A Swing-State Theorem, with Evidence

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Abstract

We study the effects of local partisanship in a model of electoral competition. Voters care about policy, but they also care about the identity of the party in power. These party preferences vary from person to person, but they are also correlated within each state. As a result, most states are biassed toward one party or the other (in popular parlance, most states are either 'red' or 'blue'). We show that, under a large portion of the parameter space, electoral competition leads to maximization of welfare with an extra weight on citizens of the 'swing state:' the one that is not biassed toward either party. The theory applies to all areas of policy, but since import tariffs are well-measured they allow a clean test. We show empirically that the US tariff structure is systematically biassed toward industries located in swing states, after controlling for other factors. Our best estimate is that the US political process treats a voter living in a non-swing state as being worth 80% as much as a voter in a swing state. This represents a policy bias orders of magnitude greater than the bias found in studies of protection for sale.

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1 Introduction

Among the industries in the United States disadvantaged by the North American Free Trade Agreement (NAFTA) between the US, Mexico and Canada, the Florida tomato industry has a prominent place. Following implementation of the agreement in the mid-1990's, cheap winter tomatoes flooded in from Mexico that compared quite favorably with Florida winter tomatoes in quality. The industry petitioned to the Clinton administration for relief; the president made the tomato issue a high priority and dispatched one of his top lieutenants to negotiate a special side agreement with Mexico. The agreement was reached in October 1996 and required Mexican tomatoes sold in the US to be subject to a price floor (explained to the public as a protection to consumers against 'price instability') (Lukas, 1998).

A natural question is why the US government should have placed such a high priority on one small industry in one state. It may help to understand this if we recall that a presidential election was scheduled for November 1996, and Florida had been appearing to be one of the most fiercely contested states. As one political reporter summarized the point, the question was "how much the tomato issue could affect swing votes in Florida, which has gone Republican in recent years but which now seems in play, with Mr. Clinton slightly ahead of Mr. Dole in the polls." (Sanger, 1996). The political logic is summarized more bluntly elsewhere in the same report: " 'The math was pretty simple,' another official said. 'Florida has 25 electoral votes, and Mexico doesn't.' "

This is a case in which trade policy was invoked to protect an industry apparently because it was concentrated in a state that was expected to have a very small margin of victory for whichever party would win it in the upcoming presidential election, so that a small change in policy might be the deciding factor in which party would win it. The logic of protection in this case has nothing to do with appealing to a median voter or responding to lobbyists or influence peddling. An electoral system such as the American system seems to be set up in such a way as to create strong incentives for this type of calculation, and indeed other examples can be found, such as steel tariffs appealing to the states of West Virginia and Pennsylvania, in which the calculus is similar.

To analyze these effects formally, this paper studies the effects of local partisanship in a model of electoral competition for congressional seats or electoral-college votes, as in a US-style presidential election. That is, voters care about policy, but they also care about the identity of the party in power. These party preferences vary from person to person, but they are also correlated within each state. As a result, most states are biassed toward one party or the other (in popular parlance, most states are either 'red' or 'blue'). Extensive evidence confirms that US states vary widely and persistently in their partisan leanings, in ways that seem to be driven by factors other than pure economic interest. Glaeser and Ward (2006), for example, report that in data from the Pew Research Center in the 2004 Presidential election the correlation between the Republican George W. Bush winning a state and the fraction of the state who agree that "AIDS might be God's punishment for immoral sexual behavior" is 70%, and this is correlated with a wide range of other cultural views having nothing to do with economic policy but which are strongly correlated with partisan voting behavior.[1]

In the simple version of our model we show that, under a large portion of the

[1] Ansolabehere et al (2006), however, argue that the cultural element in state voting patterns is often overstated. In addition, they document that the red-blue divide across states has been quite stable for several decades.

parameter space, electoral competition leads to maximization of the welfare of citizens of the 'swing state:' the one that is not biassed toward either party.[2] We can call this the case of an 'extreme' swing-state bias; in this equilibrium, politicians disregard the effect of policy on anyone who does not live in a swing state. In a version with some added uncertainty, there is a bias toward the swing state in policy making, but it becomes extreme in the sense that policy ignores non-swing-state welfare only in the limit as uncertainty becomes small. Thus, the model with uncertainty can rationalize a 'partial' swing-state bias.

A central goal of this paper is an empirical test for the swing-state bias, together with the more formidable task of *measuring* the size of the bias. The theory applies to any area of policy-making, and would predict a swing-state bias in tax and subsidy policy, infrastructure spending, the location of military bases, and so on.[3] We focus on import tariffs as a first case study because they are well-measured in a consistent way across industries and so allow for a clean test. We use a parametrized model to estimate the bias empirically, and find that US tariffs are set as if voters living outside of swing states count 80% as much as voters in swing states. One can interpret this as a measure of the degree of distortion created by the majoritarian electoral system,[4] and it implies a degree of bias that is orders of magnitude greater than the bias implied by empirical estimates of protection-for-sale models. We are not aware of previous attempts to quantify the normative bias created by swing-state effects. Tentatively,

[2]In the basic model we assume for simplicity that there is only one swing state.

[3]Another potential example is environmental policy. The US government recently announced a plan to expand offshore oil drilling dramatically. The move was unpopular in coastal states, and requests by governors of those states for an exemption were rebuffed – except for Florida, which happens to be the quintessential swing state (Hiroko Tabuchi, "Trump Administration Drops Florida From Offshore Drilling Plan," *New York Times*, January 8, 2018).

[4]See McLaren (2016, Section 3.1), Persson and Tabellini (2002, Ch. 8), and Grossman and Helpman (2005) for analysis of the differences between majoritarian and proportional-representation systems for policy outcomes.

the results suggest that such effects are far more important for understanding trade policy than lobbying.

The effects of electoral competition on trade policy can be analyzed from several different angles (see McLaren (2016), sections 3.1 and 3.2, for a survey). Early approaches were based on the median-voter theorem, which was adapted to trade policy by Mayer (1984) in a two-good Heckscher-Ohlin model. It was tested empirically by Dutt and Mitra (2002) and by Dhingra (2014), both of which show international evidence consistent with the broad comparative-statics predictions. However, the model is essentially vacuous outside of a two-good model since there is generically no equilibrium if the policy space has more than one dimension (Plott, 1967).[5] Indeed, defining a median voter is typically impossible when multiple goods compete for protection and voters have different preferences regarding them, so this strain of empirical work has focussed on predicting the overall level of protection, rather than its structure. No study has attempted to argue that aggressive protection of the US sugar industry from imports has resulted because the median US voter is a sugar planter.

A more promising approach is explored in Lindbeck and Weibull (1993), which incorporates partisanship as well as policy preferences into voters' behavior and shows that in an equilibrium in which politicians can commit to policy the least partisan voters, 'swing' voters, tend to get the most weight. This framework, from which we draw heavily, was further developed by Dixit and Londregan (1996), with a more general model of electoral competition that incorporates income inequality and differences in the ability of a party to channel income to a given group (so that each party has a natural constituency), in addition to partisanship. Swing-voter effects emerge as one of

[5] Note that the last section of Mayer (1984) attempts to generalize the model to many goods, but does so by imposing the fiction that each election is a referendum on a single good's tariff.

a number of influences on policy. The authors show evidence that US garment workers tend to live in swing states, which could be the reason for their favorable treatment in trade policy.

These approaches all assume a unitary national election, but national elections with a state-by-state majoritarian structure are different in important ways. Brams and Davis (1974) study the allocation of campaign resources across states in an electoral-college game, arguing that large states receive disproportionately large allocations in equilibrium; and Colantoni, Levesque, and Ordeshook (1975), who argue that this empirical finding disappears when 'competitiveness' of the state is included (essentially the closeness of the state to 'swing state' status), and that in addition more competitive states receive more campaign resources. Although both papers are based on a theoretical model, neither of these solves for Nash equilibrium campaign strategies.

Strömberg (2008) fully characterizes Nash equilibrium in a model of campaign competition with probabilistic voting and partisan bias that varies by state. To make the model tractable, he uses a law of large numbers that applies when the number of states is sufficiently large. In equilibrium, campaign resources allocated by each party in state s are proportional to Q_s, which is the derivative of the probability that party A wins the election with respect to the average state-s voter's preference for party A. This is a value that Strömberg (2008) estimates from election data, and can be interpreted as the likelihood that state s (i) is a swing state, and (ii) is pivotal (meaning that a change in the outcome for state s will change the outcome of the national election). Strömberg (2008) shows that Q_s is highly correlated with observed campaign resources.

The Strömberg (2008) model is close to the issues that are our focus, but our interest is on the influence of swing-state effects on *policy*, rather than campaign strategy, and on quantifying the implied welfare bias against citizens living outside of swing states. Fajgelbaum et al. (2019) show that US tariffs in the recent trade wars have tended to protect industries located in swing counties. Persson and Tabellini (2002, Ch. 8) study a stylized model of electoral competition with two states with opposite partisan bias plus a swing state, and show that the swing state enjoys a bias in the design of fiscal policy. Conybeare (1984) looks for swing effects on tariffs in Australia and McGillivray (1997) in Canada and the US, with mixed results. Wright (1974) argues that swing states during the Great Depression tended to receive more New-Deal spending, while Wallis (1998) argues that the finding may be due to a special Nevada effect (since Nevada was a swing state that received disproportionate spending, but that may be due to the fact that it also had a powerful Senator).[6]

Most importantly, Muûls and Petropoulou (2013) study a model of trade policy and swing-state effects that is complementary to ours in several respects. They have a simple policy space ('protection' or 'free trade') and thus cannot discuss optimal policy as we do. They have a rich conception of how electoral competition works, in which politicians cannot commit to policy, but incumbent office holders choose policy to signal their underlying preferences to voters; by contrast, we have a blunt model of commitment to policy as in the standard median-voter model. The crisp swing-state theorem that emerges in our model is not present in theirs; their main result is that the more protectionist voters there are in the states with the lowest partisan bias, the more likely a government is to provide trade protection even if the government's preferences are for free trade. In short, our model is much simpler and provides a crisper theorem,

[6] Slightly farther from the topic of the present paper, Hauk (2011) finds that industries concentrated in smaller states tend to receive higher tariffs, and Fredriksson et al. (2011) find that industries in majority-controlled Congressional districts tend to have higher tariffs. Both studies derive their hypotheses from legislative bargaining under the influence of lobbying rather than electoral competition, though.

while their model is richer and more realistic in its portrayal of political dynamics. More importantly, our empirical approach allows us to estimate the strength of the swing-state bias as a structural parameter.

We draw on all of this work, and we bring the theory to data by adapting a version of the general-equilibrium set-up of Grossman and Helpman (1994), which has been used for empirical work by Goldberg and Maggi (1999), Gawande and Bandyopadhyay (2000) and many others.

The next section presents the formal model in detail, and the following sections analyze its equilibrium. The benchmark swing-state theorem with its extreme swing-state bias is derived in Section 2.2, and the version with added uncertainty leading to a partial swing-state bias is discussed in Section 2.3. A special case that can be taken to data is presented in Section 3, and empirical analysis is offered in Sections 4 through 5.

