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Corruption and Voter Turnout: A Spatial Econometric Approach

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Abstract: An FBI sting investigation, from 1984 through 1987, called "Operation Pretense" exposed extensive corruption amongst Mississippi's county supervisors. In response, Mississippi's legislature asked voters in the November 1988 general election to choose between the then-prevalent "beat system" of county governance and a more centralized "unit system" thought to be less corruption-prone. Voters opted for the unit system in 47 of Mississippi's 82 counties. We use spatial econometric techniques to examine voter turnout rates in that election. We compare spatial econometric and ordinary least squares models: both reveal that, *ceteris paribus*, revelations of supervisor corruption influenced voter turnout rates positively at the county level. However, we find no relationship between corruption and voters' beat-unit choices using spatial econometric techniques — suggesting that voters did not go to the polls to punish corrupt politicians, but were motivated by candidates' and parties' greater electioneering efforts to gain access to or to protect corruption rents.

1. Introduction

Each county Board of Supervisors in Mississippi has five members elected to concurrent terms of four years. Under the "beat system," which was in place in all but two of the state's 82 counties before the November 1988 general election, individual supervisors exercised nearly unconstrained administrative control of their individual, geographically defined subcounty districts or "beats." Voters in each beat elect their supervisor, each of whom is responsible for buying and maintaining county vehicles, handling contracts with suppliers, controlling inventories, and directing the activities of county workers. Because the county school board and the sheriff are responsible, respectively, for overseeing the public schools and the criminal justice system (Karahan et al., 2006), building and maintaining county roads and bridges account for most of the beat supervisors' attention. In that setting relevant spending decisions are taken unilaterally by each beat's supervisor, meaning that, at best, the line between legislative and executive power is fuzzy. Given few checks and balances on supervisors' budgetary discretion, the beat system is susceptible to corruption because resource-allocation decisions at the beat level do not require approval by the county's four other supervisors.

Under the alternative "unit system" decision-making is more centralized, and governing powers are separated more sharply: legislative functions clearly are the responsibility of the five-member Board of Supervisors, while executive duties are delegated to a professional county administrator. Supervisors still represent the voters in their individual districts, but the Board of Supervisors serves to a greater degree in a policymaking capacity, tasked

[1] Dr. Coats passed away unexpectedly in December of 2015. At the time he was a Professor of Economics at Nicholls State University in Louisiana.

collectively with establishing overall county budgetary priorities by simple majority rule. The unit system's centralization of county purchasing and personnel matters circumscribes individual supervisory discretion in contracting with vendors and in hiring and firing county employees. Supervisors are further limited by roadwork budgets, which must be approved by the full board, and by county road managers, who maintain day-today control of work crews (Karahan et al., 2006, pp. 1-2).

Following revelations of widespread corruption amongst county supervisors, the Mississippi legislature voted to place a referendum on the November 1988 national election ballot requiring simple majorities of each county's voters to choose one of the two systems of local governance: the beat system or the unit system. The impetus for that ballot question followed an FBI sting of Mississippi's county supervisors, code-named "Operation Pretense," which ran from March 1984 until late 1987. The investigation uncovered substantial corruption involving county supervisors, vendors, and other interested parties, which began in the wake of allegations from a Pentecostal minister, the co-owner of a construction supply business, that some county supervisors had demanded kickbacks from procurement contracts. Undercover FBI agents produced evidence of misuses of public office for personal gain by large numbers of the state's county supervisors (Karahan et al., 2006, p. 2). Operation Pretense led to convictions on various corruption charges of 54 county supervisors hailing from 26 counties. Joining those convicted supervisors were two state highway commissioners, a road foreman, and 13 vendors of equipment and supplies. Only one indicted supervisor was judged "not guilty" at trial (Karahan et al., 2006, pp. 2-3). Two other indicted supervisors escaped guilty verdicts: one died awaiting trial, and another was unable to stand trial because of his mental incompetence (Karahan et al., 2006, pp. 2-3). In return for cooperation with federal investigators, other vendors and public officials had the charges against them dismissed or dropped.[2]

In placing the beat-unit question on the 1988 ballot, the legislature warned voters that counties approving a change from the beat to the unit system would not be given a chance to revert to the beat system until 1995. By 1991, complaints began to arise that the unit system had not met expectations, leading the legislature to relent to pressure and allow voters in every county the right to petition to hold a new beat-unit election in November 1992. Of the 47 counties that chose the unit system in 1988, 22 petitioned for a reexamination of the beat-unit question in 1992. Of the 22 petitioning counties, only Tate and Jones counties voted to revert to the beat system. Not surprisingly, none of the counties that remained under the beat system bothered to submit petitions to change their 1988 choice.

Using a choice model with a dependent variable defined as the ratio of beat to unit votes, Karahan et al. (2002) examine the outcomes of governance elections of 1988 and of 1992 when the issue was revisited by petitioning counties. Karahan et al. (2002) find no evidence that the voting outcome was different in the counties where one or more supervisors had been convicted in Operation Pretense.[3] Karahan et al. (2006) analyze the county supervisor elections of 1987, using more accurate corruption conviction data from Crockett (2003), who found, in contrast to Karahan et al. (2002), that voter turnout[4] was significantly and positively related to whether or not any of a county's supervisors had been convicted of corruption, after controlling for other factors.

Unlike Karahan et al. (2006), the present study examines voter turnout rates in the beat-unit election of 1988, a measure that was on the same ballot as the U.S. presidential and congressional races. Unlike the 1987 county supervisor election, no state or local issues were on the 1988 ballot other than the question of county governance. It is noteworthy that in 13 of the 82 counties in Mississippi the total number of votes cast on the beat-unit referendum exceeded those for U.S. president.

Using a logistic transformation of the dependent variable and standard ordinary least squares (OLS) regression techniques, Karahan et al. (2009) found supervisor corruption to be a positive determinant of voter turnout as well as the beat-unit choice faced by voters.[5] Karahan et al. (2009) also entered as an independent variable *NeighborTurnout*, defined as the log of the average voter turnout rates in neighboring

[2] Karahan et al. (2006) provide data on supervisor convictions by county.

[3] The information on county supervisor corruption convictions in that study was obtained from a combination of newspaper reports and FBI files obtained through a "Freedom of Information Act" request.

[4] Voter turnout was measured as a ratio of total votes cast for county supervisors in 1987 to 1990 county voting-age population.

[5] Karahan et al. (2009) defined corruption as a binary variable equal to one if one or more county supervisors had been convicted on federal corruption charges. Similar results were ob-

counties. They argued that this variable controlled for any spatial dependence in the voting process. However, it has been shown that using ordinary least squares (OLS) regression techniques in conjunction with a spatially-weighted dependent variable leads to an endogeneity problem resulting in biased and inconsistent results (Moon and LeSage, 2008).[6] Given the problems encountered with using OLS as an estimation strategy, our motivation in this paper is to ask whether modern spatial econometric techniques can improve the estimates presented in Karahan et al. (2009).

In the following section, we discuss how corruption affects the market for votes. Then we summarize our theoretical turnout model, emphasizing the demand-side of that market. In Section 4, we describe our data, our empirical model of voter turnout in the 1988 beat-unit elections, and our spatial econometric method. We then report our estimation results. Conclusions are discussed in the last section.

