Appendix: Green Party Vote Shares and Public Support for Climate Policy

Contents

A Additional Figures and Tables

Figure A.1 is similar to Figure 3 but provides a more complete spread of votes for parties across the ideological spectrum. There are four new groups of parties in this figure: other left parties, liberal parties, other right parties, and other far right parties. Left parties include the Socialist Party (SP) and the Party for the Animals (PvdD). Liberal parties include the People's Party for Freedom and Democracy (VDD) and Democrats 66 (D66). Right parties include the Christian Democratic Appeal (CDA), the Christian Union (CU), the Farmer-Citizen Movement (BBB), and the New Social Contract (NSC). Other far right parties include the Forum for Democracy (FvD) and JA21.

As evidenced by the figure, Green voters were still most likely to remain Green voters, with liberal parties and the PvdA being their most likely switches. By contrast, non-Green voters in election t were most likely to support liberal parties and right parties in election $t + 1$.

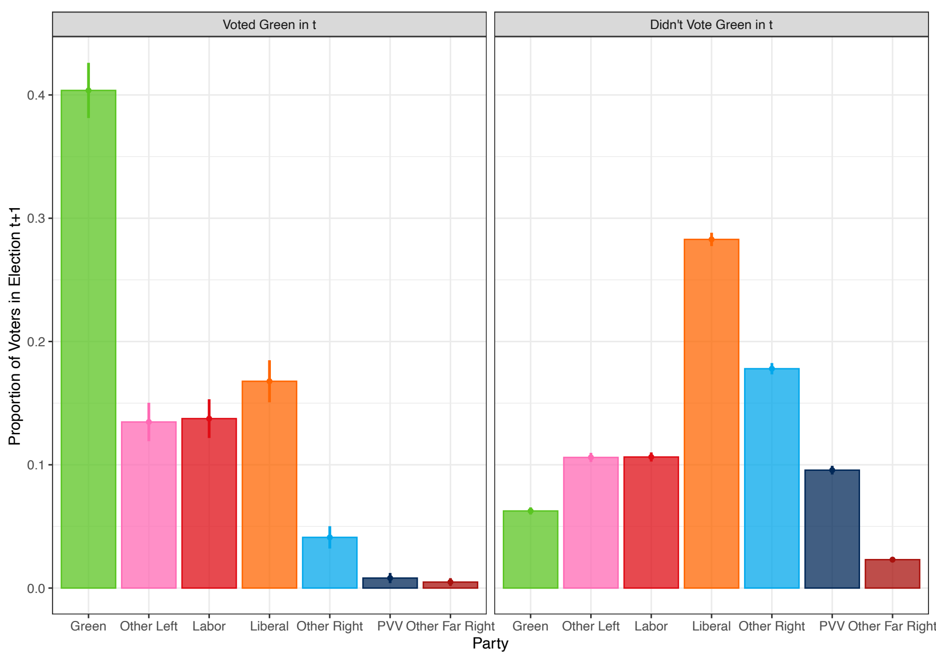

Figure A.1: Party Votes by Green and non-Green Voters (Full Distribution)

Figures A.2 and A.3 replicate Figures 3 and A.1 using sympathy toward the Greens (above or below the median) rather than a vote for the Greens. Results are similar to plots subsetting by Green vote.