2 The Model

Consider the following small-open-economy model. There are a continuum of citizens, each of whom has a type indexed by s, where $s \in [0, 1]$. These citizens will all be affected by the government's choice of policy. This is represented by a vector $t \in \mathbb{R}^n$ for some n; for example, t could be a net tariff vector, and n the number of tradable goods. The citizen's type summarizes all of the information about how policy will affect that citizen economically; for example, it may summarize the factor ownership or the sector-specific human capital of the citizen, and thus what the effect of policy choices will be on that citizen's real income. For now, we will not specify these economic details, and simply write the citizen's indirect utility by $U(s, t)$. Assume that U is bounded and is differentiable with respect to t.

There are M states in which people may live. Each one elects a representative to the congress. The states differ in their economic characteristics, as summarized by the state-specific density $h^i(s)$ for the economic types of the citizens living in state i. In each state, the candidate with the most votes wins, with ties decided by a coin flip.

There are two national parties, A and B, and each fields two candidates in each state. After the election, the party with the largest number of seats controls the legislature, and thus has the right to introduce a bill regarding policy – specifically, a proposed value for t. (If the seats are evenly divided, control is determined by a coin flip.) If a majority of members vote in favor of the bill, it becomes law; otherwise, the default policy t^0 remains in effect.

As in Lindbeck and Weibull (1993), elections are characterized both by credible commitment by candidates and by idiosyncratic party preferences on the part of voters. There are two candidates for office in each state, each representing one of the two parties. Each party commits publicly before the election to its policy, which entails committing to a value for t that the party will propose and pass if it captures control of congress. The two parties move simultaneously in choosing policy. Each voter in equilibrium then understands what the realized policy will be if either party wins, and on the basis of that can calculate the utility that the voter would receive if either party was to win control of congress. The voter then votes for the local candidate of the party that offers that voter the highest expected utility. This expected utility is determined both by the voter's expected real income and by the voter's inherent preference $\mu \in (-\infty, \infty)$ for party A. For any voter j in state i, the value of μ is equal to $\overline{\mu}^i + v^j$. The value $\overline{\mu}^i$ is a fixed effect common to all citizens of state i, while the value v^j is an idiosyncratic effect with mean zero whose distribution function F and density f are common to all citizens in all states. Thus, a state i with $\overline{\mu}^i > 0$ has a partisan bias in favor of party A;[7] a state with $\overline{\mu}^i < 0$ is biassed in favor of party B; and a state with $\overline{\mu}^i = 0$ is neutral. These $\overline{\mu}^i$ values are the form taken by local partisanship in the model, and can be interpreted as capturing the cultural differences quantified by Glaeser and Ward (2006).

Without loss of generality, we can number the states in order of decreasing $\overline{\mu}^i$. Denote by $\widetilde{m}^A$ the number of states biassed toward party A, and by $\widetilde{m}^B$ the number of states biassed toward party B. We will assume that exactly one state, numbered $\widetilde{m}^A + 1$, has $\overline{\mu}^i = 0$, and we will call this the 'swing' state. To save on notation, let i^* denote $\widetilde{m}^A + 1$ from now on.

The uniform case will be of special interest in what follows:

$$f_{unif}(v) = \begin{cases} 0 \text{ if } v < -a \\ 1/(2a) \text{ if } v \in [-a, a]; \text{and} \\ 0 \text{ if } v > a \end{cases}$$

for some $a > 0$.

We assume that each voter votes sincerely. What this means in this case is that if party A offers a policy t^A and party B offers t^B, then voter j in state i will vote for A if

$$U(s, t^A) + \mu > U(s, t^B)$$

and will vote for B otherwise. For each citizen type, s, the probability that a randomly selected citizen in state i will vote for party A is equal to:

$$\theta(t^A, t^B, i, s) \equiv 1 - F(U(s, t^B) - U(s, t^A) - \overline{\mu}^i). \tag{1}$$

[7] Alternatively, the partisan bias could be assumed to be a preference for one party's local candidate over the other party's, without changing much of substance in the model.

Of course, this also gives the fraction of s-type voters in i that will vote for party A, and party A's total votes in the state are given by:

$$\theta(t^A, t^B, i) \equiv 1 - \int F(U(s, t^B) - U(s, t^A) - \overline{\mu}^i) h^i(s) ds. \qquad (2)$$

For each state i, we define economic welfare as a result of any policy t:

$$W(t, i) = \int U(s, t) h^i(s) ds.$$

Note that this excludes partisan preference, although that is part of preferences. We will denote as 'full welfare' $W(t, i)+ \overline{\mu}^i$ in the event that party A wins, and $W(t, i)$ otherwise.

The following observation on the nature of voting in the uniform case will be useful later.

Lemma 1. *In the uniform case, if $0 < \theta(t^A, t^B, i, s) < 1$ for all s, then party A's candidate wins in state i if and only if t^A offers state i higher full welfare than t^B does.*

This follows immediately by performing the integral in (2), using the uniform density. Since with the uniform density

$$F(x) = \frac{x + a}{2a} \forall x \in [-a, a],$$

equation (2) reduces to

$$\theta(t^A, t^B, i) = \frac{1}{2} - \frac{\left(\int (U(s, t^B) - U(s, t^A)) h^i(s) ds - \overline{\mu}^i\right)}{2a},$$

which is a vote share less than one half if and only if $\int (U(s, t^B) - U(s, t^A)) h^i(s) ds - \overline{\mu}^i = W(t^B, i) - W(t^A, i) - \overline{\mu}^i > 0$. This simple result is due to the fact that with the uniform distribution for partisan preferences, the probability that a given voter switches her vote from A to B in response to a change in B's policy is proportional to the change in her utility that would result from the policy change.

2.1 Political payoffs

Each party's payoff is given by the function $G(m)$, where m is the number of seats the party wins. The function G is strictly increasing, so that parties care not only about victory, but about the margin of victory. However, we do allow for the possibility that the parties care primarily about winning power. In particular, we specify the function as follows:

$$G(m) = g(m) + \delta(m)$$

where $g(m)$ is strictly increasing and (weakly) concave with $g(0) = 0$, and:

$$\delta(m) = \begin{cases} 0 \text{ if } m < M/2; \\ 1/2 \text{ if } m = M/2; \text{and} \\ 1 \text{ if } m > M/2 \end{cases} \tag{3}$$

is a dummy variable for control of the congress. Thus, δ reflects concern about control, while g reflects concern about the margin of victory. It is possible that each party cares primarily about control of the legislature with the margin of victory only a minor concern, in which case $g(M) - g(0)$ will be small.

In what follows, the seats held by the two parties resulting from the election are denoted by m^A and m^B respectively.

Note that even in a pure-strategy Nash equilibrium, the outcome can be random because of tied elections in some states. This complicates evaluation of the parties' payoffs somewhat. The following lemma is helpful in doing this, and in analyzing Nash equilibrium.

Lemma 2. *The utility-possibilities frontier for the two parties is bounded above by a frontier made by randomizing over only adjacent values of m^A. Precisely:*

For any choice of probability distribution over t^A and t^B (including degenerate ones), consider the payoff point $(E[G(m^A)|t^A, t^B], E[G(m^B)|t^A, t^B])$, where the expectation is calculated with respect to the probability distribution over m^A and m^B induced by the distribution over the t^A and t^B together with any tie-breaking. This payoff point must lie on or below the frontier:

$$\{(\alpha G(x)+(1-\alpha)G(x+1), \alpha G(M-x)+(1-\alpha)G(M-x-1))|\alpha \in [0,1], x = 0, 1, ..., M-1\}. \tag{4}$$

This frontier is concave (strictly so if g is strictly concave).

This is illustrated in Figure 1, which illustrates a case in which $M = 6$. Each dot in the figure shows the payoff for the two parties for a given division of the seats between them. Point a, for example, represents the outcome when Party A has all 6 seats, point b the outcome when Party A has 4 seats and Party B has 2, point c the outcome when each party has 3 seats, and point d when Party B has all 6 seats. The straight lines connecting adjacent points show payoff combinations made from randomizing between them. In the event that each party cares primarily about winning a majority of seats and only to a small degree about the margin of victory the dots will be clustered close to $(0, 1)$ and $(1, 0)$, with point c isolated very close to $(\frac{1}{2}, \frac{1}{2})$.[8]

[8] The role of the concavity in the lemma is subtle. It ensures that the frontier derived is the true utility-possibilities frontier, since neither party can achieve a higher payoff by randomizing.

2.2 Pure-strategy Nash equilibria in the basic model: An extreme swing-state bias.

A Nash equilibrium in pure strategies is a pair of policies t^A and t^B such that given t^A, t^B maximizes $E[G(m^B)|t^A, t^B]$, and given t^B, t^A maximizes $E[G(m^A)|t^A, t^B]$. We will see here that such equilibria feature some strong properties. Note that because both parties' payoffs are discontinuous in the policy choices, we cannot assume that either party will choose its policy to satisfy a first-order condition (and in fact, as we will see, the payoff function is typically discontinuous at the equilibrium point). This means that the techniques used to analyze equilibrium in Lindbeck and Weibull (1993) and Dixit and Londregan (1996) cannot be applied, so we need an alternate route, which we describe as follows.

The first point to note is that in any equilibrium in pure strategies, either party has the option of mimicking the other (by correctly anticipating what the other will do; of course, the two parties move simultaneously). For example, party A can always choose to set t^A equal to t^B. In that case, A will win all of the A-biassed states, B will win the B-biassed states, and the swing state will be be tied. Therefore, by this strategy party A can assure itself a payoff of:

$$\widetilde{G}^A \equiv \frac{1}{2}[G(\widetilde{m}^A) + G(\widetilde{m}^A + 1)],$$

and thus must achieve at least as high a payoff in any pure-strategy equilibrium. By a parallel argument, party B must achieve a payoff of at least

$$\widetilde{G}^B \equiv \frac{1}{2}[G(\widetilde{m}^B) + G(\widetilde{m}^B + 1)] = \frac{1}{2}[G(M - \widetilde{m}^A - 1) + G(M - \widetilde{m}^A)]$$

in any pure-strategy equilibrium.

We can call the values $\widetilde{G}^A$ and $\widetilde{G}^B$ the two parties' 'natural payoffs.' It can be seen that they are not merely lower bounds for the pure-strategy payoffs, but upper bounds as well.

Proposition 3. *In any pure-strategy Nash equilibrium, the two parties achieve exactly their 'natural' payoffs.*

Proof. We have already seen that party A's payoff must be at least $\widetilde{G}^A$ and party B's payoff must be at least $\widetilde{G}^B$. Note that this payoff pair lies on the payoff frontier (4) derived in Lemma 2. That means that if party B receives a payoff of at least $\widetilde{G}^B$, then party A must receive a payoff of *at most* $\widetilde{G}^A$. Similarly, if party A receives a payoff of at least $\widetilde{G}^A$, then party B must receive a payoff of *at most* $\widetilde{G}^B$. Thus, the two parties' payoffs are exactly their 'natural' payoffs. □

We can now derive the main result concerning the role of the swing state in the policy outcome of electoral competition. The result emerges in a particularly simple way in the special case of the uniform distribution, so we start with that.

