ATTRIBUTION AND ACCOUNTABILITY
Voting for Roads in Ghana

By ROBIN HARDING*

I. Introduction

THE 2010 yam season brought a bumper harvest in Yendi, in Ghana's Northern Region, resulting in one of the highest yields ever. But by the end of November, instead of being sold in the markets of southern cities like Ho, Koforidua, and Accra, the yam remained in the north, rotting by the roadside. The roads were already in a poor state, and the onset of the rains left them flooded, littered with potholes, and impossible for trucks and lorries to traverse. With no way to transport their goods to market, the farmers embarked on mass demonstrations. Soon they were joined by citizens from many other walks of life. Wielding placards displaying slogans like "No road, no vote" and "Where is the better Ghana?", the protestors demanded that the government repair the road before the 2012 general elections or risk losing their votes.[1]

This short narrative presents an unusual but powerful image: the more common impression of African elections is that votes are exchanged for cash or gifts or are given freely in accordance with ethnic loyalties, not that they are used to hold politicians accountable for their performance in providing public goods and services. Indeed, a senior

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[1] *Ghanaian Chronicle* 2010; *Daily Graphic* 2010.

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figure from one of Ghana's two major political parties painted a much more typical picture when he said, "There is a high phenomenon of bribery and corruption in African politics . . . and the reason is that a very large majority of those who are going to vote have no idea why they are even voting. Are you voting because you don't have electricity, you don't have water, your needs are not being satisfied by the particular government in power? [No,] you are voting because on the day of voting somebody offers you 10,000 cedis [about US$1]—you just walk in and vote and come out, without thinking about the long term effects of voting for a particular party on the development of your community."[2]

These contrasting images raise an important question: Do voters in Africa use elections to hold governments accountable for their performance in office? A positive answer would counter the prevailing wisdom—that African elections are solely about clientelism and ethnic voting—and would add weight to a growing body of work that argues that performance evaluation does have a role in determining voters' choices in Africa. Such evaluation matters because if citizens in Africa use elections to hold governments accountable for their performance in providing goods and services, then competitive elections are generating the accountability mechanisms that underpin the potential developmental benefits of democracy. The research herein contributes to that body of work by providing robust, systematic evidence that voters in a single African country do use elections, at least in part, to hold the government accountable for its performance in providing public goods. Specifically, I show that vote shares in Ghana are significantly affected by changes to the condition of local roads.[3]

An important question to ask is whether or not the distribution of local road maintenance is clientelistic. Susan Stokes and colleagues propose a useful conceptual scheme of distributive politics that differentiates between programmatic and nonprogrammatic forms of distribution, wherein the former requires criteria for distribution that are both formal and public and that actually shape the distribution of resources.[4] By this scheme, clientelism represents a subset of nonprogrammatic politics for which the key aspect is contingency: under

[2] Author interview with the National Democratic Congress (NDC) Regional Party Chairman, Ashanti Region, July 2007.

[3] In the strictest sense, local roads are arguably quasi-public goods rather than pure public goods, since excludability by location is possible. By the same measure, many other things that are also commonly viewed as public goods, such as education and law enforcement, are likewise better classified as quasi-public goods. But while such a distinction may be useful to note, it is not critical to the question this research asks about the nature of the link between voters and politicians: that is, who is being held accountable?

[4] Stokes et al. 2013.

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clientelism, an individual's access to resources is contingent on his or her provision of political support.[5] This support is critical for the nature of the link between voters and politicians in democracy, because contingency of this type undermines or even reverses democratic accountability; where the receipt of benefits is contingent on political support, voters are being held accountable by politicians.

The purpose of this research is to investigate whether the opposite is true: that votes are being used to hold politicians accountable for their performance in providing some type of good or service. To explore this question, it is necessary to investigate the relationship between votes and goods whose distribution is not clientelistic. As I discuss below, the latter is true of road maintenance in Ghana, because the budget for road maintenance is distributed according to formal rules, the details of which are publicly available. But if voters are to effectively condition their votes on public goods, they must be able to attribute the provision of those goods directly to the actions of the politicians for whom they are voting. So to assess the impact of public goods on votes, it is also necessary to look at goods that can be attributed to political action, and again this is true of roads in Ghana. Therefore, taking road maintenance in Ghana to be an attributable good whose distribution is not clientelistic, I use an original data set combining electoral outcomes at the polling-station level with precise, localized information on changes to road conditions to investigate whether roads affect votes in Ghana.

The data set contains electoral returns from the 2004 and 2008 presidential elections collected from a random sample of more than three thousand polling stations located within more than sixty constituencies throughout Ghana. These returns were geographically referenced to data on changes to the condition of roads in the precise localities around the polling stations for the years between the 2004 and 2008 elections. The temporal and spatial character of the data allows me to overcome problems of potentially confounding unobservable factors by estimating a first difference model within very localized areas (of, on average, less than a few thousand voters). Doing so enables me to separate the effect of road conditions on vote shares from any time-invariant characteristics of local areas that could possibly confound this relationship. Furthermore, including district-specific time trends ensures that this relationship is also not confounded by unobserved time-varying factors. This identification strategy therefore provides a high degree of

[5] Although clientelism can and has been defined in a variety of ways, the notion of contingency is common to all definitions. See Hicken 2011 for a useful review.

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confidence that the implied relationship between roads and votes is not spurious—voting behavior in Ghana is significantly influenced by local road conditions.

I present a series of results to demonstrate the robustness of these findings, including estimates that show that the relationship between roads and votes holds when a measure of changes to wealth is added, and estimates that deal with potential bias caused by outliers. In addition, I use data on a variety of education inputs from the annual Ghanaian schools census to undertake a falsification test of the assertion that votes can be conditioned only on attributable policy outcomes. As expected, only education inputs that can be attributed to executive action are significantly related to presidential vote shares.