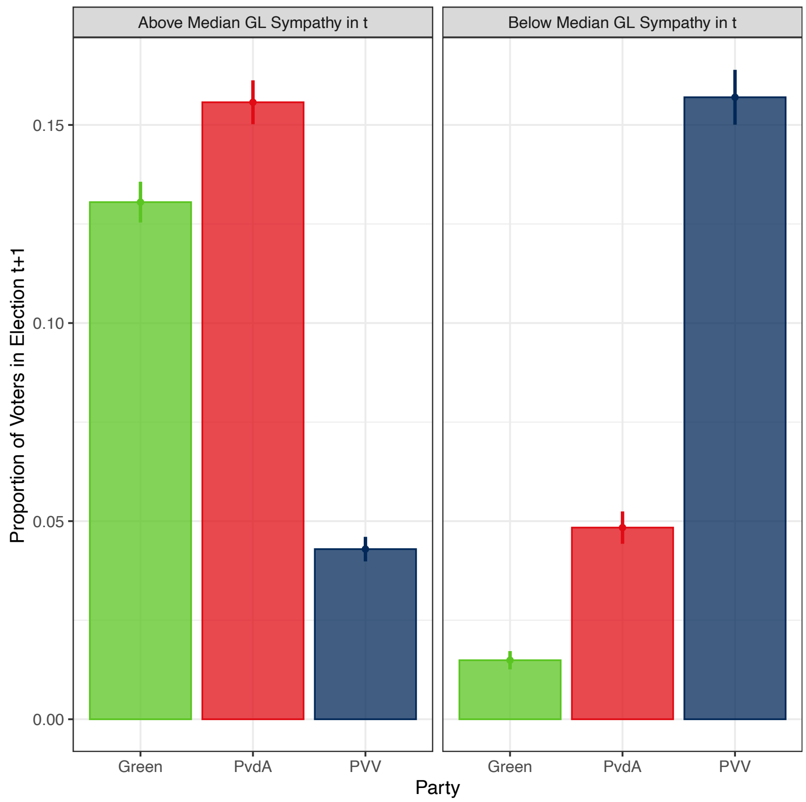

Figure A.2: Party Votes by Sympathy for GL

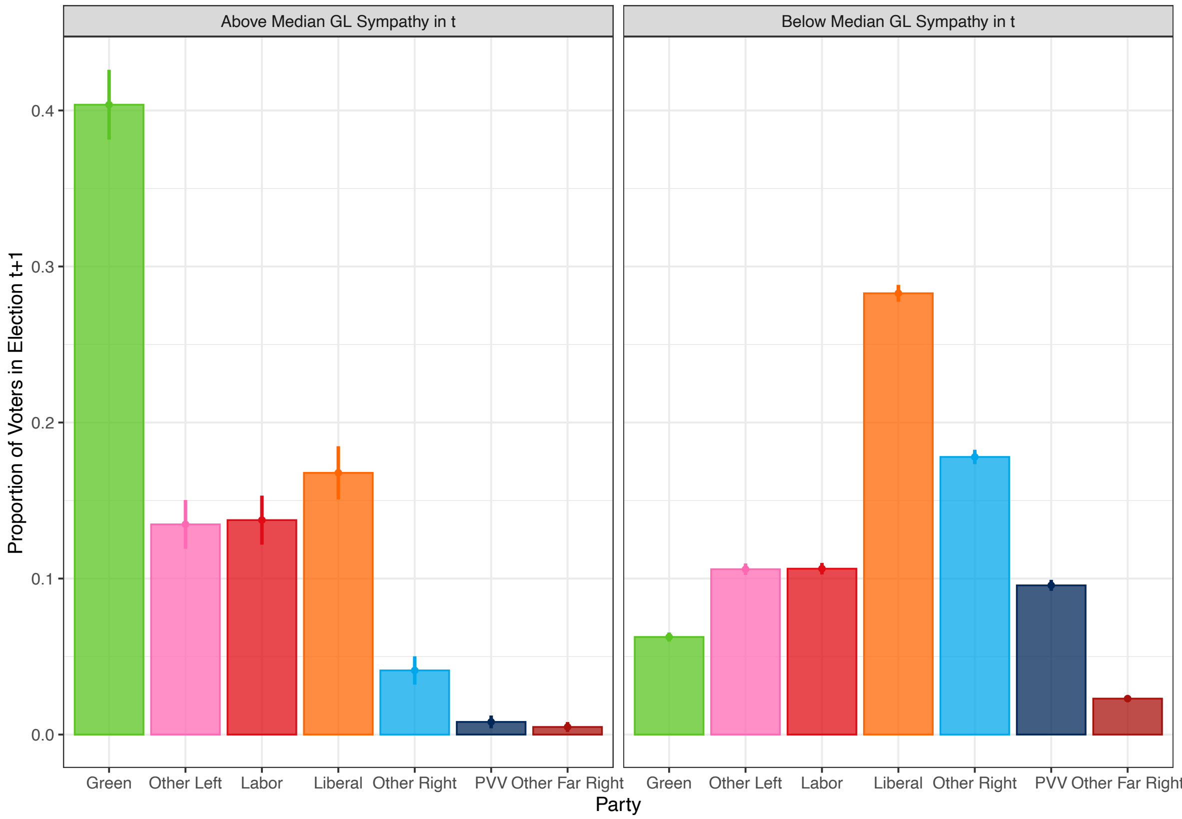

Figure A.3: Party Votes by Sympathy for GL (Full Distribution)

Figure A.4 subsets the data by the party each respondent voted for in election t. It displays the distribution of sympathies for each voter group, and illustrates the share of voters within each group that finds each party most sympathetic. Unsurprisingly, voters are overwhelmingly likely to have the most favorable opinion of the party that they voted for. Most relevant for the current analysis, Green voters, besides expressing greatest sympathies toward the Green party, are most likely to express the most sympathy toward the Labor Party as well as some liberal parties (Democrats 66 is a more socially progressive liberal party that has advanced more climate-friendly policies). Additionally, among Green voters, the far right is the least likely to be seen as sympathetic.

