REDISTRIBUTION, PORK AND ELECTIONS[*]

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Abstract

Why might citizens vote against redistributive policies from which they would seem to benefit? Many scholars focus on "wedge" issues such as religion or race, but another explanation might be geographically-based patronage or pork. We examine the tension between redistribution and patronage with a model that combines partisan elections across multiple districts with legislation in spatial and divide-the-dollar environments. The model yields a unique equilibrium that describes the circumstances under which poor voters support right-wing parties that favor low taxes and redistribution, and under which rich voters support left-wing parties that favor high taxes and redistribution. The model suggests that one reason standard tax and transfer models of redistribution often do not capture empirical reality is that redistributive transfers are a less efficient tool for attracting votes than are more targeted policy programs. The model also underlines the central importance of party discipline during legislative bargaining in shaping the importance of redistribution in voter behavior, and it describes why right-wing parties should have an advantage over left-wing ones in majoritarian systems.

1 Introduction

Since the classic work of Meltzer and Richards (1981), political economy models of taxes and redistribution in democracies often rest on the simple assumption that voters make their electoral choices based on the goal of maximizing their own income after taxes and transfers. If taxes are used to redistribute income from higher to lower income individuals, this assumption implies that lower income individuals should prefer left-wing parties that advocate higher taxes and more redistribution, while higher income individuals should prefer right-wing parties that advocate lower taxes and less redistribution. Party competition, however, should drive tax and redistribution outcomes to the preferences of the median voter. This intuitively appealing framework has become a genuine workhorse model in the study of political economy, and scholars have relied on the simple assumption about individual income and the vote to study an impressive array of questions.[1]

However, empirical support for the core prediction from the Meltzer-Richards model — that redistribution should increase with inequality — is sketchy at best (e.g., Bénabou 1996, Perotti 1996, Lindert 1996, Alesina and Glaeser 2004, Moene and Wallerstein 2001, Bassett et al. 1999), and there is little evidence that tax and transfer policies respond to the preferences of the median voter (e.g., Milanovic 2000, Kenworthy and Pontusson 2005). A central explanation for this apparent failure emphasizes how non-economic considerations in voter decisions encourage what we call *cross-over voting*, which occurs when a voter supports a party that advocates policies that seem to be against the voter's economic interest. *Poor cross-over voting* occurs, for example, when lower-income individuals support right-wing parties that favor low taxes and redistribution, and *rich cross-over voting* occurs when higher-income individuals support left-wing parties that advocate higher taxes and redistribution.

In studies of American politics, scholars and commentators often contend that issues related to the so-called "culture wars" – such as abortion, gay marriage, stem cell research, and school prayer – have supplanted traditional economic and security issues in the minds of voters (e.g.,

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[1]Applications include transitions between democracy and authoritarianism (Acemoglu and Robinson 2006, Boix 2003), the effect of income inequality on economic growth (Alesina and Rodrik 1994), the impact of skill specificity on preferences for social protections (Iversen 2005), the impact of individual mobility and inter-jurisdictional competition on redistribution (Epple and Romer 1991), and the impact of electoral laws and separation of powers on economic performance (Persson and Tabellini 1999; 2000), to name but a few.

Frank 2004, Hunter 1991, Wattenberg 1995, Greenberg 2004). If such non-economic issues trump economic ones, and if attitudes on these issues cross-cut attitudes on economics, then there are good reasons to expect that governments should engage in less redistribution than predicted from a standard Meltzer-Richards framework (Roemer 1998, Lee and Roemer 2006). But while such issues are clearly important to certain voters, recent empirical research provides scant support for the "culture wars" arguments (e.g., Bartels 2008, Ansolabehere et al. 2006), and income is a strong and increasingly important predictor of the vote (McCarty et al. 2006). Outside the US, comparative studies of non-economic considerations and vote choice have typically emphasized the rise of post-material values (over "culture wars" issues), but such studies also find that economics — typically measured as social class — trumps post-material values when it comes to predicting actual vote choice (e.g., Inglehart 1990).

But even if the second-dimension arguments that are most prominent in the literature do not seem central to explaining vote choice, the fact remains that the number of cross-over voters is uncomfortably large from the perspective of tax and transfer models. In the US, Gelman et al. (2008) estimate that over 40 percent of rich individuals supported the Democrats in 2004, and that around 40 percent of poor individuals supported the Republicans. These may seem like high cross-over voting rates, but comparative research suggests they are not. Using surveys from 35 elections in 23 countries, for example, Huber and Stanig (2009) find that income-based voting polarization between rich and poor is higher in the US than in any other country but one. Put differently, the US is among the countries where voter behavior best approximates what is assumed in the Meltzer-Richards-type models.

This paper therefore seeks to explain cross-over voting, but to do so without assuming the existence of a second dimension of policy that cross-pressures voters to support parties that are against the voters' economic self-interest. The central distinguishing feature of the model is that it includes two types of transfers that are crucial to voting calculations based on economic self-interest. The first is the means-tested redistribution from rich to poor that is central to median voter tax and transfer models. The second is geographically-targeted transfers or patronage to specific districts, which we call pork. Both types of transfers have received considerable attention

in the political economy literature, but previous research seldom considers both in a unified model.

The importance of pork in electoral politics has long been recognized. Key (1984), for instance, attributes the weakness of pre-World War II southern Republicans at the state level in part to their ability to win patronage as part of the winning coalition at the national level. Research on Japan has described the central role of pork in the strategies of the ruling Liberal Democratic Party (e.g., Curtis 1992, Ramseyer and Rosenbluth 1995, Fukui and Fukai 1996). And McGillivray's (2004) study illustrates how politicians target trade protections to benefit the firms and industries in specific districts in Canada, the US, and Britain.

Policies that provide district-specific benefits obviously include those things that often come immediately to mind when the word "pork" is used: monies for public works such as airports, roads, and bridges. But such programs are in fact the tip of the iceberg when it comes to policies that provide district-specific economic benefits. Whenever a government decides, for example, where to locate government offices, hospitals, universities, military bases, or nationalized industries, there is a significant impact on the local economy and on the location of jobs. Government subsidies, tariff policies, and investments in research typically benefit specific institutions or industries (such as automobiles, alternative energy, or agriculture) and have very geographic-specific effects. The size and scope of all such programs is very large, and indeed comparable to that of redistributive programs. More importantly, their value to specific individuals can dwarf that of transfer payments.

But the amount of pork or patronage that can be used for electoral ends is both endogenous to the political process and finite, and the scope of broad-based redistributive programs is certainly one factor that influences its prevalence, and thus its appeal to voters. A clear understanding of how voters make choices based on personal economic benefits therefore requires one to examine the tension between targeted transfers and redistributive programs. We explore this tension in the context of a model where party platforms describe party commitments to the balance between means-based redistributive programs and to pork. Elections unfold across multiple districts and legislative bargaining determines final policy outcomes. There are two types of voters, the poor (who receive mean-tested redistribution) and the rich (who receive no redistributive transfers and pay taxes). Pork is transferred directly to the districts through legislative bargaining, and it benefits

all voters in the district. Redistributive transfers are shared equally among all the poor voters. The government is a majority-rule legislature composed of the winning candidates from two parties. The left-wing party designates a higher level of government revenues be spent on redistribution than does the right-wing party. It also has a more left-wing ideological position on policies unrelated to redistribution, and can advocate higher taxes. Poor voters therefore prefer the redistributive policy and the ideological policy position of the left-wing party, while the rich voters prefer the right-wing party on these dimensions. After elections, the party winning a majority of seats determines the proportion of the budget that is used for redistribution and for pork, and legislative bargaining determines how the pork is distributed across districts.

The basic insight of the model about cross-over voting is that when voters expect the party with "bad" redistributive policies to win at the national level, they may nonetheless cross-over vote for this party in their district in order to obtain local pork. In what follows, we flesh out how variables like party discipline, the number of poor voters, party system polarization, and the ability of left parties to expand the size of the budget affects cross-over voting incentives. Here, however, we wish to highlight three general themes that emerge from the analysis.

First, the model brings into sharp relief the fact that the tax-and-transfer redistributive programs that are central to the Meltzer-Richards models are relatively inefficient electoral tools for political parties. Such means-tested programs often reach only a minority of voters in a given district, and they thus may often fail to influence its pivotal voter's calculation. If the benefits of means-tested programs do reach the median voter in a given district, they typically must be spread quite thinly across many individuals in society, lowering their value relative to more targeted policies. And if individuals are mobile yet collect the same redistributive benefits regardless of where they live, then broad-based redistributive programs cause politicians to abdicate a great deal of political control over how benefits are distributed across districts. A more targeted approach to distributing government benefits avoids these inefficiencies. Thus, if a party focuses more on targeted rather than redistributive transfers, it may have an electoral advantage, and may encourage cross-over voting by individuals who are willing to sacrifice on a redistributive policy dimension to gain more targeted transfers.

Second, the effect of individual income on the vote, and thus the relative efficiency of pork as an electoral tool, depends crucially on the role of political parties in legislative bargaining over the distribution of pork across districts. In order for pork to affect voting decisions, voters have to be able to form expectations about how their vote will affect its distribution, which we argue should depend on whether parties can exercise discipline over their members in the legislature. When parties are "strong" (i.e., highly disciplined), the majority party can exclude members of the minority party from pork, creating incentives for voters to support the winning party at the national level in order to obtain pork in their district. This is precisely how voting for the LDP is often described in Japan. When parties are weak, and there is some form of free-for-all bargaining over pork distribution, the impact of the voting outcome on pork weakens, and voters therefore have a stronger incentive to vote their redistributive interests. The model therefore highlights the importance of considering how the structure of legislative politics affects voting on redistribution by constraining the ability of candidates to make arbitrary promises to voters.

Third, the model suggests that although cross-over voting by rich and poor can occur in equilibrium, there is an asymmetry that advantages the rich voters and the right-wing party. Since cross-over voting occurs in order to obtain pork, and since the right-wing party spends a lower proportion of the budget on redistribution, it can devote a higher proportion of the budget to pork. The combination of more pork and the greater efficiency of pork for attracting voters implies that the incentives for the poor to cross-over vote for the right are typically greater than are the incentives for the rich to cross-over vote for the left, even when the left-wing party can raise taxes substantially to finance its programs. Our model therefore provides an intuition for why right-wing parties should have an advantage over left-wing ones in plurality rule electoral systems.

To examine the robustness of our model and link it with some of the main concerns of the elections literature, we explore several extensions of the model. First, we consider the possibility that left-wing parties are able to to raise taxes so high that they offer *both* more redistribution and more pork to voters. This possibility can eliminate the right-wing advantage, but it is very difficult to raise taxes high enough to create a left-wing advantage. Second, we examine the effect of a "middle class" which is not taxed but may or may not receive redistributive benefits.