The primary contribution of this research is to provide strong, tangible evidence of voters in an African country, in this case Ghana, using elections to hold politicians accountable for their performance in office. The results should not be taken to mean that ethnicity and clientelism play no part in determining electoral outcomes in Ghana, but rather that these are not the only determinants of voter choice therein. Providing robust evidence identifying the existence of a link between votes and public goods is an important contribution to the literature on electoral politics in Africa that has begun to argue that voting in African democracies is based at least in part on evaluations of government performance. These findings matter because if citizens in Africa do vote on the basis of public goods, competitive elections are generating the accountability mechanisms that underpin the potential developmental benefits of democracy.

A second contribution of this research follows from the recognition that attribution matters. The claim this article makes is that voters in Ghana are able to hold the government accountable for road conditions because they can attribute road conditions to the executive branch. The seminal work by G. Bingham Powell and Guy Whitten recognizes that the ability of voters to attribute outcomes to political action can vary across institutional contexts.[6] Following that work, my research is among a small group of studies that acknowledges that the extent to which voters use elections to hold politicians accountable may vary over policy outcomes within a given institutional context due to the attributability of the outcomes themselves. This acknowledgement is important because it highlights the fact that the conclusions researchers draw are likely to be affected by the outcomes under investigation. The

[6] Powell and Whitten 1993.

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effect of roads on votes in Ghana that my research identifies might well generalize to other countries in which roads are similarly attributable. But the more important conclusion to draw is that in the particular case being investigated, researchers should consider which goods can be attributed to political action and to whose actions they can be attributed. More generally, this conclusion suggests a way forward for future research in this area by highlighting the importance of considering the nature of the particular context in which elections take place and of the policy outcomes under investigation.

As well as advancing the understanding of electoral politics in Africa, the insights about attribution speak more generally to the literature on the operation of democratic accountability. Given what is known about how accountability affects the provision of public goods and services, this work also contributes to the literature on the politics of development. In the following section I discuss the relationship between information, attribution, and accountability, and I provide details about the context of democracy and roads in Ghana in Section III. The empirical strategy is explained in Section IV, followed by the results in Section V, and the conclusion in Section VI.

II. Attribution and Accountability in Africa

Information, Attribution, and Accountability

Democratic elections provide structures of accountability, but the extent to which this accountability can be realized varies by context. One critical contextual factor is the availability of information, because when voters are more informed they can evaluate the government's performance more effectively.[7] Consequently, access to information is expected to affect a variety of outcomes, and numerous empirical studies have demonstrated the impact of information on the distribution of public spending, levels of corruption, and capture of rents by local governments, as well as on individual-level indicators of development, such as school enrollment, student test scores, and child mortality.[8]

Building on the recognition that information affects accountability, Anandi Mani and Sharun Mukand argue that the ability of voters to hold politicians accountable may vary across public goods, because effort exerted for the provision of some goods is more verifiable than for

[7] See Besley and Burgess 2002; and Majumdar, Mani, and Mukand 2004.

[8] For examples, see Stromberg 2004; Snyder and Stromberg 2010; Ferraz and Finan 2008; Chowdhury 2004; Reinikka and Svensson 2004; and Bjorkman and Svensson 2009.

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others.[9] Information, therefore, matters because it determines whether voters can attribute outcomes to the actions of politicians. When voters have good information about who is responsible for the policy outcomes they experience, they can use elections to hold the relevant politicians accountable for their performance in delivering these outcomes.

A useful example of an outcome that can be attributed in this way is the abolition of primary school fees in Africa, which David Stasavage and I highlight as a policy change that can be clearly traced back to executive action because the outcome (not paying school fees) is not mediated in any way by other institutions or government agencies.[10] In contrast, a policy outcome that is less easy to attribute to executive action is the provision of learning resources, like textbooks, the responsibility for which tends to be decentralized to local government agencies. Such decentralization of decision making reduces the degree of state capacity over a particular policy area—state capacity here refers to the extent to which executive decisions translate to actual policy outcomes—in part by creating opportunities for corruption. For example, Ritva Reinikka and Jakob Svensson show that schools in Uganda received on average only 13 percent of the funds committed to them under a central government grant program, with the bulk being captured as rents by local officials and politicians.[11]

Therefore, if attributability varies across policies, the extent to which voters can use elections to hold the government accountable should be expected to vary in the same way. If citizens cannot attribute responsibility for an outcome to the government, there is little reason to think that this outcome will affect their vote choice. This recognition resonates with the literature on clarity of responsibility, especially the work of Bingham Powell and Guy Whitten, who note that in developed democracies, voters' ability to hold the government responsible for the performance of the economy will vary according to the particular political context.[12] Indeed, the essence of the claim is very similar to the one being made here: that whether voters will condition their electoral support on government performance depends on their ability to correctly attribute responsibility for the outcomes they care about. Where the claims differ is in their reasons for why the ability to attribute responsibility might vary.

[9] Mani and Mukand 2007.
[10] Harding and Stasavage 2014.
[11] Reinikka and Svensson 2004.
[12] Powell and Whitten 1993.

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For the clarity of responsibility literature, what matters is the extent to which the government can exert unified control over policy-making, such that performance evaluation will be less likely in countries in which the political context gives greater influence to the opposition. In Africa's strong presidential systems, government control over outcomes depends less on the influence of the political opposition than on characteristics specific to particular policy areas, such as the decentralization of decision making or the fragmentation of funding. Factors like these can undermine state capacity, in the sense that decisions made centrally may not translate directly to outcomes being implemented on the ground, due to the actions of officials at lower levels of government. The existence of multiple funding sources, such as donor agencies, can make it more difficult for voters to correctly attribute responsibility for the outcomes they experience.