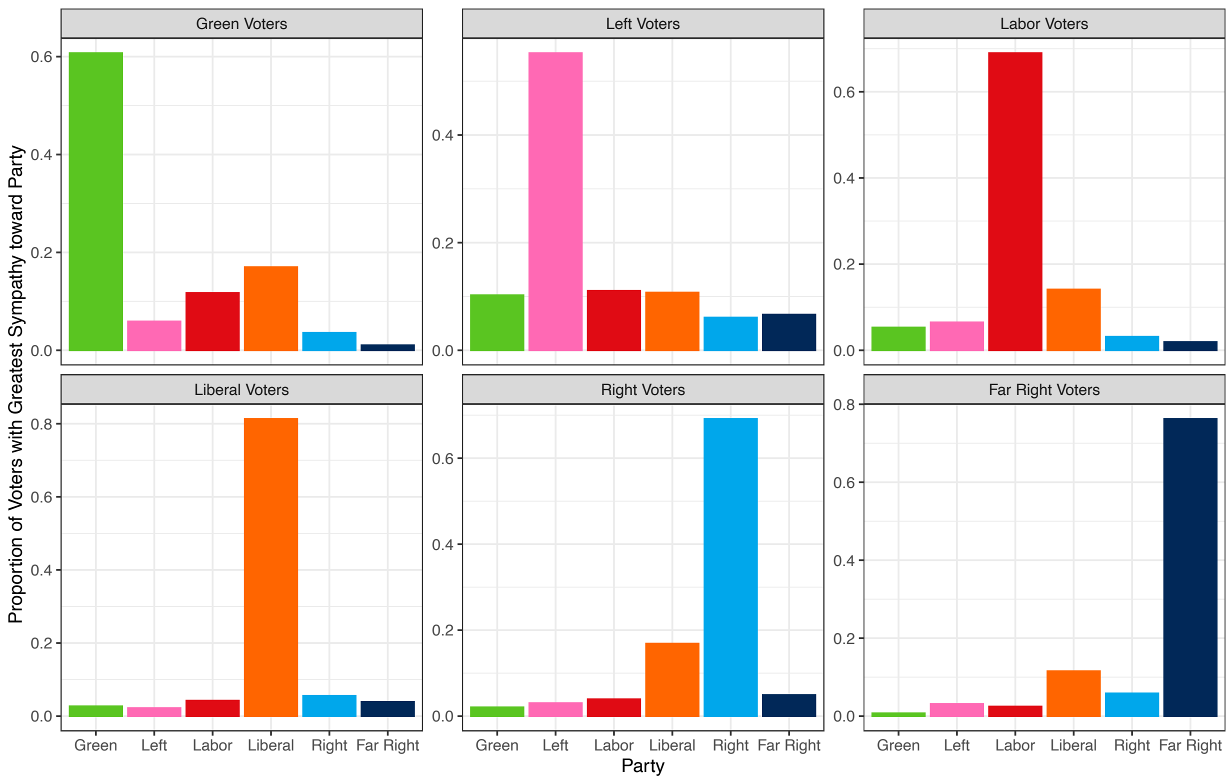

Figure A.4: Distribution of Party Sympathies by Vote Choice

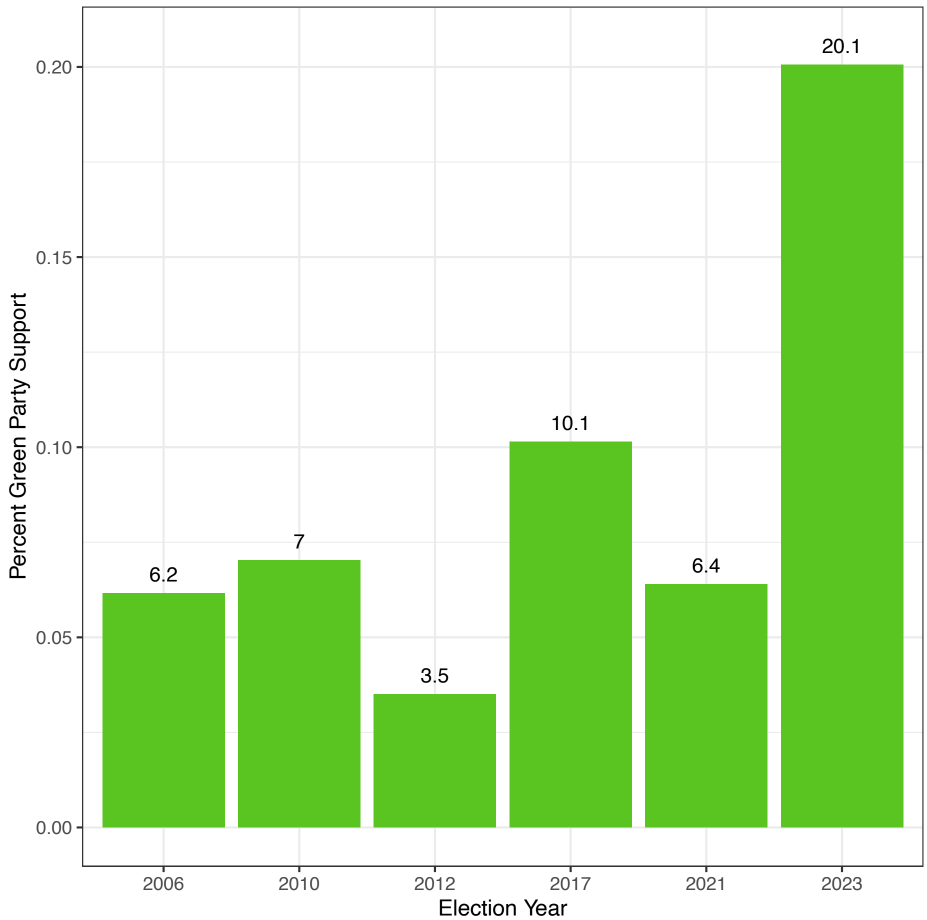

Figure A.5: Proportion of Voter Supporting the Dutch Greens, 2006-2023

The Chapel Hill Expert Survey includes an assessment of parties' stances on environmentalism, measured on a 0-10 scale. A score of 0 means a party strongly supports environmental protection even at the cost of economic growth, while a 10 means a party strongly supports economic growth even at the cost of environmental protection. Figure A.6 plots this score for Green, social democratic (what CHES calls socialist), and far right parties across 28 countries between 2007 and 2019. Unsurprisingly, Green parties are more willing to sacrifice economic gains for environmental protection, followed by social democratic parties, and finally far right parties. The figure also shows that far right parties have become slightly more anti-environment over time. Additionally, social democratic parties appear to be more pro-environment, while Green parties have become slightly more conservative on this issue since 2007.

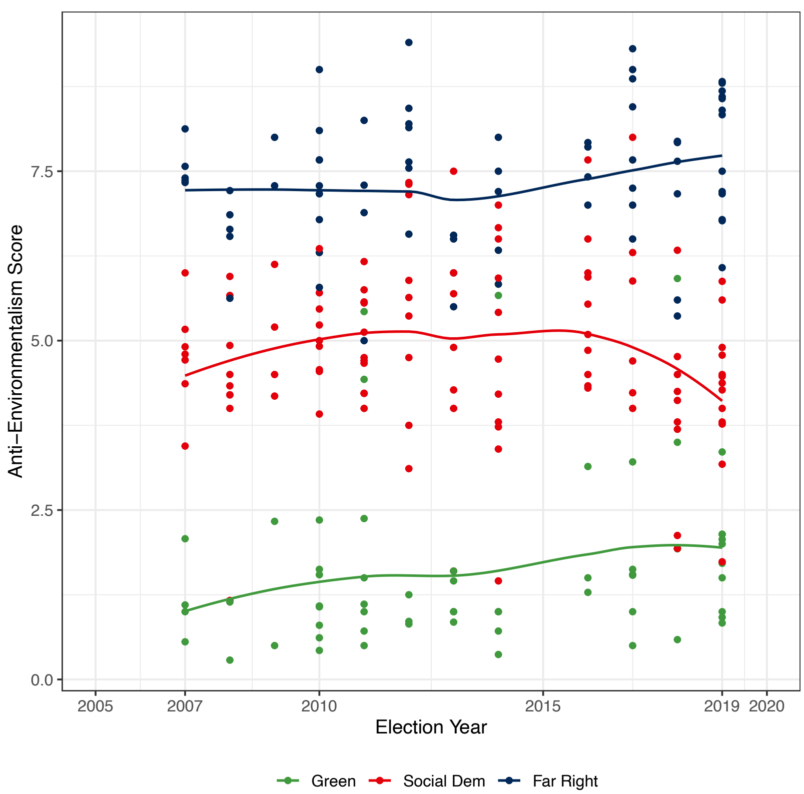

Figure A.6: Anti-Environmentalism of Green, Social Democratic, and Far Right Parties

	Vote GL in $t+1$			Vote PvdA in $t+1$		
	(1)	(2)	(3)	(4)	(5)	(6)
GL/PvdA Similarity	-0.018***	0.005	0.006	0.056***	0.056***	0.030**
	(0.006)	(0.005)	(0.011)	(0.006)	(0.006)	(0.012)
Voted Green in t		-0.541***			-0.179**	
		(0.128)			(0.088)	
Similarity × Voted Green		-0.098**			-0.076***	
		(0.044)			(0.029)	
GL Sympathy in t			-0.017*			-0.020**
			(0.009)			(0.008)
Similarity × GL Sympathy			-0.004			-0.010***
			(0.003)			(0.003)
Observations	18,128	18,126	17,167	18,128	18,126	17,167
R^2	0.572	0.602	0.564	0.596	0.597	0.605
Within R^2	0.001	0.072	0.002	0.006	0.008	0.003
Number of Respondents	7,395	7,394	7,145	7,395	7,394	7,145
Respondent fixed effects	✓	✓	✓	✓	✓	✓

Table A.1: Effects of GL/PvdA Similarity on Voting Behavior
Standard errors clustered by respondent

	Vote GL in $t+1$			Vote PvdA in $t+1$		
	(1)	(2)	(3)	(4)	(5)	(6)
GL/PvdA Weighted Similarity	-0.008***	-0.003***	0.002	0.026***	0.025***	0.005*
	(0.001)	(0.0010)	(0.002)	(0.002)	(0.002)	(0.003)
Voted Green in t		-0.406***			0.091	
		(0.087)			(0.066)	
Weighted Similarity × Voted Green		-0.019*			0.007	
		(0.010)			(0.007)	
GL Sympathy in t			-0.014***			0.001
			(0.005)			(0.006)
Weighted Similarity × GL Sympathy			-0.001*			-0.0008
			(0.0006)			(0.0007)
Observations	18,128	18,126	17,167	18,128	18,126	17,167
R^2	0.574	0.602	0.565	0.606	0.606	0.605
Within R^2	0.004	0.072	0.002	0.030	0.031	0.002
Number of Respondents	7,395	7,394	7,145	7,395	7,394	7,145
Respondent fixed effects	✓	✓	✓	✓	✓	✓

