

2.4 Party Unanimity Nash Equilibrium (PUNE)

The political competition plays out on two levels simultaneously: intra- and inter-party competition. Two types of politicians try to influence each party's policies: Opportunists try to maximize the party's probability to win and advance their own career. When facing a given policy platform from the respective of other party, the Opportunists' payoff functions are $\pi(t_A, t_B)$ for party A and $(1 - \pi(t_A, t_B))$ for party B.

Guardians, on the other hand, maximize average utility of their constituents while neglecting the probability of actually getting into office.[4] Their respective payoff functions are $W^A(t_A)$ for party A and $W^B(t_B)$ for party B.

Following Roemer (2006, Ch. 8) and Lee and Roemer (2006), the party factions within each party engage in a weighted Nash bargaining game. Thus, the factions in party A choose the policy vector t that maximizes the Nash product, given that party B plays t_B:

$$\max_{t \in T}(\pi(t, t_B) - 0)^{\alpha}(W^A(t) - W^A(t_B))^{1-\alpha}. \tag{8}$$

The corresponding maximization problem for party B, given that party A plays t_A is

$$\max_{t \in T}((1 - \pi(t_A, t)) - 0)^{\beta}(W^B(t) - W^B(t_A))^{1-\beta}. \tag{9}$$

The parameters $\alpha, \beta \in [0, 1]$ denote the relative bargaining power of the Opportunists within their parties. The Nash bargaining weights are: $((\alpha, \beta), ((1 - \alpha), (1 - \beta)))$.

A *Party Unanimity Nash Equilibrium* (PUNE) is defined as two party memberships H^A & H^B, two win probabilities π_0^A & π_0^B, and two sets of policies t_A & t_B, such that:

[4] An additional interpretation of this behavior could be that the Guardians seek to publicly propagate their agenda, even if they end up not putting their policies into practice. In early versions of the PUNE concept, Roemer (2006) included a third faction, the Reformists, who would maximize expected welfare of their voters. Mathematically, the Reformists are redundant.

(1) $H^A \cup H^B = H$, while $H^A \cap H^B = \varnothing$,

(2) t_A solves Equation (14), while t_B solves Equation (15), and

(3) for $(a_i, h_i) \in H^A \Rightarrow u(t_A; a_i, h_i) \geq u(t_B; a_i, h_i)$,
while for $(a_i, h_i) \in H^B \Rightarrow u(t_B; a_i, h_i) \geq u(t_A; a_i, h_i)$.

A PUNE guarantees that endogenously formed party membership is stable. Condition (3) states that all voters prefer to continue supporting their respective party. Neither faction of either party can deviate from their policy positions (t_A, t_B) without making the other faction worse off.

Following a convenient differential characterization of PUNEs, for a policy pair (t_A, t_B) to be a PUNE, the following equation[5] must hold for party A

$$\nabla_{t_A} W^A(t_A) = -\lambda^A(t_A, t_B) \nabla_{t_A} \pi(t_A, t_B) \tag{10}$$

with $\lambda^A(t_A, t_B) := \frac{\alpha}{1-\alpha} \frac{\Delta W^A(t_A)}{\pi(t_A, t_B)}$; and for party B

$$\nabla_{t_B} W^B(t_B) = \lambda^B(t_A, t_B) \nabla_{t_B} \pi(t_A, t_B) \tag{11}$$

with $\lambda^B(t_A, t_B) := \frac{\beta}{1-\beta} \frac{\Delta W^B(t_B)}{\pi(t_A, t_B)}$. Equations (10) and (11) provide a set of four equations with four unknowns $(\tau_A, \tau_B, \kappa_A, \kappa_B, \alpha, \beta)$ for given Nash bargaining weights $(\alpha, (1-\alpha), \beta, (1-\beta))$.

3 Shift in the Political Cleavage

This model allows me to examine how economic factors affect the political party platforms while accounting for competition between and within parties. Economic shocks

[5] Note that the Del or nabla operator ∇_{t_A} indicates a derivative with respect to a vector, in this case t_A, so that $\nabla_{t_A} = \left(\frac{\partial}{\partial \tau_A}, \frac{\partial}{\partial \kappa_A}\right)$ and $\nabla_{t_B} = \left(\frac{\partial}{\partial \tau_B}, \frac{\partial}{\partial \kappa_B}\right)$.

impact the voters' evaluation of party positions and can make some voters switch their party allegiance over time, change the set of swing voters, and increase or decrease the polarization of party positions on both policy dimensions. First, I show that a change in policy divergence on one dimension (for instance, more convergence on economics) leads to the opposite change in policy divergence on the other dimension (more divergence on the value/climate dimension). Second, I analyze the role of income inequality with and without political campaign contributions while preserving mean income. Third, I examine the effects of income growth while keeping the level of income inequality fixed. Fourth and fifth, I investigate the effects of rising salience of the value (climate) dimension and of low voter turnout.

Changes in the voters' distribution or in their preferences can lead the parties to adjust their positions on the economic or the value dimension. As the swing-voter curve is a straight line (for linear consumption utility[6]) and separates the electorate in roughly two halves, its slope $\frac{\Delta\tau}{2\phi\Delta\kappa}$ is a pivotal factor in shaping the groups of voters that the parties represent and for the party platforms. A change in policy divergence on one dimension (for instance, decreasing $\Delta\tau$) affects the slope of the swing-voter curve and leads to a realignment of some voters, as Figure 5 illustrates. The change in the slope may be caused by various shocks, e.g., on the voters' preferences, their distribution, or the public-good technology. Here, I first assume for better tractability that the shock that decreases economic divergence $\Delta\tau$ in the example does not affect the voter distribution in (a_i, h_i) space. In the analyses of shocks on income inequality and per-capita income in the following sections, I consider the various changes in voter distributions separately. A decreasing slope (from black dashed line to red solid line) implies that high-income socially-liberal voters in the upper-right corner switch their support from party B to party A and low-income socially-conservative voters in the bottom-right corner switch from party A to party B. As a result, all voters which party A gains are

[6] Assuming concave consumption utility does not change the qualitative results.

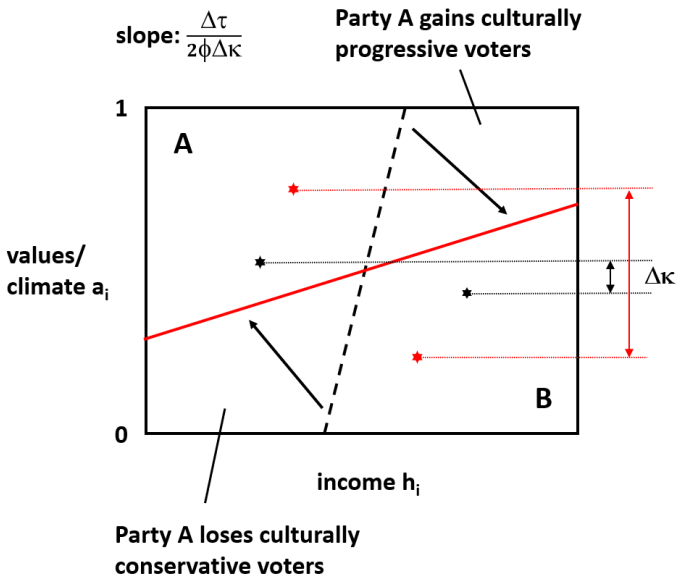

Figure 5: Party realignment of voters for a decreasing slope of the swing-voter curve