As a consequence, voters' ability to effectively hold politicians accountable will be limited where low levels of information and weak state capacity make it hard for them to attribute outcomes to action. In such contexts, political competition is often characterized by clientelism and ethnic voting. One explanation for this is that for politicians, making credible policy commitments to voters requires the provision of costly information about, among other things, political decision making, and that a cheaper alternative is to use patron-client relationships instead of forming direct links with voters.[13] Information has also been linked to ethnicity, such that the prevalence of ethnic politics can be understood as a response to electoral competition in democracies with low levels of information, because ethnic categories provide costless signals to voters about which parties are likely to support their interests.[14]

If electoral competition is based on clientelism and ethnicity, the accountability mechanism driving democracy's developmental benefits may be undermined.[15] Competitive elections generate incentives for politicians to broaden the provision of public goods because they allow citizens to hold politicians accountable. In political systems in which clientelistic or ethnic ties dominate, however, voting is about demonstrating loyalty in return for private transfers. The accountability relationship may even be perverted by clientelism, with voters themselves being held accountable for their behavior by politicians and parties.[16]

[13] Keefer and Vlaicu 2008.

[14] Chandra 2004.

[15] Foundational works concerning the importance of accountability for democracy's benefits include Bates 1981; Bueno de Mesquita et al. 2001; and Lake and Baum 2001.

[16] Stokes 2005.

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As a result, public goods provision is lower in such systems, because politicians direct resources toward more easily targetable private goods instead of responding to programmatic accountability.[17]

The African Context

The potential impact of clientelism and ethnicity on public goods provision is particularly pertinent in sub-Saharan Africa, where there is a widespread impression that elections are dominated by vote buying and ethnic mobilization. This impression is not without foundation. Vote buying is a very direct form of clientelism, which can be defined generally as the contingent transfer of private goods in exchange for political support. Research into political competition in Africa has highlighted the existence of widespread clientelism, depicted variously as patronage, prebendalism, tribute, or straightforward vote buying.[18] Experimental work suggests that voters in Africa are more responsive to clientelistic than programmatic appeals, and that vote buying increases turnout.[19] At the same time, it has been widely recognized that voting in Africa is often based on ethnoregional identities.[20] As a result, the general perception presents a fairly pessimistic view of African elections—that they are little more than contests in corruption and ethnic loyalty.

But this is not the whole story; a smaller but growing body of work has noted other possible determinants of voting behavior in Africa, including urban/rural cleavages and economic factors.[21] At the same time, researchers have begun to consider whether votes may be affected by evaluations of incumbent performance.[22] This article contributes to such research by providing robust evidence that public goods do have an effect on vote shares. In addition, it builds upon the literature by recognizing that because the ability of voters to attribute outcomes to political action varies across types of public goods, investigating whether citizens vote on the basis of programmatic accountability requires looking at the goods for which it is actually possible for them to do so. Finding that changes to the provision of an unattributable good have no impact on votes may just mean that the goods in question provide no relevant information about politicians' efforts on which voters can

[17] Keefer and Vlaicu 2008; Hicken and Simmons 2008.

[18] See Lemarchand 1988; Lewis 1998; van de Walle 2003; Bratton 2008; Kramon 2009.

[19] Wantchekon 2003; Vicente 2014.

[20] See Posner 2005; van de Walle 2007; Mozaffar, Scarritt, and Galaich 2003; Ishiyama 2012. In contrast, Young 2009b provides evidence that although coethnicity is a very strong determinant of voter choice across Africa, electoral support for coethnics is not always guaranteed.

[21] Nugent 1999; Kimenyi and Romero 2008; Posner 2005.

[22] Lindberg 2005; Lindberg 2010; Young 2009a; Bratton, Bhavnani, and Chen 2012.

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condition their electoral support. In contrast, if we find that changes to attributable goods have no impact on votes, we might infer that voters have chosen to ignore this information.

The first task is to identify public goods for which outcomes are attributable. As I explain in Section III, roads in Ghana are one such public good. I use an original panel data set containing information on road conditions and election results at a very localized level throughout Ghana to provide robust, microlevel evidence that voters in Africa do care about public goods. While this data set has many advantages, it is worth noting that it does not allow us to investigate any potential heterogeneity in the extent to which different types of voters are influenced by programmatic issues. It is possible, for example, that education and gender affect the degree to which voters engage in performance evaluation at the polls. Similarly, as work by Danielle Resnick suggests, urban and rural voters may be influenced by programmatic issues in different ways.[23] Finally, it is also possible that partisanship affects the influence of programmatic issues on voter choice. Future work should seek to investigate these possible sources of heterogeneity.[24]

III. Road Maintenance in Democratic Ghana

Ghana's Democracy

Ghana has held regular multiparty elections every four years since 1992. The president and parliament are elected concurrently, the former by direct popular vote in a two-round, run-off system, and the latter in 230 single-member constituencies using the first-past-the-post system.[25] The presidency has turned over three times since 1992; Jerry Rawlings of the National Democratic Congress (NDC) stepped down in 2000 at the end of his second term in office, and John Atta Mills, his replacement as leader of the NDC, lost the election to John Kufuor of the New Patriotic Party (NPP). Kufuor stepped down in 2008 after serving the constitutional limit of two terms, and his replacement as leader of the NPP, Nana Akufo-Addo, lost to the NDC's John Atta Mills in the 2008 election. Mills died in 2012 and Vice President John Mahama assumed the presidency. Ghana has a stable two-party system, with the presidential

[23] Resnick 2012.

[24] I am grateful to an anonymous reviewer for highlighting these possible sources of heterogeneity among African voters.

[25] The number of constituencies was expanded to 275 for the 2012 elections. Details of the structure of electoral administration are included in Harding 2015.