When no income class has a majority, the left party can overcome its electoral disadvantage with a broad-based redistributive program that provides benefits to middle- as well as lower-income voters. But if a majority of voters are poor, then such a program can actually help the right to secure a victory by diluting the value of redistributive transfers. Third, when parties control redistricting processes and thus the distribution of voter types across districts, there can be stark implications for the geographic distribution of public money when parties are strong. Since a planner who allocates the distribution of voters needs only to place a majority of voters in a majority of districts, she can achieve large swings in distributive outcomes under strong parties even when the number of sympathetic voters is relatively small. Finally, when parties are "Downsian" and adopt platforms to maximize their legislative seats, anticipated losers adopt the ideal points of their natural constituents. This minimizes (but does not eliminate) the extent of cross-over voting to the winning party. While losing parties are ideological purists, winning parties will typically deviate from their constituents' preferred policy somewhat in order to draw cross-over votes.

Our model joins a line of recent research that examines how redistribution is affected not by a second dimension that is orthogonal to economic self-interest, but by the ability of governments to target transfers to specific groups on a basis other than income. Levy (2005), for example, examines the formation of electoral coalitions between the rich (who receive low taxes) and those poor who value education (who receive higher educational spending). Fernàndez and Levy (2008) examine how the number of ethnic groups affects incentives of poor voters to support right-wing parties to obtain group-based benefits. And Austen-Smith and Wallerstein (2006) examine how the ability to target transfers based on race affects redistribution. Although none of these models shares the institutional structure of our model or its focus on cross-over voting, like our model, they each underscore the fact that the distribution of government resources occurs along pathways other than income-based redistribution. Further, they show that such pathways can affect the formation of electoral coalitions based on income, and the amount of income-based redistribution that occurs.

Our work also joins an extensive list of models that have considered the interaction between elections and government policy. With respect to electoral structure, our analysis is perhaps most closely related to Dixit and Londregan (1995), who examine political competition among parties

with fixed ideological platforms and the ability to commit to transfer payments to groups within a single electorate. Their model, however, does not include means-tested redistributive programs. Our model is also similar in structure to Milesi-Ferretti et al. (2002), who allow parties to compete on transfers to specific groups (such as the poor or the aged) and to geographic constituencies. Their paper, however, assumes that the distribution of groups within each district is the same in majoritarian systems, and they do not explicitly consider means-tested transfers based on income, and thus their model cannot examine the question of cross-over voting that is central here. Snyder and Ting (2003) have partisan elections with fixed platforms, but the subsequent legislation is on a spatial dimension. While there is no election in their model, Jackson and Moselle (2002) consider the problem of simultaneous bargaining over spatial policy and pork in a legislature. The lack of a simple equilibrium solution in their work motivates our simplifying assumption that these two issues are considered separately in our legislature.[2]

The remainder of the paper is organized as follows. Section 2 describes the basic structure of the model. Section 3 examines the unique equilibrium when parties are weak, and section 4 examines the unique equilibrium when parties are strong. We then consider several extensions in Section 5: allowing the left-party to adopt very high-taxes, including the middle-class, allowing endogenous districting, and allowing endogenous party platforms with Downsian parties. The final section discusses the implications of our results.

2   The Model

Our model combines partisan elections across multiple districts with legislative policy choices in both spatial and divide-the-dollar environments. All election candidates and legislators belong to one of two (non-strategic) parties, denoted P_L and P_R, which respectively represent "Left" and "Right." There is a continuum of voters who are divided into n districts, denoted $S_1, \ldots, S_n$. The set of all voters has measure n, where n is an odd integer, and each district has measure 1. Let

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[2]A related class of models explores the legislative or electoral tradeoffs between universal and targetable programs. Volden and Wiseman (2007) derive closed-form solutions in a legislative bargaining game over the distribution of particularistic benefits and a collective good. Christiansen (2009) extends their model to include the election of legislators with diverse preferences over particularistic and collective goods. Models of electoral systems and redistribution in this vein include Persson and Tabellini (1999) and Lizerri and Persico (2001).

m denote the size of the smallest majority. For the election in each district, each party has a candidate, and a winner is chosen by plurality rule. Within each party, candidates are identical across districts.

A central variable in the model is the distribution of voters in each district. There are two types of voters, denoted by $t \in \{P, R\}$, which correspond informally to "poor" and "rich," respectively. The poor voters qualify for means-tested income support and pay no taxes, whereas the rich pay taxes and receive no means-tested transfers. Let p_k^t be the proportion of voters of type t in S_k. The total number of type t voters in society is then $n^t = \sum_{k=1}^{n} p_k^t$. We refer to a district as "rich" or "poor" if the respective types are a majority of its population, and let d^R and d^P represent the number of rich and poor districts, respectively. The legislature is composed of the n winning candidates.

Each party, P_j, has an exogenous platform, $\lambda_j \in [0, 1]$, that is adopted by all of its candidates, and to which the parties credibly commit. A platform, λ_j, describes two (perfectly correlated) elements of a party's policy intentions. First, λ_j is party j's ideal point in a general ideological policy space. We assume that voters care about electing a representative in their district who is close to them in this ideological space. This may simply be an expressive preference, or there may be non-financial issues that individual legislators can influence independently in their districts. The second element is the party's commitment to the two types of government financial transfers that exist in the model: pork and redistribution. "Pork" is tax revenues that are transferred directly to the districts through legislative bargaining. These transfers benefit all members of the district, regardless of their income. The proportion of total spending that P_j pledges to devote to pork is simply λ_j. "Redistribution" is a means-tested income support or welfare program that benefits only the poor, and that is shared equally among all poor. This program consumes the entire non-pork portion of government revenues, and thus the proportion of total spending that P_j pledges to redistribution to the poor is $1 - \lambda_j$. We assume that P_R prefers a smaller welfare system than P_L, which implies $\lambda_R \geq \lambda_L$.

The legislature is represented by an n-vector $\mathbf{x}$ of the platform positions of the winning candidates, and the median value x of $\mathbf{x}$ (*i.e.*, the majority platform) determines the majority's ideological

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policy, as well as how the legislature disperses money across society. The proportion of government revenues allotted to pork is the majority platform, x. Pork is allocated to districts through an indivisible grant at the district level, and is denoted by an n-vector $\mathbf{y}$ of district allocations. The proportion $1 - x$ is devoted to redistribution to the poor, and is spread equally among all poor voters.

The model allows party platforms and the government's budget to be linked in a way that allows P_L to advocate larger overall budgets. Let $c \in [0, 1]$ denote an exogenous constraint on total government spending. The government budget is $b(x) = 1 + (1 - c)(1 - x)$. At one extreme, if $c = 1$, the government's resources are fixed at 1 regardless of which party wins the election, and any increases in welfare spending must therefore come at the expense of pork. The parties' differing commitments to pork and redistribution are therefore all that distinguishes them from each other, reducing the model to the standard divide-the-dollar framework common to many models of distributive politics. As c declines, the government budget increases as the proportion of revenues devoted to welfare spending increase, which implies that for any pair of party platforms, the total taxes and spending by P_L will grow relative to that of P_R. At the other extreme, where $c = 0$, redistribution is funded entirely by *incremental* tax dollars. The parameter c therefore represents an exogenous constraint — such as debt, existing social policy, the state of the economy, or international factors — on the feasibility of tax increases, and thus on how much larger the government will be when P_L wins than when P_R wins. Note that the total quantity of pork, $xb(x)$, is increasing in x, and the total quantity of welfare spending, $(1 - x)b(x)$, is decreasing in x, which implies that the total amount of pork available to P_R is greater than that available to P_L for any c. The budget is financed by a flat tax on all rich voters.

Although in principle c could be negative (and we explore this possibility in an extension below), it makes sense to focus attention on parameterizations of c that reflect the existing empirical understanding of differences between left and right parties. Such research suggests that globalization, the size of the welfare state, and voter distaste for large deficits makes the effect of partisan control of government on the overall size of government either quite small or non-existent (e.g., Cusack 1997, 1999, Garrett and Lange 1991, Scharpf 1991, Kwon and Pontusson 2009). It therefore makes

little sense to allow c to be so small that the budget differences between the two parties becomes unrealistically large. When $c = 0$ in our model, every extra dollar spent by the left on redistribution is funded by additional taxation, which probably allows the difference between left and right budgets to exceed what we actually observe empirically.[3]

Voters have Euclidean preferences over ideological policy and quasilinear utility over money. For the former, each type t of voter has a common ideal point over her representative's position-taking preferences, where $z^t \in [0, 1]$.[4] A key assumption is that voters' preferences over redistribution and ideological policy are correlated: $t = R\,(P)$ implies that $z^t \geq (<) \frac{\lambda_L + \lambda_R}{2}$. Thus poor voters are drawn to the ideological position of P_L. Clearly, allowing poor voters to prefer the λ_R spatial position would create obvious—and trivial—incentives for poor voters to vote against their economic interests. Each district k voter's utility function is then:

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u_k(\mathbf{x}, \mathbf{y}; t) = \begin{cases} u(|z^t - x_k|) + y_k + \frac{(1-x)b(x)}{n^P} & \text{if } t = P \\ u(|z^t - x_k|) + y_k - \frac{b(x)}{n^R} & \text{if } t = R, \end{cases}
$$

where $u : \Re_+ \to \Re_-$ is continuous, concave, and decreasing. For convenience, we will simply write $u^t(x_k)$ in place of $u(|z^t - x_k|)$. Legislators have single-peaked position-taking preferences over spatial policy, maximized at their party platform, and quasilinear utility y_k over pork in their district. Since the model does not address candidate selection of campaign strategies, it is unnecessary to specify utilities for election candidates.

The game begins with simultaneous elections in each district, where voters simultaneously choose between candidates from each party. After the election winner is determined in each district, legislative bargaining determines the level of redistribution and the allocation of pork across districts. This bargaining takes place in two stages. First, legislators bargain over spatial policy. As noted above, legislators from the same party have identical ideological (i.e., spatial) preferences

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[3]For example, if the left party commits 55 percent of the budget to redistribution and the right party commits 45 percent, then when $c = 0$, the left party budget would be 7 percent larger than that of the right party. This number is itself large, and to allow this difference to become even larger by allowing $c < 0$ is substantively questionable.

[4]The results of the model are unchanged with heterogeneous voter types, if the median voter in a type t district is located at a common z^t. The results are substantially unchanged even when district medians are somewhat heterogeneous, but clearly the presence of "conservative" poor voters or "liberal" rich voters will lead to greater incentives for cross-over voting.

regarding redistribution. It is clear that in this stage, a wide variety of simple bargaining arrangements would lead to a median voter result. We therefore suppress the details of this stage, and allow the aggregate amount of redistribution to be $1 - x = 1 - \lambda_j$, where P_j is the party that wins a majority of districts. Second, legislators bargain over pork. Since legislators maximize the proportion of the available pork, λ_j, that goes to their districts, this process pits them against each other, independent of party. We separate the two stages for analytical tractability; bargaining over both stages simultaneously can make the derivation of comparative statics almost impossible (Jackson and Moselle 2002).