more socially-liberal (and richer) than the ones party A loses. The Guardians of party A thus argue for a more socially-liberal (e.g. environmentalist) party position than before the shock (when it was already more socially-liberal than the position of party B). The opposite holds true for party B: all the voters it gains are more socially-conservative (and poorer) than the ones it loses. This makes the Guardians of party B argue for an even more socially-conservative position than before the shock. The set of swing voters, by contrast, which both Opportunist factions cater to, is identical for both parties and its change plays a subordinate role for the party positions on the value issue. Overall, the party divergence on the value dimension $\Delta\kappa$ increases. Moreover, the same party realignment raises the (lower) average income of party A supporters and decreases the (higher) average income of party B supporters. This reinforces the initial convergence of economic party policies ($\Delta\tau \downarrow$) and the resulting divergence of party positions on the value issue ($\Delta\kappa \uparrow$).

A similar logic applies to shocks that trigger a change in party divergence on the value issue $\Delta\kappa$ first. I summarize the described mechanism in Lemma 1 and refer to it in the analysis of economic factors below.

Lemma 1. – Voter realignment and polarization.

An increase (decrease) in policy divergence on one dimension (e.g., the economic issue $\Delta\tau$) while the voter distribution in (a_i, h_i) space remains unchanged leads to a party realignment of voters resulting in a decrease (increase) in policy divergence on the other dimension (the value issue $\Delta\kappa$): $\frac{d\Delta\kappa}{d\Delta\tau} < 0$ or $\frac{d\Delta\tau}{d\Delta\kappa} < 0$.

3.1 The Role of Income Inequality

The assumed log-normal income distribution is a good representation of real income distributions in democratic high-income countries, such as the U.S. today. Median income is $h_{med} = e^{\mu}$ and mean income is $\bar{h} = e^{\mu + \frac{\sigma^2}{2}}$. I measure income inequality here as the ratio of median income to mean income $\frac{h_{med}}{\bar{h}}$.

In the decades since 1970, income inequality in the U.S. and other OECD countries has been rising (cf. Figure 6). Here, I examine the role of income inequality separately from

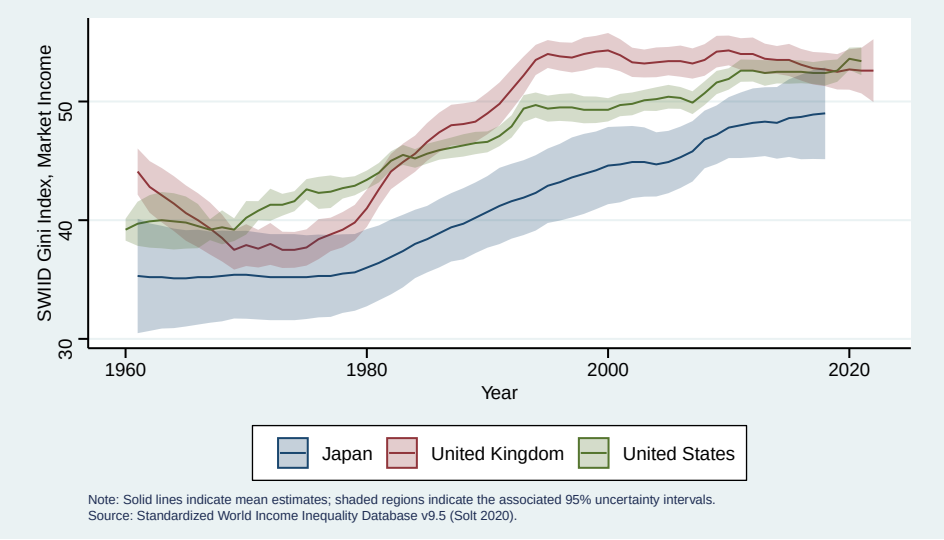

Figure 6: Rising Gini indices of market incomes in the U.S., the U.K., and Japan (Solt 2020).

the economic growth which historically happened during the same time, first without ($\rho = 0$) and subsequently with effective campaign contributions ($\rho > 0$). To this end, I introduce an increase in σ^2 – the variance of the normal distribution underlying the log-

normal income distribution and, therefore, the parameter capturing income inequality. While doing that, mean income $\bar{h} = e^{\mu + \frac{\sigma^2}{2}}$ remains constant. Such a mean-preserving increase in income inequality implies a decrease in median income $h_{med} = e^{\mu}$. Moreover, the change in the income distribution does not affect the voters' distribution on the value dimension.

Since the swing-voter curve is upward sloping and party A represents the voters with more socially-liberal views (by definition) and with lower income (as a model outcome) in the upper-left corner (cf. Figure 5), the average income of party-A supporters decreases when campaign contributions play no role ($\rho = 0$). At the same time, the average income of party-B supporters must increase to ensuring a constant overall mean income. The Guardian factions of both parties seek to follow their voter groups, while the Opportunists' reasoning does not change. As a result, the party positions unambiguously diverge more on the economic dimension. This party divergence on economics leads to a realignment of voters (cf. Lemma 1), a steeper swing-voter curve and more party convergence on the value/climate issue ($\Delta\kappa \downarrow$). Proposition 1 sums up this result.

Proposition 1. – Rising inequality without campaign contributions.
If campaign contributions are ineffective ($\rho = 0$), then a mean-preserving rise in income inequality leads to additional party divergence on the economic issue ($\Delta\tau \uparrow$) and additional convergence on the value (climate) issue ($\Delta\kappa \downarrow$).

Proof. See Appendix B.1. □

However, this result changes with a larger role for electoral campaign spending. Success or defeat in political competition is not only determined by the voters' views and the candidates' strategic choice of platforms. Electoral campaigns today often involve large organizations with hundreds of voluntary grassroots activists and paid workers and extensive advertising in traditional and social media. All of these measures aim to

improve a candidate's chances of winning and they mostly consume vast amounts of resources. The political system in the U.S. exhibits my far the largest volumes of campaign spending (cf. Figure 3) compared to other OECD countries. The campaign budgets have also been rising over the last decades (cf. Figure 2) illustrating their growing importance. Furthermore, the U.S. Supreme Court has ruled out previous legal limitations on corporate contributions to political campaigns in 2010.[7]