2. The supply of votes, the derived demand for votes, and corruption

In examining turnout we look at voters' choices along with the competitive behaviors of candidates and electoral elite (simply, electoral elite). Early studies of voter turnout from a public-choice perspective focused on Downs' (1957) calculus-of-voting equation, also referred to as an instrumental model of voting (Fiorina, 1976), wherein individuals are motivated to vote by the expected net benefits if their favored candidate or preferred policy wins. The strict Downsian voting calculus is

$$V = pB - C, \tag{1}$$

where V represents the individual's decision to vote, if $V > 0$, or abstain, if $V < 0$ (the voter is indifferent between voting and not voting if $V = 0$); p is the probability that the voter's vote changes the election's outcome; B is the benefit to the voter from his preferred candidate or policy winning; and C is the cost of voting.

Downs (1957) noted that the probability of one vote changing the outcome of a mass election essentially is nil, meaning that the act of voting fails a benefit-cost test (and so, too, does gathering information ahead of time about candidates and policies). Voting is irrational unless voters consistently fail to accurately estimate their chances of being decisive.[7] This bare-bones Downsian model implies that decisions to vote are based on the voter's expectation of changing the electoral outcome, what has come to be known as "instrumental voting": votes are instruments to change the election outcome. Riker and Ordeshook (1968) returned voting to the realm of rationality, by adding a "D" term to the Downsian equation, with D representing the utility generated by the act of voting, apart from the expectation that the action will change any outcome. Mostly, D is thought to encompass such things as the value of performing one's civic duty or costs of not voting owing to social pressure, no matter the outcome of the election. Thus, the benefits of voting may outweigh the costs even if the voter has no expectation of changing the outcome of the election.

The probability of changing an election's outcome and, hence, voter turnout rates in the Downsian model hinge on three factors: inversely on the size of the electorate, directly on the expected closeness of the vote, and the individual voter's subjective probability of being decisive given the voter's estimates of the first two factors. The evidence on the effect of closeness on turnout is mixed. Kramer (1970-71) finds that turnout is increased by face-to-face contact between voters and electoral elites and/or their campaign volunteers, even though such contact does not seem to affect voters' choices. Coats (1984) reports strong relationships between turnout and closeness in several regressions examining Victorian-era parliamentary elections in the United Kingdom. Basing their work on campaigns for the U.S. House of Representatives, Cox and Munger (1989) find that when they hold campaign spending constant, turnout is higher in closer elections. They reason that tighter races elicit greater electioneering effort by political elites. More recently, Nichter (2008) suggests that many pre-Election Day activities, usually thought of as attempts to buy the votes of swing voters, instead are designed to increase the turnout rates of the core

tained in an alternative specification where the number of convicted supervisors – ranging from zero to five – replaced the 0/1 dummy variable.

[6] Given the simultaneity bias of OLS, maximum likelihood methods are used to estimate the parameters of the resulting spatial econometric model.

[7] Voters may be systematically wrong about their estimates of changing the election outcome. See, for instance, Darmofal (2010) on evidence of systematic error in voting efficacy. We should note that unlike many market decision environments, there is no natural feedback or error correcting mechanism for voter estimates of voting efficacy.

constituencies of a candidate or party. Because the electoral elite reward loyal voters who show up at the polls, including those who might not otherwise have turned out, the probability of winning is raised without having to monitor actual vote choices.

On the other hand, in examining a large set of California ballot propositions, Matsusaka (1993) finds no clear relationship between closeness and turnout. However, Rallings and Thrasher (2007) do find a closeness effect in an individual-level study of British elections. Fauvelle-Aymar and François (2006) examine French legislative districts using aggregate election results and find that expected closeness, based on early round (primary) elections, increases turnout. Examining turnout in local French elections, where some districts also have departmental elections on the same ballot and some do not, and where the departmental elections are geographically random, Fauvelle-Aymar and François (2015) find higher voter turnout rates in districts where a departmental-level election was also on the ballot, which is consistent with Pecquet, Coats, and Yen (1996). Based on meta-analysis of aggregate-level turnout studies, Geys (2006) concludes that the empirical evidence supports three propositions. Other things being equal, aggregate voter turnout is higher when 1) elite election spending is higher; 2) constituencies are smaller; and 3) elections are closer. Matsusaka and Palda (1999), using a dataset of surveys of individual Canadian voters, find no effect of closeness on the likelihood of voting, noting that the supply or voter side of turnout behavior is unlikely to yield further insights except on the question of voter investment in information about the issues in the election. As Schwartz (1987) stated, "saying that closeness increases the probability of being pivotal . . . is like saying that tall men are more likely to bump their heads on the moon" (p. 118). While closeness might matter to U.S. Senators (Boudreaux et al., 2011) or in small representative bodies or committees, it makes no sense to include either p or B in the voter calculus equation, as $p \approx 0$. We see, then, that a purely supply-side or instrumental theory of the vote motive has no solid basis in theory, nor is it uniformly supported in the empirical literature.

Since voters seldom, if ever, can expect to be decisive, the voter's decision equation in its Riker and Ordeshook (1968) version reduces to

$$V = D - C. \tag{2}$$

Lacking an instrumental component ($pB \approx 0$), we surprisingly sometimes see empirical support for the hypothesis that closeness affects turnout, as predicted by the instrumental voting model. As Aldrich (1993) notes, both the D and C terms are likely to be small and can be expected to vary from voter to voter, suggesting an upward-sloping supply of voters or support for any one side. Since D and C are usually small and vary somewhat randomly across the population, $D - C$ is also random and can be sorted into increasing order, making the supply of votes upward sloping.

Just as transportation to the polls can be a method of reducing the cost of voting, making the C term a target for voting "transactions," the D term is also a potential transactional term.[8] The D term need not be only a psychological cost of abstention, but can include any payment to vote, including direct monetary payments, employment or promises of employment, or any sort of in-kind payment to go to the polls. The D term, of course, includes social-pressure or psychological costs, such as a threat to publicize the names of non-voters to publically shame them.

We suggest that when electoral elites offer their supporters selective incentives to vote, this reduces the C term of the recipients and, *ceteris paribus*, raises supporters' turnout rates. If V is mildly negative, it would take only a small payment, a transportation subsidy or a perhaps a pizza slice (such as the oft-used bribe to get students to a campus event) to get the voter to the polls. Once at the polls, though, voters cast their ballots for their preferred choices, as secret ballot elections (Coats et al., 2014) reduce the abilities of electoral elites to monitor vote contracts.[9]

[8] It really would make no difference in the logic of the model if the selective incentives to voters were described as increases in the D term or reductions in the C term, if we recognize that the C term could take on negative values. Also, some may disagree with labeling such selective incentives to vote as "expressive" arguments. Instead, Cox (2004) describes selective incentives as being *non-instrumental reasons to vote* or, in the case of Cox and Kousser (1981, p. 170) in discussing bribes to one's opponents' supporters to stay home under a secret ballot institution, as being *non-instrumental reasons to not vote*. To avoid making a distinction that we feel is unnecessary, we will refer to such selective incentives as "expressive" reasons, though such reasons are clearly lie strictly within the traditional rational domain.