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candidates of the NPP and NDC having won at least 93 percent of the votes between them in each of the past four elections.[26]

Although the 1992 parliamentary election was boycotted by opposition parties, elections since then have been widely regarded as free, fair, and competitive.[27] The clientelistic nature of political competition has been highlighted in Ghana,[28] as has the strong ethnoregional basis of political competition, with the NPP commonly viewed as the Ashanti or Akan party (the Ashanti is a subgroup of the broader Akan group) and the NDC as that of the Ewe group.[29] Although ethnic identification may explain voting patterns in the Ashanti and Volta regions, where these groups are dominant, it simplifies what is in reality a more complicated picture. Studies of voting behavior have recognized an urban/rural cleavage in Ghana and have also noted the influence of economic factors and partisan divisions.[30] In addition, evidence from public-opinion data suggests that some voters in Ghana may use elections to hold politicians accountable for their performance.[31]

Ghana's Roads

The quality of roads is an important issue throughout Africa. Especially in largely agrarian societies, transport infrastructure can have a critical impact on development and poverty alleviation.[32] As well as being dangerous, poor-quality roads increase agricultural costs, threatening food security, and high transport costs can undermine improvements to education and health care. These factors make roads a salient issue; in surveys carried out across nineteen African countries between 2008 and 2009, 16 percent of respondents said that infrastructure/roads was one of the three most important problems facing their country. In Ghana specifically, infrastructure/roads was cited behind only unemployment, poverty, the economy, and water as the most important problem the government needed to address.[33]

This analysis focuses on Ghana's 13,367-kilometer trunk-road network, which consists of major roads connecting towns and cities.[34] The

[26] Ghanaian election results are available at http://www.africanelections.tripod.com/, accessed May 12, 2012.

[27] For a discussion of the 1992 elections, see Oquaye 2006.

[28] Lindberg 2003.

[29] Fridy 2007.

[30] Bawumia 1998; Nugent 1999; Youde 2005; Michelitch 2015.

[31] Lindberg 2005.

[32] On the positive impact of roads, see deGrassi 2005 and Bryceson, Bradbury, and Bradbury 2008. For somewhat contrary findings, see Gachassin, Najman, and Raballand 2010.

[33] www.afrobarometer.org/data/merged-round-4-data-20-countries-2008, accessed May 12, 2015.

[34] Ghana also has urban roads (four thousand kilometers) and rural feeder roads (thirty-two thousand kilometers). Road network distances as of 2004, data provided by the Ghana Highways Authority.

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Ghana Highways Authority (GHA) is responsible for the development and maintenance of the network. There is large variation in the quality of trunk roads, with surfaces ranging from asphaltic concrete to gravel, and their condition varies widely, as surfaces can subside, crack, and develop potholes. This variability significantly impacts the ease, speed, and safety of travel and is highly visible to citizens in the course of their daily lives.

The process for maintaining Ghana's trunk-road network is highly centralized. Although the GHA has regional and district offices, all important road maintenance decisions are made centrally. While minor ongoing maintenance happens throughout the road network and is managed at the regional level, major periodic maintenance and construction projects are all determined at the center. Each year the GHA's regional directors send a list of roads needing attention to the Ministry of Roads and Highways. The ministry sets a ceiling budget for the Maintenance Department at the GHA, which then allocates this budget based on need.[35] Analysis of road maintenance outcomes suggests that as well as being publicly available, these formal criteria determine the distribution of road maintenance. Analyzing improvements to road conditions at the constituency level shows that need, measured as the quality of roads in a given constituency in 2004, is the only significant correlate of subsequent changes to road conditions in that constituency. The results of this analysis are presented in Table 2 of the supplementary material.[36]

Importantly, there is no significant correlation between the incumbent party's vote share in 2004 and subsequent changes in road conditions, which implies that road maintenance was not targeted to the incumbent's core supporters. This analysis also shows that there is no significant correlation between road maintenance and the proportion of the population belonging to the Akan group, which rules out the possibility that the incumbent party targeted road maintenance to core supporters on an ethnic basis. Since competing theories of distributive politics suggest that patronage is more likely to be targeted at swing voters rather than at core supporters, I also investigate whether there is a relationship between road maintenance and the margin of victory in the 2004 election. Again though, I find no significant correlation between road maintenance and this measure of swing voters. Indeed, in all

[35] The ministry also provides emergency budgets for repairing unexpected damage. Information on the process of road-maintenance budgetary allocations was collected during the author's interview with the Director of Road Maintenance at the GHA in Accra, December 2010.

[36] Harding 2015.

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these analyses the only significant correlate of road maintenance is prior road quality. It is therefore reasonable to assume that the distribution of road maintenance in Ghana is not clientelistic. Moreover, since road maintenance is not correlated with expected determinants of patronage distribution (either core or swing voters), it is also reasonable to assume that it is not correlated with targeted patronage. This latter point is important, because if road maintenance were correlated with targeted patronage, we would not know whether any vote-share change related to road maintenance was actually attributable to the road maintenance itself or to the unobserved patronage.[37]

In addition, that the decision-making process for road maintenance is so highly centralized means that changes to road conditions in Ghana can be attributed directly to the actions of the executive. This sets road maintenance apart from the provision of other public goods and services in Ghana, such as various education inputs, for which the decision making is decentralized and funding flows are fragmented. Although actual maintenance work is routinely undertaken by contractors, it is governed by a uniform performance-based contracting process and subject to careful monitoring and control procedures with penalties for noncompliance, leaving little scope for variation in the quality of outcomes.[38] Regional Tender Boards are responsible for maintenance contracts, but well-established bidding and monitoring procedures allow for very little variation across regions. This means that the key factor determining road conditions is the allocation of funds at the ministerial level, so it is possible for voters to directly attribute changes in road conditions to executive actions.