Rich voters donate larger sums and are strongly overrepresented in campaign donations to both parties. Furthermore, in the context of the present model, their willingness to donate is higher the closer their preferred candidate is to their own policy preferences. With effective campaign donations, the parties' Opportunist factions try to maximize their parties' probabilities to win by catering not only to the swing voters, but also to those wealthy donors who predominantly replenish their campaign funds. The role of campaign donations adds an additional term to the marginal effects of changes in the economic policies τ_A and τ_B on party A's probability to win π:

$$\frac{\partial \pi}{\partial \tau_A} = \frac{1}{2\epsilon} \int_0^\infty -\frac{\partial \hat{a}(h_i)}{\partial \tau_A} dF(h_i) + \underbrace{\rho \left(\frac{\partial C^A}{\partial \tau_A} - \frac{\partial C^B}{\partial \tau_A} \right)}_{<0} \tag{12}$$

and

$$\frac{\partial \pi}{\partial \tau_B} = \frac{1}{2\epsilon} \int_0^\infty -\frac{\partial \hat{a}(h_i)}{\partial \tau_B} dF(h_i) + \underbrace{\rho \left(\frac{\partial C^A}{\partial \tau_B} - \frac{\partial C^B}{\partial \tau_B} \right)}_{>0} \tag{13}$$

which are part of the parties' first-order conditions 10 and 11. For party A, marginally increasing the tax rate τ_A and thus widening the gap between τ_A and τ_B boosts donations by (on average richer) party-B supporters more than donations by party-A supporters. This worsens party A's campaign budget relative to party B and induces an additional

[7] Citizens United v. Federal Election Commission, 558 U.S. 310 (2010).

incentive to reduce party A's tax policy τ_A. For party B, increasing its tax rate τ_B partially closes the gap between τ_A and τ_B and in a similar way reduces donations of party-B supporters by more than those of party-A supporters.[8] That increases party A's probability to win π (i.e., decreases party B's probability to win $(1-\pi)$) and provides an additional incentive for party-B Opportunists to push for a lower tax rate τ_B. The incentives to reduce policies τ_A and τ_B along the wishes of rich donors are stronger the more effective campaign contributions are in providing an advantage to a candidate, i.e., the higher parameter ρ is.

When the income inequality rises (while still preserving the mean), a larger share of total income shifts into the hands of rich and very rich voters. They provide the largest political campaign contributions and their income increase further reinforces their willingness to donate. This is because with a higher income, larger utility differences are at stake with differences in proposed income tax policies. Hence, on the one hand, rising inequality boosts the levels of campaign spending. On the the other hand, the income concentration at the top of the distribution reinforces the marginal effects of changes in the economic policies τ_A, τ_B on the respective party's relative campaign finance position $\rho\left(\frac{\partial C^A}{\partial \tau_m} - \frac{\partial C^B}{\partial \tau_m}\right)$. Thus, it intensifies the campaign-finance channel on the equilibrium economic policies as captured in the latter terms of Equations (12) and (13). Consequently, the inequality increase boosts the incentives for both parties to shift their economic policies more towards the rich donors and to reduce proposed tax rates τ. The induced tax decrease is larger for party A than for party B as the preferred tax rates of the more wealthy party-B voters have a lower bound at zero. Thus, the campaign donation channel contributes to a convergence of economic policies (at lower levels), while the rise in inequality simultaneously has the direct effect of contributing to divergence, as discussed for Proposition 1.

[8] For this to hold, $\bar{h} > 2$ is sufficient, but not always necessary.

The net effect depends on the relative strength of the two channels: If campaign money is very effective (high ρ) and the campaign-donation channel, therefore, sufficiently strong, then the increase in income inequality overall leads to economic policy convergence between the two parties. As stated in Lemma 1, economic policy convergence translates into additional divergence on the value (climate) policy dimension. This result is summed up in Proposition in Proposition 2.

Proposition 2. – Rising inequality with campaign contributions.
If campaign contributions play a sufficiently important role, i.e. if ρ is sufficiently high, then a mean-preserving rise in income inequality leads to additional party polarization on the value (climate) issue.

Proof. See Appendix B.2. □

In turn, regulatory measures that limit the effectiveness or the allowed amount of campaign donations counteract this polarizing effect of income inequality on the value (climate) dimension. Thus, the analysis suggests that a stricter regulation of campaign finances can play an important role for preventing or reducing political polarization on value-related policy issues such as the climate policy or identity politics.

3.2 The Effect of Growth

For most democratic countries, the decades since 1970 brought not only rising levels of income inequality, but primarily growth in income per capita. The following analysis shows that income growth does not preclude the convergence of economic policies and growing polarization of parties on the value/climate dimension. If anything, it rather constitutes another contributing factor with a similar mechanism. To separate the effects of income growth from the discussed effects of rising inequality, I model economic growth here by assuming a distribution-preserving proportional increase in every voter's

income, i.e. an increase in μ, but no change in σ^2.

As a result of income growth, the cost of a marginal increase in the income tax τ to the individual household rises and its marginal benefit from the public good (more of which is provided now) decreases for all voters (due to $P''(\tau) < 0$). Consequently, each voter prefers a lower tax rate τ_i^* than before and both parties' Guardian factions push for lower tax rates which reflect the decreasing average preferred tax rates of their supporter groups. However, the decrease in the preferred tax rate is higher for voters with a lower income. One reason for this is that preferred tax rates of rich households cannot move much when converging to zero from an already low level. Overall, the distribution-preserving rise in mean income leads to converging party positions on the economic dimension $\Delta\tau \downarrow$.

The difference in the parties' economic positions $\Delta\tau$ is in the numerator of the slope of the swing-voter curve (3) and its decrease causes the swing-voter curve to become flatter. In connection with Lemma 1, this leads to a realignment of voter groups that reinforces the party polarization on the value/climate dimension: Party A loses (richer) voters with a low climate preference to party B and in turn gains (poorer) voters with higher climate preference from party B. Party B experiences the opposite effect. The voter realignment makes party-A (party-B) supporters become on average more (less) environmentalist. The Guardians in each party follow this development and prefer more strongly diverging positions on the value/climate issue. This effect carries over to the overall party positions, even though the individual voters' environmental preferences do not change. The effect channel is summed up in the following proposition.

Proposition 3. – Income growth.

Distribution-preserving income growth ($\mu \uparrow$ with σ const.) decreases the party polarization on the economic dimension: $\frac{\partial \Delta\tau}{\partial \mu} < 0$ and contributes to party polarization on the value/climate dimension.

Proof. See Appendix B.3. □

The resulting increase in value policy polarization $\Delta\kappa \uparrow$ now additionally contributes to the decrease in the slope of the swing-voter curve (cf. (2) and (20)). This additionally reinforces the voter realignment and the resulting further convergence in economic policies τ and divergence in climate policies κ. Figure 7 shows a numerical illustration of the effect of income growth on value policy polarization in a calibrated simulation.