[9] Cox and Kousser (1981) found lower voter participation rates from effective monitoring of bribery payments after the secret ballot was passed in New York, suggesting that at least some voters were paid *not* to turn out (i.e., to abstain) on Election Day. Lott (1986) tells us that monitoring contracts for specific performance (such as how one votes) and being able to punish shirking behavior is not always necessary if one can be reasonably sure of how the agent (a legislator, in Lott's case) will perform, as principals can often come to learn the preferences of their agents.

Encouraging loyal voters (the "party faithful") to go to the polls nevertheless may be enough to assure political elites that the election will go their way.

"Expressive voting" behavior is the main alternative to the instrumental voting model. Brennan and Brooks (2014) present a short historical progression of the idea from the early 1950s to the work of Hamlin and Jennings (2011). The overall theme is that voters act not on the belief that their votes will influence an election, but simply to make a statement. Voting in the expressive model is much like cheering for one's favorite team, flying a flag, or even participating in a protest rally (Laband et al., 2009). Copeland and Laband (2002) report evidence that voting to express one's preference on a ballot issue is related to other forms of expression, such as wearing political buttons, posting political signs in one's yard, or placing a political bumper sticker on one's car. This can be interpreted as voter expressiveness being a complement to these other form of expression rather than a substitute. Cebula (2004) finds support for expressive voting, noting that the emotional issue of the Vietnam War increased voter participation while disillusionment with government and the Watergate scandal increased apathy. Cebula (2005) later finds that strong feelings of either approval or disapproval for the current president led to higher voter turnout rates, as did U.S. participation in the first Gulf War (known as "Desert Storm"), which was thought by many to be a "just war." Cebula (2008) also finds that the presence of emotionally charged referendums, such as questions about same-sex marriage, abortion rights, and affirmative action, lead to greater voter participation. As more evidence to the expressive voting hypothesis, Cebula and Mixon (2012) find that the ending of the military draft in the U.S. reduced the aggregate voter participation rate. Using the results of a single-issue special election in Mississippi, Karahan and Shughart (2004) show that elections which have "expressive" traits seem to explain voter turnout better. Brennan and Brooks (2014) maintain, however, that much needs to be done in the expressive voting area inasmuch as "it is not obvious how the expressive domain is composed - or what optimization within it might mean for the calculus of a vote-maximizing candidate" (p. 125).

A supply-side theory of turnout, wherein voters' decisions to vote or not are based solely on a Downsian instrumental motivation, fails the rationality test; however, there is substantial support, both theoretically and empirically, for an expressive-voter model. Instead of analyzing voting behavior strictly through an instrumental approach, we suggest that an expressive-voting theory of vote supply coupled with Olson's (1965) demand-side approach to voter mobilization by electoral elites explains some of voter turout. This demand-side approach for examining voter turnout is described in Karahan et al. (2006). They present a theory that brings the possibility of corrupt office holders and office seekers into the discussion of elite-led voter turnout, focusing attention on "rational elites" more than "rational voters." Demand and supply of voters are integrated similarly to Cox's integration of the two, which examines mobilization under different voting rules (1999). We suggest, then, that electoral elites offer their supporters selective incentives to vote, increasing the D or decreasing the C terms of their voters, fitting within the "voter mobilization by electoral elites" perspective of Key (1949), Cox and Munger (1989), Aldrich (1993), and Cox (1999).

The benefits of holding office increase if the electorate fails to punish officials found to engage in bribe taking and other remunerative misuses of public office. The extra income that can be earned through unpunished corrupt activity makes office-holding more valuable and increases the competition for that office. With the probability of corruption being detected held constant, we predict to find more rent-seeking (Tullock, 1967) as well as more rent-protecting (McChesney, 1997) effort by incumbents and challengers in more corrupt jurisdictions.

We can understand the benefits of office-holding or winning a referendum as the net expected value of the campaign, which is equal to the probability of victory times the value of victory, including gains from corruption, minus campaign costs. The probability of victory increases with expected vote support, first increasing at an increasing rate until the elites anticipate that the race will end in a dead heat, and increasing at a declining rate thereafter. Since corruption increases the expected returns to electoral victory, it increases elites' demands for votes, which is derived from the value of the office and the marginal productivity of campaigning effort. Note that while no voter may expect to change the election outcome, the elite may expect to change the outcome by offering selective incentives to voters, so that voting

may be expressive while mobilization effort is not. The elite's net expected benefits from winning the election can be expressed as

$$Z = q(v_1 - v_2)*K - EC(v_1,v_2) \quad (3)$$

where:

Z is the net benefit of winning the election to the elite of interest;[10]

v_1 refers to the vote for the candidate or option of interest, while v_2 represents the votes for the opposition;

q is the probability of winning the election, and is a function of the expected vote difference, $v_1 - v_2$, such that $\frac{\partial q}{\partial v_1} > 0$; $\frac{\partial^2 q}{\partial {v_1}^2} > 0$ if $v_1 > v_2$; $\frac{\partial^2 q}{\partial {v_1}^2} > 0$ if $v_1 < v_2$; so that $\frac{\partial q}{\partial v_1}$ is maximized where $v_1 - v_2 = 0$.

K is the value of winning or the size of the prize to be won in the electoral contest; and

EC is the expected total cost of the campaign waged in competing in the election, where the marginal costs of another supporter increases with more supporters, $\frac{\partial^2 EC}{\partial {v_1}^2} > 0$, as well as with opposition, $\frac{\partial^2 EC}{\partial {v_2}^2} > 0$, because of the upward sloping nature of the supply of voters.

Note that $\frac{\partial q}{\partial v_1}$ increases with each additional vote given the opponent's support and that $\frac{\partial q}{\partial v_1}$ reaches a maximum when the expected election outcome is tied. Think of the subjective probability, q, as being much like a logit probability function, so the marginal benefit of another vote declines after one's expected vote goes over the expected dead-heat. Electoral closeness can be thought of as being measured by $v_1 - v_2$, though this is a negative measure (the election is closer the smaller this difference becomes).

The more tolerant the jurisdiction is to the corrupt behavior of their officials, the higher is Z, and so the demand for another vote becomes greater as more corrupt politicians exploit this tolerance. While there are few competitors on the demand side of this market, vote buying (including transportation subsidies) is likely to contain elements of price discrimination; the marginal cost of another vote increases in any case as elites face an upward-sloping supply of voters. Even if elites are not providing voters with selective incentives, increased demand for votes generates greater campaigning effort and, thus, greater awareness of the election and greater participation by voters. Electoral elites are usually careful to raise concern among their supporters while attempting to limit concern or awareness among those of the opposition. For instance, Pecquet, Coats, and Yen (1996) note that school boards in Louisiana often schedule special elections to raise school taxes when few are expected to vote. While Louisiana school officials do little to advertise the election to the general public, they constantly remind their employees of the election.

The costly efforts of electoral elites seeking political office or to win a ballot issue are often in the form of selective incentives that lower voters' net costs of voting, turning the net benefits of voting from negative to positive, and overcoming the "paradox of voting" that has bewildered public choice scholars since Downs (1957). Politicians and other elites are central players in the electoral process (Jacobson and Kernell, 1983), shaping the benefits and costs of prospective voters to get them to the polls (Morton, 1987; Uhlaner, 1989). Nichter (2008) discusses how knowledge of the variation in the probability of support for one side or another across districts or identifiable groups, such as unions, can be used for offering selective incentives to voters. In competing for votes, elites point to their side's strengths and opponents' weaknesses; they advertise to promote their agenda, increase name recognition, and make promises to transfer wealth to members of important special-interest groups to garner their support. Candidates also offer selective incentives (Olson, 1965) to get their supporters to the polls in ways that either reduce *C*, such as transportation, or increase *D*, such as providing voters with meals, liquor, cigarettes, favored treatment in getting government jobs, and even cash. For instance, Nichter (2008) mentions that Democratic Party workers in East St. Louis were convicted of offering cigarettes, beer, medicine, and small cash payments to increase core supporters' turnout on Election Day in 2004. Nichter goes on to tell of politicians and party workers distributing coupons for meals, handing out cash, and hiring members of large families as campaign workers to inflate one side's vote total.