Table A.2: Effects of GL/PvdA Similarity (Weighted) on Voting Behavior
Standard errors clustered by respondent

	Green Vote Share in $t+1$ (1)	PvdA Vote Share in $t+1$ (2)
GL/PvdA Similarity	-0.049***	0.051***
	(0.001)	(0.003)
Observations	1,123	1,123
R^2	0.668	0.231
Within R^2	0.443	0.040
Municipality fixed effects	✓	✓

Table A.3: Effects of GL/PvdA Similarity on Municipal Vote Shares
Standard errors clustered by municipality

	Vote GL in $t+1$			Vote PvdA in $t+1$		
	(1)	(2)	(3)	(4)	(5)	(6)
Anti-Environmentalism (GL)	-0.079***	-0.026**	0.018	0.265***	0.259***	0.064**
	(0.013)	(0.011)	(0.026)	(0.017)	(0.017)	(0.033)
Voted Green in t		0.084			-0.013	
		(0.176)			(0.118)	
Anti-Environmentalism × Voted Green		-0.225*			0.030	
		(0.117)			(0.081)	
GL Sympathy in t			0.014			0.026**
			(0.011)			(0.012)
Anti-Environmentalism × GL Sympathy			-0.013*			-0.012
			(0.007)			(0.008)
Observations	18,128	18,126	17,167	18,128	18,126	17,167
R^2	0.573	0.602	0.565	0.604	0.604	0.605
Within R^2	0.004	0.072	0.002	0.025	0.026	0.002
Number of Respondents	7,395	7,394	7,145	7,395	7,394	7,145
Respondent fixed effects	✓	✓	✓	✓	✓	✓

Table A.4: Heterogeneous Effects of Shifting Green Ideal Points on Voting Behavior
Standard errors clustered by respondent

	Vote GL in $t+1$			Vote PvdA in $t+1$		
	(1)	(2)	(3)	(4)	(5)	(6)
Anti-Environmentalism (PvdA)	0.011	-0.025***	-0.006	-0.026***	-0.030***	-0.048***
	(0.009)	(0.008)	(0.016)	(0.009)	(0.010)	(0.018)
Voted Green in t		-0.895***			-0.715***	
		(0.281)			(0.204)	
Anti-Environmentalism × Voted Green		0.144**			0.174***	
		(0.064)			(0.046)	
GL Sympathy in t			-0.024			-0.076***
			(0.020)			(0.018)
Anti-Environmentalism × GL Sympathy			0.004			0.019***
			(0.005)			(0.004)
Observations	18,128	18,126	17,167	18,128	18,126	17,167
R^2	0.572	0.602	0.564	0.594	0.595	0.606
Within R^2	0.0002	0.072	0.001	0.0006	0.004	0.004
Number of Respondents	7,395	7,394	7,145	7,395	7,394	7,145
Respondent fixed effects	✓	✓	✓	✓	✓	✓

Table A.5: Heterogeneous Effects of Shifting PvdA Ideal Points on Voting Behavior
Standard errors clustered by respondent

B Full Model Description and Analysis

Consider $i = 0, 1, \ldots, n$ voters who choose against three parties, a Green party G, a Left/Social Democratic party L, and a (far) Right party R indexed as $j \in \{G, L, R\}$. Each party advances a platform on climate change policy $x_j \in \mathbb{R}$ and suppose that $x_G < x_L < x_R$. Voters have ideal points x_i and a quadratic utility function over policy, $v(x_j, x_i) = -(x_j - x_i)^2$. I will focus on the decision calculus of the voter indexed 0; for the substantively interesting case, suppose that she has an ideal point x_0 satisfying $v(x_G, x_0) > v(x_L, x_0) > v(x_R, x_0)$. This means that voter 0 would vote for the Green party if she voted sincerely. To economize notation, let $u_j = v(x_j, x_0)$. If party j wins, voter 0's payoff is u_j. The winner of the election is the party with the most votes. Ties are broken at random.

I will contrast two cases. In the first case, voter 0 is simply instrumental and cares about the election winner, getting payoff u_j. This might represent an electoral environment in which voters cast their ballots *exclusively* on the basis of climate policy, or an environment where preferences over parties are fixed. I use this case as a baseline. In the second case, the voter receives idiosyncratic shocks for choosing a specific party. Let $\varepsilon_j \sim G(\cdot)$ be an additional party-specific payoff that voter 0 gets when voting for party j. This shock would represent the value of party j on all other electorally salient dimensions besides climate policies or some other variability in party preferences. Her preferences for parties are perturbed by these shocks, given her expectations about the voting intentions of others. In this case, voter 0's payoff of voting for party j is $\mathbb{1}_{j \text{ wins}} u_j + \varepsilon_j$.

I consider the decision of voter 0 to cast her vote for one of the three parties with beliefs about the behavior of other voters. Although the other n voters are not strategic, voter 0 can form expectations about when her vote will affect the outcome, and subsequently when it is in her interest to vote strategically (similar to Fisher and Myatt 2017). Suppose the other voters have cast their votes such that each party receives y_j votes. Then, $y = (y_G, y_L, y_R)$

summarizes an electoral outcome. Since voter 0 does not know how each other person voted, these are random variables. Suppose that voter 0 believes that others vote for party j with probability $p_j \in [0,1]$, so $p = (p_G, p_L, p_R) \in \mathcal{P}$ specifies voter 0's beliefs about the intentions of the other players. For a fixed p, the other n voters' decisions are independent. However, to fully parameterize the strategic voting dynamic, suppose that voter 0 does not know p, meaning there is aggregate uncertainty about the electoral environment. Let $p \sim F(\cdot)$ with full support on $\mathcal{P}$ and associated density $f(\cdot)$.

Given this setup, from the perspective of voter 0, the likelihood of any electoral outcome y when she believes that votes are cast according to p is

$$P(y|p) = \frac{n!}{y_G! y_L! y_R!} p_G^{y_G} p_L^{y_L} p_R^{y_R},$$

but, since she does not know p for sure,

$$P(y) = \int_{\mathcal{P}} P(y|p)\, dF.$$

The analysis now considers voter 0's optimal choices given her preferences over electoral outcomes u_j and, where applicable, party-specific shocks ε_j, and given her expectations about the behavior of other voters.

Notes on the Model

Two points about the model deserve further comment. First, one might argue that the model setup most readily applies to majoritarian voting systems, while Green parties often find electoral success in countries with proportional systems (although both Germany and France use forms of first-past-the-post voting). Furthermore, incentive to vote strategically might be tempered in proportional systems (see Cox and Shugart 1996; Slinko and White

2010). To view PR voting within the context of the model, think of the election winner as the opportunity to become the formateur, and voters ideologically aligned with Green and left-leaning parties may wish to deny the far right the opportunity to become the formateur. Although we have never observed the Greens as a possible formateur, the opportunity cost of voting for the Social Democrats over the Greens might be that the Greens are excluded from a coalition government downstream.