We consider two different bargaining processes for the pork, which capture the extremes of party discipline in the legislature. In the *weak party* bargaining process, parties do not play a role in how members form coalitions, and legislators are free to bargain with any other legislator, so bargaining over pork involves the entire chamber. The election outcome therefore has no impact on the *distribution* of pork. In the *strong party* bargaining process, the majority party has unlimited proposal power and discipline. Because of perfect party discipline, the majority party can pass any legislation that is approved by a majority of its members, and therefore may divide the pork only among districts represented by the party.

We are again agnostic about the details of the bargaining game at this stage, simply because many bargaining games predict equal *ex ante* expected payoffs in games where all players have equal voting weight. This is true of the noncooperative models of Baron and Ferejohn (1989) and Morelli (1999), and also of power indices based on cooperative game theory, such as Shapley and Shubik (1954) and Banzhaf (1968). Thus the weak party bargaining process implies an *ex ante* expected pork level of $\frac{xb(x)}{n}$ for all districts. Likewise, the strong party bargaining process implies an *ex ante* expected pork level of $\frac{xb(x)}{\overline{n}}$ in districts represented by the majority party, where $\overline{n}$ is the total population of such districts. When parties are strong, districts not represented by the majority party receive 0 with certainty.

Because the outcome of the bargaining process can be reduced to an expected payoff, the model is effectively a simultaneous-move game amongst voters. We assume that voters choose as if they were pivotal in choosing their district's legislator. This implies that voters of the same type in

a given district always vote the same way; thus, let v_k^t be the vote by type t in S_k. While Nash equilibria in this game are typically not unique, we can derive a unique prediction by considering coalition-proof Nash equilibria (CPNE). CPNE rule out Nash equilibria in which subsets of players may credibly deviate from a Nash equilibrium. The concept is weaker than that of a strong Nash equilibrium, which rules out *any* Nash equilibrium in which a subset of players may profitably deviate. By contrast, CPNE only rules out equilibria with *self-enforcing* deviations. A coalition of deviators is self-enforcing if no subset thereof would receive strictly higher payoffs from deviating in turn from the coalition's proposed alternative strategy profile. As Bernheim, Peleg, and Whinston (1987) show, all strong Nash equilibria are CPNE, but CPNE are not generally guaranteed to exist. In general, CPNE may exist when strong Nash do not, and as we show in Proposition 2 below, CPNE is sufficient to guarantee a unique configuration of election returns when Nash equilibria are not unique.

3   Weak Parties

We begin with the weak parties case, which will build intuition and serve as a benchmark for the subsequent analysis. In this environment, the distribution of pork is not controlled by the majority party. Instead, there is an "open" bargaining process that allows all elected legislators an equal opportunity to gain pork for their districts. This results in an *ex ante* expected pork allocation of $xb(x)/n$ regardless of the election winner.

To characterize voting strategies, note that poor voters always prefer a P_L victory on ideological grounds (i.e., $u^P(\lambda_L) \geq u^P(\lambda_R)$), while rich voters similarly prefer P_R. There are two cases to consider. First, if a poor voter perceives that her vote will not affect which party wins the election, then her vote will affect neither her expected redistribution benefit nor her expected pork allocation. She will therefore vote for P_L to secure the preferred ideological policy benefits from a friendly legislator. Second, if a poor voter resides in a pivotal district, her vote determines the national party winner. A potential trade-off therefore exists between the expected amounts of pork and

redistribution. Comparing expected utilities, a poor voter chooses P_L if:

$$u^P(\lambda_L) + \frac{\lambda_L b(\lambda_L)}{n} + \frac{(1-\lambda_L)b(\lambda_L)}{n^P} \geq u^P(\lambda_R) + \frac{\lambda_R b(\lambda_R)}{n} + \frac{(1-\lambda_R)b(\lambda_R)}{n^P}. \qquad (1)$$

Since $\lambda_L b(\lambda_L) \leq \lambda_R b(\lambda_R)$, the pivotal poor voter chooses P_L whenever $n^P < n$, which is always true.

The calculation for rich voters is very similar. In a non-pivotal district, they effectively choose only on the basis of ideology and therefore always choose P_R. In a pivotal district, a rich voter chooses P_R if:

$$u^R(\lambda_R) + \frac{\lambda_R b(\lambda_R)}{n} - \frac{b(\lambda_R)}{n^R} \geq u^R(\lambda_L) + \frac{\lambda_L b(\lambda_L)}{n} - \frac{b(\lambda_R)}{n^R}. \qquad (2)$$

Since supporting P_R yields higher ideological utility, more pork, and lower taxes, rich voters have a weakly dominant strategy of voting for P_R.

We summarize these derivations in Proposition 1, which simply states that under weak parties, voters vote according to their ideology. Their strategies are unaffected by incentives to support the candidate that will bring the most pork to the district and so cross-over voting does not exist.

Proposition 1 *When parties are weak, there is no cross-over voting in equilibrium: rich voters support P_R and poor voters support P_L.* ∎

4   Strong Parties

We now consider the strong party case. Strong parties control the distribution of pork, and thus create cross-over voting incentives by rich and poor. In contrast with the weak party case, individuals may vote for the "wrong" party — even when it gives them worse ideological policy, higher taxes (for the rich) and lower levels of redistribution (for the poor) — because so doing allows them to elect a legislator from the winning coalition, ensuring access to pork.

4.1 Main Result

As before, poor voters prefer P_L on ideology and redistribution, and rich voters always prefer P_R on these dimensions. However, both types of voters may have incentives to cross-over and support the "wrong" party if so doing ensures access to a sufficient level of pork. To characterize the equilibrium levels of support for each party, then, it is useful to characterize the circumstances under which the rich and the poor will engage in cross-over voting.

We first consider the optimal voting strategies in a single district k. Let w_{-k} represent the number of districts excluding k that are expected to vote for P_R and suppose that district $k's$ pivotal voter is rich. When would such a voter cross-over and support P_L? If the district is pivotal for the election outcome (i.e., $w_{-k} = m - 1$), then her utility from supporting the candidate from party j is:

$$u^R(\lambda_j) + \frac{\lambda_j b(\lambda_j)}{m} - \frac{b(\lambda_j)}{n^R}. \tag{3}$$

Since $u^R(\lambda_R) > u^R(\lambda_L)$, $\frac{\lambda_R b(\lambda_R)}{m} > \frac{\lambda_L b(\lambda_L)}{m}$ and $\frac{b(\lambda_R)}{n^R} \leq \frac{b(\lambda_L)}{n^R}$, the rich voter will never support P_L. That is, voting for the left would yield lower ideological utility, less pork, and potentially higher taxes than voting for the right, so cross-over voting will not occur.

If a rich voter lives in a non-pivotal district and a majority of districts are expected to support P_R (i.e., $w_{-k} \geq m$), then the rich voter will cross-over and support the left party only if

$$u^R(\lambda_R) + \frac{\lambda_R b(\lambda_R)}{w_{-k} + 1} - \frac{b(\lambda_R)}{n^R} < u^R(\lambda_L) - \frac{b(\lambda_R)}{n^R}.$$

Since the rich voter gets more pork and higher ideological utility by supporting P_R (with no implications for taxes), this expression can obviously never be satisfied. Consequently, a rich voter might support P_L only if she lives in a non-pivotal district, and if a majority of districts are expected to support P_L (i.e., when $w_{-k} < m - 1$). In this case, a rich voter supports P_L only if:

$$u^R(\lambda_R) - u^R(\lambda_L) < \frac{\lambda_L b(\lambda_L)}{n - w_{-k}}. \tag{4}$$

When $w_{-k} < m - 1$, voting for P_L yields lower policy utility but more pork. The rich voter will

vote for P_L if the loss in ideological utility is small relative to the gain in pork (i.e., if $u^R(\lambda_R) - u^R(\lambda_L)$ is small relative to $\frac{\lambda_L b(\lambda_L)}{n - w_{-k}}$). Thus, cross-over voting by the rich can only occur if a majority of districts are expected to vote for P_L and the ideological utility losses of voting left are small relative to the pork gains. This cross-over voting behavior by voters in rich districts is summarized in Remark 1.

Remark 1 *Rich voters will support P_L if and only if $w_{-k} < m - 1$ and (4) holds.* ∎

Next consider cross-over voting by poor voters. In non-pivotal districts, their cross-over voting incentives are similar to the cross-over voting incentives of rich voters. If P_L is expected to win a majority of districts (i.e., $w_{-k} < m - 1$), then the poor voters in a non-pivotal district cannot influence the level of redistribution, and they obtain a worse policy outcome and less pork by supporting P_R. That is, the poor voters will cross-over and vote P_R only if:

$$u^P(\lambda_L) + \frac{\lambda_L b(\lambda_L)}{n - w_{-k}} < u^P(\lambda_R), \tag{5}$$

which can never be satisfied.

If poor voters are in a non-pivotal district and P_R is expected to win a majority of districts $(w_{-k} \geq m)$, then they cannot influence the level of redistribution. In casting their vote, like the rich voter when P_L is expected to win a majority of districts, they must weigh a trade-off between ideological policy and pork. Supporting P_L yields better ideological policy but less pork. The poor voters in this case will cross-over and vote for P_R if:

$$u^P(\lambda_L) - u^P(\lambda_R) < \frac{\lambda_R b(\lambda_R)}{w_{-k} + 1}. \tag{6}$$

The central difference between poor voters and rich voters occurs in pivotal districts. Recall that rich voters in a pivotal district will never vote for P_L because so doing results in worse ideological policy, less pork and potentially higher taxes. Poor voters in a pivotal district, by contrast, face a trade-off. If they support P_R, they receive *more* pork but less redistribution and worse ideological

policy, so the poor voter in a pivotal district will cross-over and support P_R if:

$$u^P(\lambda_L) + \frac{\lambda_L b(\lambda_L)}{m} + \frac{(1-\lambda_L)b(\lambda_L)}{n^P} < u^P(\lambda_R) + \frac{\lambda_R b(\lambda_R)}{m} + \frac{(1-\lambda_R)b(\lambda_R)}{n^P}. \qquad (7)$$

Note that (7) implies (6) for $w_{-k} = m - 1$.