Moreover, there is evidence that Ghanaians do just this. Newspaper reports during the 2004 presidential election campaign provide examples of citizens directly crediting President Kufuor with improving road conditions.[39] More explicit evidence comes from examples of citizens throughout the country protesting about the state of roads, often using the slogan "No road, no vote."[40] Any doubts over which votes they are referring to are dispelled by other slogans seen at the same demonstrations, such as, "Mr. President our road our better Ghana," "Be a father to us also," and "Mr. President stop this terrifying deaths [*sic*]."

[37] I am grateful to an anonymous reviewer for highlighting this concern.

[38] Information on contracting and monitoring maintenance procedures comes from the *Road Maintenance Work Procurement Operations Manual*, Ghana Highways Authority, February 2001.

[39] Integrated Regional Informational Networks 2004; Mealer 2004.

[40] Reports recorded the use of this slogan by protestors in 2007 in Anlo Beach, Western Region; in 2008 in Bunkpurungu and Yendi, Northern Region, and in Kintampo North, Brong Ahafo Region; in 2010 in Bimbilla, Northern Region; and in 2011 in Aflao, Volta Region.

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The picture this paints was summed up by an official at the Ministry of Roads who said that "the president can intervene . . . people blame the president."[41] Citizens in Ghana draw direct lines of accountability from road conditions to executive actions, actively demanding better roads from the president and threatening to withold their votes if these demands are not met.

Candidates themselves also draw lines of accountability for voters by focusing on roads during election campaigns. During the 2004 campaign, President Kufuor, Vice President Mahama, and other government ministers highlighted improvements to the road network and claimed credit for the government for these achievements.[42] In 2008, President Kufuor urged Ghanaians to reflect on his government's achievements with regard to roads, and the power of this campaign strategy was highlighted by the fact that the opposition party felt it necessary to counter it directly by asking, "Is it Abena we are going to chop? (Will people be literally eating the roads?)"[43] Improvements to road conditions in Ghana are arguably attributable to executive actions; therefore, the question that remains is, do changes to road conditions influence votes?

Before proceeding it is important to consider the comparability of the Ghanaian case with other African countries and the extent to which findings about how roads affect votes there may generalize. The preceding discussion highlighted two characteristics of Ghana that might matter here. First, Ghana is relatively stable and democratic compared with other African countries. It is possible that in such a context, where elections may be more meaningful and competitive than in less stable democracies, citizens may be more inclined to use their votes to hold the government accountable. In addition, greater systemic stability might mean that citizens have more information about political efforts, increasing their ability to hold politicians accountable.

Ghana is not an anomaly; other African countries are also stable and democratic. In 2011 Ghana was just one of eighteen countries (38 percent of the total) in sub-Saharan Africa coded as democratic by the Polity IV index, and one of fourteen (30 percent) coded as electoral democracies by Freedom House.[44] In 2006 Ghana was one of thirty-six

[41] Author interview with Principal Engineer, Department of Urban Roads, Accra, December 2010.

[42] *Ghanaian Chronicle* 2004a, *Ghanaian Chronicle* 2004b, *Ghanaian Chronicle* 2004c.

[43] AllAfrica 2008; Clottey 2008.

[44] Of these eighteen countries coded as democratic by the Polity IV Project index, six achieved the same score as Ghana or higher. Data from http://www.systemicpeace.org/inscrdata.html, accessed May 24, 2015, and Freedom House, www.freedomhouse.org, accessed May 24, 2015.

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countries (80 percent) coded as having an executive elected via competitive multiparty elections by the World Bank's Database of Political Institutions,[45] and in 2008 Ghana was one of seventeen (36 percent) coded as democratic by José Cheibub, Jennifer Gandhi, and James Vreeland.[46] Moreover, the strong ethnic basis to party competition in Ghana means that it represents a good test case, because we might expect little room for public goods to play a role in determining votes.

Second, the preceding description of road maintenance illustrates a high degree of state capacity concerning roads in Ghana. Because such levels are not experienced everywhere, we should not necessarily expect specific findings about the effect of roads to generalize to all African countries.[47] Importantly though, this analysis focuses on road conditions in Ghana because they are attributable to executive action. Although this may be true in other countries, different outcomes may also be attributable in other cases; therefore, potentially more generalizable would be the finding that votes are affected by the provision of public goods that can be attributed to political action.

IV. Empirical Strategy

I investigate the impact of roads on votes by means of an original panel data set that combines electoral returns with detailed data on local road conditions throughout Ghana.

Election Results

To undertake the analysis at the lowest possible level of aggregation, I collected results from more than three thousand polling stations for the 2004 and 2008 presidential elections from a sample of seven hundred electoral areas throughout the country.[48] Resource constraints mean that archives of election results are not perfectly kept in Ghana, and in

[45] Beck et al. 2001.

[46] Cheibub, Gandhi, and Vreeland 2009.

[47] A recent World Bank report highlighted the success of reforms to road-sector institutions in Ghana, including the establishment of a road fund and road agency (the GHA), which meet "almost all of the best practice guidelines for road sector institutions." Foster and Pushak 2011, 10. While not all African countries perform as well in this regard, the picture outside Ghana is far from bleak. Most countries have now established road funds and road agencies, and out of twenty countries surveyed by the World Bank in 2007, road funds in eight of them performed at least as well or better than that in Ghana. Foster and Briceno-Garmendia 2010.

[48] Although constituency-level results from the 2004 and 2008 elections are publicly available, aggregating votes across such large units raises serious issues of ecological inference. On ecological inference and aggregation bias, see King, Rosen, and Tanner 2004 and Achen 1995.