Second, the model is decision-theoretic rather than fully strategic. Myatt (2007) develops a fully game-theoretic model in which strategic voting emerges as the response to a coordination problem against a mutually disliked status quo. In this framework, the strategic voting incentive is similar, in that voter 0 is uncertain about the intentions of others, and so the effective tradeoff is that she wants to coordinate either around one party, either the Greens or the Social Democrats, to defeat the Right party. Relatedly, since the model does not fully incorporate the strategic dynamics of other voters, I rely on aggregate uncertainty about the probability that other voters vote for each of the three parties, $P(y)$. Technically, this ensures that no voter is able to identify to the two leading parties in the field, otherwise strategic voting would be total and the trailing party between the Greens and the Social Democrats would be entirely abandoned. Substantively, we can interpret this assumption as voter 0's uncertainty over the beliefs of the intentions of others, rather than simply uncertainty over the electoral outcome $P(y|p)$.

Theoretical Analysis

I analyze the optimal voting decision first in the case where voter 0 only cares about the election winner based on her underlying preferences over climate policy, drawing heavily on the structure of Fisher and Myatt (2017), and then build in party-specific preference shocks.

Baseline

Recall that voter 0 is *ex ante* ideologically aligned with the Greens, and has preferences $u_G > u_L > u_R$. If she voted sincerely, she would cast her vote for the Green Party, with her second choice being the Social Democrats and finally her least-preferred outcome would be for the Right to win the election. However, voting sincerely for her preferred choice, the Greens, may not be optimal if her vote does not influence the winner of the election. It follows that voter 0 needs to calculate the probability of particular electoral outcomes. It is therefore useful to know, as Lemma A.1 shows, that the probability of an electoral outcome y can be approximated as the size of the electorate n grows large[1] as follows:

$$P(y) \approx \frac{f(y/n)}{n^2}.$$

This approximation defines voter 0's beliefs about the probability of close races, or events in which her vote would be influential. In particular, she considers her probability of being pivotal, or the chance that her vote breaks or creates some sort of tie between parties. In a three-way race, there are several different types of tied or near-tied situations that may arise. Table A.1 lists all possible events in which she could be pivotal and the payoff that voter 0 would get for voting for each of the three parties in each scenario.

For parties j, k, and ℓ, let the probability that a two-way tie arises be $p_{jk} = P(y_j = y_k > y_\ell)$ and let the probability that a three-way tie occurs be $p_3 = P(y_j = y_k = y_\ell)$, which are well-defined for large electorates by Lemma A.2 using the approximation from above. The lemma also shows that in large electorates, three-way ties are much less likely. Given these probabilities and the payoffs from each pivotal event, voter 0's optimal decision can be

[1] I focus on approximations as the size of the electorate grows large but do not model voters as a continuum because in this latter case no voter would be pivotal, and thus all voting would be expressive or sincere rather than strategic.

Event	$u(\text{vote } G)$	$u(\text{vote } L)$	$u(\text{vote } R)$	Description
$y_G = y_L = y_R$	u_G	u_L	u_R	all parties tied
$y_G = y_L > y_R$	u_G	u_L	$\frac{u_G+u_L}{2}$	G, L tied leading R
$y_G = y_R > y_L$	u_G	$\frac{u_G+u_R}{2}$	u_R	G, R tied leading L
$y_L = y_R > y_G$	$\frac{u_L+u_R}{2}$	u_L	u_R	L, R tied leading G
$y_G = y_R > y_L + 1$	u_G	$\frac{u_G+u_R}{2}$	u_R	G, R tied leading L
$y_L = y_R > y_G + 1$	$\frac{u_L+u_R}{2}$	u_L	u_R	L, R tied leading G
$y_L = y_G > y_R + 1$	u_G	u_L	$\frac{u_L+u_G}{2}$	L, G tied leading R
$y_G = y_R = y_L + 1$	u_G	$\frac{u_G+u_L+u_R}{3}$	u_R	near three-way tie
$y_L = y_R = y_G + 1$	$\frac{u_G+u_L+u_R}{3}$	u_L	u_R	near three-way tie
$y_L = y_G = y_R + 1$	u_G	u_L	$\frac{u_G+u_L+u_R}{3}$	near three-way tie
$y_G - 1 = y_L > y_R$	u_G	$\frac{u_G+u_L}{2}$	u_G	G leads near two-way tie with L
$y_G - 1 = y_R > y_L$	u_G	u_G	$\frac{u_G+u_R}{2}$	G leads near two-way tie with R
$y_G - 1 = y_L = y_R$	u_G	$\frac{u_G+u_L+u_R}{3}$	$\frac{u_G+u_L+u_R}{3}$	G leads near three-way tie
$y_L - 1 = y_G > y_R$	$\frac{u_G+u_L}{2}$	u_L	u_L	L leads near two-way tie with G
$y_L - 1 = y_R > y_G$	u_L	u_L	$\frac{u_L+u_R}{2}$	L leads near two-way tie with R
$y_L - 1 = y_G = y_R$	$\frac{u_G+u_L+u_R}{3}$	u_L	$\frac{u_G+u_L+u_R}{3}$	L leads near three-way tie
$y_R - 1 = y_G > y_L$	$\frac{u_G+u_R}{2}$	u_R	u_R	R leads near two-way tie with G
$y_R - 1 = y_L > y_G$	u_R	$\frac{u_L+u_R}{2}$	u_R	R leads near two-way tie with L
$y_R - 1 = y_G = y_L$	$\frac{u_G+u_L+u_R}{3}$	$\frac{u_G+u_L+u_R}{3}$	u_R	R leads near three-way tie

Table A.1: Pivotal Events in the Theory

constructed. Expected payoffs from voting for each party can be expressed as follows:

$$U(G) = p_3\Big(5u_G + u_L + u_R\Big) + p_{GL}\Big(3.5u_G + 0.5u_L\Big) + p_{LR}\Big(2u_L + 2u_R\Big) + p_{GR}\Big(3.5u_G + 0.5u_R\Big).$$
$$U(L) = p_3\Big(5u_L + u_G + u_R\Big) + p_{GL}\Big(3.5u_L + 0.5u_G\Big) + p_{LR}\Big(3.5u_L + 0.5u_R\Big) + p_{GR}\Big(2u_G + 2u_R\Big).$$
$$U(R) = p_3\Big(5u_R + u_G + u_L\Big) + p_{GL}\Big(2u_G + 2u_L\Big) + p_{LR}\Big(3.5u_R + 0.5u_L\Big) + p_{GR}\Big(3.5u_R + 0.5u_G\Big).$$

Using these expected utilities, we can now state the optimal voting decision for voter 0. Proposition A.1 characterizes voter 0's optimal voting decision in an environment with three parties, holding fixed the climate policy platforms of each party, and where the votes faces uncertainty over the voting intentions of others in a large electorate (Fisher and Myatt 2017).