Remark 2 summarizes the cross-over voting conditions for poor voters:

Remark 2 *Poor voters will support P_R if either $w_{-k} \geq m$ and (6) holds, or $w_{-k} = m - 1$ and (7)* *holds.* ■

Together, Remarks 1 and 2 suggest two important implications of the model. First, Remark 1 indicates that rich voters will never cross-over and support P_L when a majority of districts support P_R, and Remark 2 indicates that poor voters will never cross-over and support P_R when there are a majority of districts supporting P_L. Thus, in any Nash equilibrium, the winning party must carry all like-minded districts. If P_L wins a legislative majority in equilibrium, then *all* districts for which poor voters are a majority must vote for P_L. Similarly, if P_R wins, all rich districts must vote for P_R. Second, the remarks suggest an important advantage that right-wing parties enjoy in pivotal districts. If a pivotal district has a majority of rich voters, then since these voters receive no redistribution and know that P_L offers less pork than P_R, they never face a trade-off between ideological policy, pork and redistribution. Rich voters in pivotal districts will therefore always support the right-wing party, ensuring a P_R victory. By contrast, if a pivotal district has a majority of poor voters, then by (7), it is not certain that P_L will win because the poor voters may face a tradeoff: supporting P_R will often yield more pork, but supporting P_L will yield superior outcomes in ideological policy and redistribution. If the value of pork from P_R is relatively large, poor voters may cross-over and support P_R in a pivotal district.

We can now characterize the equilibrium levels of voter support for each party. It is useful to define explicitly the number of districts that will cross-over if the "wrong" party is expected to win. If P_R is expected to win a majority of seats, then Remark 2 indicates that the number of poor

districts supporting P_R is:

$$\overline{w} = \max\left\{ w \;\middle|\; u^P(\lambda_L) - u^P(\lambda_R) < \frac{\lambda_R b(\lambda_R)}{d^R + w + 1} \right\}. \tag{8}$$

Intuitively, $\overline{w}$ is the size of the largest collection of poor districts such that poor voters contained within are willing to support P_R. Since $\frac{\lambda_R b(\lambda_R)}{d^R + w + 1}$ is decreasing in w, $\overline{w}$ is uniquely defined. For obvious reasons, we bound $\overline{w}$ at 0 and d^P when the expression (8) implies a value less than 0 or greater than d^P, respectively.

Similarly, let the number of non-pivotal rich districts that would support P_L if P_L is expected to win be (uniquely) defined as:

$$\underline{w} = \max\left\{ w \;\middle|\; u^R(\lambda_R) - u^R(\lambda_L) < \frac{\lambda_L b(\lambda_L)}{d^P + w + 1} \right\}. \tag{9}$$

As with $\overline{w}$, we bound $\underline{w}$ between 0 and d^R in the obvious way.

Let w^* be the number of districts supporting the winning party. We can use $\overline{w}$ and $\underline{w}$ to characterize the unique winner and w^* in a coalition-proof Nash equilibrium. The CPNE are unique up to combinations of the districts supporting each party, and we therefore use the term "unique" in this context.[5]

Proposition 2 *There is a unique coalition-proof Nash equilibrium, where:*

(i) If $d^R \geq m$ then P_R wins and $w^* = d^R + \overline{w}$.

(ii) If $d^R < m$ and (7) is satisfied, then P_R wins and $w^* = d^R + \overline{w}$.

(iii) If $d^R < m$ and (7) is not satisfied, then P_L wins and $w^* = d^P + \underline{w}$.　■

Proof. Notationally, let $\mathcal{W}$ denote a generic winning coalition, and $\mathcal{C}$ a subcoalition of deviators from a prescribed strategy profile.

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[5]Since districts of a given type have identical pivotal voters, any combination of $\overline{w}$ poor districts (or $\underline{w}$ rich ones) could vote with the winners in equilibrium. If district medians of a given type were heterogeneous, then $\overline{w}$ and $\underline{w}$ would not be unique and some combinations would be possible in a coalition, since districts would differ in their propensities to cross-over vote.

Observe first that by (8), the number of poor districts supporting P_R in a Nash equilibrium cannot be greater than $\overline{w}$ (otherwise, a poor district supporting P_R would prefer switching to P_L) or less than $\overline{w}$ (otherwise, a poor district supporting P_L would prefer switching to P_R). Thus, only $\overline{w}$ poor districts can support P_R in a Nash equilibrium. Likewise, by (9), the number of rich districts supporting P_L in a Nash equilibrium can only be $\underline{w}$. Thus, for any configuration of districts and voter preferences, a profile of voting strategies in which each citizen votes as if she were pivotal is a Nash equilibrium only if: P_R wins and $w^* = d^R + \overline{w}$ (with all rich districts voting for P_R), or P_L wins and $w^* = d^P + \underline{w}$ (with all poor districts voting for P_L). We now consider possible CPNE for each case.

(i) There cannot be an equilibrium majority for P_L because for any such majority of size $|\mathcal{W}|$, any subcoalition $\mathcal{C}$ of $|\mathcal{W}| - m + 1$ rich districts would prefer to defect collectively to P_R. All such defectors would then receive $u^R(\lambda_R) + \frac{\lambda_R b(\lambda_R)}{m} - \frac{b(\lambda_R)}{n^R}$. A proper subset of $\mathcal{C}$ of size d would then receive $u^R(\lambda_L) + \frac{\lambda_L b(\lambda_L)}{d+m-1} - \frac{b(\lambda_L)}{n^R}$ by deviating back to P_L. Since it is not profitable for any member of $\mathcal{C}$ to deviate back to P_L, P_L cannot win in a CPNE.

To show that P_R wins in equilibrium, observe first that by Remarks 1, 2, and (8), the strategy profile under which all rich districts and $\overline{w}$ poor districts vote for P_R is a Nash equilibrium.

To show coalition proofness, consider any potential subcoalition of deviators $\mathcal{C}$. $\mathcal{C}$ cannot contain any rich districts, since any profitable deviation must result in a P_L victory, and by (3) a subcoalition of $\mathcal{C}$ of rich districts would deviate to form a minimal-winning P_R coalition. Thus $\mathcal{C}$ can consist only of poor districts, and cannot affect P_R's victory. By (8), no subcoalition of poor districts in $\mathcal{W}$ can do better by switching to P_L, and no subcoalition of districts outside $\mathcal{W}$ can do better by switching to P_R. Finally, any $\mathcal{C}$ containing members of both $\mathcal{W}$ and the losing coalition cannot strictly increase the payoffs of all members of $\mathcal{C}$. The unique CPNE therefore has $w^* = d^R + \overline{w}$ districts supporting P_R.

(ii) We first show that P_L cannot win in equilibrium when (7) is satisfied. Suppose otherwise. Because $|\mathcal{W}| = m$ would imply that poor voters in pivotal districts vote for P_L in violation of (7), it follows that $|\mathcal{W}| > m$. The maximum payoff that poor voters from poor districts could therefore ever receive from a P_L majority would occur when $|\mathcal{W}| = m + 1$. Such a majority would yield poor

voters in $\mathcal{W}$ a utility of:

$$u^P(\lambda_L) + \frac{\lambda_L b(\lambda_L)}{m+1} + \frac{(1-\lambda_L)b(\lambda_L)}{n^P} < u^P(\lambda_L) + \frac{\lambda_L b(\lambda_L)}{m} + \frac{(1-\lambda_L)b(\lambda_L)}{n^P}.$$

But since by (7) we have $u^P(\lambda_L) + \frac{\lambda_L b(\lambda_L)}{m} + \frac{(1-\lambda_L)b(\lambda_L)}{n^P} < u^P(\lambda_R) + \frac{\lambda_R b(\lambda_R)}{m} + \frac{(1-\lambda_R)b(\lambda_R)}{n^P}$, the utility to voters in poor districts from a minimal winning majority for P_R is greater than the utility from any possible P_L majority. From this it follows that if a majority of size $|\mathcal{W}| \geq m+1$ formed for P_L, there would exist a subcoalition $\mathcal{C}$ of $|\mathcal{W}| - m + 1$ poor districts that would prefer to defect collectively to P_R, thus inducing a minimum winning P_R majority. To show that $\mathcal{C}$ is self-enforcing, note again that by (7), there is no subset of $\mathcal{C}$ that would prefer to defect back and support P_L, because all members prefer a minimum winning coalition for P_R to any winning coalition for P_L. This contradicts the existence of a CPNE where P_L wins.

It remains to show that a P_R victory with $w^* = d^R + \overline{w}$ represents a CPNE. Observe first that (7), (8), and Remarks 1 and 2 establish that it is a Nash equilibrium for all rich districts and exactly $\overline{w} \geq m - d^R$ poor districts to vote for P_R. Thus the strategy profile supporting a P_R victory is a Nash equilibrium.

To show that this equilibrium is coalition-proof, there are three cases. First, suppose that a potential defecting coalition $\mathcal{C}$ is composed only of districts not in $\mathcal{W}$. Then (8) clearly implies that these districts (which must be poor) cannot benefit by defecting. Next, suppose that $\mathcal{C}$ is composed only of districts in $\mathcal{W}$. Let $d = w^* - m$. Any $\mathcal{C}$ must satisfy $|\mathcal{C}| > d$; otherwise, districts in $\mathcal{C}$ would not cause P_L to win and would therefore receive no pork for defecting. Now suppose that there exists a $\mathcal{C}$ with $|\mathcal{C}| > d$ that prefers to defect to P_L. Then there exists a proper subset of $\mathcal{C}$ that would give P_R a minimum winning coalition by defecting back to P_R. By an argument identical to that in the proof that P_L cannot win, this outcome is better for poor districts in $\mathcal{C}$ than any winning coalition for P_L when (7) is satisfied. It must therefore also be better for any rich district in $\mathcal{C}$. Finally, suppose that $\mathcal{C}$ contains districts both in $\mathcal{W}$ and not in $\mathcal{W}$. There is clearly no $\mathcal{C}$ that strictly improves all members' payoffs if P_R continues to win. But if P_L wins, then by an argument identical to that of the previous case there exists a subcoalition of $\mathcal{C}$ that would restore defect back

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to a minimum-winning P_R coalition.

Thus there does not exist a self-enforcing $\mathcal{C}$. We conclude that in the unique CPNE, $w^* = d^R + \overline{w}$.

(iii) This proof is symmetric to that of case (i) and is therefore omitted. ∎

Proposition 2 demonstrates that when parties are strong, cross-over voting incentives exist for rich and poor alike, as voters in both income groups may have incentives to support the "wrong" party in order to ensure access to pork. The extent to which this occurs depends on how voters weigh trade-offs between ideological policy, taxes, redistribution, and pork.