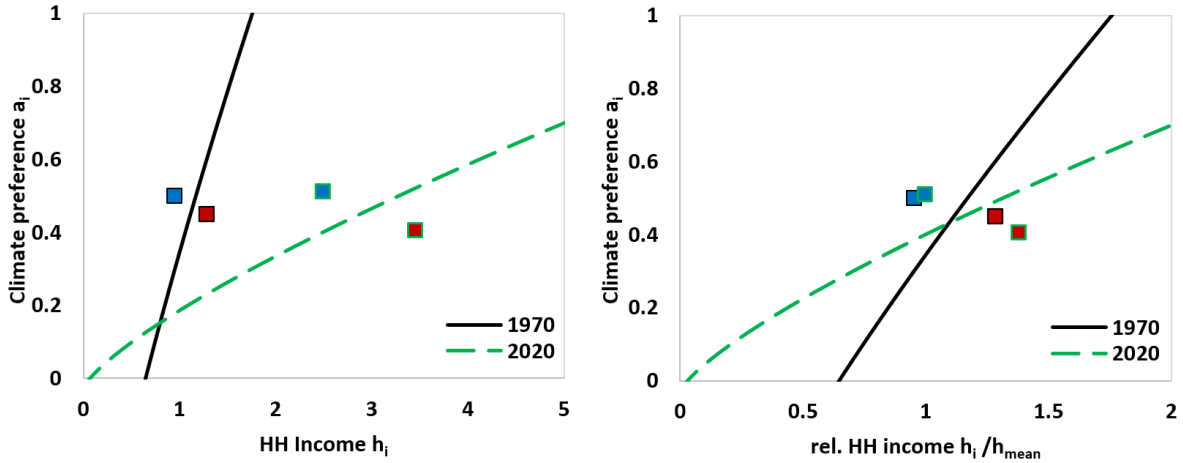

Figure 7: Change in the division of the voter type space due to distribution-preserving income growth. The left panel shows the voter-type space over absolute household income (with mean 1 in 1970 and mean 2.5 in 2020). The right panel shows the voter-type space over household income relative to the respective mean income.

3.3 Rising Salience of the Climate Issue

So far in the analysis, the economic forces let the change in the predominant political cleavage occur for a given salience of the value dimension ϕ relative to the economic dimension. but it seems plausible that if a policy dimension become the primary dimension of political competition and polarization, it also become more salient. The relative salience of the value dimension ϕ is in the denominator of the slope of the swing-voter curve 3. If it increases exogenously, then this directly leads to a decrease in the slope of the swing-voter curve an analog party realignment of voters as in the cases of Propositions 2 and 3. Again, party A gains more socially-progressive or environmentalist voters

form party B and loses more socially-conservative less environmentalist voters to party B. Both parties' Guardian factions follow these shifts and push for more polarized party positions on the value/climate issue.

Proposition 4. – Salience of the value issue.

A higher relative salience of the value/climate issue ϕ decreases the slope of the swing voter line and, through the resulting realignment of voters, leads to more party polarization on the climate issue ($\Delta\kappa \uparrow$) and less party polarization on the economic issue ($\Delta\tau \downarrow$).

Proof: The slope of the swing voter line (SVL) in a_i-h_i space $\frac{\Delta\tau}{2\phi\Delta\kappa}$ decreases with a rising salience of the climate issue ϕ. The rest of the proof follows the logic of Proposition 2. □.

3.4 Polarization of Climate Preferences

For the channels in the previous propositions to work, the distribution of voter preferences on the values dimension does not have to change. If cultural preferences change as well and become more polarized, e.g. due to a growing share of college graduates over decades (Gethin et al. 2022) , then the same self-reinforcing feedback loop as above occurs, accompanied by a resulting decrease in $\Delta\tau$ instead of vice versa. But the magnitude of the resulting polarization of parties on the value dimension is larger than without accounting for voter realignment in a counterfactual one-dimensional setup.

Proposition 5. – Polarization of preferences.

More polarized voter preferences on the value/climate issue translate into more strongly polarized party positions on the value dimension ($\Delta\kappa \uparrow$) due to realignment of voters and less polarized positions on the economic issue ($\Delta\tau \downarrow$) than in a one-dimensional political competition over the value dimension only.

Proof. A more polarized (e.g. more binomial) distribution of value/climate preferences in the electorate and within each income group directly provides an incentive for both parties' Guardian factions to push for more extreme (high or low) value/climate policy positions, implying $\Delta\kappa \uparrow$. This reduces the slope of the swing voter line $\frac{\Delta\tau}{2\phi\Delta\kappa}$ and, thus, triggers a realignment of voters according to the logic of Proposition 2 resulting in even more extreme party positions on climate and less extreme party positions on the economic issue. □

Furthermore, in each electoral cycle, there are numerous value issues other than climate that play into voters' decisions: immigration, gun control, abortion, etc. The voters' views may become more polarized on some of these issues, but not on others. Also, some topics may be particularly salient at a point in time. If that happens and the parties' Guardian factions succeed in pushing for more extreme positions on these issues, then the model predicts that this would also contribute to further convergence of the parties' economic stances, as we show in Proposition 5. The convergence on the economic dimension, in turn, contributes to more polarization on, for instance, the climate issue along the lines of Lemma 1, even though the voters' climate preferences remain unchanged. In this way, polarization on one value issue can spill over to the others.

3.5 Voter Turnout

Usually, in liberal democracies, not all citizens with the right to vote do turn out on election day. The share of non-voters is higher among low income groups in the population (and among ethnic minorities). Here, we show that decreasing voter turnout can lead to lower income inequality among the actual voters and, thus, contribute to party convergence on the economic policy dimension. Economic policy convergence, in turn, decreases the slope of the swing voter curve and triggers a realignment of voters in a similar fashion as discussed above and expressed in Propositions 1 and 2.

Proposition 6. – Voter turnout.

Decreasing voter turnout, especially among low-income groups contributes to a realignment of voters that increases party polarization on the climate issue.

Proof. See Appendix. □

4 Discussion

In this section, I discuss how the analytical model results compare to empirical data on party positions in major OECD democracies. To this end, I examine data by the Comparative Manifesto Project (https://manifesto-project.wzb.eu/datasets). This data base offers a text-analysis-based coding of party platforms on major policy issues, as well as composite indicators. I use the indicator "414 - Economic Orthodoxy" as a proxy for the parties' economic policy position. It captures views on fiscal austerity, public good provision, size of government, tax levels, and government interventions in the economy in general. For the parties' environmental policy stance, I use the indicator "501 - Environmental Protection: Positive". Finally, I use the composite indicator "soc - Society (Progressive - Conservative)" to capture the growing party polarization on value related issues as immigration, gun control, abortion, etc. in general.

4.1 United States

In the United States, as well as in the U.K. and Japan, income inequality has been rising since the 1970s (Figure 6). The party data on the economic dimension confirms the trend of converging party positions on issues of "economic orthodoxy", especially during the administrations of Bill Clinton and George W. Bush. The detailed data on congressional voting scores by the League of Conservation Voters (LCV) in Figure **??** shows the strong increase in actual voting behavior. The data on party programs resembles this development, as illustrated in Figure 9. The party positions on progressive

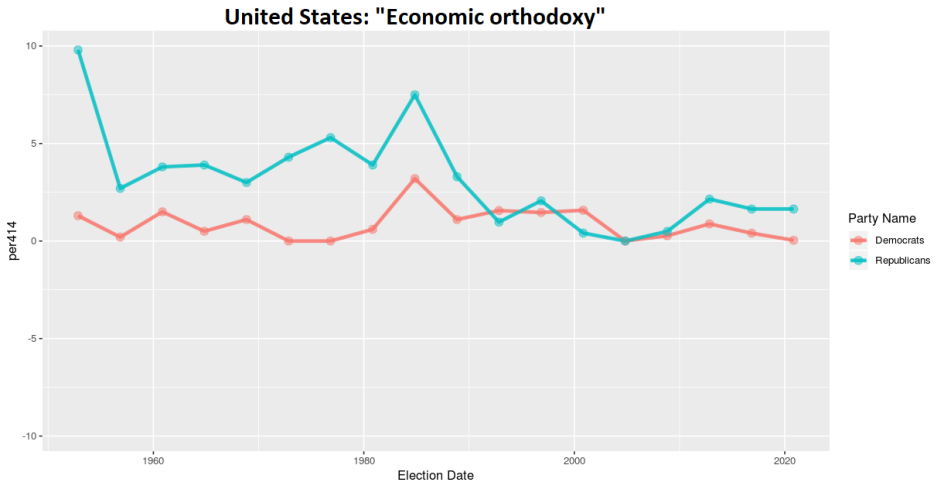

Figure 8: Converging party positions on "economic orthodoxy" in the United States.