Campaign effort, bribery and/or intimidation, and selective incentives all can both increase candidate or option 1's votes or support and, alternatively,

[10] Stigler (1972) argues that election results are not "all or nothing," but "more or less." That is, a candidate who wins an election with a large vote margin (a landslide) will be more secure and more effective in office than one who wins 50 percent plus one of the votes.

reduce option 2's (the opposition's) support. We should also note that since political elites do not know exact votes, they have expectations only about the votes, and it is, in part, this uncertainty about vote outcomes that drives elites to motivate more of their supporters to get to the polls.

The model used in Karahan et al. (2006) links the demands of politicians for votes to the electorate's supply of votes. This model suggests that an electoral elite's demand for votes is a function of the office's value, if won, which in turn is determined by the availability of corruption rents. Higher-valued offices elicit more effort by candidates to get voters to the polls. We therefore predict larger voter turnout rates in jurisdictions where corruption is a fact of political life because voters do not punish venal office holders. "Closeness" (narrower expected vote margins) affects turnout in this model not only because it affects the probability of a single vote being pivotal, but also because closer elections increase the expected payoff to a candidate and his organization of getting voters who are likely to support him at the polls on Election Day (Key, [1949] 1984, 523–526; Cox and Munger, 1989; Aldrich, 1993; Cox, 1999). Candidates and their campaign operatives offer incentives to increase electioneering effort in tight races because an additional vote has a greater effect at the margin on the probability of victory, increasing the expected net benefit of winning even if the additional effort does not directly affect individual voting decisions (Aldrich, 1993). Electoral elites also have a higher incentive to gain votes and, thus, to motivate their supporters when K is higher. Votes gained by one's opponents in ever-tighter races drive up the demand by the elite. The size of the prize from an election also increases vote demand and the motivation of elites on both sides to increase their electoral effort until the marginal benefit of another vote gained is equal to the marginal cost of obtaining that extra vote.

3. Voter turnout, corruption and voting on institutions

Mississippi consistently ranks among the most politically corrupt states in the nation. In examining public official convictions by state from 1976 to 2008, Liu and Mikesell (2014) found Mississippi to be the most corrupt when convictions are examined relative to employment and trailing only Alaska in corruption when public official convictions are measured relative to state population. By examining political official convictions per year per million persons, Escaleras, Calcagno, and Shughart (2012) found the state to be the nation's fourth most corrupt one. They also find that the reported cost per vote is higher in the more corrupt states than in the less corrupt states, as they report in Table 1, which we have reproduced from their paper.

Table 1. Average cost per vote in the most and least corrupt U.S. states.

State	Average cost per vote	Period
Most corrupt states[a]		
Alaska	$18.11	1978-2002
Illinois	$ 5.97	1978-2002
Louisiana	$11.27	1979-2003
Mississippi	$9.94	1979-2003
Least corrupt states[a]		
Oregon	$4.96	1978-2002
Utah	$3.84	1980-2004
Vermont	$3.81	1980-2004
Washington	$3.15	1980-2004

Notes. This table is taken directly from Escalaras, Calcagno and Shughart (2012, p. 792), with the authors' permission. Source of cost per vote: Jensen and Beyle (2003). U.S. Department of Justice (1999, 2005) provided data for calculating corruption rankings, based on average number of convictions of public officials per million population per year.

The FBI's convictions in Operation Pretense elevated Mississippi to rank among the most corrupt U.S. states, as documented in Escaleras et al. (2012) and Liu and Mikesell (2014). After the FBI uncovered this widespread corruption and obtained a large number of convictions of Mississippi's county supervisors, critics of the beat system, including Mississippi's governor at the time, Ray Mabus, and Attorney General Robert Whitehall, appealed to voters to support the unit system, telling them that getting rid of the beat system would help to clean up corrupt county governments in Mississippi.

Mauro (1998) points out that venal public officials choose to supply goods whose value is difficult to monitor and assess in order to minimize the chances of being caught and convicted. So many contributors to the literature on corruption have noted the strong relationship between corruption and low rates of economic growth that this has become a stylized fact. Using country-level data, Mauro (1995) argues that one explanation for the strong correlation between corruption and slow economic growth is that expensive and technologically advanced goods, typically produced by only a few large firms, are fertile fields for corruption, which substitutes for more spending

on productive public goods like education. This reallocation occurs because the per capita benefits of rent-seeking thereby are larger and, hence, rent-seeking becomes more likely. Some areas of the public budget, such as military spending and expensive infrastructure projects, are low-volume, high-value undertakings which generate high payoffs per corrupt incident. Tanzi and Davoodi (1997) likewise suggest that, by diverting resources away from other, possibly more productive public-spending programs, corruption impairs economic development. Relying on the same argument as Tanzi and Davoodi (1997), Liu and Mikesell (2014) found that corruption led to more state spending on construction and highway projects, possibly diverting resources away from more productive public uses. Further, Liu and Mikesell (2014) estimate that the states they found to be among the ten most corrupt could have reduced their annual state spending by an average of $1,308 per person if corruption in those states were reduced to the national average.

Because most of the attention of Mississippi's county supervisors is directed toward relatively high-cost road and bridge projects, especially those where it is difficult to ascertain competitive values, Mississippi's county supervisors are placed in positions where the temptation of corruption is likely to appear and to appear often.[11] Following the theory of Karahan et al. (2006) discussed above, voter turnout in the 1988 beat-unit referendum is expected to be higher in the counties where the FBI uncovered supervisor corruption than in other counties where no such evidence was found. In seeking to retain the governance system that enabled corruption, corrupt politicians and their supporters who profited from connections with these politicians had stronger incentives to get their supporters to the polls. Of course, as we suggested above, turnout is expected to be higher in close elections as both sides promote their causes, investing more "face time" and money in efforts to win races.

Voting for either the beat system or the unit system suffers from a public goods problem, but the public goods problem is more pronounced for the latter than for the former. While corrupt politicians and some of their supporters will share in the concentrated benefits of the beat system, everyone else will share in the gains from the less corruption-prone unit system. Consistent with Olson's (1965) reasoning, support for the unit system (a large-numbers public good) is more vulnerable to free-riding than support for the beat system (a small-numbers public good), implying larger turnouts for beat supporters than for unit supporters.[12] Therefore, we would expect a larger vote-motivating effort on behalf of the beat supporters than on the unit supporters in those more corrupt counties. That more intense voter-motivating effort should drive up beat support where the prize of winning is higher, especially in those counties with more county road miles. In corrupt counties, then, the ratio of beat-to-unit votes is expected to be larger than in non-corrupt counties.