Proposition A.1 *Let the electorate be sufficiently large ($n \to \infty$). Voter 0's optimal voting decision is as follows:*

- *Voter 0 never votes for the Right party.*
- *Voter 0 votes strategically for the Social Democrats over the Green party if and only if*

$$\underbrace{\frac{u_G - u_L}{u_G - u_R}}_{\substack{\textit{relative preference}\\ \textit{for Greens}}} \leq \underbrace{\frac{p_{LR} - p_{GR}}{2p_{GL} + p_{LR}}}_{\substack{\textit{beliefs of value of}\\ \textit{strategic vote}}}. \tag{1}$$

- *If this inequality fails to hold, voter 0 votes for the Greens.*

Proposition A.1 provides two important insights into the voting behavior of voter 0. First, it reveals that voter 0 would never cast her vote for the Right party, as doing so is dominated by her preferences for the Greens. If it were ever the case that voter 0 had to consider strategic incentives in a two-way race between the Greens and the Right, she would always vote for the Greens, as it aligns with her preferences and it enhances the electoral viability of the Greens within such a strategic setting.

However, the voter may indeed prefer the Social Democrats to the Greens if she believes that her vote will have an effect on the electoral outcome. In particular, if she believes that a vote for the Social Democrats could prevent the Right from winning the election, then she has an incentive to cast her vote not for her most preferred party, the Greens, but for the party that has a chance of winning the election. Formally, this is represented by Equation 1 in the proposition. The left-hand side is the relative preferences over climate policy given voter 0's ideal point and parties' anticipated platforms: the numerator is the relative valuation of the Greens and Social Democrats, while the denominator captures her desire to stave off the Right. This ratio demarcates the tradeoff between the willingness to sacrifice some policy gains by switching her vote from the Greens to the Social Democrats in order to prevent the Right from winning. The right-hand side of Equation 1 measures the net incentives from voting strategically. If these strategic incentives dominate the tradeoff from her policy preferences, then voter 0 chooses the Social Democrats, otherwise she votes for the Greens. Moreover, such an incentive is strengthened when the belief that the Greens could credibly compete for the lead decreases: as p_{GL} and p_{GR} approach zero, voter 0 always votes strategically for the Social Democrats.

Baked into the strategic vote is a willingness to accept a climate policy that is further from voter 0's ideal point: she prefers the Greens on policy terms to the Social Democrats. However, her *induced* preference lends itself to a choice to vote for the Social Democrats if voter 0 believes that the Social Democrats are more likely to be tied with the Right for the lead than the Greens are. This is captured on the right-hand side of Equation 1, which is positive only if $p_{LR} > p_{GR}$, meaning that voter 0 has to believe ties between the Social Democrats and the Right are more likely than ties between the Greens and the Right.

This said, the incentive to vote strategically holds her preferences over parties, which are formed given her own preferences x_0, fixed. Hence, switching her vote from the Greens to the Social Democrats does not require voter 0 to become "less green" in her preferences for climate policy. Rather, the relative difference in platforms between the Greens and Social Democrats is acceptable enough such that the voter is willing to cast a vote to block the Right from winning.

It also bears underscoring that voter 0 does not always face strong strategic voting concerns. If her beliefs about the probability of possible ties (p_{jk}) are small, then the right-hand side of Equation 1 goes to zero, at which point she votes for the Social Democrats if and only if $u_L \geq u_G$, which is not true given her preferences. Hence, when the strategic voting incentive is weak, voter 0 casts her vote for the Greens, in line with her sincere preferences.

Let us now consider when voter 0 is more or less likely to vote strategically. Since voter 0's choice is effectively between the Greens and the Social Democrats, Corollary A.1 studies the relationship between these parties' payoffs to voter 0.

Corollary A.1 *Voter 0 is less likely to vote for the Greens (and thus more likely to vote strategically for the Social Democrats) as the payoffs from the Greens' and Social Democrats' climate policies converge.*

Specifically, voter 0 is more likely to vote for the Green party when the Greens and the Social Democrats promote platforms generating payoffs that are further from each other, or when the difference between u_G and u_L is large. Formally, the left-hand side of Equation 1 grows in $u_G - u_L$. When parties are distinct in their climate offerings, then voter 0 has greater incentives to cast her vote for a party offering a policy closer to her ideal point, namely the Greens. Put differently, if the Social Democrats are not as ambitious in their climate policy, then the policy value of voting for them goes down.

By contrast, if the Greens and the Social Democrats are relatively aligned in their stance on climate policy, then voter 0 becomes more likely to cast a strategic vote. Counterintuitively, voter 0 is more likely to consider voting for a party with whom she has greater policy disagreement, assuming that such disagreement is not too great relative to her first choice. This suggests that strategic voting by Green voters should be more likely, all else equal, in electoral environments where the Greens and the Social Democrats have relatively little difference in their climate policy proposals.

To isolate the effects of each party's platforms, recall that voter 0 has quadratic utility over policy and an ideal point x_0. The left-hand side of Equation 1, which is voter 0's internalization of the policy tradeoffs involved in voting sincerely for the Greens versus strategically for the Social Democrats, can also be written as

$$\frac{u_G - u_L}{u_G - u_R} = \frac{(x_L - x_G)(x_L + x_G - 2x_0)}{(x_R - x_G)(x_R + x_G - 2x_0)} \equiv \mathcal{G}.$$

Corollary A.2 *The relative preference for the Greens over the Social Democrats $\mathcal{G}$ is:*

- *decreasing in the Greens' platform* x_G *if* $x_0 < x_G$ *and increasing in* x_G *if* $x_0 \in [x_G, \frac{x_L+x_R}{2}]$*;*
- *increasing in the Social Democrats' platform* x_L*;*

Corollary A.2 studies shifts in voter 0's electoral valuation of the Greens over the Social Democrats as a function of shifting party platforms, holding fixed that the voter has an ideal point satisfying $v(x_G, x_0) > v(x_L, x_0) > v(x_R, x_0)$. Another way to think about this is that voter 0's ideal point x_0 obeys $x_0 \leq \frac{x_G+x_L}{2}$. Locating the voter on the ideological spectrum helps to interpret the results, as the corollary's findings rely on the induced tradeoffs when parties move away from voter 0's ideal point.