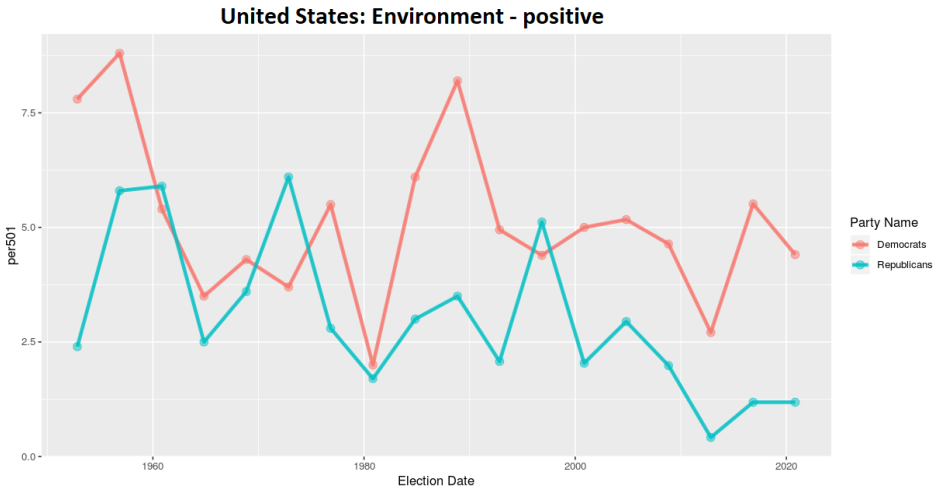

Figure 9: Diverging party positions on "Environment - positive" in the United States.

vs. conservative values (Figure 10) also shows growing polarization that is consistent with the model predictions in the 1980s (Reagan Administration) and since the Obama years. The Clinton Administration in the 1990s does not fit the picture as well, probably due to its relatively strong stance on law-and-order-politics in the campaigns.

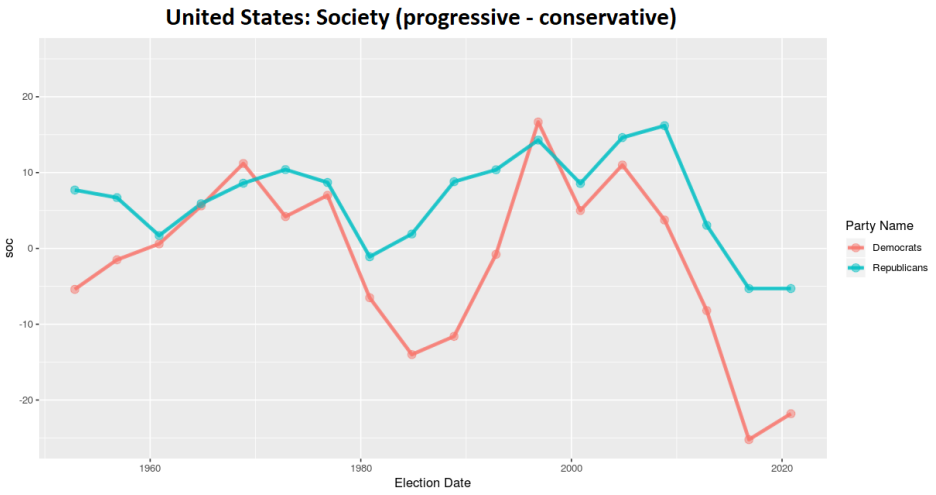

Figure 10: Diverging party positions on "Society (progressive - conservative)" in the United States.

4.2 United Kingdom

The United Kingdom has also seen some party convergence on the economic orthodoxy dimension. At the same time, there was increasing divergence on the environmental dimension and the social-value dimension in general (Figures 12 and 13). But this divergence is less pronounced than in the United States (Figure 11). This is consistent with the model predictions given that campaign spending is more strictly regulated and plays a much smaller role in the U.K. (Figure 3). A similar pattern appears for Canada (see Appendix **??**): Slightly increasing polarization on environmental and societal-value issues, but less pronounced than in the United States, consistently with the smaller role of campaign contributions.

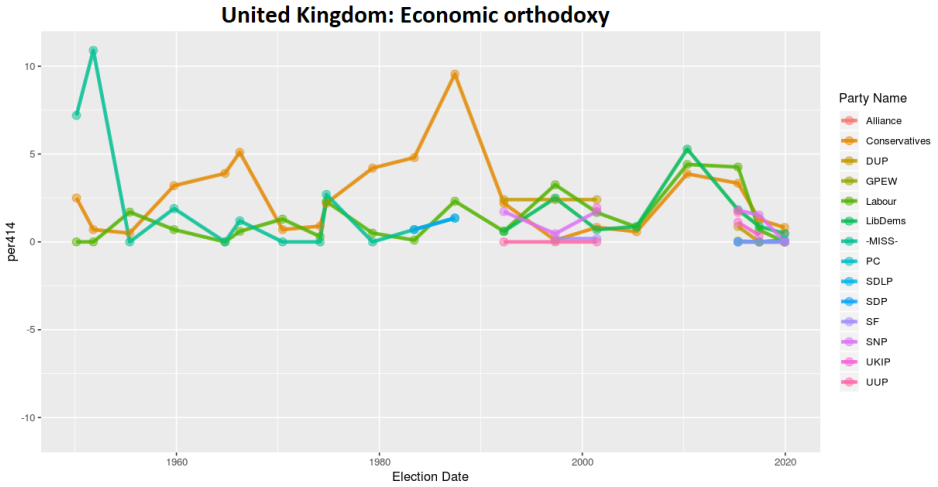

Figure 11: Converging party positions on "economic orthodoxy" in the United Kingdom.