Proposition 4. *If f is uniform, then in any pure-strategy Nash equilibrium, t^A and t^B must be local maxima for swing-state welfare.*

Put slightly differently, in any pure-strategy equilibrium, both t^A and t^B must locally maximize $W(t, i^*)$ with respect to t. The proof is very simple. Suppose that there is a pure-strategy equilibrium in which party A commits to a policy vector t^A that is not a local welfare maximizer for the swing state, and party B commits to some policy t^B. We have already observed that in this, as in any pure-strategy equilibrium, each party receives its natural payoff. Now observe that party A has the option of choosing policy vector t^A, mimicking party A's strategy. If it does that, it will again receive its natural payoff, winning all of its home states and winning the swing state with 50% probability. But since t^A is not a local welfare maximizer for the swing state, party B can also deviate from t^A slightly in a direction that improves the swing state's welfare, winning the swing state with certainty, without changing the outcome of the election in any other state. (Note that when t^A is close to t^B $0 < \theta(t^A, t^B, i^*, s) < 1 \forall s$, so Lemma 1 will apply.) Therefore, with this deviation, party B has strictly increased its payoff. We conclude that the original policies (t^A, t^B) were not an equilibrium. That is sufficient to prove the result.

Naturally, this yields a stronger result in the event that state i^* welfare has only one local maximum, such as when it is quasiconcave in t.

Corollary 5. *If f is uniform and $W(i^*, t)$ has only one local maximum with respect to t, then any pure-strategy equilibrium maximizes swing-state welfare; or in other words, $t^A = t^B = argmax_{\{t\}} W(i^*, t)$.*

The result and its proof are slightly more complicated if we relax the assumption of a uniform distribution:

Proposition 6. *In any pure-strategy Nash equilibrium, both parties choose policies that satisfy the first-order condition for maximizing swing-state welfare. Precisely, in any pure-strategy Nash equilibrium:*

$$W_t(t^A, i^*) = 0,$$

where the subscript indicates a partial derivative.

Proof. Suppose that $\widetilde{t}^A$ and $\widetilde{t}^B$ are a pure-strategy Nash equilibrium with $W_t(\widetilde{t}^B, m^*) \neq 0$. We know that $E[G(m^A)|\widetilde{t}^A, \widetilde{t}^B] = \widetilde{G}^A = E[G(m^A)|\widetilde{t}^B, \widetilde{t}^B]$.

Now, party A's share of the swing-state vote for any policy vector t that it might choose, $\theta(t, \widetilde{t}^B, i^*)$, is given by:

$$\theta(t, \widetilde{t}^B, i^*) \equiv 1 - \int F(U(s, \widetilde{t}^B) - U(s,t))h^{i^*}(s)ds,$$

which has derivative:

$$\theta_t(t, \widetilde{t}^B, i^*) = \int f(U(s, \widetilde{t}^B) - U(s,t))U_t(s,t)h^{i^*}(s)ds.$$

If t is set equal to $\widetilde{t}^B$, the swing-state vote is split:

$$\theta(\widetilde{t}^B, \widetilde{t}^B, i^*) = 1/2$$

and the derivative of the vote share is proportional to the derivative of swing-state welfare:

$$\theta_t(\widetilde{t}^B, \widetilde{t}^B, i^*) = \int f(0)U_t(s, \widetilde{t}^B)h^{i^*}(s)ds = f(0)W_t(\widetilde{t}^B, m^*) \neq 0.$$

But this non-zero derivative implies that we can find a sequence of policies t^k, $k = 1, 2, ...,$ converging to $\widetilde{t}^B$, with

$$\theta(\widetilde{t}^B, t^k, i^*) > 1/2$$

for all k. But then for high enough k, party A will win all of the $\widetilde{m}^A$ states that lean toward A, and also win the swing state for sure. Therefore, the party's payoff will be strictly higher than $\widetilde{G}^A$, and the proposed policy pair $(\widetilde{t}^A, \widetilde{t}^B)$ cannot be an equilibrium. This contradiction establishes that equilibrium requires that $W_t(\widetilde{t}^B, i^*) = 0$. Parallel logic shows that we must also have $W_t(\widetilde{t}^A, i^*) = 0$. □

The idea of the proof is straightforward. If party B is expected to choose a policy that violates the first-order condition for swing-state welfare, then party A can always mimic B's choice, then sweeten the policy slightly for swing-state voters and thus win the swing state, strictly improving its payoff. The proposition offers a natural corollary, as follows. First, if a function on $\mathbb{R}^n$ attains a maximum at some value t^* and at no other point on $\mathbb{R}^n$ is the first-order condition for maximization of the function satisfied, then we will say that the function is *regular*. The following is immediate:

Corollary 7. *If $W(t, i^*)$ is regular with respect to t, then the only possible pure-strategy Nash equilibrium has $t^A = t^B = t^*$, where t^* maximizes $W(t, i^*)$.*

Comment. This result differs from the equilibrium condition in Strömberg (2008) in a number of ways. First, unlike Strömberg, we assume that both parties care not only about winning but about the margin of victory. Even if the parties' interest in the margin is very small, this has a large effect on the equilibrium, because parties in our model cater to the swing state even if they know it will not be pivotal. Indeed, if $\tilde{m}^A > \tilde{m}^B + 1$, in a pure-strategy equilibrium party A will win the election for sure, so the swing state will not be pivotal; but both parties cater to swing-state voters because A wants to win by a large margin and B wants to lose by a small margin. Further, nothing in our result depends on the existence of a large number of states; the proposition works with any value for M.

2.3 No exact swing state, and probabilistic elections: A partial swing-state bias.

In our working paper (Ma and McLaren (2018)), we discuss extensively the conditions required for existence of a pure-strategy equilibrium and various extensions to the model, including multiple swing states and the possibility of filibuster. Here we discuss what is likely the most important extension: Allowing for the likely case that politicians do not know for sure what the vote count will be in any given state, which implies that at best a state will be swing only in an approximate sense.

If $\bar{\mu}^i \neq 0$ for each state i but there is one state for which $\bar{\mu}^i$ is *close* to zero, the basic logic of the model applies provided we add a small amount of noise to the model. Let us modify the model in the following way. Suppose that for each state $\bar{\mu}^i = \hat{\mu}^i + \eta^i$, where $\hat{\mu}^i$ is a constant known to all, $\hat{\mu} \equiv \{\hat{\mu}^i\}_{i=1}^M$, while η^i is a random shock whose value is known to neither party until after the votes have been counted, but the distribution of η^i is common knowledge. Further, suppose that the η^i are i.i.d, and the distribution of η^i is given by the density $\rho(\eta^i;\gamma)$, where $\rho(\eta;\gamma) \to 0$ as $\gamma \to \infty$ for $\eta \neq 0$ and $\rho(0;\gamma) \to \infty$ as $\gamma \to \infty$. Larger values of γ imply a distribution for η^i with the mass more concentrated around zero and a variance that shrinks to zero in the limit as γ becomes large.

This puts the model into the tradition of probabilistic voting models such as Persson and Tabellini (2002) or Strömberg (2008), for example. With this framework, any tariff pair (t^A, t^B) will result in a probability $\pi^j(t^A, t^B; \hat{\mu}^j, \gamma)$ that party A will win state j. If we focus on the case in which $g(m)$ from (2.1) is linear, then the payoff for party A will be $G^A(t^A, t^B; \hat{\mu}, \gamma) \equiv E[G(m)|(t^A, t^B; \hat{\mu}, \gamma)] = g(\bar{m}^A(t^A, t^B; \hat{\mu}, \gamma)) + prob(m^A > M/2|(t^A, t^B; \hat{\mu}, \gamma))$, where $\bar{m}^A(t^A, t^B; \hat{\mu}, \gamma))$ is the expected number of seats captured by party A and the probabilities are computed from the underlying π^j probabilities. Party B's payoff function, $G^B(t^A, t^B; \hat{\mu}, \gamma)$, is constructed analogously (and is equal to $g(M) + 1 - G^A(t^A, t^B; \hat{\mu}, \gamma))$. (We assume that M is odd here just to eliminate the nuisance of ties, without changing anything of substance.)

It is straightforward to show the following proposition.

Proposition 8. *With $g(\cdot)$ linear and M an odd number, fix $\hat{\mu}^i \neq 0$ for $i \neq i^*$ and consider a sequence of values $\hat{\mu}_k^{i^*}$ such that $\hat{\mu}_k^{i^*} \to 0$ as $k \to \infty$. Suppose in addition that $\gamma_k \to \infty$ as $k \to \infty$, that $G^A(\cdot, \cdot; \hat{\mu}_k, \gamma_k)$ is strictly quasi-concave in its first argument,* *and $G^B(\cdot,\cdot;\hat{\mu}_k,\gamma_k)$ in its second argument, for all k; that t must be chosen from a compact space $T \subset \Re^n$, that $W(\cdot,\cdot)$ is regular with respect to t as defined in Section 2.2 and continuously differentiable; and that $W_t(t,i)$ is uniformly bounded for all i. Then if for each k there is a Nash equilibrium in pure strategies (t_k^A, t_k^B) for the model with $\hat{\mu}^i = \hat{\mu}_k^i$ and $\gamma = \gamma_k$, then we must have $t_k^A \to t^*$ and $t_k^B \to t^*$ as $k \to \infty$, where t^* is the optimal value of the policy vector for state i^*.*

This means that if there is a state that is approximately swing, and politicians can form a good estimate of election outcomes given policy choices but the estimate is subject to error, then there will be a swing-state bias in tariff choices but it may be less extreme than in the benchmark model. Tariffs will maximize a weighted welfare function that may put *some* weight on non-swing-state welfare, but for large k it will be smaller than the weight on swing-state welfare. This contrast with the benchmark model will be explored in the empirical analysis.

Summary. (1) The simple model of electoral competition we have presented has a stark prediction in the case of perfect information: In a pure-strategy equilibrium, policy will exhibit an extreme swing-state bias; it will maximize the welfare of the swing state (or the joint welfare of the swing states) without any regard to the well being of voters living in other states. This pure strategy equilibrium exists in a broad swath of the parameter space. (2) Importantly, when some noise is added to the model, the effect is softened, and a partial swing-state bias is possible, which becomes extreme in the limit as the amount of uncertainty becomes small.

3 Bringing the model to the data.

We wish to look at trade policy to test for swing-state effects as predicted by the model, but we need to make some additional assumptions about the nature of the economy in order to be able to do so. One approach is to simplify the economy along the lines employed by Grossman and Helpman (1994), which allows us to analyze the equilibrium using partial-equilibrium techniques. This has disadvantages, in that for example the effect of trade policy on wages and employment is omitted by construction, a consideration which is central to trade policy politics in practice. But it is simple and transparent and allows us to focus in a clean way on the differences in industrial composition across states, and so as a first pass this is the approach that we take.

Assume that all consumers have the same utility function, $c_0 + \Sigma_{i=1,\ldots n} U^i(c^i)$, where c^i is consumption of good i, U^i is increasing and concave, and c_0 is consumption of the numeraire good 0. Each good is produced with labor and an industry-specific fixed factor that is in fixed and exogenous quantity in each state, with the exception that good 0 is produced using labor alone with a constant unit marginal product of labor. Each state's labor supply is fixed – labor cannot move from state to state.