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many districts the 2004 results have been lost or are incomplete;[49] nevertheless, as the maps in Figure 1 show, the coverage of the data remains broad. After collating the returns from the 2004 and 2008 (first round) presidential elections for each polling station, I aggregated them to the electoral-area level to link them geographically to data on road conditions.[50] Electoral areas are very localized units, containing an average of five polling stations. This aggregation of data generated cross-temporal electoral data from a sample of 438 electoral areas (in fifty-three districts, across nine regions). For each electoral area, I investigated the determinants of *incumbent vote share change*, which is defined as the difference in the share of the votes won by the NPP in the first rounds of the 2004 and 2008 presidential elections.[51]

Road Conditions

The GHA produces an annual road condition report, which provides detailed systematic and objective information on the condition of the entire trunk-road network in the same period each year. Between March and April the GHA sends out teams of inspectors with vehicle-mounted electronic measurement devices to collect data on road-surface distresses and roughness for each of the more than 2,400 road segments in the network. Distress is measured by a "windshield" survey of road conditions. In this survey, raters traveling in a slow-moving vehicle (at about 30 kilometers per hour) observe the road surface for distresses and determine their severity and extent based on clear guidelines established by the GHA. The raters also disembark from the vehicle and inspect distressed sections on foot to get more detailed measurements of slight distresses (for example, cracks), which are not visible from the moving vehicle. Roughness is measured using a RideMate device, which is installed in the vehicle and measures the degree of bumpiness in a given road segment. These two measurements are combined to produce an annual condition score (0 to 100) for each road segment. More details about the geocoding of these road condition scores, along

[49] Analysis of the areas in which data were unavailable shows no significant differences in the variables of interest between these areas and those from which data were collected. This analysis is reported in Harding 2015, section B.3.

[50] This process was necessary for geocoding the data, because information about the precise locations of polling stations is not available.

[51] The share for the major opposition party (the NDC) is not equivalent to the inverse of the NPP share, because other smaller parties also compete. All of the results hold when the dependent variable is calculated as change in the NDC vote share, although the signs are reversed. More information about the data used in this paper is contained in Harding 2015.

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with plots showing that the scale is approximately continuous, are included in section C.2 of the supplementary material.[52]

I use these condition scores to create two different measures of changes in road conditions between the elections. First, I construct a measure of the change in the average condition of roads in the precise vicinity of each electoral area. To do so, I geocode the condition data into a digital map of the trunk-road network, and compute condition scores for each electoral area by averaging across all road segments that intersect a five-kilometer buffer around the centroid of the electoral area. I then subtract the mean 2004 condition score from the mean 2007 score to create the variable *average road condition change*.[53] To ensure that the results are not driven by the choice of five-kilometer buffers, I vary the buffer sizes from three to seven kilometers. The number of intersecting road segments varies across electoral areas and drops as the size of the buffers is reduced. Since some buffers are not intersected by any road segments, smaller buffer sizes reduce the sample. I also construct a measure of changes to the condition of the road segment that is closest to the centroid of each electoral area (*closest road condition change*). This measure contains information about only one road segment for each electoral area, but it is a useful alternative because it does not necessitate dropping any electoral areas from the analysis.

Figure 2 presents summary statistics for changes to vote shares and road conditions.[54] Overall, the condition of roads in the sample improved while vote shares for the incumbent decreased over the period. That the majority of changes to vote shares was fairly small reflects the high degree of stability in Ghanaian electoral politics. Since in a number of cases the incumbent vote share change was more extreme, I run tests to check that these outlying cases are not driving the results (see Section V).

Sample

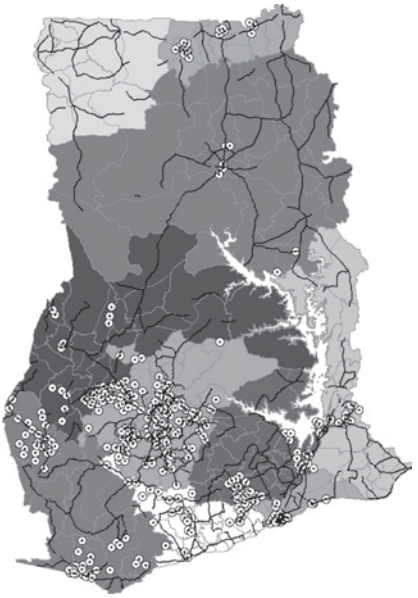
The maps in Figure 1 show the distribution of the sample. In Figure 1 (a), the shading demarcates the ten administrative regions. In Figure 1 (b), shading reflects population density by constituency (darker is denser).

[52] Harding 2015.

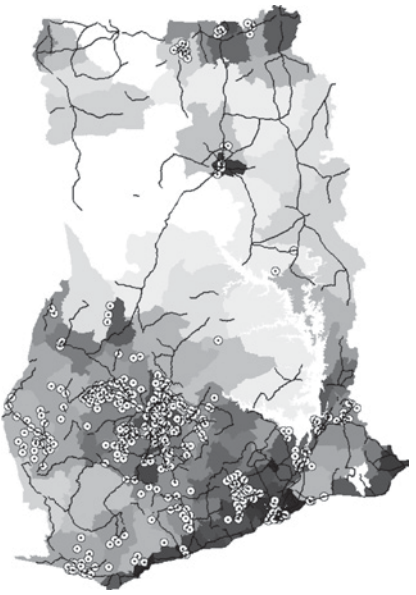
[53] The 2008 data is not directly comparable with other years because in 2008 the condition survey was carried out between May and June. This is problematic because the rainy season starts in May, and variations in climate throughout the country mean that electoral areas are not affected equally. Therefore, I look instead at the change in condition scores between 2004 and 2007. When the models are estimated using the 2008 data, the coefficient for the road conditions variable is positive but not always significant at standard levels. Since the rains have such variable impact on roads across Ghana, it is unclear how these results should be interpreted.

[54] Full summary statistics are contained in Harding 2015.