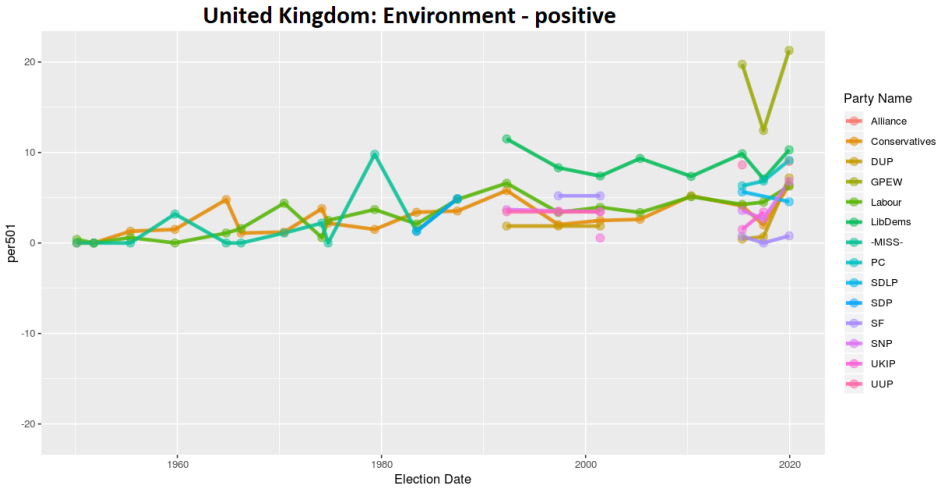

Figure 12: Diverging party positions on "Environment - positive" in the United Kingdom.

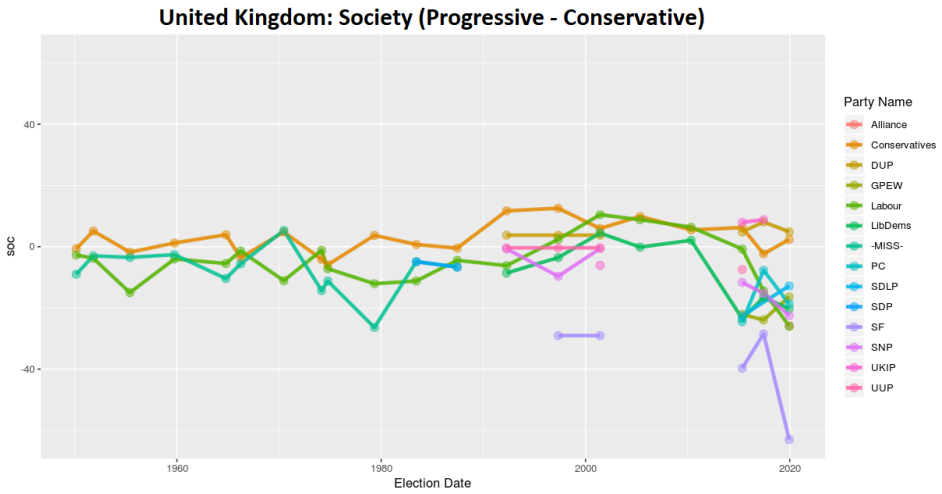

Figure 13: Diverging party positions on "Society (progressive - conservative)" in the United Kingdom.

5 Conclusion

Economic forces such as income inequality and economic growth influence the polarization of party positions on an economic dimension and a value politics dimension. While many political issues are perceived by voters as value-driven or primarily moral, I apply the analysis to climate policy. This policy issue has relatively recently gained a lot in salience and importance to voters and has at the same time very long-run implications that fit the long time horizon of the framework. I develop a setting of two-dimensional political competition and two-dimensional heterogeneity of voters on income (log-normal distribution) and the value dimension (uniform distribution). I show analytically that rising income inequality without the additional channel of campaign donations by households leads to more divergence of party platforms on the economic dimension that triggers a realignment of voter groups between the two parties finally resulting in more convergence of party positions on the value issue. However, when political campaign contributions by households are accounted for, rising inequality shifts a larger share of income into the hands of wealthy voters who are more willing to donate to candidates. This raises the weight of these rich donors' preferences in the parties' objective functions and makes them shift the party positions more toward the prefer-

ences of high-income donors. in doing so, the parties converge more on the economic issue, which in turn leads to more divergence on the value/climate issue.

The last decades did not only bring about rising inequality levels in many democratic countries, but also growing income levels. The analysis shows that rising average income does not counteract, but instead reinforces the economic policy convergence and the resulting divergence of parties on the value/climate dimension. Furthermore, rising salience of the value/climate issue, as well as more polarized voter preferences on values/climate, and lower voter turnout all contribute to and reinforce the channel of growing party polarization on the value/climate issue.

Reducing income inequality does not necessarily seem to get unequivocal support from electorates in OECD countries and slowing or reversing economic growth is not desirable and not an option. However, the analysis suggests that a strict regulation of campaign donations is likely to substantially hamper if not break the link from rising income inequality to political polarization on value issues and climate policy. Moreover, higher voter turnout could also contribute to lowering polarization and the ensuing policy uncertainty.

Appendix

A Model Details

A.1 Nash bargaining interpretation of PUNE

If Opportunists and Guardians do not agree on a policy platform in party A, then party B wins the election with certainty and the Opportunists' payoff is zero, while the Guardians' payoff is the average welfare in the case of enactment of party B's policy vector t_B. The same logic holds for party B. If there is a weighted Nash bargaining solution, then it must be PUNE. On the other hand, when there is a PUNE, then it is exactly the solution to a corresponding weighted Nash bargaining game if $ln(\pi(\cdot, t_B))$ and $ln(W^A(\cdot) - W^A(t_B))$ are concave functions on T and if $ln(1 - \pi(t_A, \cdot))$ and $ln(W^B(\cdot) - W^B(t_A))$ are concave functions on T (cf. "Assumption A" in Roemer (2006, p. 157)).

A.2 Differential Characterization of PUNEs

The differential formulation of PUNE is along the lines of Roemer (2006). In the case of party A, the weighted Nash bargaining game is defined by a maximization of the Nash product, as stated in (8) in Section 2.4

$$\max_{t \in T} (\pi(t, t_B) - 0)^{\alpha} (W^A(t) - W^A(t_B))^{1-\alpha}$$

Applying logs yields

$$\max_{t \in T} \alpha \, ln(\pi(t, t_B)) + (1 - \alpha) \, ln(\Delta W^A(t))$$

with $\Delta W^A(t) = W^A(t) - W^A(t_B)$. For maximization, the gradient w.r.t. the policy vector t is taken and set to zero

$$\frac{\alpha}{\pi(t,t_B)}\nabla_t\pi(t,t_B) + \frac{(1-\alpha)}{\Delta W^A(t)}\nabla_t W^A(t) = 0$$
$$\nabla_t W^A(t) = -\frac{\alpha}{1-\alpha}\frac{\Delta W^A(t)}{\pi(t,t_B)}\nabla_t\pi(t,t_B)$$

Defining $\lambda^A(t,t_B) = \frac{\alpha}{1-\alpha}\frac{\Delta W^A(t)}{\pi(t,t_B)}$ yields the equation

$$\nabla_t W^A(t) = -\lambda^A(t,t_B)\nabla_t\pi(t,t_B)$$

In the same way, the corresponding maximization problem for party B from (9) is

$$\max_{t\in T}((1-\pi(t_A,t)) - 0)^\beta (W^B(t) - W^B(t_A))^{1-\beta}$$

can be transformed to

$$\nabla_t W^B(t) = \lambda^B(t_A,t)\nabla_t\pi(t_A,t)$$

with $\lambda^B(t_A,t) = \frac{\beta}{1-\beta}\frac{\Delta W^B(t)}{(1-\pi(t_A,t))}$

The two factions of party A now engage in a bargaining game in which the Guardians try to maximize their constituents' welfare while the Opportunists insist on a minimal probability of winning π_0, given that party B plays the platform t_B:

$$\max_{t\in T} W^A(t) \quad s.t. \quad \pi(t,t_B) \geq \pi_0^A \tag{14}$$

Conversely, party B solves the following problem in a similar way for a given platform

t_A of party A:

$$\max_{t \in T} W^B(t) \quad s.t. \quad 1 - \pi(t_A, t) \geq 1 - \pi_0^B. \tag{15}$$

The respective strategies are equivalent to maximizing the probability of winning, subject to a lower bound of the average welfare of the party's constituents.