Competition for public office is one form of rent-seeking behavior. Just as greater reliance on the revenues generated by mineral resources is associated with more public-sector corruption in a cross-country setting, as Mauro (1998) and Sachs and Warner (1995) suggest, larger potential corruption rents of the magnitude seen in some Mississippi counties are expected to produce more electioneering effort to capture those rents.

Figure 1 provides a map of Mississippi showing the geographical distribution of corruption (counties where one or more supervisors had been convicted in Operation Pretense). A clustering of corrupt counties is evident there, suggesting that the incidence of supervisor corruption is not distributed randomly across the state. The map supplies a rationale for spatial estimating methods. The next section describes our data and provides details of our empirical models and estimation procedures.

4. Data, Model and Methods

Our modelling follows Karahan et al. (2009), which utilizes two separate specifications to test the effect of corruption on voter turnout and the choice of the "beat" or "unit" mode of governance by studying Mississippi's 1988 beat-unit elections. The data for our study are assembled from various sources.[13]

[11] Because infrastructure maintenance is less visible than new construction projects to voters, it is also to be expected that vote-seeking politicians will tend to neglect the former in favor of the latter (see, e.g., Shughart, 2006).

[12] We should point out here that a "good government" or "honest government" bias could influence expressive voters more so than strictly self-interested instrumental voters (see Brennan and Brooks, 2014 on the "how to vote" question).

[13] The corruption data are from Crocket (1993). The Mississippi State Highway Department (1982, 1993) provided us with road mileage information. Observations on county voting age populations are from the US Census Bureau (1999). The 1988 presidential election results, the beat-unit referendum results, and the (unreliable) lists of registered voters are from Office of the Secretary of State (1988–1992).

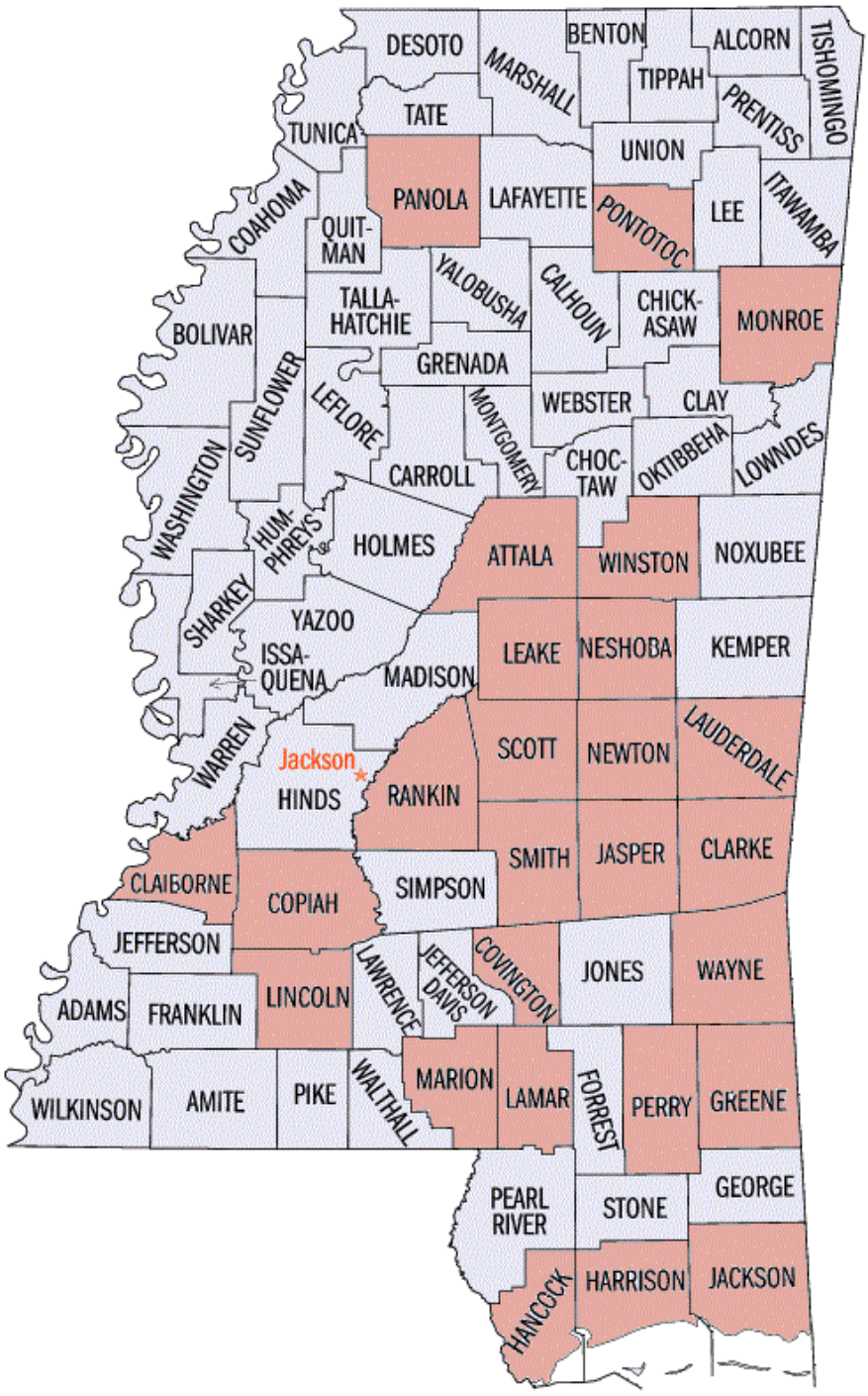

Figure 1. Corrupt Mississippi counties (dark shaded), as identified by Operation Pretense.

We use the log-odds ratio of a county's voters participating in the November 1988 beat-unit referendum as our dependent variable, *Turnout.* While we would have liked to use the number of registered voters in the state's 82 counties in the denominator, we rely instead on county voting-age populations (those 18 and older) because of the unreliability of Mississippi's data on registered voters.[14] Defining the voter participation rate, *VPR,* as the number of beat-unit votes cast as a percentage of the county's voting-age population, *Turnout* is $ln\left(\frac{VPR}{1-VPR}\right)$, the logistic transformation of *VPR.* Our dataset includes elections in all of Mississippi's 82 counties.

The independent variable of interest, *Corruption*, is binary, set equal to one if one or more supervisors had been convicted on federal corruption charges, and zero otherwise. At least one of five supervisors was indicted and subsequently convicted in 26 of the state's 82 counties. While we could control for standard determinants of county voter turnout using various demographic measures such as education, income, race, and density, including the county-level voter turnouts in the U.S. presidential election on the same ballot, *PresidentialTurnout,* better controls for such variance. The log of the average voter turnout rates in bordering counties, *NeighborTurnout*, was chosen to account for the possibility that turnout in a given county may be influenced by turnout in neighboring counties. This possibility is apparent in Figure 2, which shows how neighboring counties appear to have similar preferences for governance. *NeighborTurnout* thus aims to control for spatial dependence in the underlying voting process.