Let the sum of indirect utility in state s be given by $v(p, I_s)$, where p is the vector of domestic prices across all goods and I_s is state-wide income. The world price vector is p^*, which we take as given, and the vector of tariffs is $p - p^*$.[9] Suppose that the government maximizes weighted welfare, where the weight on state-s welfare is A_s, with $A_s = 1$ if s is a swing state and $A_s = \beta$ if s is not a swing state. The objective

[9] For a given import-competing industry i, if $p^i > p^{i*}$ there is a positive import tariff, while if $p^i < p^{i*}$ there is a negative import tariff, or an import subsidy. For a given export industry, those two cases represent an export subsidy and an export tax respectively.

function is:

$$\Sigma_s A_s \left[v\left(p, R_s(p) + \alpha_s TR(p, p^*)\right)\right], \tag{5}$$

where $R_s(p)$ is the state-s revenue function, $TR(p, p^*)$ is national tariff revenue, α_s is the state-s share of tariff revenue, and the summation is over all states.

3.1 Derivation of a regression equation.

We now show how this set-up yields an estimating equation. Taking the derivative of (5) with respect to p_i and setting equal to zero yields:

$$\Sigma_s A_s \left[\tilde{Q}_s^i - \tilde{C}_s^i + \alpha_s TR_i(p, p^*)\right] = 0, \tag{6}$$

where $\tilde{Q}_s^i$ and $\tilde{C}_s^i$ are the quantities of consumption and production of good i in state s respectively, and $TR_i(p, p^*)$ is the derivative of tariff revenue with respect to p^i. (Throughout, tildes will refer to physical quantities, and the corresponding variables without tildes will represent values.)

Since tariff revenue is given by

$$TR(p, p^*) = (p - p^*)\tilde{M}, \tag{7}$$

where $\tilde{M}$ is the vector of net imports in quantity units, the derivative of tariff revenue is given by

$$\begin{aligned} TR_i(p, p^*) &= \tilde{M}^i + (p^i - p^{*i})\frac{d\tilde{M}^i}{dp^i}, \\ &= \tilde{M}^i + \tilde{M}^i \frac{(p^i - p^{*i})}{p^i}\frac{p^i d\tilde{M}^i}{\tilde{M}^i dp^i}, \\ &= \tilde{M}^i\left(1 + \left(\frac{\tau^i}{1+\tau^i}\right)\eta^i\right), \end{aligned}$$

where τ^i is the *ad valorem* equivalent tariff on good i, so $\tau^i = \frac{p^i - p^{*i}}{p^{*i}}$ and η^i is the elasticity of import demand for good i with respect to the price of good i.[10]

[10] For an import-competing industry, $\tilde{M}^i > 0$ and $\eta^i < 0$. For an export industry, $\tilde{M}^i < 0$ and $\eta^i > 0$.

Consequently, we can write the first-order condition:

$$\Sigma_s A_s \left[\tilde{Q}_s^i - \tilde{C}_s^i + \alpha_s \tilde{M}^i \left(1 + \left(\frac{\tau^i}{1+\tau^i}\right)\eta^i\right)\right] = 0. \tag{8}$$

Now, multiplying through by p^i, we can express the condition in terms of *values* of production and consumption of good i in state s, Q_s^i and C_s^i, respectively, as well as the value of national imports, M^i:

$$\Sigma_s A_s \left[Q_s^i - C_s^i + \alpha_s M^i \left(1 + \left(\frac{\tau^i}{1+\tau^i}\right)\eta^i\right)\right] = 0. \tag{9}$$

Finally, since in this model everyone consumes the same quantity of each non-numeraire good (assuming away corner solutions), we can write

$$C_s^i = \rho_s \left(Q^i + M^i\right), \tag{10}$$

where ρ_s is the state-s share of the country's population and Q^i is national production of good i.

Finally, we reach an estimating equation as follows:

$$\begin{aligned} & \Sigma_{s\in S} \left[Q_s^i - \rho_s \left(Q^i + M^i\right) + \alpha_s M^i \left(1 + \left(\frac{\tau^i}{1+\tau^i}\right)\eta^i\right)\right] \\ = \quad & -\beta \Sigma_{s\notin S} \left[Q_s^i - \rho_s \left(Q^i + M^i\right) + \alpha_s M^i \left(1 + \left(\frac{\tau^i}{1+\tau^i}\right)\eta^i\right)\right], \end{aligned} \tag{11}$$

where S is the set of states that are classified as swing states.

This is a regression equation, without intercept, where each observation is an industry i. The only parameter to be estimated is β. The rest is data. A value of $\beta = 0$ is consistent with the extreme swing-state bias of the benchmark model, while $0 < \beta < 1$ indicates a partial swing-state bias consistent with the probabilistic model. A value $\beta = 1$ would indicate no bias at all, and $\beta > 1$ would indicate a bias *against* the swing states.

To understand this equation better, we can rewrite it by defining the marginal benefit to the swing states of an increase in the tariff on i, MB_i^{SS}, as:

$$MB_i^{SS} \equiv \left(\frac{Q_{SS}^i}{Q^i} - \rho_{SS}\right) + \left(\frac{M^i}{Q^i}\right)(\alpha_{SS} - \rho_{SS}) + \left(\frac{M^i}{Q^i}\right)\left(\frac{\tau^i}{1+\tau^i}\right)\eta^i \alpha_{SS},$$

where $Q_{SS}^i = \Sigma_{s \in S} Q_s^i$ is swing-state industry-i production and $\alpha_{SS} \equiv \Sigma_{s \in S} \alpha_s$ and $\rho_{SS} \equiv \Sigma_{s \in S} \rho_s$ are the aggregate swing-state share of government spending and population respectively. Here we have divided through by the value of industry i output to scale the expression. The first term can be called the 'direct redistribution term;' if the swing-state share of industry-i output ($\frac{Q_{SS}^i}{Q^i}$) exceeds the swing-state share of population (ρ_{SS}), then an increase in the tariff on i redistributes real income to swing-state residents by raising swing-state producer surplus more than it lowers swing-state consumer surplus. The next two terms have to do with tariff revenue, and so are proportional to import penetration, $\frac{M^i}{Q^i}$. The first of these terms can be called the 'fiscal redistribution term,' and represents the possibility that the swing-state share of government spending (α_{SS}) exceeds the swing-state share of population (ρ_{SS}), so that an increase in the tariff on i will provide an indirect redistribution to swing states through expenditure. This may not be important in practice, but it has been important at times in the past, as for example in the early US economy, when low-population western states supported tariffs because they received vastly disproportionate shares of the revenues for infrastructure development (Irwin (2008)). The last term is the portion of the marginal distortion cost of the tariff that is borne by swing-state residents. The aggregate marginal distortion is proportional both to the size of the tariff and to the elasticity of import demand, and swing-state residents' share of this is equal to their share of tariff revenue, or α_{SS}.

We can define MB_i^{NSS} analogously as the marginal benefit to non-swing state residents, by taking the sums over $s \notin S$, and this gives the first-order condition as:

$$MB_i^{SS} = -\beta \cdot MB_i^{NSS}. \tag{12}$$

The MB_i^{SS} and MB_i^{NSS} terms can be computed from data. If we find that on the whole the marginal benefit for swing states is much smaller than for non-swing states, implying that tariffs are closer to the swing-state optimum than the non-swing-state optimum, then that implies a small value of β and a correspondingly large bias towards swing states.

4 Data.

Here we describe the construction and data sources of the variables used to estimate the model. Our empirical strategy will be described in the following section.

4.1 Swing-state indicators.

States can be classified as swing-states or non-swing states in a variety of ways. One approach, which we can call the 'switching' criterion, is to call a state 'swing' if the winning party in a state election changed at least once over a given period.[11] A second approach is to classify a state as swing if the outcome in a given election is sufficiently close. This criterion can produce a range of different classifications, for two reasons. First, note that a swing state can be defined in principle for any election, and so there are different swing-state designations for each election for the Senate, House of Representatives, and the Presidency. Since we do not have employment figures by House district, we limit our attention to Senate and Presidential swingness. Second, we need to choose a cutoff for swing status. Since the ideal would be the narrowest

[11] We thank Peter Schott for suggesting this approach.

criterion possible that allows enough variation in the variable to allow estimation, in our preferred specification we define a state as a swing state in a given election if the vote difference between the two major parties is less than 5 percentage points. We also check robustness with a 10 percentage point criterion.

What is most important for politicians' incentives is the anticipated closeness of a state in an upcoming election. In our simplest baseline model, that is known with certainty since the $\bar{\mu}^i$ parameters are known with certainty. Of course, this is an approximation at best; politicians poll and use informal information-gathering and experience to judge what the swing states are going to be in any given election, and at times this assessment will be in error. One can think of the election results as revealing the *ex ante* expected swing status of each state up to this forecast error, and hence a noisy judgment of the swing states that really matters to us. One way of reducing some of the noisiness is to define swing states based on the average absolute value of the vote margin over a decade. This is what we have done, resulting in a group of swing states on average over the 1980's and also over the 1990's, using both the 5 and 10 percent thresholds.

Voting data come from the website of the Office of the Clerk of the House of Representatives.[12] Table 1, Panel A lists the swing states defined by presidential elections, and Panel B by senate elections. In each case the first column shows the list of swing states based on the 'switching' criterion over the 1990's. Our intention has been to identify swing states based on political conditions in the 1990's; for the presidential switching criterion, we needed to add the 1988 election since there was not enough variation based on only the 1992 and 1996 elections (very few states switched parties

[12]See http://history.house.gov/Institution/Election-Statistics/Election-Statistics/

from the 1992 presidential election to the 1996 one). The second column lists swing states based on a 5% vote-margin criterion, and the third column lists the additional states that become swing when the criterion is loosened to 10%. Each row shows the states that were within the margin in the given year as marked, followed by a row listing the states whose *average* margin over the 1990's is within the given margin. Note that the list of swing states varies considerably by criterion. For example, Arizona is a swing state in the 1990's much more often in presidential elections than in senate elections. Relaxing the criterion from 5% to 10% in any given election tends roughly to double the number of swing states. Note from Panel B that, averaging over the 1990's, there are no swing states using the 5% senate criterion.

Looking over Table 1, most of the classifications are as one would expect, but there are also surprises. Some of these are due to the distinction between presidential and senatorial elections. Following the events of November 2000, we tend to think of Florida as the quintessential swing state, and it does appear in the list several times, but in the Senate elections it is more often not a swing state. For example, in 1992 Democratic Senator Bob Graham won re-election with 65% of the vote. On the other hand, some readers will be surprised to see Texas in the second column of Panel A as a presidential swing state, given its status as a quintessential Red State. This is likely due to special circumstances during 1992 and 1996, when Texas businessman Ross Perot ran an unusually successful independent campaign, winning 22% and 7% of the Texas vote in those two years respectively, and holding the Republican victory margin in the Texas presidential ballot to under 5%. By contrast, in 2000, Republican (and Texan) George W. Bush won Texas by a 21% margin. But Texas is not in the swing-state lists at all for the Senate races. Another example is California; as much as it may be the quintessential Blue State, it does show up in the first column of Panel A, because the state went for George H. W. Bush in 1988, and it does show up in Panel B because it had some close Senate races. We allow in our empirical work for both types of swingness to matter, remembering that what matters is not which states are perceived as swing *now*, but which were perceived as swing in the mid-1990's when US tariffs were re-written.

4.2 Trade barriers.

We use both U.S. Most-Favored Nation (MFN) tariffs and U.S. tariffs on goods imported from Mexico as trade barriers for the estimation.