B Proofs

B.1 Proof to Proposition 1

Proposition 1: *If campaign contributions are ineffective ($\rho = 0$), then a mean-preserving rise in income inequality leads to additional party divergence on the economic issue ($\Delta\tau \uparrow$) and additional convergence on the value (climate) issue ($\Delta\kappa \downarrow$).*

Proof. A mean-preserving rise in income inequality (i.e., rising σ^2) for a log-normal income distribution implies:

$$\frac{\partial h_i}{\partial \sigma} < 0 \quad \forall \quad h_i < \bar{h}$$
$$\frac{\partial h_i}{\partial \sigma} > 0 \quad \forall \quad h_i > \bar{h}$$

The Guardians in each party seek the income tax policy τ that maximizes the welfare of their constituents, that is, of the voter with the average income of all the voters of that party: $\bar{h}_A$ and $\bar{h}_B$. As the swing-voter curve (SVC) is upward sloping, party A has a higher share of low-income voters (who become poorer) and a lower share of high-income voters (who become richer) than party B. Therefore, $\frac{\partial \bar{h}_A}{\partial \sigma} < 0$ and $\frac{\partial \bar{h}_B}{\partial \sigma} > 0$ holds.[9] A lower $\bar{h}_A$ implies a higher τ_A preferred by party-A Guardians. A higher $\bar{h}_B$ implies a

[9] If $\bar{h}_A, \bar{h}_B$ move, they must move in opposite directions as the overall mean income $\bar{h}$ remains unchanged.

lower τ_B preferred by party-B Guardians. This translates into equilibrium economic policies of the parties as the Opportunists' reasoning is not affected. As $\tau_A > \tau_B$, this yields $\frac{\partial \Delta\tau}{\partial \sigma} > 0$ with $\Delta\tau = \tau_A - \tau_B$.

The SVC is not directly affected by the increase in inequality σ^2, only through changes in (τ, κ). The resulting realignment of voters between parties now occurs through two mechanisms:

1) Lemma 1 shows that $\frac{\partial \Delta\tau}{\partial \sigma} > 0$ implies $\frac{\partial \Delta\kappa}{\partial \sigma} < 0$. This decrease in $\Delta\kappa$ reinforces the increase in the slope of the SVC.

2) Each voter's value stance a_i does not change with changing income h_i. But the average value stance of the supporters of party A and party B, $\bar{a}_A$ and $\bar{a}_B$ can change with a changing income distribution due to voter realignment, even before accounting for the changing slope of the SVC. If we assume an exogenous upward-sloping SVC (before adjusting due to changing policies), then the changing income distribution itself "moves" some voters across this "fixed" SVC, in one or both directions. For $h_{med} < \bar{h}$, the voter density in the lower-income part of the SVC is higher than in the (upper-right) higher-income part (due to the skewness of the log-normal income distribution). Hence, with an increase in income inequality, more voters move into the set of party-A supporters at lower income levels, and therefore lower value stance a_i than at higher h_i and a_i. That makes the average a_i of party-A supporters decrease (and that of party-B supporters increase in a similar way) and contributes to a decreasing polarization of average preferred value positions of the voters sets supporting the two parties.

Both mechanisms 1) and 2) work in the same direction and lead to $\frac{\partial \Delta\kappa}{\partial \sigma} < 0$ for $\rho = 0$ (ineffective campaign contributions). □

B.2 Proof to Proposition 2

Proof. A mean-preserving rise in income inequality implies: $\bar{h} = const.$ and $d\sigma^2 > 0$ (cf. the variance σ^2 of the normal distribution underlying the log-normal income

distribution, Section 2.1). The concentration of income at the top if the distribution implies:

$$\frac{\partial}{\partial\sigma}\left(\underbrace{\rho\left(\frac{\partial C^A}{\partial\tau_A}-\frac{\partial C^B}{\partial\tau_A}\right)}_{<0}\right)<0 \quad \text{and} \quad \frac{\partial}{\partial\sigma}\left(\underbrace{\rho\left(\frac{\partial C^A}{\partial\tau_B}-\frac{\partial C^B}{\partial\tau_B}\right)}_{>0}\right)>0 \tag{16}$$

The voters of party A have a lower average income than the swing voters on the swing-voter line (2). Therefore, $\tau_{A,Guar} < \tau_A < \tau_{SV}$ holds with the referred tax rate of party A Guardians $\tau_{A,Guar}$ and the preferred tax rate of the swing voters τ_{SV}. In analogous fashion, $\tau_{B,Guar} < \tau_B < \tau_{SV}$.

$\Rightarrow$ $\frac{\partial\pi}{\partial\tau_A} < 0$, $\frac{\partial\pi}{\partial\tau_B} > 0$ holds for Equations (12) and (12). Together with (16), this implies:

$$\frac{\partial}{\partial\sigma}\left(\frac{\partial\pi}{\partial\tau_A}\right)<0 \quad \text{and} \quad \frac{\partial}{\partial\sigma}\left(\frac{\partial(1-\pi)}{\partial\tau_B}\right)<0$$

$\Rightarrow$ With an increase in σ, the Opportunist factions in both parties try to increase their probability to win π, for party A, and $(1-\pi)$, for party B, by decreasing their tax rates τ_A, τ_B: $\frac{\partial\tau_A}{\partial\sigma} < 0$ and $\frac{\partial\tau_B}{\partial\sigma} < 0$. Both parties shift to lower tax rates preferred by richer voters than before. But as party A represents poorer voters than part B, this implies a stronger decrease in τ_A than tau_B, because $\frac{\partial}{\partial h_i}\left(\frac{\partial\tau_i^*}{\partial h_i}\right) > 0$. In other words: τ_B is closer to the lower bound of 0 and decreases less. Overall, rising income inequality (i.e., rising σ^2) pushes the parties Guardian factions further apart, but lets the Opportunist faction argue more strongly for lower and converging income tax rates. The latter effect dominates if campaign contributions are sufficiently effective, i.e. if ρ is sufficiently high. In this case, $\frac{\partial\tau_A}{\partial\sigma} < \frac{\partial\tau_B}{\partial\sigma} < 0$. This implies $\frac{\partial(\tau_A-\tau_B)}{\partial\sigma} < 0$. Combined with Lemma (1), this implies $\frac{\partial(\kappa_A-\kappa_B)}{\partial\sigma} > 0$. □

B.3 Proof to Proposition 3

Proof. Voter i individually prefers the income tax rate τ_i^* that maximizes her utility (1) according to her first-order condition w.r.t. τ

$$\frac{\partial u_i}{\partial \tau} = -h_i + P'(\tau) = 0, \quad P_\tau(\bar{h}(\mu)\tau_i) = h_i.$$