Since county roads are the main responsibility of the supervisors and a measure of the value of their public offices, we also enter *Miles,* the per capita road miles in the county, on the right-hand side. While the county road miles data are from 1993, these data are the nearest in time for published data that report county road mileages not contaminated by state-maintained roads or U.S. highways. While Cox (1998) suggests using the raw vote difference $(v_1 - v_2)$ to measure closeness, the relative closeness, or $\frac{v_1 - v_2}{total\ votes}$, is more consistent with our turnout measure, so we include *CloseElections*, defined as the ratio of the absolute difference between the actual 1988 beat-unit vote in a county to the total votes cast on the governance issue in that county.[15]

The turnout model is specified as follows when using OLS as the estimation technique:

$$\begin{aligned} Turnout = {} & \beta_0 + \beta_1\, Corruption + \beta_2\, Miles \\ & + \beta_3\, PresidentialTurnout + \beta_4\, NeighborTurnout \\ & + \beta_5\, CloseElection + \varepsilon \end{aligned} \tag{4}$$

Given the problems encountered with using OLS as an estimation strategy, we examine formal spatial econometric techniques to deal with these issues. A family of spatial econometric models can be formalized in the following manner:

$$\begin{aligned} & y = \rho W y + X\beta + u \\ & u = \lambda W u + \varepsilon \\ & \varepsilon \sim \mathrm{N}(0, \sigma^2 I_N), \end{aligned} \tag{5}$$

where y is an nx1 vector of observations on the dependent variable, X is an nxk matrix of independent variables, and ε is an error term assumed to be independently and identically distributed. The matrix W comprises an nxn first-order spatial contiguity weight matrix "which express for each observation (row) those locations (columns) that belong to its neighborhood set as nonzero elements" (Anselin and Bera, 1998, p. 243). Normally, a row-stochastic weight matrix is used, which means that the rows of the matrix sum to unity. This transformation of the

[14] The lists of registered voters by county (Office of the Secretary of State, 1988-1992, 401-02) are not routinely and consistently purged, resulting in the peculiar situation that such lists contain more names than the total populations of about one-third of Mississippi's counties. Such inaccurate lists of eligible or registered voters have led us to rely on county voting-age populations (US Census Bureau, 1999) instead of the number of registered voters in computing our turnout variable. We compared the county voting-age population to total population ratio with that of registered voters to county population. The voting-age to county population ratio ranges from 0.62 to 0.79, with a mean of 0.70, while the ratio of registered voters to county population varies from 0.36 to 1.06, with a mean of 0.68.

It is possible that corruption and fraudulent voting could explain the substantial differences between voting-age populations and the number of registered voters at the county level, which could lead to biased results. However, tests of paired differences of means indicate that supervisor corruption cannot explain those differences. One possible explanation is that because African Americans account for 40% of Mississippians statewide, fears of racism charges have deterred election officials from purging the voting rolls of voters who have died or moved to other counties or states.

[15] Given that expectations about election outcomes on the part of voters usually are unobservable and, at best, based on often unreliable pre-election polls, we use actual closeness as a proxy for expected closeness, which is an assumption commonly adopted in the literature (e.g., Matsusaka, 1993). When we define closeness using voting-age populations in the denominator instead of the sum of beat and unit votes, we find very little difference in the estimates. Note that our closeness measure is really a negative measure of the election's closeness, and perhaps we should call it "vote difference."

spatial weight matrix provides an intuitive explanation for the Wy and Wu terms. The Wy term can be thought of as a weighted average of the surrounding observations on the dependent variable, and Wu can be thought of as a weighted average of the surrounding error terms. Depending on the regression-modeling context, both ρ and λ measure the extent of the spatial autocorrelation.

By placing restrictions on the general model above, we can obtain the two spatial econometric models most widely used in practice. Setting $\lambda=0$ results in the spatial autoregressive (SAR) model:

$$y = \rho Wy + X\beta + \varepsilon \qquad (6)$$
$$\varepsilon \sim N(0, \sigma^2 I_N)$$

The SAR model is used to control for spatial dependence in the dependent variable. As Karahan et al., (2009) suggest, the geography of counties in Mississippi leads to the possibility that turnout in one county is influenced by the same factors that influence turnout in adjacent counties. Figure 2 clearly suggests that neighboring counties seem to behave similarly, i.e., that corrupt counties are not randomly distributed by location. If this is indeed the case, the SAR model would be appropriate for capturing this effect as well as for avoiding the simultaneity bias of OLS.

A second class of spatial econometric models can be obtained from the general model above by imposing the restriction $\rho=0$:

$$y = X\beta + u \qquad (7)$$
$$u = \lambda Wu + \varepsilon$$
$$\varepsilon \sim N(0, \sigma^2 I_N)$$

This model is referred to as the spatial error model, or SEM. The SEM model is designed to control for unobserved factors that may vary systematically over geographic space. For example, it may be the case that political attitudes, access to media outlets, or other determinants of voter turnout are important but cannot adequately be controlled for because the data either are not available or cannot be proxied for in the resulting model specification. If this residual spatial autocorrelation is ignored, the inferences drawn from the OLS results may be misleading, owing to the fact that the OLS standard errors will have downward bias (Barry, Pace and Sirmans, 1998).

We also use a beat-unit choice model to examine the greater voter mobilization effort by beat-supporting electoral elites than unit-supporting elites because of the greater concentration of benefits on the corrupt beat elite than the more general or public good benefits on the unit elite. The choice model, then, is similar to the turnout model we developed, except that the dependent variable is now the number of votes cast for the beat system relative to votes for the unit system and the neighbor variable is slightly different. In this specification, the independent variable *NeighborChoice* is computed by taking the natural logarithm of the beat-unit vote ratio from all neighboring counties, which is designed to capture any spatial effects. The choice model when using OLS as the estimation technique is therefore

$$Choice = \varphi_0 + \varphi_1 Corruption + \varphi_2 Miles + \varphi_3 PresidentialTurnout + \varphi_4 NeighborChoice + \varphi_5 CloseElection + \varepsilon \qquad (8)$$

We expect that the estimated coefficients on all of the explanatory variables except for *CloseElection* will be positive. As mentioned in footnote 9, our measure of *CloseElection* is a negative or inverse measure, with a smaller value associated with closer elections. Therefore, we expect a negative correlation between our *CloseElection* measure and turnout, since close elections produce greater competition for votes and higher voter turnout rates.

Model selection in spatial econometrics is facilitated by several Lagrange Multiplier (LM) tests developed by Anselin et al. (1996). Florax et al. (2003) outline a procedure for testing the residuals from an OLS model using the LM Lag and LM Error tests. The LM Lag test analyzes the residuals of an OLS model to determine if the proper specification is the SAR model, while the LM Error test does the same to determine if the SEM model is appropriate. The results in Tables 1 and 2 indicate that the SAR model is the appropriate spatial econometric model to utilize in both the turnout and beat-unit choice cases because the LM Lag test is statistically significant at the 5% level while the LM Error test is insignificant.[16]

Interpretation of the coefficients in a spatial econometric model that contains a spatially lagged y variable requires that one take into account the feedback and spillover effects that manifest themselves in such models (LeSage and Pace, 2009). In the standard OLS regression framework, the regression parameters are

[16] Note that the SAR models we estimate do not include either the *NeighborTurnout* or *NeighborChoice* variable because the SAR model is designed to capture any spatial autocorrelation in the dependent variable.