The general intuition for the model rests on the link between district-level voting incentives and national outcomes. Figure 1 illustrates this link. In the example, there are six poor districts and five rich districts. We assume that if P_R is expected to win, it is profitable for exactly three poor districts to support P_R (i.e., $\overline{w} = 3$), and if P_L is expected to win, it is profitable for exactly one rich district to support P_L (i.e, $\underline{w} = 1$). The figure depicts the only two Nash equilibria that can exist in the case. If P_R is expected to win, then all rich districts must support P_R, and by the definition of $\overline{w}$, three poor districts prefer supporting P_R to P_L. Similarly, if P_L is expected to win, then all poor districts support P_L, and by the definition of $\overline{w}$, one rich district prefers P_L to P_R.
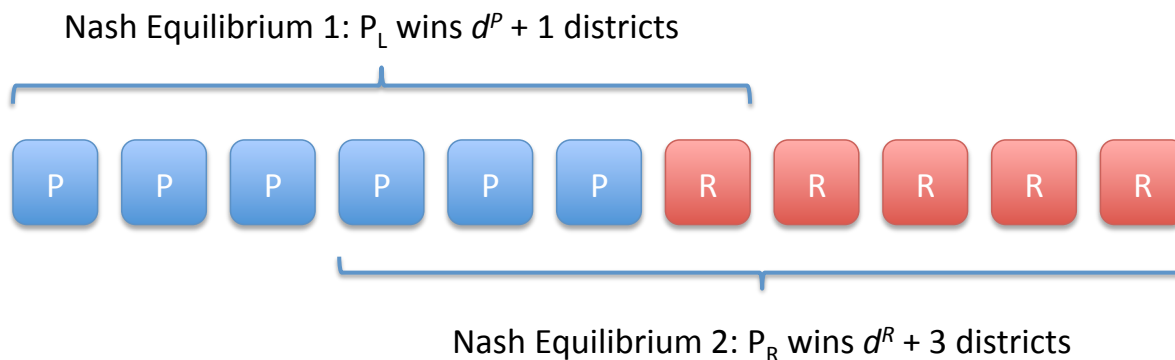

Figure 1: *Nash equilibria when $\overline{w} = 3$ and $\underline{w} = 1$.*

Which one of these equilibria is the unique CPNE depends on whether a poor pivotal district prefers a P_L or P_R legislative majority. Suppose that a pivotal poor district would vote for P_R. Then Nash Equilibrium 1 is not a strong Nash equilibrium because one rich district and one poor

district would prefer to switch to P_R. It also cannot be a CPNE because neither defecting district could have an incentive to defect back to supporting P_L: both defecting districts would be pivotal in maintaining a P_R majority, and both prefer P_R when they are pivotal. Consider Nash equilibrium 2. This equilibrium may not be strong, since three poor districts might prefer to switch jointly to P_L. That is, it may be better for the three poor districts to be part of a minimum winning coalition for P_L than part of an oversized coalition (of size 8) for P_R. Nash Equilibrium 2 is coalition-proof, however, since any such defection to P_L is vulnerable to defection back to P_R: any one of the three defecting poor districts would be pivotal and would thus prefer switching to P_R, regaining a winning coalition for that party. The example therefore illustrates how cross-over voting by the poor can occur even when the poor have a majority of districts.

By the same logic, if a pivotal poor district prefers P_L, then Nash Equilibrium 2 is not a CPNE because the three poor districts supporting P_R would prefer switching to P_L. And Nash Equilibrium 1 is a CPNE: no coalition defecting from the majority would be stable because it would have to contain enough poor districts to change the majority to P_R, and in any such coalition, poor districts would defect back to supporting P_L. Thus cross-over voting by the rich can occur when the poor control a majority of districts and a pivotal poor voter prefers P_L.

4.2   Implications

The equilibria described in Propositions 1 and 2 yield several insights about how the availability of district-based pork and income-based redistribution affects voting behavior and election outcomes. We focus here on how party discipline affects voting behavior, the right-wing advantage that exists when parties are strong, and the factors affecting cross-over voting — and thus the size of legislative coalitions — in strong party systems.

Party discipline and ideological voting. Propositions 1 and 2 make a simple but important point about how income and voting should be related across different types of party systems. If a voter believes that electoral outcomes will not affect the distribution of pork, then they can vote their redistributive interests, whereas if they believe that their access to government pork depends on their being represented by someone from the majority party, then they may vote

against their redistributive interests to gain access to pork. We have argued that party discipline in legislative bargaining over pork should play a central role in shaping voter expectations about electoral outcomes and the distribution of pork. In systems where parties are weak and do not constrain legislative bargaining over pork, voters need not worry about how elections affect pork, and thus can vote their redistributive interests. In systems where a disciplined majority party controls the distribution of pork, both rich and (especially) poor voters will have incentives to cross-over and vote for the "wrong" party. We should therefore expect to see the strongest relationship between income and the vote in systems with weak parties.

From a poor voter's perspective, the appeal of weak parties depends on the left party's electoral prospects. Strong parties tend to benefit anticipated election winners, who will then benefit from the ability to exclude election losers from pork. In this environment, when a majority of districts are rich, a poor district can receive pork benefits only at the expense of an ideologically undesirable representative. By contrast, weak parties tend to benefit anticipated election losers, and thus a poor voter in the position of Proposition 2(iii) can expect a positive share of the pork along with an ideologically compatible representative.

Party discipline and the right-party advantage. Since party strength affects voting incentives by conditioning expectations regarding pork, strong parties also create an asymmetry between cross-over voting incentives for rich and poor, one that advantages right-wing parties. Because the right-wing party wants to limit redistribution, it has more government revenues available for pork — even if the left-wing party funds all the "extra" redistribution it advocates with taxes on the rich (this follows from the fact that $\lambda_j b(\lambda_j)$ is increasing in λ_j). This implies that poor voters have a greater incentive to cross-over than do rich voters.

This fact has two implications for the right party's electoral prospects. First, as Proposition 2 describes and Figure 1 illustrates, even if a majority of districts are poor, the right-wing party might win due to cross-over voting by the poor. By contrast, if rich voters control a majority of districts, the left-wing party will never win. Second, left-wing coalitions are "smaller" than right-wing coalitions. That is, when the left wins and the poor control $d^P = d$ districts, the resulting left-wing coalition is no larger than the right-wing coalition that forms when the rich control $d^R = d$

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districts. The following remark follows immediately from (8) and (9).

Remark 3 *For equivalent values of d^R and d^P, $\overline{w} \geq \underline{w}$.* ∎

The remark indicates that we should expect more poor districts to support right-wing majorities than rich districts to support left-wing majorities. As a consequence, a symmetric partisan swing in voter types can have different implications depending on its direction. Due to Proposition 2(ii), a swing may not shift partisan control at all if (7) is satisfied. But otherwise, a swing from rich to poor will induce a relatively small P_L majority, while a swing from poor to rich will induce a relatively large P_R majority.

The analysis therefore suggests a different explanation for why right-wing parties have an advantage in majoritarian systems (e.g., Iversen and Soskice 2006), one that is grounded in the analysis of pork. The analysis further suggests that this advantage should be contingent on the existence of strong parties. On this point, it is interesting to note that the Democrats in the "weak party" US have controlled majorities in the US House for much more time than have left-wing parties in "strong party" majoritarian systems like Australia, Britain, Canada, Ireland, Japan and New Zealand (until 1993). Using data from Iversen and Soskice, for example, from 1945-98, right-wing parties controlled government 74 percent of the time in these strong party countries, whereas the Democrats controlled the House in all but six years (or over 90 percent of the time).

Cross-over voting by the pivotal poor district when parties are strong. The effect of strong parties on voting outcomes depends to a large degree on the behavior of the poor voters in pivotal districts. Equation (7) determines how pivotal poor citizens vote and by extension whether P_R can win even in the face of a majority of poor districts. It is therefore important to explore the factors that affect whether equation (7) is satisfied. To do so, denote by D the difference between the right-hand side and left-hand side of (7), so that $D > 0$ implies that poor districts will cross-over to P_R. Maximizing D therefore makes such cross-over voting "easier." Remark 4 summarizes the effects of the size of the poor population, the exogenous budget constraint, and platform locations.

Remark 4 *For a poor voter in a pivotal district, D increases (i.e., (7) is more easily satisfied) as:*

(i) n^P increases.

(ii) c increases.

(iii) λ_R increases or λ_L decreases, if and only if for $j = L, R$, either $\lambda_j \leq \frac{2n^P - 3m}{2n^P - 2m}$, or $\lambda_j > \frac{2n^P - 3m}{2n^P - 2m}$ and $c > \frac{m(3 - 2\lambda_L) + n^P(2\lambda_L - 2)}{2m(1 - \lambda_L) + n^P(2\lambda_L - 1)}$. ∎

Proof. Let $W = \frac{\lambda_j b(\lambda_j)}{m} + \frac{(1 - \lambda_j)b(\lambda_j)}{n^P}$ denote the aggregate transfers expected by a poor voter in a coalition of size m.

(i) This follows from the fact that $(1 - \lambda_L)b(\lambda_L) > (1 - \lambda_R)b(\lambda_R)$.

(ii) Since $\frac{\partial W}{\partial c} = \frac{\lambda_j(\lambda_j - 1)}{m} - \frac{(\lambda_j - 1)^2}{n^P} < 0$, an increase in c will increase the relative value of cross-over voting by the pivotal poor if $\frac{\partial^2 W}{\partial c \partial \lambda_j} > 0$. This condition ensures that the decrease in utility from an increase in c is minimized when λ_j is largest (and thus the decrease in utility is lower for λ_R than for λ_L). Differentiating again yields $\frac{\partial^2 W}{\partial c \partial \lambda_j} = \frac{2\lambda_j - 1}{m} - \frac{2(\lambda_j - 1)}{n^P}$. Note that if $n^P \geq m$, then $\frac{\partial^2 W}{\partial c \partial \lambda_j} > 0$ if $\lambda_j > \frac{n^P - 2m}{2n^P - 2m}$, which always holds since $n^P - 2m < 0$. And if $n^P < m$, then $\frac{\partial^2 W}{\partial c \partial \lambda_j} > 0$ if $\lambda_j < \frac{n^P - 2m}{2n^P - 2m}$, which always holds since $\frac{n^P - 2m}{2n^P - 2m} > 1$.

(iii) For $j = L, R$, increasing λ_R or decreasing λ_L increases support for P_R if $\frac{\partial W}{\partial \lambda_j} > 0$. We show that the conditions in the remark are those that ensure $\frac{\partial W}{\partial \lambda_j} > 0$. Note that $\frac{\partial W}{\partial \lambda_j} > 0$ requires

$$c(2\lambda_j n^P + 2m - 2\lambda_j m - n^P) > -2\lambda_j m - 2n^P + 2\lambda_j n^P + 3m. \tag{10}$$

To sign the derivative, it is useful to note the following.

1. $2\lambda_j n^P + 2m - 2\lambda_j m - n^P \geq 0$ if $\lambda_j \geq \frac{n^P - 2m}{2n^P - 2m}$.

2. $-2\lambda_j m - 2n^P + 2\lambda_j n^P + 3m > 0$ if $\lambda_j > \frac{2n^P - 3m}{2n^P - 2m}$.

3. $m < n^P$ implies that $-2\lambda_j m - 2n^P + 2\lambda_j n^P + 3m < 2\lambda_j n^P + 2m - 2\lambda_j m - n^P$.

4. $\frac{2n^P - 3m}{2n^P - 2m} > \frac{n^P - 2m}{2n^P - 2m}$.

Let $S = \frac{m(3 - 2\lambda_L) + n^P(2\lambda_L - 2)}{2m(1 - \lambda_L) + n^P(2\lambda_L - 1)}$. There are three cases to consider:

Case 1: $\lambda_j < \frac{n^P - 2m}{2n^P - 2m}$. In this case, (10) is satisfied if $c < S$ and the conditions imply $S > 1$, ensuring that the derivative is positive.