Given the log-normal income distribution (with mean μ and variance σ^2 of the underlying normal distribution), an income quantile $p \in [0,1]$ can be expressed as $exp(\mu + \sqrt{2\sigma^2} erf^{-1}(2p-1))$. This implies that $\frac{\partial h_i(\mu)}{\partial \mu} = h_i$ for all h_i. By dividing the FOC above by $\bar{h}$, we obtain

$$\frac{P_\tau(\bar{h}\tau_i)}{\bar{h}} = \frac{h_i}{\bar{h}} \tag{17}$$

Note that the public-good function $P(\bar{h}\tau)$ is assumed as purely a function of aggregate tax revenues $\bar{h}\tau$. Thus, we can restate (17) as $g(\bar{h}(\mu)\tau_i) = \frac{h_i(\mu)}{\bar{h}(\mu)}$ with $g(\bar{h}\tau_i) := \frac{P_\tau(\bar{h}\tau_i)}{\bar{h}}$. Totally differentiating both sides w.r.t. μ and τ_i yields

$$\frac{\partial g}{\partial \tau_i} d\tau_i + \frac{\partial g}{\partial \mu} d\mu = 0 \tag{18}$$

as $\frac{\partial}{\partial \mu}\left(\frac{h_i(\mu)}{\bar{h}(\mu)}\right) = 0$. The derivative of $g(\bar{h}(\mu)\tau_i)$ w.r.t. τ_i is $\frac{\partial g(\bar{h}(\mu)\tau_i)}{\partial \tau_i} = \frac{P_{\tau\tau}(\bar{h}\tau_i)}{\bar{h}}$. The derivative w.r.t. μ is $\frac{\partial g(\bar{h}(\mu)\tau_i)}{\partial \mu} = \frac{\partial g}{\partial \bar{h}} \cdot \frac{\partial \bar{h}}{\partial \mu} = \frac{\partial g}{\partial \bar{h}} \bar{h} = \bar{h} \frac{\partial}{\partial \bar{h}}\left(\frac{P_\tau}{\bar{h}}\right) = \frac{\partial}{\partial \bar{h}}(P_\tau) - \frac{P_\tau}{\bar{h}}$. In the public-good function $P(.)$, mean income $\bar{h}$ and tax rate τ_i always appear as the product $\bar{h}\tau_i$. Therefore, we can restate $\frac{\partial g}{\partial \mu} = P_{\tau\tau}\frac{\tau_i}{\bar{h}} - \frac{P_\tau}{\bar{h}}$.

Substituting both derivatives $\frac{\partial g}{\partial \tau_i}$ and $\frac{\partial g}{\partial \mu}$ into 18 and simplifying yields

$$\frac{d\tau_i}{d\mu} = -\frac{\partial g}{\partial \mu} \Big/ \frac{\partial g}{\partial \tau_i} = -\tau_i + \frac{P_\tau}{P_{\tau\tau}} < 0 \tag{19}$$

Voter i's preferred income tax rate always decreases with rising μ for $P_\tau > 0$, $P_{\tau\tau} < 0$.

To examine how the decrease in the preferred tax rate depends on personal income, we take the derivative of (19) w.r.t. τ_i:

$$\frac{\partial}{\partial \tau_i}\left|\frac{d\tau_i}{d\mu}\right| = \frac{P_\tau P_{\tau\tau\tau}}{P_{\tau\tau}^2} > 0 \quad \text{for} \quad P_\tau, P_{\tau\tau\tau} > 0$$

Thus, the decrease in the preferred income tax rate is higher for those voters and groups of voters who already prefer a higher tax rate before the rise in μ. The Guardians in each party, who drive the divergence of party platforms, prefer a tax rate τ that corresponds to the average income of the respective group (i.e. half) of voters. Therefore, the Guardians of party A prefer a higher tax rate than the Guardians of party B. The same holds true for the resulting overall party policies.

As shown above, this implies that an increase in μ triggers a stronger decrease in τ_A than in τ_B, leading to convergence of economic policies $\Delta\tau \downarrow$ for the two voter groups H_A and H_B. However, the changes in the income levels and in the resulting economic policies τ also modify the swing-voter curve and additionally lead to a realignment of some voters, even if climate policies κ are assumed to be constant. To show the implications of the voter realignment, it is useful to express the income levels relative to the respective mean income, i.e., $\frac{h_i}{\bar{h}}$ instead of h_i. The advantage is that the increase in μ does not change the distribution of voters in this space as both h_i and $\bar{h}$ increase by the same factor. This also yields the alternative expression for the SVC: $\tilde{a}\left(\frac{h_i}{\bar{h}}\right) = \left(\frac{h_i}{\bar{h}}\right)\frac{\bar{h}\Delta\tau}{2\phi\Delta\kappa} + \frac{\kappa_A+\kappa_B}{2} - \frac{P(\tau_A)-P(\tau_B)}{2\phi\Delta\kappa}$. We calculate the reaction of the slope of this alternative SVC $\tilde{a}\left(\frac{h_i}{\bar{h}}\right)$ to an increase in μ (still κ assumed unchanged):

$$\frac{\partial}{\partial\mu}\left(\frac{\partial\tilde{a}}{\partial(h_i/\bar{h})}\right) = \frac{1}{2\phi\Delta\kappa}\frac{\partial}{\partial\mu}(\bar{h}(\tau_A-\tau_B)) = \frac{1}{2\phi\Delta\kappa}\bar{h}\left(\tau_A-\tau_B+\frac{\partial\tau_A}{\partial\mu}-\frac{\partial\tau_B}{\partial\mu}\right)$$

Using (19), this simplifies to

$$\frac{\partial}{\partial \mu}\left(\frac{\partial \tilde{a}}{\partial(h_i/\bar{h})}\right) = \frac{1}{2\phi\Delta\kappa}\bar{h}\left(\frac{P_\tau^A}{P_{\tau\tau}^A} - \frac{P_\tau^B}{P_{\tau\tau}^B}\right) \tag{20}$$

The crucial term $\frac{P_\tau}{P_{\tau\tau}}$ is negative and its absolute value increases in τ depending on the functional form of $P(\tau)$. For instance, it always increases in τ for the functional form $P(\tau) = p_0(\bar{h}\tau)^\theta$ with $\theta < 1$. For the functional form $P(\tau) = p_0\left[(\bar{h}\tau)^\theta - p_1\bar{h}\tau\right]$, which is used for the numerical illustrations, the absolute value of $\frac{P_\tau}{P_{\tau\tau}}$ increases in τ if $p_0 > 2-\theta$.

If its absolute value increases in τ, the term $\left(\frac{P_\tau^A}{P_{\tau\tau}^A} - \frac{P_\tau^B}{P_{\tau\tau}^B}\right)$ is negative. This implies that the slope of the SVC becomes flatter, while still dividing the voter type space in two halves. This implies that party A loses some voters with low income (and a low climate preference) to party B and gains voters with high income (and high climate preference) from party B (cf. right-hand panel in Figure 7). This realignment additionally increases (decreases) the average income of party-A (party-B) supporters. As a result, τ_A and τ_B converge even more than without accounting for the voter realignment. □

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