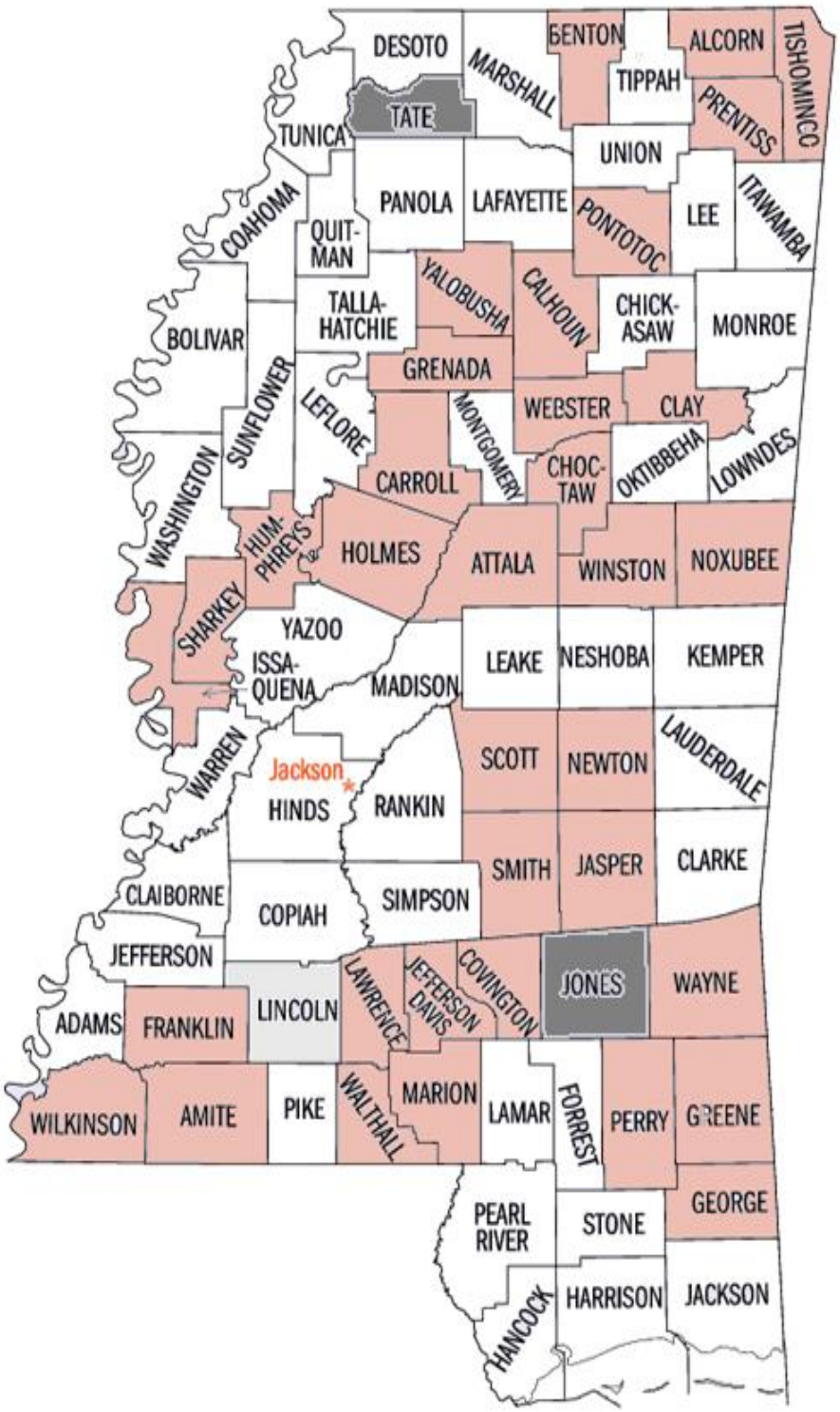

Figure 2. Beat System and Unit System counties (1988).

Note: Tate and Jones Counties reverted to the beat system in 1992. The remaining shaded counties are those that chose the beat system in 1988. Crockett (2003, p. 297) states that Lincoln County reverted to the beat system in early 2000.

interpreted as the partial derivative of the dependent variable with respect to the explanatory variables, and the change in an independent variable at location *i* impacts only the dependent variable at location *i*; other locations are not affected by this change in the independent variable. In contrast to the standard OLS case, spatial regression models allow for spillovers and feedback effects, and these effects must be taken into account when interpreting the coefficient estimates. Formally, we can examine the partial derivative of y_i with respect to changes in explanatory variables for location *i* as well as location *j*, where $i \neq j$. For the SAR model in the simple case of a single explanatory variable, we can express the following relationship

$$\begin{aligned} y &= S(W)x + V(W)\varepsilon \\ S(W) &= V(W)(I_n\beta) \\ V(W) &= (I_n - \rho W)^{-1} = I_n + \rho W + \rho^2 W^2 + \rho^3 W^3 + \cdots \end{aligned} \tag{10}$$

The multiplication of the *S(W)* matrix by our coefficient estimate generates an $n \times n$ matrix of effects estimates whereby the diagonal elements represent the direct plus feedback effects and the off-diagonal elements represent the indirect or spillover effects.[17] Mathematically, we can express each of these partial derivative effects as follows:

$$\textbf{Direct plus feedback effect}: \frac{\partial E(y_i)}{\partial x_i} = S(W)_{ii} \tag{11}$$

$$\textbf{Indirect Effects}: \frac{\partial E(y_i)}{\partial x_j} = S(W)_{ij} \tag{12}$$

The direct plus feedback effect is the marginal effect of a change in an independent variable at location *i* and shows how it affects the dependent variable at location *i*, while the indirect effect shows how a change in an independent variable at location *j* affects the dependent variable at location *i*, where $i \neq j$. The feedback effect occurs because in the matrix expansion of the *V(W)* term, we have powers of the spatial weight matrix, such as W^2, which implies a "neighbor-to-neighbor" relationship. In our original *W* spatial weight matrix, the main diagonal consists of all zeros, indicating that no county can be a neighbor to itself. However, the W^2 spatial weight matrix consists of these "neighbor-to-neighbor" relationships whereby an observation can be a neighbor to itself, which means that the powers of the spatial weight matrix contain elements on the main diagonal. These powers of the spatial weight matrix pick up the so-called feedback effects because the spatial relationship between the observations implies that the effect of a change in an independent variable can go from location *i* to location *j* and back again.

Given the potentially large numbers of observations that can be analyzed, LeSage and Pace (2009) recommend several scalar summary measures of the direct and indirect effects.[18] The average direct effect is taken to be the average of the main diagonal of the *S(W)* matrix, while the average total effect is the average of the row sums of the *S(W)* matrix. The average indirect effect is the difference between the average total effect and the average direct effect.

5. Empirical results

Table 2 contains the original results from Karahan et al. (2009) and the results from the SAR model. The qualitative results from the SAR specification are very similar to the OLS results in that the identical pattern of statistical significance is exhibited. In other words, the hypothesis that supervisor corruption in a county positively affects voter turnout is maintained. However, the quantitative results are different when drawing inferences from the SAR model. First, note that the coefficient on the *NeighborTurnout* variable in the OLS specification is nearly double that of the ρ parameter in the SAR model, thus illustrating the biased nature of the OLS estimates when attempting to control for spatial dependence in this manner. The estimates of the marginal effects shown in Table 2 represent the total effects as defined earlier.[19] Both models have decent predictive power, with the adjusted coefficients of multiple determination explaining roughly 66% of the variation in the dependent variable.