Case 2: $\lambda_j \in \left[\frac{n^P - 2m}{2n^P - 2m}, \frac{2n^P - 3m}{2n^P - 2m}\right]$. In this case, (10) is satisfied if $c > S$ and the conditions imply that $S < 0$, ensuring that the derivative is positive.

Case 3: $\lambda_j > \frac{2n^P - 3m}{2n^P - 2m}$. In this case, (10) is satisfied if $c > S$ and the conditions imply that $S < 1$, so the derivative is positive only if $c > S$. ∎

Part (i) of Remark 4 establishes that since P_L redistributes a greater proportion of the budget to the poor, an increase in the number of poor voters diminishes the value of supporting P_L and increases the relative value of cross-over voting. The model suggests, then, that in majoritarian systems with many poor voters, some poor voters may obtain more resources from government if they support the right-wing parties. So doing allows them to share a relatively large amount of pork with a relatively small number of others. Such incentives may help explain why right-wing parties are often able to use patronage to become entrenched in relatively poor democracies. Such parties can use pork and lower taxes to construct majorities of the rich and a subset of the poor.

Part (ii) focuses on the role of the exogenous constraint on the left party's ability to raise taxes, c. The poor always prefer a smaller c because as c declines, additional taxes paid by the rich increase the size of government. But to determine the effect of c on cross-over voting, we must consider whether changes in c cause a bigger decrease in the utility of supporting P_L versus P_R. The result establishes that as the budget constraint becomes stronger, the relative value to poor voters in pivotal districts of supporting P_R increases. This is true because a strong constraint diminishes the relative value of P_L's advantage on redistribution. If redistribution is funded by additional taxes, this makes P_L more attractive to the poor. If redistribution is funded by taking away from pork, it is relatively less valuable, and P_R therefore become more attractive. So the electoral advantage of the right-wing party should be largest among the poor when it is most difficult for left-wing parties to raise taxes to fund redistribution.

Finally, part (iii) shows that there exist non-trivial circumstances under which poor voters in pivotal districts benefit from large λ_j. Thus, as either party moves to the extreme (with P_L promising more redistribution and P_R promising more pork), the value of supporting the right-wing party increases. Since party polarization affects pork, ideology and redistribution, the result reflects the tradeoff between all of these factors.

5   Extensions

5.1   Can the Left Compete on Pork?

In the strong party model, the right-wing advantage occurs in part because of the assumption that the left party has a greater commitment to redistributive spending. A consequence of this assumption, embodied by the budget constraint parameter c, is that the right can always offer more pork and therefore attract more cross-over votes. As argued above, we feel that assuming $c \in [0, 1]$ is a very reasonable constraint on the ability of left parties to tax. But it is nonetheless worth asking whether the left can overcome the right-wing advantage by setting taxes so high with a negative c that it offers more redistribution and pork than the right-wing party.

The next remark establishes two effects of large budgets on P_L's competitiveness. First, pivotal poor voters can be induced to vote always for P_L if c is negative and platforms are relatively pork-oriented. These conditions give P_L a larger pork allocation (i.e., $\lambda_L b(\lambda_L) > \lambda_R b(\lambda_R)$) and imply that (7) can never be satisfied, so poor voters will not allow P_R to win when a majority of districts are poor. Second, even when P_L can offer more pork than P_R, the symmetric condition to (7) for pivotal rich voters to cross over is difficult to satisfy. The necessary condition in the remark cannot hold, for example, if $n_R < m$ (i.e., rich voters are not a majority), or even if $\lambda_L \leq 1/2$ (i.e., the left platform sits in the left half of the policy space). The reason is that rich voters are taxed for the very large budget that would provide both more generous redistribution and more pork. This suppresses P_L's pork advantage and also rich voters' incentives to cross-over vote.

Remark 5 *(i) Pivotal poor voters vote for P_L if $\lambda_L + \lambda_R > 1$ and $c < \frac{\lambda_L + \lambda_R - 2}{\lambda_L + \lambda_R - 1}$.*

(ii) Pivotal rich voters vote for P_L only if $\lambda_L + \lambda_R > 1$, $c < \frac{\lambda_L + \lambda_R - 2}{\lambda_L + \lambda_R - 1}$ and $n_R > m/\lambda_L$.   ∎

Proof. (i) It is easily verified that if $\lambda_L b(\lambda_L) > \lambda_R b(\lambda_R)$, then (7) can never be satisfied, and so pivotal poor voters vote for P_L. This condition reduces to $(\lambda_L + \lambda_R - 1)c < \lambda_L + \lambda_R - 2$, which cannot be satisfied (given $c \leq 1$) if $\lambda_L + \lambda_R \leq 1$. Thus, $\lambda_L b(\lambda_L) > \lambda_R b(\lambda_R)$ only if $\lambda_L + \lambda_R > 1$ and $c < \frac{\lambda_L + \lambda_R - 2}{\lambda_L + \lambda_R - 1}$.

(ii) From (3), a pivotal rich voter votes for P_L if:

$$u^R(\lambda_L) + \frac{\lambda_L b(\lambda_L)}{m} - \frac{b(\lambda_L)}{n^R} > u^R(\lambda_R) + \frac{\lambda_R b(\lambda_R)}{m} - \frac{b(\lambda_R)}{n^R}. \tag{11}$$

Noting that $u^R(\lambda_R) > u^R(\lambda_L)$ and rearranging terms, (11) holds only if $\frac{\lambda_L b(\lambda_L) - \lambda_R b(\lambda_R)}{m} > \frac{b(\lambda_L) - b(\lambda_R)}{n^R}$. Since $b(\lambda_L) - b(\lambda_R) > 0$, this requires $\lambda_L b(\lambda_L) > \lambda_R b(\lambda_R)$, as in part (i). Further, since $\lambda_L \le \lambda_R$, the condition implies $\frac{\lambda_L(b(\lambda_L) - b(\lambda_R))}{m} > \frac{b(\lambda_L) - b(\lambda_R)}{n^R}$, which reduces to: $n_R > m/\lambda_L$. ■

The implications of this remark for the set of possible CPNE are significant. Applying the same equilibrium derivation as that in Proposition 2, there exist conditions — unrealistic ones in our view — when the left party can negate the right-wing advantage with very high taxes and budgets. And unless some very constraining parameter restrictions are satisfied, *when a majority of districts are rich, rich voters will not join a P_L coalition.*[6] More typically, the party whose natural constituents control a majority of districts will win. Thus, while an outsized left budget may indeed eliminate the right wing advantage, it is more difficult for the left to gain a corresponding left wing advantage.

5.2 Redistribution and the Middle Class

Our model suggests that left-wing parties face a distinct electoral disadvantage. Since they spend a greater proportion of revenues on redistribution to the poor, left-wing parties should be less able than right-wing parties to target subgroups of the population using pork. Many "redistributive" programs, however, have a strong middle-class component, and are quasi-redistributive, such as social insurance or tax deductions. By broadening the set of individuals who benefit from redistribution, such programs might be an antidote to the left-wing disadvantage when redistribution occurs from rich to poor.

This subsection examines the electoral effects of a welfare program that gives redistributive benefits to a larger segment of the population. To this end, we introduce the "middle class," which is a subset of the rich voters examined in the core model. Let the middle class be of type M, and assume that the measure of type M voters is n^M and let $n^{\underline{R}}$ be the measure of individuals

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[6]Of course, (7) is also not always satisfied, though the analogous parameter restrictions on whether pivotal poor voters will cross over are less demanding than those for the rich.

who remain "rich," so that $n^M + n^{\underline{R}} = n^R$. We do not assume that middle class voters have an ideological affinity with a particular party. Instead, middle class voters share a common ideal point $z^M \in (z^L, z^R)$, and can have ideological leanings toward either party. For simplicity, we assume that poor and rich voters receive higher policy utility than middle class voters from the left and right party platforms, respectively; i.e., $u^M(\lambda_L) < u^P(\lambda_L)$ and $u^M(\lambda_R) < u^R(\lambda_R)$.

We focus on strong parties and consider two different redistribution regimes regarding the middle class. In the first, which we call *narrow redistribution* (*NR*), the middle class receive no redistributive benefits, but they are distinguished from the rich by the fact that they pay no taxes. The middle class therefore make their vote solely on the basis of pork and ideology. In the second redistribution regime, *broad redistribution* (*BR*), the middle class pay no taxes *and* receive the same redistributive benefit as poor voters (i.e., per capita benefits are uniform across non-rich voters). That is, they have the same government benefits as poor voters, and thus differ from the poor only in their ideological preferences.

We begin by considering voting incentives in non-pivotal districts. There are two cases. First, if P_L is expected to win a majority of districts (i.e., $w_{-k} < m - 1$), then middle-class voters in a non-pivotal district cannot influence the level of redistribution, and thus their incentives are the same under *BR* and *NR*. They will support P_R if

$$u^M(\lambda_L) + \frac{\lambda_L b(\lambda_L)}{n - w_{-k}} < u^M(\lambda_R). \tag{12}$$

Equation (12) implies that if z^M is closer to z^L than z^R, then a middle-class voter will not support P_R. But if the middle-class voter is sufficiently right-leaning, she may favor P_R.

It is important to note that if neither the rich nor the poor form a majority in a given district, the middle class are pivotal in this district, even if they do not have a majority. If (12) is satisfied, then the rich will also support P_R (i.e., (4) is not satisfied) because the rich are closer ideologically to P_R than are the middle class. Thus, there will be a majority in favor of P_R. Similarly, since (6) is never satisfied (i.e., poor voters will always support P_L when P_L is expected to win a majority of districts), if (12) is not satisfied, the middle class and poor will support P_L.

Second, when P_R is expected to win a majority of seats ($w_{-k} \geq m$), the middle class are also pivotal. Again, middle-class voters in a non-pivotal district cannot influence the level of redistribution under either welfare program, and thus support P_R if:

$$u^M(\lambda_L) - u^M(\lambda_R) < \frac{\lambda_R b(\lambda_R)}{w_{-k} + 1}. \tag{13}$$

Voting behavior depends on the location of z^M. If z^M is closer to z^R than to z^L, middle-class voters support P_R. Otherwise middle-class voters must weigh the trade-off between better ideological policy from P_L against the higher level of pork from P_R.

In this case, the rich always prefer supporting P_R. Expression (13) then implies that a majority in the district will support P_R unless poor voters are a majority. Similarly, if (13) is not satisfied, then poor voters must join the middle class in supporting P_L (i.e., (13) implies (5)). Now a majority in the district will support P_L, unless the rich are a majority. Thus, so long as neither the rich nor poor are a majority in the district, the middle class will again be pivotal.