Many empirical studies of trade policy have used non-tariff barriers (NTB's) instead of tariffs, on the ground that MFN tariffs are established through international negotiation and thus cannot reflect domestic political pressures in the way indicated by simple political-economy models. In particular, both the pioneering papers of Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000) used the 1983 NTB coverage ratio of an industry – the fraction of products within the industry that were subject to any NTB in 1983 – as the measure of trade policy. That is not helpful for our purposes. We wish to exploit the first-order condition (11), which (as summarized in (12)) is derived from the marginal benefit of a tariff increase to either swing-state or non-swing-state residents. But there is no way to interpret this equation in terms of the marginal benefit of increasing an industry's NTB coverage ratio.[13] (See Gawande and Krishna (2003) for discussion of the appropriateness of NTB coverage ratios more broadly.)

[13]Note, for example, that an important part of the first-order condition is the effect of a tariff change on tariff revenue, but most NTB's do not generate revenue. The revenue effects are empirically important, as noted later in Footnote 20.

Further, current interpretation of the multilateral process suggests that negotiations have the effect of neutralizing terms-of-trade externalities across countries, allowing each national government to choose a politically optimal tariff structure subject to the constraint given by the trading partners' overall terms of trade (see Bagwell and Staiger (1999)). This allows much scope for domestic politics to affect the structure of tariffs, even if the overall level of tariffs is constrained by negotiation. Indeed, Fredriksson et al (2011) show that the inter-industry pattern of US MFN tariffs is highly correlated with domestic political pressures in a way consistent with models of unilateral tariff setting.

For these reasons, we use the MFN tariffs.[14] Now, care must be used in the use of tariffs because they are set by Congress, and tariff bills are passed infrequently. Consequently, MFN tariffs show a great deal of inertia. In any given year, MFN tariffs most likely reflect political calculations made when the bill was passed, which may have been many years ago.[15] Our focus is the MFN tariffs as of 1996, because that is the first election year after the Uruguay Round reset US trade policy.[16] We wish to examine the effect of political conditions at the time at which tariffs are set, and so we use data on political and economic conditions over the 1990's together with the 1996 tariffs. The relevance of Presidential elections is clear, since the executive branch sets the agenda by negotiating the agreement through the US Trade Representative, appointed by the President, but we allow for Congressional pressure by looking at

[14] We use tariffs on all merchandise trade, including manufacturing, agriculture, mining, oil and gas.

[15] A striking example of this tariff inertia is Fredriksson, Matschke, and Minier (2011), who measure the bias in tariff setting in favor of the majority party in Congress. The results for 1993 show a positive bias, but the results for 1997 show a *negative* bias, as if tariffs punish the constituents of the party in power. The explanation is that the tariffs have barely changed at all between the two years, but in the intervening years party control of the House had switched.

[16] Tariffs were reset by the Uruguay Round Agreements Act, Public Law 103-465, 108 Stat. 4809, signed into law by President Clinton on December 8, 1994.

swingness in both Senate elections and the Presidential election.

In addition to MFN tariffs, we use US tariffs on imports from Mexico in the years leading up to NAFTA, which were, at the margin, subject to unilateral discretion by the US government. Before the North American Free Trade Agreement (NAFTA) came into force in 1994, the U.S. imposed tariffs on imports from Mexico that were on average below MFN tariffs because many goods were duty free due to the Generalized System of Preferences (GSP). [17] Because eligibility for duty-free access under the GSP is subject to importing-country discretion, there is potentially more scope for political influence over tariffs on Mexican imports than on MFN tariffs. Both the MFN tariffs and the Mexico-specific tariffs are collected by John Romalis and described in Feenstra, Romalis, and Schott (2002).

Table 2 shows the means and standard deviations of the Mexico-specific tariffs from 1989 to 1999 based on the Harmonized System 8-digit code. They started decreasing before NAFTA, with a small drop from 1990 to 1991 and a large drop from 1993 to 1994. To allow for the possibility that 1993 tariffs were affected by expectations of the NAFTA agreement which was then being completed, we employ both tariffs in 1993 and averaged tariffs from 1991 to 1993 as the pre-NAFTA Mexico-specific tariffs.

4.3 Other variables

We use aggregate income in industry i in state s to proxy for the value of output of industry i in state s, Q_s^i. This is the aggregate of the TOTINC variable, total personal income, of the US Census, for all workers employed in i and residing in s. This variable is taken from the IPUMS public-use micro-samples from the U.S. Census (Ruggles et.

[17] See Hakobyan (2015) for an analysis of the GSP, and Hakobyan and McLaren (2016) for a discussion of the GSP in the case of Mexico and how tariffs changed with the NAFTA.

al., 2010). Because of this, we are limited to the Census' industry categories. Therefore, we aggregate MFN tariffs and pre-NAFTA Mexico-specific tariffs up to the Census categories by computing the import-weighted average of all tariffs in each industry. Import data are downloaded from the Center for International Trade Data at U.C. Davis.[18]

The Census has a number of advantages over a potential alternative, the County Business Patterns (CBP), for our purposes. For example, if a worker commutes to work across a state line, his/her earnings will be reported in the county where the workplace is located for the CBP, but will be listed in the state where the worker lives for the Census. But as a voter, where the worker lives is what matters. These effects may be very important quantitatively; many of the Labor-Market Areas constructed in Tolbert and Sizer (1996), for example, cross state lines, implying large numbers of workers who commute to jobs in a state other than their state of residence. In addition, the CBP data report only payroll income; an owner-operated firm will have profits that are not part of the payroll, but should be part of the income variable reported in the Census. An additional problem is the large number of industry-state observations for which the CBP suppresses number of workers and all payroll information because of confidentiality constraints.

The state share of national population is calculated by dividing state s's population by total population, which can be found on the website of Federal Reserve Bank of Saint Louis, sourced to the Population Estimates Branch of the U.S. Bureau of the Census.[19] The state share of tariff revenue is approximated by the central government spending share of state s. The government spending information is also from the U.S.

[18] See http://cid.econ.ucdavis.edu/.

[19] See http://research.stlouisfed.org/fred2.

Census.

Lastly, elasticities of import demand for good i are from Kee, Nicita, and Olarreaga (2009).

5 Empirical Analysis.

We wish to estimate the weight, β, that is placed by the political process on voters in non-swing states. We do this in two ways, both using the first-order condition (12) (or equivalently, (11)). First, we use (11) as a regression equation, and then we use it to compute the implied value of β in each industry individually. Each of these two methods can generate many different estimates based on which criterion for swing state is used. Rather than pick our favorite estimate and present that to the reader, we will show a range of estimates, which in some cases conflict with each other, and then summarize the main story that emerges.

To use (11) as a regression equation, we treat each industry in each year as an observation. The regressand is the marginal benefit of an increase in the tariff on industry i to the swing states, and the sole regressor is minus one times the marginal benefit of the tariff increase to the non-swing states. The coefficient is then the estimated value of β. Note that it is important that there be no intercept, because that would violate the first-order condition that comes from the theory. The implied error subsumes all factors that differ across industries that are not in the model but that might affect tariff formation, such as differences in enforceability of tariffs, and measurement error.

5.1 MFN tariffs and preferential tariffs on Mexican imports.

The regression results are given in Tables 3 through 8. Each of these tables is based on one swing-state criterion. Table 3 and Table 7 are based on the switching criterion, Table 4 is based on the 5% vote difference criterion, and Table 5 and Table 8 are based on the 10% vote difference criterion (Table 6 uses both). In each table, the first four columns show the estimates of β from (11) as a regression equation, using respectively the 1996 MFN tariffs; tariffs averaged over the 1990's; the pre-NAFTA tariffs on Mexico in 1993; and the tariffs on Mexico averaged over 1991-3. As a robustness exercise, Table 6 allows for the value of β to vary by year, and uses the year-by-year varying swing-state indicators from Table 1. Coefficients significantly different from zero are marked by asterisks, while those significantly different from 1 (indicating a swing-state bias) are marked with a dagger.

All estimates lie strictly between 0 and 1, with both $\beta = 0$ and $\beta = 1$ rejected. The estimates vary from 0.196 (for the 5% senate criterion for 1998 in Table 6) and 0.872 (for the 1993 pre-NAFTA tariffs with the 'switching' criterion in Table 3). Since any estimate below $\beta = 1$ implies a swing-state bias, clearly, the estimates imply a strong bias. At the same time, since the estimates are all significantly different from zero, the extreme bias of the benchmark model with no uncertainty is also rejected. The estimated swing-state bias tends to be somewhat weaker for the pre-NAFTA tariffs on Mexico and stronger for the stricter swing-state criteria (5% instead of 10%). No obvious time trend is revealed by the year-by-year estimates in Table 6.

Now, a major concern is measurement error, particularly with regard to the elasticities of import demand, which are difficult to estimate. If all terms of (11) are measured with an iid error, then the estimator for β will tend to be biassed toward zero. For this reason, it is conceivable that we would find a spurious swing-state bias that is really simply the result of classical errors-in-variables attenuation. If we had available variables that are highly correlated with the right-hand-side of (11) but uncorrelated with the measurement error, we could use them as instrumental variables, but such variables are difficult to come by in this context. Another way of dealing with this is to use what we will call a 'reverse regression.' We divide both sides of (11) by $-\beta$ and make the right-hand side, with the non-swing-state variables, into the regressand, while the left-hand side with the swing-state variables takes the role of the regressor. Under this approach, the regression coefficient is interpreted as β^{-1}, and a swing-state bias is indicated by a value of the coefficient in excess of 1. Since the classical errors-in-variables bias will also bias this coefficient toward zero, if the reverse regression yields estimates that exceed unity, we can take this as strong evidence in favor of a swing-state bias. The results of this reverse regression are reported in the last four columns of Tables 3 through 8, which have the same format as the first four columns, and also use daggers to indicate a significant difference from unity. A value slightly below unity is found for the 1996 MFN tariffs with the 10% senate criterion in Table 8, and three values fall below unity in the senate criterion in the last two columns of Table 6, but all other point estimates are above 1.

The various estimates from the regression approach are summarized in Figure 2. Each point in the scatter plot is a pair of estimates for β from Tables 3 through 8 (excluding the year-specific estimates of Table 6), where the horizontal axis measures the 'regular regression' estimate from the first four columns of the table and the vertical axis measures the 'reversed regression' estimate from the last four columns (that is, the vertical component of each point is the reciprocal of the corresponding regression coefficient in the reversed regression). The 45° line is drawn as a dotted line, and the horizontal line is at the value $\beta = 1$. The fact that every point is above the 45° line is evidence that measurement error is indeed a problem. Note that only one estimate is in excess of $\beta = 1$. If one assumes that in each case the true value must lie between the basic estimate and the reverse-regression estimate, then in each case but that one the true value is indicated as within the unit interval, and in that one exception the midpoint between the two estimates is well within the unit interval. The median of all of these estimates is $\beta = 0.8$.

Stepping away from the regression approach, the second approach to measuring the bias is a straightforward industry-by-industry calculation. In any industry i where MB_i^{SS} and MB_i^{NSS} are of opposite signs, $-\frac{MB_i^{SS}}{MB_i^{NSS}}$ is the value of β implied by optimization. These implied values of β of course vary from one industry to the next – which would be the case even if the model held exactly, given the likely presence of measurement error – so we present both a mean and a median to summarize the results. This is detailed in Table 9. Because of outliers the mean values are erratic, but the median is always strictly between zero and unity, with a median value of 0.797.