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Region
(a)



Population Density
(b)

FIGURE 1
MAPS OF SAMPLE DISTRIBUTION[a]

[a] Dots represent sampled electoral areas; white circles are five-kilometer buffers; black lines are trunk roads. In (a) shading reflects regions and gray lines mark constituency boundaries. In (b) shading reflects population density by constituency (darker is denser).

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Although not perfectly representative, the sample is well distributed and provides good coverage of the population across the country. From Figure 1(a) we can see that the sample covers all but one of Ghana's ten regions. There are no data from the Upper West Region, because none of the polling station returns from the 2004 elections have survived there. Although coverage in the largest geographical region (Northern) appears fairly sparse, Figure 1(b) shows that this reflects the area's very low population density therein. It also highlights the lack of data in the densely populated border area around Aflao, in the southeastern corner of the country. In addition, the two maps show that the Ashanti Region (in the center of the country) is somewhat overrepresented in the sample. Overall though, these maps demonstrate a high degree of data coverage.

Estimation Strategy

Estimation of a fixed-effects model uses the temporal dimension in the data to control for unobserved time-invariant factors at the electoral-area level. Assuming that any unobserved confounding factors at the electoral-area level are fixed over time, this approach identifies the effect of changes to road conditions on electoral support.[55] In the absence of additional observable time-varying factors at the electoral-area level, the fixed-effects model implies that

$$votes_{it} = \alpha_i + \beta roads_{it} + \lambda_t + \varepsilon_{it}, \quad (1)$$

where $votes_{it}$ is the vote share for the incumbent party in electoral area i at time t, α_i is a fixed effect that absorbs any time-invariant factors for electoral area i, λ_t is a year effect, $roads_{it}$ denotes road conditions, and β is the causal effect of interest.

Rather than estimate all of the α_i parameters, it is equivalent to difference over the two time periods and to estimate the first difference equation

$$\Delta votes_{it} = \Delta\lambda_t + \beta\Delta roads_{it} + \Delta\varepsilon_{it}, \quad (2)$$

where the Δ prefix denotes the change between the two time periods (for example, $\Delta votes_{it} = \Delta votes_{i2008} - \Delta votes_{i2004}$). Doing so absorbs the electoral-area fixed effects (α_i). The coefficient of interest is β, the effect

[55] See Angrist and Pischke 2009 for a useful discussion of the benefits of fixed-effects models for causal inference.

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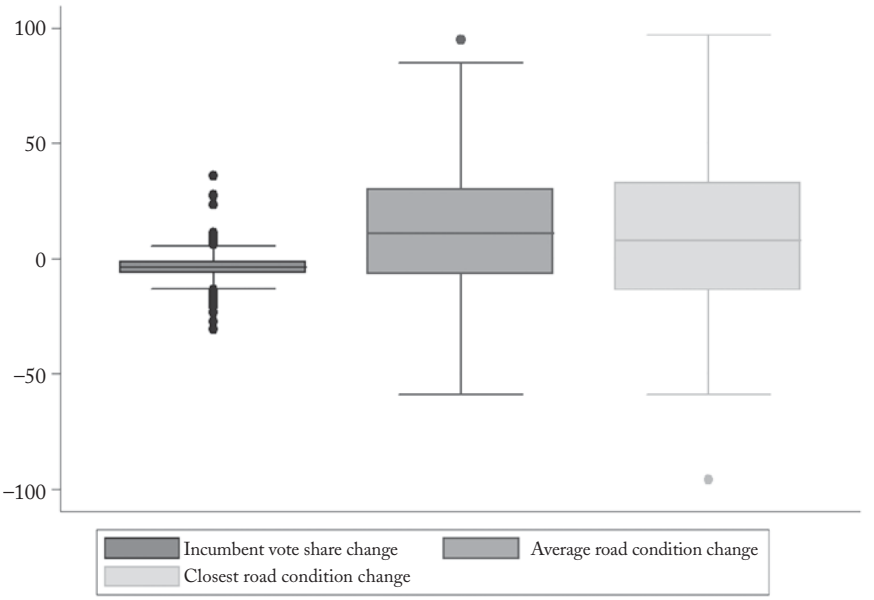


FIGURE 2
SUMMARY STATISTICS[a]

[a] The figure shows changes in presidential vote shares won by the incumbent party, the NPP, between the 2004 and 2008 elections for the sample of 438 electoral areas; average changes in road condition scores between 2004 and 2007 across all road segments within a five-kilometer buffer for the 280 electoral areas that have road segments within five kilometers; and changes to condition scores between 2004 and 2007 for the closest road segment to each of the 438 electoral areas in the sample.

of changes to road conditions ($\Delta roads_{it}$) on changes in vote shares ($\Delta votes_{it}$) *within* electoral areas.

The endogeneity concern here is that rather than voters responding to better roads by increasing their support for the incumbent, it could be that incumbents simply reward supporters by improving roads in areas where they win more votes. A major benefit of the fixed-effects model is that by differencing over the time periods, the focus is on *trends* in road improvements and vote shares within electoral areas, not *levels* across electoral areas. The fixed-effects model therefore reduces the endogeneity concern to a worry that road improvements are targeted to areas where support for the incumbent is known to be increasing *between* elections. This is less problematic because it is extremely unlikely that the incumbent has good information about the changing levels of support between elections, especially at a level as localized as electoral

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areas. In Ghana there are no opinion polls on which the incumbent can base this kind of targeting, and political parties have very limited local infrastructure outside of election campaigns. Moreover, although there are local district elections, these are nonpartisan, so they provide no information about changes in support at the local level. Therefore, the incumbent does not have the information necessary to target road maintenance in this way.[56]

The model in equation 2 does not control for potentially confounding time-varying factors; for example, if wealth increased between 2004 and 2008, support for the incumbent might increase. At the same time, greater wealth might also increase citizens' ability to lobby for improved roads, resulting in a spurious correlation between roads and vote shares. Without data on time-varying covariates at the electoral-area level, it is not possible to control for such factors explicitly, but it is possible to control for any unobserved time-varying factors at the district level by including district-specific time trends ($\Delta\mu_j$) and estimating

$$\Delta votes_{ijt} = \Delta\lambda_t + \beta\Delta roads_{ijt} + \Delta\mu_j + \Delta\varepsilon_{ijt}, \quad (3)$$

where $\Delta votes_{ijt}$ is the vote share for the incumbent party in electoral area i in district j at time t. Electoral areas are nested within districts, so standard errors are clustered by district to counteract potential within-district correlation in the errors.