Next, consider voting behavior in pivotal districts. Under NR, which gives the middle class tax relief but not redistributive benefits, the middle class will support P_R if:

$$u^M(\lambda_L) + \frac{\lambda_L b(\lambda_L)}{m} < u^M(\lambda_R) + \frac{\lambda_R b(\lambda_R)}{m}. \tag{14}$$

Since $\lambda_R b(\lambda_R) > \lambda_L b(\lambda_L)$, the middle class always prefer P_R if $u^M(\lambda_R) \geq u^M(\lambda_L)$. If $u^M(\lambda_R) < u^M(\lambda_L)$ the middle class face a trade-off between ideological utility and pork.

Under BR, which gives the middle class tax relief and redistributive benefits, the middle class will support P_R if:

$$u^M(\lambda_L) + \frac{\lambda_L b(\lambda_L)}{m} + \frac{(1 - \lambda_L) b(\lambda_L)}{n^M + n^P} < u^M(\lambda_R) + \frac{\lambda_R b(\lambda_R)}{m} + \frac{(1 - \lambda_R) b(\lambda_R)}{n^M + n^P}. \tag{15}$$

With broad redistribution to the middle class, the incentives of the middle class resemble those of poor voters in a pivotal district. That is, by supporting P_R, they receive more pork but less redistribution. Also note that the pivotal middle class voter obviously prefers broad redistribution

to narrow redistribution.[7]

These conditions allow us to derive aggregate behavior at the national level. Under both middle class redistribution regimes, there are opportunities for P_L to increase its support that did not exist when the middle class were given neither tax breaks nor redistribution. Rich voters in the basic model never supported P_L when their district was pivotal. By contrast, when (14) or (15) is not satisfied, the middle class will support P_L. Under narrow redistribution, such left-wing support by middle-class voters would be due exclusively to the fact that they are more ideologically leftist than rich voters in the basic model. By contrast, under broad redistribution, the presence of redistributive benefits can induce even relatively conservative pivotal middle-class voters to choose P_L instead of P_R.

But middle class redistribution will not inevitably increase support for P_L. Although it is easily verified that both redistributive programs do not increase rich voters' incentives to cross over, poor voters may be adversely affected by middle class redistribution. Under NR, equation (7) continues to describe the circumstances under which poor voters in a pivotal district cross over to P_R. But under BR, equation (7) is modified to accommodate the reduced benefits for the poor as follows:

$$u^P(\lambda_L) + \frac{\lambda_L b(\lambda_L)}{m} + \frac{(1-\lambda_L)b(\lambda_L)}{n^M + n^P} < u^P(\lambda_R) + \frac{\lambda_R b(\lambda_R)}{m} + \frac{(1-\lambda_R)b(\lambda_R)}{n^M + n^P}. \tag{16}$$

Comparing this expression with (7) reveals that poor voters in a pivotal district will be *more* tempted to cross over to P_R when middle class voters share redistributive benefits. The logic is simple: redistributing tax revenues to the middle class is identical to increasing the number of poor in the basic model. It dilutes the value of redistribution and thus raises the relative value of pork.[8]

Under either redistributive program, if middle class voters choose P_R (according to (15) or (14)), then pivotal rich voters must also do so. And if middle class voters choose P_L, pivotal poor voters must do so as well. Thus, as long as neither the rich nor the poor have a majority in a district, the middle class will be pivotal within any district that is pivotal. Combined with our previous

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[7]Not satisfying (14) implies not satisfying (15) if $\frac{(1-\lambda_L)b(\lambda_L)}{n^M+n^P} > \frac{(1-\lambda_R)b(\lambda_R)}{n^M+n^P}$, which is ensured by the fact that $(1-x)b(x)$ is decreasing in x.

[8]Not satisfying (16) implies not satisfying (7) if $\frac{(1-\lambda_L)b(\lambda_L)}{n^P} - \frac{(1-\lambda_L)b(\lambda_L)}{n^M+n^P} > \frac{(1-\lambda_L)b(\lambda_L)}{n^P} - \frac{(1-\lambda_R)b(\lambda_R)}{n^M+n^P}$. Simplifying yields $n^M(1-\lambda_L)b(\lambda_L) > n^M(1-\lambda_R)b(\lambda_R)$, which holds by the fact that $(1-x)b(x)$ is decreasing in x.

observations about middle-class voting in non-pivotal districts, it follows that middle-class voters are pivotal in all districts with neither a rich nor poor majority. We therefore let d^M denote the number of districts with either a middle-class majority or no majority of any type. We also refer to both types of districts as "middle class districts."

The presence of middle class voters introduces a minor equilibrium selection issue because winning coalitions may consist of up to three types of districts. We focus on what are perhaps the simplest equilibria, where voters who would benefit most from crossing over do so "first." This is equivalent to having middle class voters vote first. In other words, an electoral coalition in favor of P_R (respectively, P_L) contains no poor (respectively, rich) districts unless all middle class districts are already included.

Using this refinement, it is straightforward to derive the equilibrium coalition size for each party. Analogously to (8), if P_R is expected to win a majority, then Remark 2 and (13) imply that the number of poor and middle class districts supporting P_R is:

$$
\overline{w}^M = \begin{cases} \overline{w} \equiv \max\left\{ w \mid u^P(\lambda_L) - u^P(\lambda_R) < \frac{\lambda_R b(\lambda_R)}{d\underline{R}+w+1} \right\} & \text{if } \overline{w} > n^M \\ \max\left\{ n^M, \max\left\{ w \mid u^M(\lambda_L) - u^M(\lambda_R) < \frac{\lambda_R b(\lambda_R)}{d\underline{R}+w+1} \right\} \right\} & \text{otherwise.} \end{cases} \tag{17}
$$

Intuitively, $\overline{w}^M$ is the size of the largest collection of non-rich districts that are willing to support P_R. The value of $\overline{w}^M$ is determined by calculating first the number of middle-class districts that are willing to cross over, followed by the number of additional poor districts if all middle-class districts cross over. This parameter shares several properties with $\overline{w}$ in the basic game. First, it is easily verified that $\overline{w}^M$ is uniquely defined. Second, we impose the obvious bounds of $\overline{w}$ at 0 and $d^P + d^M$ when the expression (8) implies a value less than 0 or greater than $d^P + d^M$, respectively. Finally, it is meaningful only in cases where P_R will win a majority. Note that when neither rich nor poor districts are a majority, the support of a pivotal middle-class district for P_R (i.e., satisfying (13)) implies that $\overline{w}^M \geq (n+1)/2 - n^R$.

We similarly define the number of non-pivotal rich and middle class districts that would support

P_L if P_L is expected to win be (uniquely) defined as:

$$\underline{w}^M = \begin{cases} \underline{w} \equiv \max\left\{w \mid u^R(\lambda_R) - u^R(\lambda_L) < \frac{\lambda_L b(\lambda_L)}{d^P + w + 1}\right\} & \text{if } \underline{w} > n^M \\ \max\left\{n^M, \max\left\{w \mid u^M(\lambda_R) - u^M(\lambda_L) < \frac{\lambda_L b(\lambda_L)}{d^P + w + 1}\right\}\right\} & \text{otherwise.} \end{cases} \tag{18}$$

As with $\overline{w}^M$, we bound $\underline{w}^M$ between 0 and $d^{\underline{R}} + d^M$ in the obvious way.

These expressions allow us to characterize the unique CPNE. The first three cases of Proposition 3 are essentially Proposition 2. When either rich or poor districts are a majority, the equilibrium is virtually identical to that of the basic game. The only difference is that middle-class districts are more willing to cross over than extreme districts. This sometimes increases the size of winning coalitions. Cases (iv) and (v) address environments in which neither rich nor poor districts are majority. Here, middle-class voters are pivotal, but the equilibria resemble those in which poor districts are a majority because the outcomes depend on the behavior of pivotal middle-class districts, as given in (15) and (14).

Proposition 3 *There is a unique coalition-proof Nash equilibrium, where:*

(i) If $d^{\underline{R}} \geq m$ then P_R wins and $w^* = d^{\underline{R}} + \overline{w}^M$.

(ii) If $d^P \geq m$ and either BR and (16) is satisfied, or NR and (7) is satisfied, then P_R wins and
$w^* = d^{\underline{R}} + \overline{w}^M$.

(iii) If $d^P \geq m$ and either BR and (16) is not satisfied, or NR and (7) is not satisfied, then P_L
wins and $w^* = d^P + \underline{w}^M$.

(iv) If $d^{\underline{R}}, d^P < m$ and either BR and (15) is satisfied, or NR and (14) is satisfied, then P_R wins
and $w^* = d^{\underline{R}} + \overline{w}^M$.

(v) If $d^{\underline{R}}, d^P < m$ and either BR and (15) is not satisfied, or NR and (14) is not satisfied, then
P_L wins and $w^* = d^P + \underline{w}^M$. ■

Proof. Each case is proved almost identically to the corresponding case in Proposition 2; case (i) with Proposition 2(i), cases (ii) and (iv) with Proposition 2(ii), and cases (iii) and (v) with

Proposition 2(iii). For each, we assign cross-over districts by maximizing the number of middle-class districts in the winning coalition, and replace $\overline{w}$ and $\underline{w}$ with $\overline{w}^M$ and $\underline{w}^M$, respectively. We also use the specified pivotal voter conditions (16), (7), (15), and (14). ∎

Proposition 3 suggests that the general logic of cross-over voting by the poor is largely independent of whether there exist government benefits targeted at the middle class. For instance, if a majority of districts are rich, Propositions 2 and 3 both predict that the right-wing party wins and poor voters cross-over if the pork benefits of so doing outweigh the ideological costs. Similarly, if a majority of districts are poor, Propositions 2 and 3 imply that the election result depends on a pivotal poor voter's trade-off between patronage, redistribution and ideological benefits. A new case arises when the middle class is introduced, where there is neither a majority of rich districts nor a majority of poor ones. Here, the middle class is pivotal in the election outcome and they make a calculation similar to that of pivotal poor voters, weighing the higher pork offered by P_R and the higher redistribution offered by P_L against ideological utility (which could favor either party). If the middle class favor P_L, then the poor will also favor P_L; if the middle class favor P_R, the poor will make the same cross-over calculation that they make if the rich control a majority of districts.

Although the logic of poor support for right-wing parties is the same in the presence of middle class benefits, the level of support can be affected by such benefits, particularly under the broad redistribution regime. If the poor control a majority of districts, then broad redistribution dilutes the value of redistribution to the poor, and cross-over voting incentives increase relative to the case where no middle class benefits exist (i.e., it is easier to satisfy (16) in Proposition 3 than to satisfy (7) in Proposition 2). By contrast, if the poor control a minority of districts, then broad redistribution can decrease cross-over voting by the poor. Without middle class benefits, the poor will cross-over and support P_R if the patronage benefits are sufficiently large. But with middle class benefits and enough middle class districts to prevent the rich from controlling a majority of districts, poor voters will never cross-over if the middle class voters prefer P_L to P_R. So middle class redistribution regimes can increase (and will never decrease) poor support for right-wing parties when the poor control a majority of districts, and can decrease (but will never increase) poor support for right-wing parties when the poor do not control a majority of districts.