To summarize, although it is possible to find formulations of the problem for which the estimate of β exceeds unity, the overwhelming tendency is for it to lie strictly between 0 and 1. This provides evidence in favor of a swing-state bias in trade policy, of the moderate sort predicted by the probabilistic voting model rather than the extreme sort predicted by the benchmark model.[20]

[20] Since tariff revenue is an unimportant source of funds in modern central government financing, it is natural to ask whether these results are driven at all by the portions of MB_i^{SS} that capture revenue effects (the last two terms, multiplied by M^i) or are driven purely by the disproportionate-production effect (the first term). It turns out that the revenue terms really do matter. If we repeat the empirical procedures

5.2 Summary of Empirical Results.

We estimated a model in which tariffs are chosen to maximize a social welfare function that puts some weight, β, on non-swing-state welfare, as is suggested by a version of the swing-state model with probabilistic election outcomes, and we estimate what the weight is by making use of the first-order condition for the optimal tariff vector. Using a wide range of swing-state criteria and estimation methods, we find that the value for β most consistent with the data is typically strictly between zero and unity. For both of our two broad approaches, we arrive at a median value of 0.8, so we may well adopt that as a rule of thumb benchmark estimate.

It may be of interest to compare this exercise with estimates of the social welfare weight in the protection-for-sale literature. In Grossman and Helpman (1994)'s notation, the equilibrium tariffs maximize an objective function that is the sum of (i) welfare of the interest groups buying protection, and (ii) total social welfare multiplied by a weight equal to $a > 0$. A strong bias toward the interest groups would be indicated by a value of a close to zero, while as $a \to \infty$ the equilibrium policy converges to social welfare maximization, hence free trade. Estimates of a have tended to find very large values, often above 100 and even above 3,000 (see Gawande and Krishna (2003), who point out that the high values are 'troubling' especially in face of how little interest groups pay for the protection they receive). For example, Goldberg and Maggi (1999) find estimates equivalent to approximately $a = 50$ to $a = 70$.[21] We can compare those results directly with ours as follows. In our notation, the equilibrium tariff

omitting the revenue terms, the estimates are more erratic, with numerous estimates of β in excess of 1. As much as tariff revenues make up an insignificant fraction of government finances, at the margin tariff revenue does seem to be relevant in determining the level of each individual tariff. This is consistent with Matschke (2008), who finds that revenue considerations have explanatory power for the pattern of US tariffs.

[21] In their notation, β is the weight on welfare for groups outside of organized lobbies, and groups in a lobby receive a weight of 1. Their estimates range from $\beta = 0.981$ to 0.986.

maximizes the sum of (i) swing-state welfare with (ii) non-swing-state welfare multiplied by β. That can be equivalently written as swing-state welfare times $(1-\beta)$ plus total social welfare times β. Maximizing this is equivalent to maximizing swing-state welfare plus total social welfare times $\frac{\beta}{(1-\beta)}$. Therefore, our $\frac{\beta}{(1-\beta)}$ corresponds to the Grossman-Helpman a. Given a benchmark estimate of $\beta = 0.8$, which is the median of our regression estimates, this then takes a value of $0.8/0.2 = 4$, as compared with estimates of a in the triple digits. Therefore, our estimates provide a picture of swing-state bias that is orders of magnitude greater than the interest-group bias implied by empirical protection-for-sale models. One interpretation is that the swing-state model is more useful than a protection-for-sale model in understanding departures of US trade policy from free trade.

6 Conclusion.

We have studied a model of electoral competition in which national election victory depends on winning a majority of states or electoral votes, and where states differ in their degree of inherent partisan bias. In the simplest version of the model with no uncertainty and one 'swing state,' which has no partisan bias at all, the only equilibrium in pure strategies is one in which both parties commit to the policy that maximizes welfare in the swing state, ignoring the welfare of all other states. This can be called an 'extreme swing-state bias.' This equilibrium exists if the partisan bias of the other states is strong enough or if the economic interests of the various states are not too different. A richer version of the model with uncertainty added allows for a partial swing-state bias, converging to the equilibrium with the extreme bias in the limit as the uncertainty becomes vanishingly small.

Looking at data on US trade policy, both MFN tariffs and preferential tariffs on imports from Mexico for the 1990's, we find evidence that US trade policy exhibits a strong bias in favor of citizens who live in swing states. We reject the extreme swing-state bias, but our median estimate implies a welfare weight for citizens living outside of swing states equal to about 80% of that for swing-state residents. This implies a bias orders of magnitude greater than the bias estimated in numerous studies based on lobbying models, suggesting that electoral pressures such as studied here may be a much larger driver of trade policy than lobbying.

Finally, this all may have implications for proposals to reform or abolish the electoral college, which has become an increasingly frequent topic of debate in the US following a presidential election in 2000 and another in 2016 in which the candidate with the most votes lost the election.[22] Moving to a system in which the national vote total determines the winner of the election (or equivalently, a system in which electoral votes for each state are awarded in proportion to the share of the state's vote) would move the system much closer to the basic Lindbeck and Weibull (1993) model. This in general creates its own policy bias, if the distribution of partisan preferences is different for voters with different economic interests, but it is possible that the policy outcome would be very different from the current swing-state-favoring outcome.[23] An analysis of the outcome from that change lies beyond the scope of this paper, but identifying

[22]See Michelle Goldberg, "Tyranny of the Minority," *New York Times*, September 25, 2017, for example.

[23]Consider the following stark example. There are two partisan states, A and B, and one swing state, C. States A and B have the same economic structure and so the same tariff preferences. State C has a different economic structure. States A and B have equal and opposition partisan preferences: Partisan preferences for each economic type in A are distributed uniformly between $-\lambda$ and 0, and in B between 0 and λ, where $\lambda > 0$. In C, partisan preferences are distributed uniformly between $-\lambda$ and λ. In the present model, if there is an equilibrium in pure strategies, the swing-state welfare-maximizing tariff will be implemented, which will be the tariff vector that maximizes C welfare. But if the electoral college is eliminated, partisan preferences will have, for each economic type, mean zero and the same distribution, and so the Lindbeck and Weibull (1993) equilibrium will maximize national social welfare.

the bias of the current system ought to be a useful first step.[24]

7 Appendix

Proof of Lemma 2.

Proof. The only part of the statement that requires proof is that the Pareto frontier is concave, which requires checking because of the jump in $G(m)$ at $m = M/2$. We treat the case where M is even; the odd case is a trivial extension. For $m^A + 1 < M/2$ (corresponding to the lower-right side of Figure 1), the slope of the frontier, or the change in party-A welfare per unit change in party-B welfare when we transfer one seat from B to A, is given by:

$$\frac{G(m^A+1) - G(m^A)}{G(M-m^A-1) - G(M-m^A)} = -\frac{\triangle g(m^A+1)}{\triangle g(M-m^A)},$$

where $\triangle g(m) = g(m) - g(m-1)$. This slope is negative and greater than unity in absolute value, and declines in magnitude as m^A rises, due to the concavity of g. The slope from point $m^A = M/2 - 1$ to $m^A = M/2$ is given by:

$$\begin{aligned}
\frac{G(M/2) - G(M/2-1)}{G(M/2) - G(M/2+1)} &= -\frac{\triangle g(M/2) + \frac{1}{2}}{\triangle g(M/2+1)) + \frac{1}{2}} \\
&= -\frac{\triangle g(M/2+1)\left(\frac{\triangle g(M/2)}{\triangle g(M/2+1)}\right) + \frac{1}{2}}{\triangle g(M/2+1) + \frac{1}{2}}.
\end{aligned}$$

This is (-1) times a weighted average of $\left(\frac{\triangle g(M/2)}{\triangle g(M/2+1)}\right) > 1$ and unity, and so by the concavity of g it is smaller in magnitude than any of the slopes with $m^A + 1 < M/2$. Thus, the slope of the frontier declines in magnitude from $m^A = 0$ to $m^A = M/2$, and

[24] Note that even with the electoral college abolished, the bias revealed in the Senate would remain.

by similar logic it is straightforward that the slope continues to decrease to the point at which $m^A = M$. Thus, the frontier is concave. $\square$

Proof of Proposition 8.

Proof. The first part of the proof follows the proof of Lindbeck and Weibull (1993), Proposition 1. If we define $\tilde{G}_k^P \equiv G^P(t^*, t^*; \hat{\mu}_k, \gamma_k)$ as the 'natural payoffs' for $P = A, B$, then it is easy to see that for any k, in any pure-strategy equilibrium, the payoffs will be the natural payoffs. Since each party always has the option of choosing the other party's policy vector, each party must receive at least its natural payoff in equilibrium; but since the payoffs have a constant sum, this also ensures that each party will receive no more than its natural payoff. Now, suppose that for some k there is an equilibrium, say (t_k^A, t_k^B), with $t_k^A \neq t_k^B$. This implies that $G^A(t_k^A, t_k^B; \hat{\mu}_k, \gamma_k) = G^A(t_k^A, t_k^B; \hat{\mu}_k, \gamma_k) = \tilde{G}_k^A$. But then by quasi-concavity, any choice for t^A that is a weighted average of t_k^A and t_k^B must give party A a strictly higher payoff. This is a contradiction, so only symmetric equilibria are possible, say $(t_k^A, t_k^B) = (t_k, t_k)$.

Now, suppose that there is a value $\epsilon > 0$ such that $|t_k - t^*| > \epsilon \forall k$. If we adopt the notation that $\pi_1^i(t^A, t^B; \hat{\mu}^i, \gamma)$ refers to the gradient of the π^i function with respect to the t^A vector and π_2^i the gradient with respect to the t^B vector, then $\pi_1^i(t_k, t_k; \hat{\mu}^i, \gamma) = \rho(-\hat{\mu}^i; \gamma_k) W_t(t_k, i)$. This takes a limit of 0 as $k \to \infty$ for $i \neq i^*$, because $\rho(-\hat{\mu}^i; \gamma_k) \to 0$ (since $\hat{\mu}^i \neq 0$). But since $\rho(-\hat{\mu}_k^{i^*}; \gamma_k) \to \infty$ as $k \to \infty$, $\pi_1^{i^*}(t_k, t_k; \hat{\mu}^{i^*}, \gamma_k)$ does not converge to 0. (If it did, then we could find a subsequence of t_k that converges to a policy vector $\hat{t}$ with $|\hat{t} - t^*| > \epsilon$ and $W_t(\hat{t}, i^*) = 0$. But this would contradict the regularity of $W(t, i^*)$.) As a result, eventually the first-order condition will fail for both parties, contradicting the assumption that this was an equilibrium. $\square$

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Table 1: List of Swing States
Panel A: Based on Presidential Elections

Year	(1) States based on party-switching standard (during 1988-1996)	(2) States based on the "Presidential 5%" standard	(3) States based on the "Presidential 10%" standard, excluding those in Column (2)
1992	-	AZ, CO, FL, GA, KY, LA, MT, NC, NH, NJ, NV, OH, SD, TN, TX, VA, WI	AK, AL, CT, DE, IA, IN, KS, ME, MI, MS, NM, OK, OR, PA, SC, WV
1996		AZ, CO, GA, KY, MT, NC, NV, SD, TN, TX, VA	AL, FL, IN, MO, MS, ND, NH, NM, OH, OK, OR, PA, SC
Averaged 1990s	-	AZ, CO, FL, GA, KY, MT, NC, NV, OH, SD, TN, TX, VA	AL, IA, IN, LA, MO, MS, ND, NH, NM, OK, OR, PA, SC, WI, WY
1988-1996 window	AR, AZ, CA, CO, CT, DE, FL, GA, IL, KY, LA, MD, ME, MI, MO, MT, NH, NJ, NM, NV, OH, PA, TN, VT	-	-

Note: This table shows the swing states based on three criteria. (1) The party-switching criterion classifies a state as swing if neither party won the state in every Presidential election between 1988 or 1996. (2) The Presidential 5% criterion classifies a state as swing if the vote difference is below 5% in the Presidential elections in 1992 or 1996 (first two rows), or in the vote share averaged over those years (next row). (3) The Presidential 10% criterion is analogous. NOTE: Column (2) is a subset of Column (3), but the states in Column (2) are omitted from Column (3) to save space.