[17] In regression models with more than one independent variable, the *S* (*W*) matrix would be multiplied by each independent variable, resulting in a matrix of effect estimates for each independent variable.

[18] For example, in a national county-level data setting, the *S* (*W*) matrix would consist of a 3061 x 3061 matrix of effects.

[19] Voter turnout in the corrupt counties was four percentage points higher than in the non-corrupt counties, *ceteris paribus*, according to estimates reported in Karahan et al. (2009).

Table 2. Turnout results: OLS and SAR models.

Independent Variables	OLS Results	SAR Results
Constant	0.126	–0.201***
	(0.64)	(–2.60)
Corruption	0.154***	0.193**
	(3.16)	(2.49)
Miles	6.604***	8.87**
	(2.50)	(2.58)
PresidentialTurnout	0.534***	0.726***
	(3.42)	(4.16)
CloseElections	–0.00641***	–0.00839***
	(–3.47)	(–3.72)
NeighborTurnout	0.475**	N/A
	(1.81)	
P	N/A	0.236**
		(2.00)
LM Lag	N/A	5.35**
		(0.02)
LM Error	N/A	1.26
		(0.26)
Adjusted R^2	0.65	0.66
Number of Observations	82	82

Notes: OLS results are from Karahan et al. (2009); t-statistics shown in parentheses; asterisks denote one-tailed significance at the 1% (***) and 5% (**) levels; LM test statistics are distributed χ^2 with one degree of freedom. SAR coefficients (except for the constant term) represent the total effects, which is the sum of the direct and indirect effects (LeSage and Pace, 2009).

Table 3 provides the estimates of the OLS and SAR variants of the beat-unit choice model. The OLS results are again taken from Karahan et al. (2009), while the SAR results are presented to properly control for spatial dependence in the dependent variable, where again the coefficient estimates represent the total effects for the SAR model. Comparing the results from the OLS and SAR specifications reveals that the pattern of significance in the independent variables is similar and that the OLS results tend to bias the estimate of the spatial autocorrelation parameter, which is approximately one and one-half times the estimate from the SAR model. The very notable exception in these results is that the corruption variable is no longer statistically significant. These results indicate that while corruption-prone elites may have stronger incentives to entice voters to the polls to vote against the unit system, they may not be able to discern likely "beat" voters from likely "unit" voters as well as the estimates that Karahan et al. (2009) suggested.

Table 3. Beat-Unit results: OLS and SAR models.

Independent Variables	OLS Results	SAR Results
Constant	–0.177	–0.130
	(–1.70)	(–1.11)
Corruption	0.158**	0.165
	(1.90)	(1.20)
Miles	8.435***	12.92**
	(2.58)	(2.30)
PresidentialTurnout	0.307**	0.569**
	(2.04)	(2.17)
CloseElections	–0.0153***	–0.0267***
	(–5.91)	(–5.00)
NeighborTurnout	0.537***	N/A
	(4.19)	
P	N/A	0.332***
		(2.88)
LM Lag	N/A	6.49**
		(0.01)
LM Error	N/A	0.914
		(0.33)
Adjusted R^2	0.683	0.651
Number of Observations	82	82

Notes: OLS results are from Karahan et al. (2009); t-statistics shown in parentheses; asterisks denote one-tailed significance at the 1% (***) and 5% (**) levels; LM test statistics are distributed χ^2 with one degree of freedom. The pattern of significance in the independent variables is similar and that the OLS results tend to bias the estimate of the spatial autocorrelation parameter, which is approximately one and one-half times the estimate from the SAR model. SAR coefficients (except for the constant term) represent the total effects, which is the sum of the direct and indirect effects (LeSage and Pace, 2009).

6. Conclusions

In an instrumental voting model of turnout such as the Downsian model where much of the focus is on the zero probability of a voter altering an election's outcome, voters and electoral elites play no strategic role, while in an alternative model of voter turnout focusing on the demand for votes, we see that candidates, parties, and other political groups play key roles in explaining turnout and electoral outcomes. The demand side is where attention should be focused, although the interplay between the demand and supply sides of this market should also be of interest for future research. As Mancur Olson (1965) observed, political entrepreneurs, such as candidates and political party elites, provide selective incentives

to members of special-interest groups to vote, solving the collective-action problem of voting noted by Downs (1957). Such selective incentives alter the net costs of abstaining (or of voting), thereby raising voter turnout rates, which is seen as a byproduct of competitive elections. Close elections, then, matter because additional votes increase an electoral elite's winning margin, thus increasing the expected payoff from electioneering effort rather than raising the probability of one individual's vote being pivotal.

The state legislature required voters in every one of Mississippi's 82 counties to select one of two possible forms of governance in November of 1988, a national election year. The status quo option, the so-called beat system, had been shown by a major federal investigation to be a breeder of corruption among county supervisors. The alternative for voters was the more centralized unit system that promised to promote more honest governance by reducing the discretion exercised by supervisors with respect to purchasing and personnel matters, thereby limiting their opportunities for bribery and extortion. In 35 of Mississippi's counties, a simple majority of the voters chose to keep the status quo beat system, while the rest of Mississippi's 82 counties selected reform by switching to the unit system.

In examining the election results, we see support for a demand-side theory of voter turnout. After controlling for turnout in the U.S. presidential race on the same ballot, we find that larger fractions of voters cast ballots in the counties where county supervisors had been convicted of corruption. Electoral elites more aggressively sought votes where such positions were more valuable to the winner (because of the opportunity to solicit bribes or to capture larger corruption rents) than where the electorate was less tolerant of corrupt behavior by public officials.

Our analyses, together with that of Karahan et al. (2009), support the idea that by raising the payoff to holding elective public office corruption provides extra motivation for elites to increase their vote-mobilizing efforts. The higher turnout rates we find in corrupt Mississippi counties suggest that large numbers of Mississippi voters might have been aware of, and perhaps condoned, corruption in their county governments. It should be remembered, though, that selecting and providing good institutions is a large-number public goods problem, where incentives to get out the votes for better governance are weaker, leading to more shirking on the part of the elite supporters of the unit-system regime that promised less corruption. It is suggestive in this regard that no county opting to remain under the beat system in 1988 petitioned to reconsider that decision four years later and two counties that returned majorities for the unit system initially voted to revert to the beat system in 1992.

Here we see that voter turnout is positively and significantly related to corruption on the part of some county supervisors, after controlling for turnout in the 1988 presidential race and other relevant factors, even though the choice between governance systems did not depend on total turnout. This latter result may be an artifact of a misspecified (yet fortuitously significant) OLS model in Karahan et al. (2009) or because the corruption and the governance choice relationship simply is not strong enough to be statistically significant when the spatial characteristics of the data are considered. This particular study perhaps serves as an important reminder: just as researchers using time-series models are expected to check for serially-correlated errors, researchers using geographically cross-section models should now be expected to examine their data for the presence of spatially-correlated errors.

Finally, while voters in counties where one or more supervisors had been caught in Operation Pretense's net were no more likely to vote for the unit system than voters in non-corrupt counties, we have some evidence that Mississippians living in the corrupt counties did not turn out on Election Day 1988 either to punish crooked politicians or to register their demands for reform. They arguably were motivated more by other factors, including, as we argue here, greater electioneering effort on the part of elites seeking to gain access to (or to protect) corruption rents.

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