If the voter is a particularly extreme climate voter, with an ideal point on climate policy to the left of the Green Party, $x_0 < x_G$, then a move to the right by the Green Party decreases voter 0's valuation of the Greens. From the vantage point of an extreme climate voter, this move to the right appears that the Greens and the Social Democrats are converging in their policy platforms, which heightens strategic voting considerations. Interestingly, more extreme voters may cast their vote for a more mainstream party, the Social Democrats, in this eventuality. But if voter 0 is a more mainstream climate voter, with an ideal point to the right of the Green Party, then the Greens moving to the right moves closer to their ideal point. Such a voter is more likely to stick with the Greens.

Alternatively, if the Social Democrats move to the right increasing x_L, then the voter's preferences for the Greens on policy become more accentuated and therefore makes the Greens more attractive. By moving closer to the policy of the Right, the Social Democrats decrease their strategic value to voter 0 as an electable alternative to the Greens that could beat the Right.

Party-Specific Shocks

Now suppose that voter 0 may also gain utility from voting for a particular party, valued at ε_j. She once again considers her pivotality, as in Table A.1, but also allows her vote choice to be conditioned on preference shocks, which may represent the value of the parties on dimensions orthogonal to climate policy. Now, her expected payoffs from voting for each party are

$$\tilde{U}(G) = U(G) + \varepsilon_G.$$

$$\tilde{U}(L) = U(L) + \varepsilon_L.$$

$$\tilde{U}(R) = U(R) + \varepsilon_R.$$

Proposition A.2 *Let the electorate be sufficiently large ($n \to \infty$). There exist thresholds $\bar{\varepsilon}_j$, $\bar{\varepsilon}_k$, and $\bar{\varepsilon}_\ell$ such that voter 0 votes for party j over parties k and ℓ if and only if $\varepsilon_j \geq \max\{\bar{\varepsilon}_k, \bar{\varepsilon}_\ell\}$ for all parties j, k, ℓ.*

Proposition A.2 specifies conditions under which voter 0 balances three factors that determine her vote: her climate policy preferences over parties (payoffs u_j), her beliefs about the intentions of others and whether there are returns to voting strategically (probabilities p_{jk}), and her valuation of parties on other issues (shocks ε_j). An immediate consequence of the introduction of payoff shocks is that voter 0's choice is no longer binary between the Greens and the Social Democrats. When the voter evaluates parties on other dimensions besides climate policy, or receives utility for voting for a party that is unrelated to their chances of winning the election, it is possible to cast a vote for the Right. Even though the voter has preferences over climate policy that prefer the Greens, she may vote for the Right if the value of the Right is sufficiently large on other electorally relevant dimensions.

That a relatively green voter may vote for an anti-environmental party is striking, but unsurprising if we allow her to condition her choice on other issues. However, this does not mean that her intrinsic preferences over climate policy have shifted rightward, but it could imply that climate policy has been sublimated in the voter's decision rule to other electorally important issues. The key takeaway from Proposition A.2 is that it is possible for voter 0 to cast a vote for the party that she prefers least climate policy, but such behavior can only occur on the basis of the value of other issues that matter in the election. Hence, any observed vote switching from the Greens to the Right would not be based upon a voter becoming less supportive of climate policies.

C Formal Proofs

Lemma A.1 *In large electorates* ($n \to \infty$), $P(y)$ *behaves as* $f(y/n)$. *Formally,* $\lim_{n\to\infty} P(y) = \frac{f(y/n)}{n^2}$.

Proof of Lemma A.1: This proof is similar to Fisher and Myatt (2017). Recall that $P(y)$ can be expressed as

$$\begin{aligned} P(y) &= \int_{\mathcal{P}} \frac{n!}{y_G! y_L! y_R!} p_G^{y_G} p_L^{y_L} p_R^{y_R} f(p)\ dp. \\ &= \frac{n!}{(n+2)!} \int_{\mathcal{P}} \frac{(n+2)!}{y_G! y_L! y_R!} p_G^{y_G} p_L^{y_L} p_R^{y_R} f(p)\ dp. \end{aligned}$$

Adding and subtracting $f(y/n)$ yields

$$P(y) = \frac{n!}{(n+2)!} f(y/n) \int_{\mathcal{P}} \frac{(n+2)!}{y_G! y_L! y_R!} p_G^{y_G} p_L^{y_L} p_R^{y_R}\ dp + \frac{n!}{(n+2)!} \int_{\mathcal{P}} \frac{(n+2)!}{y_G! y_L! y_R!} p_G^{y_G} p_L^{y_L} p_R^{y_R} \Big(f(p) - f(y/n) \Big)\ dp.$$

Notice that the first term is the density of a Dirichlet distribution and therefore integrates to one. We then have

$$P(y) = \frac{n!}{(n+2)!} f(y/n) + \frac{n!}{(n+2)!} \int_{\mathcal{P}} \frac{(n+2)!}{y_G! y_L! y_R!} p_G^{y_G} p_L^{y_L} p_R^{y_R} \Big(f(p) - f(y/n) \Big)\ dp.$$

We wish to show that the second term goes to zero. For $\gamma \in \mathcal{P}$ define $\mathcal{P}_\varepsilon^\gamma = \{p \in \mathcal{P} : \max |p_i - \gamma_i| \le \varepsilon\}$, or the set of vector p within an ε-neighborhood of γ. Also note that since $f(\cdot)$ is a continuous and bounded density, there is some positive D such that $|f(p) - f(\gamma)| \le D\varepsilon$ for any $p \in \mathcal{P}_\varepsilon^\gamma$, so all vectors in this set have some bound. For those $p \notin \mathcal{P}_\varepsilon^\gamma$, the value $\overline{f} = \max_{p\in\mathcal{P}} f(p)$ bounds $|f(p) - f(\gamma)|$. Then we have two cases to consider, either p is in an ε-neighborhood of y/n or it is not. Rearranging yields

$$\frac{(n+2)!}{n!} P(y) - f(y/n) = \int_{\mathcal{P}} \frac{(n+2)!}{y_G! y_L! y_R!} p_G^{y_G} p_L^{y_L} p_R^{y_R} \Big(f(p) - f(y/n) \Big)\ dp,$$

and now imposing these bounds (for the case $\gamma = y/n$) allows us to conclude

$$\left|\frac{(n+2)!}{n!}P(y) - f(y/n)\right| \leq D\varepsilon + \overline{f}\int_{\mathcal{P}\setminus\mathcal{P}_{\varepsilon}^{y/n}} \frac{(n+2)!}{n!}P(y|p)\ dp.$$