Table 1: List of Swing States
Panel B: Based on Senate Elections

Year	(1) States based on the party-switching standard (during 1990-1998)	(2) States based on the "Senate 5%" standard	(3) States based on the "Senate 10%" standard, excluding those in Column (2)
1990	-	CT, FL, KY, MN, NJ, NV, WA, WI	CA, HI, IA, IN, NC, OR, SD
1992		GA, MN, NC, NH, NJ, NY, PA, SC	CO, IL, MO, OH, OR, WA, WI
1994		CA, GA, MN, NC, NH, NJ, PA, SC, VA	CO, IL, MI, NE, NM, NV, OR, VT
1996		CA, GA, LA, MA, MT, NH, OR, PA, SD	AL, AR, CO, IA, ME, MN, NC, NV, SC, VA, VT
1998		IL, KY, MA, NC, NV, WI	GA, ME, MN, MO, NY, SC, VA
Averaged 1990s	-	None	CA, MA, MN, NC, NJ, NV
1990-1998 window	AL, AR, AZ, CA, CO, DE, FL, GA, IA, IL, IN, KY, MI, MN, MT, NC, NE, NM, NY, OH, OK, OR, RI, SC, SD, TN, VA, VT, WA	-	-

Note: The swing-state crieria are identical to those for Panel A, but for Senate rather than Presidential elections.

Table 2: Descriptive Statistics of Pre-NAFTA Tariffs on Imports from Mexico

	Observations	Mean	Standard deviation
1989	8,382	0.034	0.064
1990	8,439	0.034	0.064
1991	8,485	0.032	0.063
1992	8,502	0.032	0.063
1993	8,508	0.031	0.063
1994	8,497	0.023	0.055
1995	9,498	0.018	0.053
1996	7,690	0.017	0.038
1997	8,011	0.013	0.031
1998	7,875	0.008	0.024
1999	6,657	0.005	0.019

Note: This table contains the mean and standard deviation of the Mexico-specific tariffs from 1989 to 1999, based on the Harmonized System 8-digit code.

Table 3: Estimated β from Time-Averaged Data in 1988-1996 Based on the Presidential-Election Party Switching SS Criterion.

	Basic regressions				Reversed regressions			
	MFN tariffs in 1996	Averaged MFN tariffs in 1990-1996	Mexican tariffs in 1993	Averaged Mexican tariffs in 1991-1993	MFN tariffs in 1996	Averaged MFN tariffs in 1990-1996	Mexican tariffs in 1993	Averaged Mexican tariffs in 1991-1993
Estimated β from time-averaged data	0.714†††	0.729†††	0.827†††	0.805†††	1.204†	1.168††	1.060	1.088
	(0.043)***	(0.061)***	(0.057)***	(0.056)***	(0.103)***	(0.084)***	(0.071)***	(0.070)***
R^2 (within)	0.860	0.852	0.876	0.875	0.860	0.852	0.876	0.875
Number of observations	80	80	80	80	80	80	80	80

Note: This table presents the estimates of β using 4 trade barriers, separately, each in a separate column: MFN tariffs in 1996, MFN tariffs averaged over the 1990s, Mexico-specific tariffs in 1993, and averaged Mexico-specific tariffs averaged over 1991-1993. A state is swing if the state switches from voting for one party to voting for the other party in the 3 Presidential elections from 1988 to 1996. Columns (1)-(4) present the basic regressions and Columns (5)-(8) present the reversed regressions. ***, **, * indicate the significance of regression coefficients at the 1%, 5%, and 10% level. †††, ††, † indicate the significance of rejection of the Wald test on the hypothesis that the coefficient is equal to 1 at the 1%, 5%, and 10% level.

Table 4: Estimated β from Time-Averaged Data in 1990s Based on the Presidential-Election 5% Vote Difference SS Criterion.

	Basic regressions				Reversed regressions			
	MFN tariffs in 1996	Averaged MFN tariffs in 1990-1996	Mexican tariffs in 1993	Averaged Mexican tariffs in 1991-1993	MFN tariffs in 1996	Averaged MFN tariffs in 1990-1996	Mexican tariffs in 1993	Averaged Mexican tariffs in 1991-1993
Estimated β from time-averaged data	0.329††† (0.137)**	0.337††† (0.135)**	0.421††† (0.159)**	0.404††† (0.149)***	1.132 (0.153)***	1.155 (0.166)***	1.168 (0.151)***	1.182 (0.163)***
R^2 (within)	0.372	0.390	0.491	0.478	0.372	0.390	0.491	0.478
Number of observations	79	79	79	79	79	79	79	79

Note: This table presents the estimates of β using 4 trade barriers, separately, each in a separate column: MFN tariffs in 1996, MFN tariffs averaged over the 1990s, Mexico-specific tariffs in 1993, and averaged Mexico-specific tariffs averaged over 1991-1993. A state is swing if the vote difference of the Democratic Party and the Republican Party, averaged in 1990s, is below 5% in the Presidential elections. Columns (1)-(4) present the basic regressions and Columns (5)-(8) present the reversed regressions. ***, **, * indicate the significance of regression coefficients at the 1%, 5%, and 10% level. †††, ††, † indicate the significance of rejection of the Wald test on the hypothesis that the coefficient is equal to 1 at the 1%, 5%, and 10% level.

Table 5: Estimated β from Time-Averaged Data in 1990s Based on the Presidential-Election 10% Vote Difference SS Criterion.

	Basic regressions				Reversed regressions			
	MFN tariffs in 1996	Averaged MFN tariffs in 1990-1996	Mexican tariffs in 1993	Averaged Mexican tariffs in 1991-1993	MFN tariffs in 1996	Averaged MFN tariffs in 1990-1996	Mexican tariffs in 1993	Averaged Mexican tariffs in 1991-1993
Estimated β from	0.568†††	0.576†††	0.672†††	0.646†††	1.215†	1.214†	1.121	1.162†
time-averaged data	(0.119)***	(0.116)***	(0.121)***	(0.115)***	(0.123)***	(0.124)***	(0.077)***	(0.094)***
R^2 (within)	0.691	0.700	0.753	0.750	0.691	0.700	0.753	0.750
Number of observations	79	79	79	79	79	79	79	79

Note: This table presents the estimates of β using 4 trade barriers, separately, each in a separate column: MFN tariffs in 1996, MFN tariffs averaged over the 1990s, Mexico-specific tariffs in 1993, and averaged Mexico-specific tariffs averaged over 1991-1993. A state is swing if the vote difference of the Democratic Party and the Republican Party, averaged in 1990s, is below 10% in the Presidential elections. Columns (1)-(4) present the basic regressions and Columns (5)-(8) present the reversed regressions. ***, **, * indicate the significance of regression coefficients at the 1%, 5%, and 10% level. †††, ††, † indicate the significance of rejection of the Wald test on the hypothesis that the coefficient is equal to 1 at the 1%, 5%, and 10% level.

Table 6: Estimated β from Each Year in 1990s Based on the Presidential/Senate-Election Vote Difference SS Criterion.

	Basic regressions				Reversed regressions			
	Presidential 5% swing-state FOCs	Presidential 10% swing-state FOCs	Senate 5% swing-state FOCs	Senate 10% swing-state FOCs	Presidential 5% swing-state FOCs	Presidential 10% swing-state FOCs	Senate 5% swing-state FOCs	Senate 10% swing-state FOCs
Year1990			0.358†††	0.697†††			0.700	0.964
			(0.170)***	(0.106)***			(0.240)***	(0.099)***
Year1992	0.471†††	0.761†††	0.564†††	0.618†††	1.044	1.162†††	1.311	1.236††
	(0.161)***	(0.065)***	(0.0725)***	(0.101)***	(0.119)***	(0.0433)***	(0.206)***	(0.115)***
Year1994			0.537†††	0.627†††			1.307	1.308†††
			(0.0857)***	(0.0806)***			(0.198)***	(0.064)***
Year1996	0.385†††	0.530†††	0.500†††	0.616†††	1.031	1.345†	0.985	1.085
	(0.136)***	(0.100)***	(0.151)***	(0.115)***	(0.254)***	(0.179)***	(0.199)***	(0.180)***
Year1998			0.196†††	0.470†††			1.036	1.267†
			(0.104)*	(0.110)***			(0.323)***	(0.150)***
Fixed effects	Non-swing-state FOC * Year dummies				Swing-state FOC * Year dummies			
R^2 (within)	0.441	0.836	0.564	0.711	0.437	0.816	0.533	0.708
Number of observations	158	158	395	395	158	158	395	395

Note: This table presents the estimates of β from regression (11) pooled over the 1990's, using MFN tariffs year by year, allowing the value of β to vary by year. The swing-state criterion is the 5% or 10% Presidential standard or the 5% or 10% Senate standard as indicated (varying by year as in Table 1). Columns (1)-(4) present the basic regressions, where the right-hand-side variables are interacted wtih year dummies. Columns (5)-(8) present the reversed regressions. Throughout, ***, **, * indicate the significance of regression coefficients at the 1%, 5%, and 10% level, and †††, ††, † indicate the significance of rejection of the Wald test on the hypothesis that the coefficient is equal to 1 at the 1%, 5%, and 10% level. Standard errors are clustered by industry.

Table 7: Estimated β from Time-Averaged Data in 1990s Based on the Senate-Election Party Switching SS Criterion.

	Basic regressions				Reversed regressions			
	MFN tariffs in 1996	Averaged MFN tariffs in 1990-1996	Mexican tariffs in 1993	Averaged Mexican tariffs in 1991-1993	MFN tariffs in 1996	Averaged MFN tariffs in 1990-1996	Mexican tariffs in 1993	Averaged Mexican tariffs in 1991-1993
Estimated β from time-averaged data	0.670††† (0.056)***	0.687††† (0.066)***	0.782††† (0.075)***	0.755††† (0.073)***	1.294††† (0.063)***	1.256††† (0.046)***	1.122††† (0.034)***	1.164††† (0.034)***
R^2 (within)	0.868	0.862	0.877	0.878	0.868	0.862	0.877	0.878
Number of observations	79	79	79	79	79	79	79	79

Note: This table presents the estimates of β from time-averaged data in 1990s using 4 trade barriers, separately: MFN tariffs averaged in 1996, MFN tariffs averaged in 1990s, Mexican tariffs in 1993, and averaged Mexican tariffs in 1991-1993. A state is swing if the state switches from voting for one party to voting for the other party in the 5 Senate elections from 1990 to 1998. Columns (1)-(4) present the basic regressions and Columns (5)-(8) present the reversed regressions. Througout, ***, **, * indicate the significance of regression coefficients at the 1%, 5%, and 10% level, and †††, ††, † indicate the significance of rejection of the Wald test on the hypothesis that the coefficient is equal to 1 at the 1%, 5%, and 10% level.