Interestingly, the middle class redistribution regime has some stark consequences for the electoral success of left-wing parties. If a majority of districts are rich, then the electoral winner is independent of the redistribution regime: P_R always wins, as was also the case in Proposition 2(i). If a majority of districts are poor, then P_L will win when: (a) there is no middle class and (7) is not satisfied (see Proposition 2); (b) the middle class is not taxed (narrow redistribution) and (7) is not satisfied; and (c) there is broad redistribution to the middle class and (16) is not satisfied. As noted above, (c) is the most difficult of these conditions to satisfy. Consequently, if a majority of districts are poor, the circumstances under which P_L can win are most narrow under broad redistribution.

If no income group controls a majority of districts, then the left-wing party has the largest chance for victory under broad redistribution. If less than a majority of districts are poor, then under the basic model with no middle class program, the right-wing party always wins. Under narrow redistribution, the left can only win if (14) is not satisfied, and under broad redistribution, the left party can win only if (15) is not satisfied. As noted above, the middle class prefer broad redistribution to narrow redistribution. Broad redistribution is therefore electorally beneficial to left-wing parties when no income group controls a majority of districts.

The analysis suggests, then, that both left and right-wing parties can have incentives to create broad programs that benefit the middle class. When the poor control a majority of districts, broad redistribution to the middle class can increase poor support for right-wing parties by diluting the value of redistribution. This implicit incentive for right-wing strategy is also consistent with the results of Debs and Helmke (2008), who predict that higher income inequality results in higher levels of "bribing" of lower-income voters. When the poor control a minority of districts, by contrast, broad redistribution to the middle class can increase support for left-wing parties by giving middle class voters an incentive to vote left.

5.3   Districting

In some environments, party officials may have control over the allocation of voters to legislative districts. In the U.S., for example, legislative districts in some states can be drawn by partisan decision-makers with a preference for specific policy outcomes. It is therefore worth asking how

such a step would affect the results of the model. The extended game simply adds a first stage to the model, in which either P_R or P_L chooses how to allocate the two types of voters across the n districts.[9] As in the previous extension, parties are seat-maximizing.

Under strong parties, our analysis is simplified by the fact that the distribution of district types does not affect whether (7) is satisfied. Under strong parties, Proposition 2 therefore implies that if (7) is not satisfied, then parties are weakly better off by maximizing the number of districts in which their "natural" constituents (i.e., poor voters for P_L, rich voters for P_R) are a majority. Note that if $\overline{w}$ or $\underline{w}$ remained strictly positive under any redistricting plan, then parties would be just as well off by ensuring that sympathetic districts are a majority. In this case, (8) and (9) imply that due to crossover voting, the ultimate size of the winning coalition is independent of the number of sympathetic districts. By contrast, under weak parties, districts vote "sincerely." Without the help of crossover voting, parties are always interested in maximizing the number of districts controlled by natural constituents.

Under either assumption about party strength, partisan districting can have a pronounced effect on electoral outcomes. To achieve a majority of voters in a majority of districts, a party can achieve its goal with only $\frac{1}{2}(m)$ citizens who are natural constituents. The implications for partisan advantage are summarized by the next result.

Remark 6 *Suppose that P_j allocates voters across districts. If parties are weak or strong and (7) is not satisfied, then P_R wins if $n^P < \frac{n+1}{4}$, P_L wins if $n^R < \frac{n+1}{4}$, and P_j wins otherwise.* ∎

Thus, for n large, a party would need only about a quarter of the populace to assure itself of victory. Equivalently, only lopsided distributions of income types would result in electoral outcomes that were immune from the preferences of a districting official. While the ideological and redistributive effects of party control are the same under strong or weak parties, the pork effects are quite different. Because strong parties can control the allocation of pork more tightly, partisan districting can greatly affect the geographical distribution of public money when parties are strong. Note however that in practice there are a variety of constraints (e.g., geography, connectedness)

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[9]For a more detailed treatment of the assignment of voter types across districts, see Shotts (2002).

on the ability of a districting official to allocate voters. These constraints would have the effect of raising the threshold of voters required to achieve a party's majority of districts.

5.4 Downsian Competition

We have assumed thus far that party platforms are exogenously fixed. While there are many good reasons for believing that this assumption should hold in the short run (for example, because of organizational recruitment), it is natural to consider whether the incentives posed by our model would in fact support divergent party platforms.

To analyze the implications of our model for party platform strategy, we consider a modified version of the strong parties game that begins with an initial step where both parties simultaneously chose λ_L and λ_R. Parties have the simple Downsian motivation of maximizing the number of seats won. Since parties no longer have automatic ideological allies, we assume that poor and rich voters break ties in favor of P_L and P_R, respectively.

Given the unique CPNE of Section 4, the extended game reduces to a simple, simultaneous-move game. Unfortunately, we cannot guarantee that pure strategy equilibria exist for all parameter values. However, we are able to derive several simple statements that must hold in any pure strategy equilibrium.

First, the party that expects to lose in equilibrium must choose a platform equal to the ideal point of its "natural" constituents. This follows directly from expressions (8) and (9): a losing party will minimize the number of districts that cast cross-over votes (i.e., $\overline{w}$ and $\underline{w}$) by maximizing the policy utility of its base constituents. The winning party's decision is more complex, as it balances its constituents' utility over policy against that over pork and taxation or redistribution. Thus, we expect that losing parties will tend to be ideological "purists," while winning parties are "compromisers."

Second, under a wide range of parameter values, the election winner will not depend on the platform choices. Proposition 2 establishes that when $d^R \geq m$, P_R must win. But if rich districts are not a majority, then it is possible that the winner will be endogenously determined by the platforms. The key relationship here is (7), which determines whether a pivotal poor district will

cross-over to P_R. P_R therefore has a clear incentive to choose λ_R to satisfy (7), while P_L would like to choose a λ_L that would violate it.

In a pure strategy equilibrium, P_L can ensure that (7) is never satisfied simply by choosing $\lambda_L = \lambda_R$. Since poor voters break ties in favor of P_L, this ensures that the only possible CPNE is one in which P_L wins. Thus when a majority of districts are poor, P_R must choose $\lambda_R = z^R$, and P_L maximizes its seats won against that platform.

These observations are summarized in the following remark.

Remark 7 *In any pure strategy Nash equilibrium of the platform competition game, if $d^R \geq m$, then P_R wins and $\lambda_L = z^P$, and if $d^R < m$, then P_L wins and $\lambda_R = z^R$.* ∎

This result suggests that endogenous platforms mitigate the possibility of the "perverse" cross-over equilibrium in which a polity of poor districts elects P_R. This implies that from the perspective of a poor voter, strong but flexible (i.e., mobile) parties will typically have an advantage over weak but inflexible parties when poor districts are a majority, as they allow majority-poor districts to capture most pork benefits. They do not have this advantage when poor districts are a minority, because they will be excluded from pork unless they choose a P_R representative.

In a world with weak parties, there is a range of pure strategy equilibrium platform positions. One is simple Downsian convergence at the ideal point of the more numerous district type. To see why, note that either party can win the election outright by choosing a platform closer to this point. Under the tie-breaking assumption made above, both parties would then attract only the votes of their natural constituents. Note however that given the winning party's platform, the losing party is then free to choose *any* platform that is closer to its natural constituents than the winning party's platform. Thus there exists a wide range of divergent equilibrium platform configurations.

Interestingly, the weak party case suggests a platform-choice incentive that is opposite to that of the strong party case. In the latter, the anticipated loser tends to converge to its core constituents, while in the former, the anticipated winner converges to its core constituents with certainty. The welfare implications for poor voters are ambiguous. When poor districts are a majority, poor voters benefit ideologically but lose some pork under weak parties. When they are a minority, weak parties

reverse these relationships.

6   Discussion

When deciding how to vote, issues unrelated to economic well-being undoubtedly influence citizen choices. Our analysis, however, cautions against assuming *either* that this is the only reason why voters may support the "wrong" party *or* that when voters' voter against their "redistributive" interests, they are voting against their economic interests. Redistribution from rich to poor is but one way that governments distribute tax revenues, and voters may maximize their economic well-being by supporting a party that is not their most-preferred on that issue.

By focusing on pork-barrel politics, the model here explores one of the central ways that governments distribute revenues on a basis unrelated to individual income. A central intuition from the model concerns the importance of party discipline. When parties are weak, voters expect the same level of pork no matter which party they support, and thus redistributive preferences are fundamental to vote choice. When parties are strong, by contrast, the winning party can exclude losers from pork. The stark contrast between winning and losing in this setting makes pork an especially efficient way to attract voters. This causes voters to weigh a trade-off between pork and income-based redistribution. The value of being included in the majority-controlled pork-coalition will often be decisive, resulting in cross-over voting. Our model therefore suggests that cross-over voting levels should be highest in systems where the majority party can concentrate the distribution of pork in electorally supportive districts.

Since party discipline affects cross-over voting incentives, it also affects party competition and electoral districting. In systems with strong parties, parties will not converge to the median voter in a pure strategy equilibrium because the party that expects to lose at the national level will adopt the ideological policy most preferred by its constituents. When parties are weak, by contrast, the absence of cross-over voting incentives may lead parties to converge to the preferences of the median district. Similarly, both types of parties are interested in concentrating supporters in sympathetic districts in order to maximize their legislative majority. The incentives for doing so may be mildly

weaker under strong parties, however, due to the possibility of attracting crossover voters.

The analysis also brings into sharp relief an advantage that rich voters and right-wing parties should have in majoritarian systems with strong parties. Since the right party can offer more pork, it benefits when voters have pork-based incentives to elect a legislator from the expected majority party. Rich voters in pivotal districts never support left-wing parties, but poor voters in pivotal districts may support right-wing parties. The incentives of poor voters to do so increases as the number of poor voters increases and as constraints on the government budget increase. Party-system polarization will often also lead to more cross-over voting by the poor. These cross-over voting incentives imply that all things equal, right-wing legislative majorities should be larger than left-wing majorities, and thus national partisan swings to the right party will produce larger majorities than a swings to the left-party.

Two limitations of our model suggest avenues for further research. First, the model treats party strength as exogenous. As the analysis above suggests, party strength has implications for party strategies, and it would therefore be interesting to consider ways in which party strength might evolve in response to the electoral incentives posed in our model. Second, the model assumes that eligibility for redistribution — or the identity of the "poor" — is exogenous. As our extension in Section 5.2 illustrates, distributive programs with a strong middle-class component can affect electoral competitiveness, and politicians will therefore have an incentive to determine the cut-off for what constitutes eligibility. Analyzing endogenous determination of eligibility for redistribution programs may require a richer set of assumptions about voter types and taxation, but may make it possible to understand how politicians create electoral coalitions that transcend economic groups.

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