Consider the values $p \notin \mathcal{P}_{\varepsilon}^{y/n}$, as in the latter term. This means there is an i such that $p_i < (y_i/n) - \varepsilon$ or $p_i > (y_i/n) + \varepsilon$. In this dimension, $y_i \sim \text{Binomial}(n, p_i)$. Then $P(y_i|p) \leq P(\frac{y_i}{n} \leq p_i - \varepsilon) \leq e^{-2n\varepsilon^2}$. Then we have

$$\begin{aligned}
\left|\frac{(n+2)!}{n!}P(y) - f(y/n)\right| &\leq D\varepsilon + \overline{f}\int_{\mathcal{P}\setminus\mathcal{P}_{\varepsilon}^{y/n}} \frac{(n+2)!}{n!}P(y|p)\ dp \\
&\leq D\varepsilon + \overline{f}\frac{(n+2)!}{n!}e^{-2n\varepsilon^2}\int_{\mathcal{P}\setminus\mathcal{P}_{\varepsilon}^{y/n}} dp \\
&\leq D\varepsilon + \overline{f}(n+2)(n+1)e^{-2n\varepsilon^2},
\end{aligned}$$

which vanishes as $n \to \infty$. ■

Lemma A.2 *Define $p_{jk} = P(y_j = y_k > y_\ell)$ as the probability of a two-way or near two-way tie between parties j and k and $p_3 = P(y_j = y_k = y_\ell)$ as the probability of a three-way or near three-way tie. In large electorates ($n \to \infty$), these probabilities satisfy*

$$\begin{aligned}
p_3 &= \frac{1}{n^2}f(1/3, 1/3, 1/3). \\
p_{GL} &= \frac{1}{n}\int_{1/3}^{1/2} f(t, t, 1-2t)\ dt. \\
p_{LR} &= \frac{1}{n}\int_{1/3}^{1/2} f(1-2t, t, t)\ dt. \\
p_{GR} &= \frac{1}{n}\int_{1/3}^{1/2} f(t, 1-2t, t)\ dt.
\end{aligned}$$

As $n \to \infty$, the probability of three-way ties vanishes faster than the probability of two-way *ties.*

Proof of Lemma A.2: The definition of p_3 is immediate from Lemma A.1. To show existence of the other probabilities, take p_{LR} as an example (others are analogous). Observe that

$$P(y_L = y_R > y_G) = \frac{1}{n^2} \sum_{b=i/3}^{1/2} n^2 P(y_L = y_R = b).$$

From Lemma A.1, we have

$$\lim_{n\to\infty} n \cdot P(y_L = y_R > y_G) = \lim_{n\to\infty} \frac{1}{n} \sum_{b=i/3}^{1/2} f(\frac{n-2b}{n}, \frac{b}{n}, \frac{b}{n}),$$

where the right-hand side defines a Riemann integral that converges to $\int_{1/3}^{1/2} f(1-2t,t,t)\ dt$, so

$$P(y_L = y_R > y_G) = \frac{1}{n} \int_{1/3}^{1/2} f(1-2t,t,t)\ dt.$$

■

Proof of Proposition A.1: Observe that

$$U(G) - U(R) = 4p_3(u_G - u_R) + 1.5p_{GL}(u_G - u_L) + 1.5p_{LR}(u_L - u_R) + 3p_{GR}(u_G - u_R) > 0,$$

so it is always strictly dominant to vote for G rather than R. This proves the first point in the proposition.

Now consider the choice between G and L. The difference in expected utilities is

$$U(G) - U(L) = 4p_3(u_G - u_L) + 3p_{GL}(u_G - u_L) - 1.5p_{LR}(u_L - u_R) + 1.5p_{GR}(u_G - u_R).$$

When this difference is positive, it is optimal to vote for G; when it is negative, it is optimal to vote for L. Rearranging yields $U(G) - U(L) \geq 0$ iff

$$\frac{u_G - u_L}{u_L - u_R} \geq \frac{1.5(p_{LR} - p_{GR})}{4p_3 + 3p_{GL} + 1.5p_{LR}}.$$

Now, by Lemma A.2, note that p_3 vanishes to zero at a rate faster than p_{jk} (n^{-2} vs. n^{-1}). So for n sufficiently large, we have that voter 0 prefers G to L iff

$$\frac{u_G - u_L}{u_G - u_R} \geq \frac{p_{LR} - p_{GR}}{2p_{GL} + p_{LR}},$$

as stated in the proposition. ■

Proof of Corollary A.1: Immediate from the fact that the left-hand side of Equation 1 is increasing in $u_G - u_L$. ■

Proof of Corollary A.2: Recall that $\mathcal{G}$ is defined as

$$\mathcal{G} = \frac{(x_L - x_G)(x_L + x_G - 2x_0)}{(x_R - x_G)(x_R + x_G - 2x_0)}.$$

Partially differentiating with respect to x_G yields

$$\frac{\partial \mathcal{G}}{\partial x_G} = \frac{2(x_0 - x_G)(2x_0 - x_L - x_R)(x_L - x_R)}{(x_G - x_R)^2(-2x_0 + x_G + x_R)^2}.$$

Then $\frac{\partial \mathcal{G}}{\partial x_G} \geq 0$ iff $(x_0 - x_G)(2x_0 - x_L - x_R) \leq 0$, which occurs when $x_0 \in [x_G, \frac{x_L + x_R}{2}]$.

Partially differentiating with respect to x_L yields

$$\frac{\partial \mathcal{G}}{\partial x_L} = \frac{2(x_0 - x_L)}{(x_G - x_R)(-2x_0 + x_G + x_R)}.$$

Now, since voter 0's most-preferred party is G, it must be the case that $x_0 \leq \frac{x_G + x_L}{2}$. Hence for all $x_0 \leq \frac{x_G + x_L}{2}$ we have $\frac{\partial \mathcal{G}}{\partial x_L} \geq 0$. ■

Proof of Proposition A.2: It is straightforward that voter 0 casts a vote for party j whenever the expected utility of doing so is larger than that of voting for party k and party ℓ. Since $\tilde{U}(j) = U(j) + \varepsilon_j$, voter 0 votes for party j iff $U(j) + \varepsilon_j \geq U(k) + \varepsilon_k$ and $U(j) + \varepsilon_j \geq U(\ell) + \varepsilon_\ell$. Evaluating (and letting $p_3 \to 0$ for n sufficiently large) yields

$$\varepsilon_j \geq \varepsilon_k - \frac{3}{2}\Big(2(u_j - u_k)p_{jk} + (u_j - u_\ell)p_{j\ell} + (u_\ell - u_k)p_{\ell k}\Big) \;\equiv\; \overline{\varepsilon}_k.$$
$$\varepsilon_j \geq \varepsilon_\ell - \frac{3}{2}\Big(2(u_j - u_\ell)p_{j\ell} + (u_j - u_k)p_{jk} - (u_k - u_\ell)p_{\ell k}\Big) \;\equiv\; \overline{\varepsilon}_\ell.$$

Thus, voter 0 prefers party j to parties k and ℓ iff

$$\varepsilon_j \geq \max\{\overline{\varepsilon}_k,\ \overline{\varepsilon}_\ell\}.$$

An analogous threshold $\overline{\varepsilon}_j$ exists when considering if voter 0 should support k or ℓ over j. ■