Table 8: Estimated β from Time-Averaged Data in 1990s Based on the Senate-Election 10% Vote Difference SS Criterion.

	Basic regressions				Reversed regressions			
	MFN tariffs in 1996	Averaged MFN tariffs in 1990-1996	Mexican tariffs in 1993	Averaged Mexican tariffs in 1991-1993	MFN tariffs in 1996	Averaged MFN tariffs in 1990-1996	Mexican tariffs in 1993	Averaged Mexican tariffs in 1991-1993
Estimated β from time-averaged data	0.556††† (0.145)***	0.558††† (0.143)***	0.640†† (0.167)***	0.622†† (0.157)***	0.986 (0.186)***	1.030 (0.164)***	1.022 (0.094)***	1.034 (0.111)***
R^2 (within)	0.549	0.575	0.654	0.643	0.549	0.575	0.654	0.643
Number of observations	79	79	79	79	79	79	79	79

Note: This table presents the estimates of β from time-averaged data in 1990s using 4 trade barriers, separately: MFN tariffs in 1996, MFN tariffs in 1990s, Mexico-specific tariffs in 1993, and Mexico-specific tariffs averaged over 1991-1993. A state is swing if the vote difference of the Democratic Party and the Republican Party, averaged in 1990s, is below 10% in the Senate elections. Columns (1)-(4) present the basic regressions and Columns (5)-(8) present the reversed regressions. ***, **, * indicate the significance of regression coefficients at the 1%, 5%, and 10% level. †††, ††, † indicate the significance of rejection of the Wald test on the hypothesis that "the coefficient is equal to 1" at the 1%, 5%, and 10% level.

Table 9: Simple Statistics of the "β" Parameter in the Samples

	Mean of "β" across industries	Median of "β" across industries
(1) SS Criterion Based on Presidential-Election Party Switching.		
Use MFN tariffs in 1996	0.918	0.777
Use averaged MFN tariffs in 1990-1996	2.688	0.744
Use Mexican tariffs in 1993	0.703	0.995
Use averaged Mexican tariffs in 1991-1993	0.662	0.973
(2) SS Criterion Based on Presidential-Election 5% Vote Difference.		
Use MFN tariffs in 1996	0.215	0.517
Use averaged MFN tariffs in 1990-1996	0.232	0.449
Use Mexican tariffs in 1993	0.701	0.889
Use averaged Mexican tariffs in 1991-1993	-1.303	0.817
(3) SS Criterion Based on 10% Presidential-Election Vote Difference.		
Use MFN tariffs in 1996	-2.557	0.751
Use averaged MFN tariffs in 1990-1996	-3.055	0.732
Use Mexican tariffs in 1993	-0.429	0.987
Use averaged Mexican tariffs in 1991-1993	-0.442	0.976
(4) SS Criterion Based on Senate-Election Party Switching.		
Use MFN tariffs in 1996	-1.030	0.690
Use averaged MFN tariffs in 1990-1996	-1.757	0.661
Use Mexican tariffs in 1993	1.022	0.963
Use averaged Mexican tariffs in 1991-1993	0.257	0.946
(5) SS Criterion Based on Senate-Election 10% Vote Difference.		
Use MFN tariffs in 1996	-0.179	0.501
Use averaged MFN tariffs in 1990-1996	0.095	0.499
Use Mexican tariffs in 1993	0.642	0.919
Use averaged Mexican tariffs in 1991-1993	9.509	0.895

Note: This table presents the mean and the median of the β estimates across industries using all swing state criteria and trade barriers.

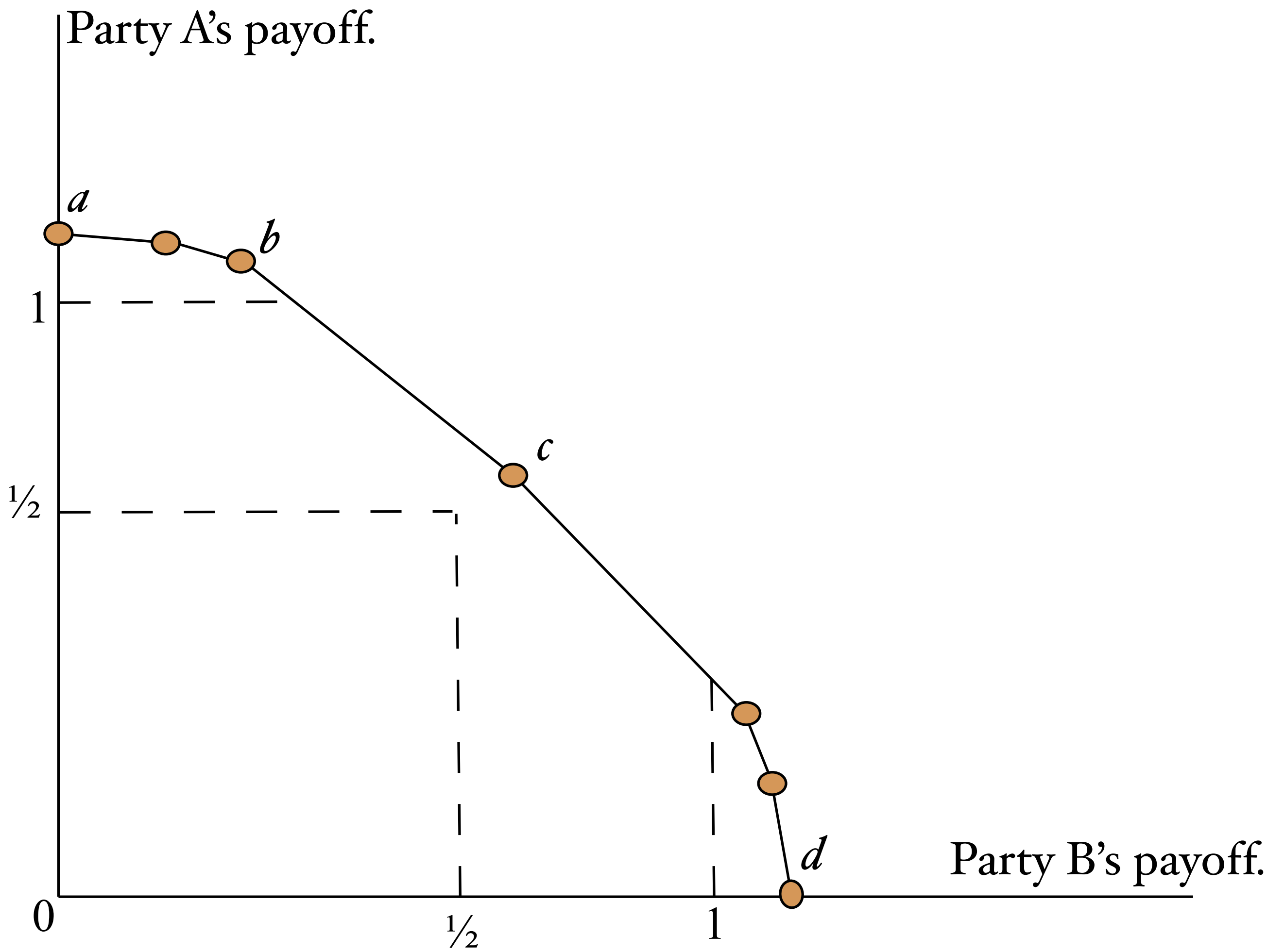

Figure 1: The Pareto frontier for the two parties.

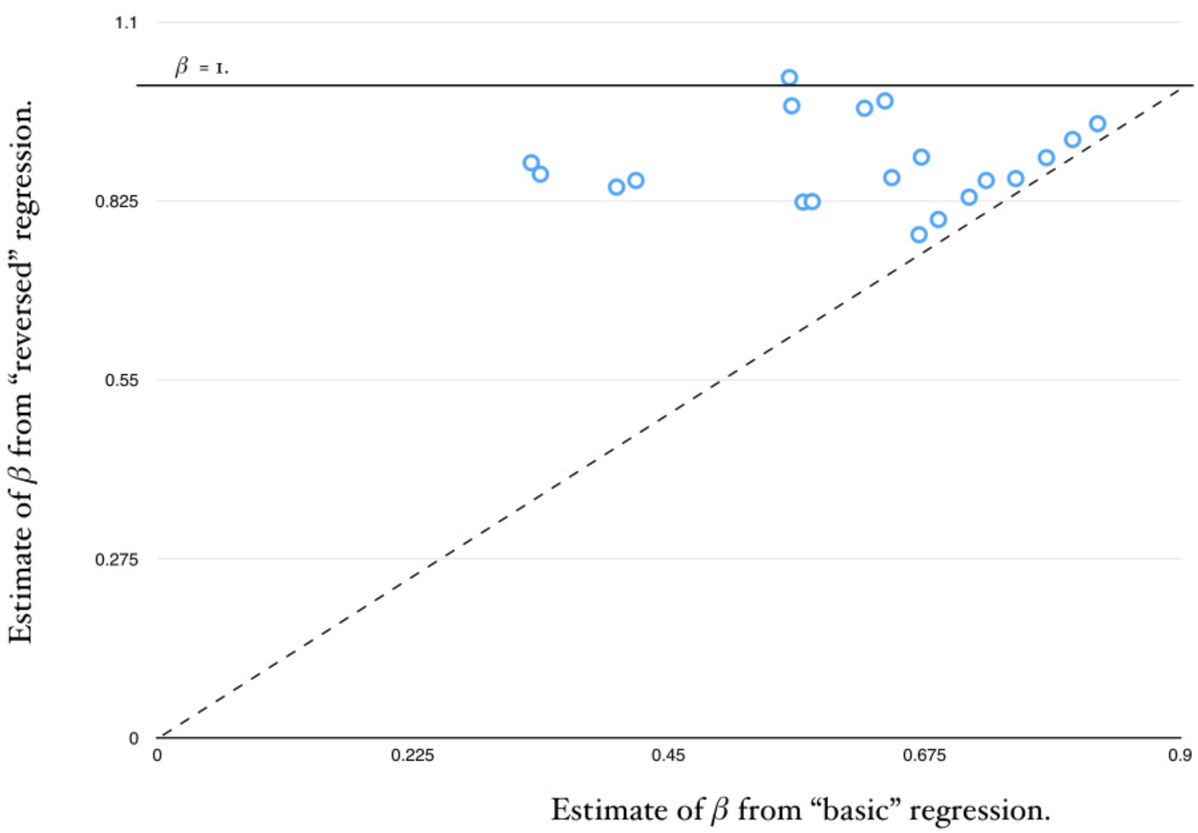

Figure 2: Regression estimates of the implied social weight on non-swing states, β.