V. Results: Do Road Conditions Affect Votes?

Main Results

AVERAGE LOCAL ROAD CONDITIONS

Table 1 reports results from estimates of equations 2 and 3, using five buffer sizes increasing in one-kilometer increments from a radius of three kilometers to seven kilometers, with and without district-specific

[56] Even if the necessary information were available, it is unlikely that the incumbent could effectively target road maintenance at such a local level. Maintenance budgets are allocated by the GHA to district offices, which then oversee maintenance projects in their districts, making it difficult for the executive to target specific electoral areas. Nevertheless, if any such targeting were taking place, evidence of political business cycles suggests that it would most likely occur just prior to the elections (Schady 2000). Therefore, ignoring the data from 2008 and looking instead at changes in road conditions between 2004 and 2007 further reduces the possibility that any relationship between roads and votes results from the targeting of maintenance projects to areas in which support for the incumbent is increasing between elections.

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TABLE 1
CHANGES TO AVERAGE ROAD CONDITIONS AND INCUMBENT VOTE SHARES[a]

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Buffer size	3 km	3 km	4 km	4 km	5 km	5 km	6 km	6 km	7 km	7 km
Average road condition change	0.040** (0.017)	0.002 (0.007)	0.048*** (0.016)	0.017* (0.009)	0.049*** (0.017)	0.022** (0.009)	0.046*** (0.016)	0.021*** (0.007)	0.048*** (0.016)	0.016** (0.007)
District time trends	no	yes	no	yes	no	yes	no	yes	no	yes
Electoral areas	216	216	251	251	280	280	313	313	344	344
Districts	45	45	47	47	51	51	52	52	52	52

*** p<0.01, ** p<0.05, * p<0.1; dependent variable is *incumbent vote share change*; district-clustered robust standard errors in parentheses

time trends. The dependent variable is *incumbent vote share change*. It is clear that *average road condition change* is positively and significantly related to changes in the share of the presidential vote won by the incumbent party. This effect holds across the range of buffer sizes, and for all but the smallest it is significant at standard levels, with and without district time trends. Statistical power diminishes when the size of the buffers is reduced, because fewer electoral areas have road segments intersecting the buffers, so the number of observations drops. For all of the buffer sizes, the magnitude of the coefficient on *average road condition change* decreases when the estimates include time trends, which control for unobserved time-varying factors at the district level.

Although the model is very lean, the nature of the estimation provides confidence that the relationship between road conditions and vote shares is not confounded by unobserved time-invariant factors at the electoral-area level or by unobserved time-varying factors at the district level. These results therefore provide strong support for the claim that changes to the average condition of local roads significantly affect vote shares. The question that follows is, how big is this effect?

Table 2 reports the magnitude of the effect of a one standard deviation increase in average road conditions within five kilometers of an electoral area. Without time trends, the implied effect is an increase in the incumbent party's vote share of 1.4 percentage points, representing

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almost one-quarter of a standard deviation. When time trends are included, the effect is slightly more than 0.6 percentage points, which is substantial given the limited variation in vote shares over time—regressing incumbent vote shares on a set of electoral area dummies accounts for 93 percent of the variation in the data. Differencing over time within electoral areas therefore leaves very little variation to be accounted for by changes to road conditions (for which there is a lot of variation—regressing road-condition scores on electoral-area dummies accounts for only 50 percent of the variation). The effects are even more substantial when we consider that the NPP's presidential candidate, Nana Akufo-Addo, won 49.13 percent of the first round votes in the 2008 presidential election. These results suggest that had the NPP invested in only a little more than one additional standard deviation improvement in road conditions across the country, they would have won the 2008 election in the first round.[57] As it was, the election went to a run off, which they lost.

It is also worth considering the possibility that the effects of road maintenance on vote shares may be heterogeneous across electoral areas and that road improvements are not uniformly distributed. This is important because it seems plausible that improvements to road conditions would have a larger effect on voter choice when those improvements are bigger and the bulk of improvements to road conditions are concentrated in these areas. Road conditions improved by one standard deviation or more (at least twenty-nine points) in 28 percent of the electoral areas in the sample, but the observed improvements in these areas alone represent 72 percent of all of the observed improvements across the entire sample.

If we focus on the electoral areas in which the vast majority of road improvements took place, we see that the impact of road improvements on votes is markedly different than across the sample as a whole. First, looking simply at the mean change in incumbent vote shares, these shares fell much less in the electoral areas in which road conditions improved by at least one standard deviation than they did in electoral areas where road conditions improved by less than one standard

[57] It is very difficult to estimate the precise cost of an additional standard deviation improvement in trunk-road conditions throughout the country. In recent years Ghana has spent on average a total of 1.5 percent of its gross domestic product (GDP) on roads, which is one of the highest amounts in West Africa. Foster and Pushak 2011. This amount, however, covers all road expenditures across all three road sectors, with the majority going to urban and rural feeder roads, so the total spent on trunk-road maintenance is much less. Furthermore, it is a very small sum compared to other areas of public expenditure; for example, in 2011 Ghana spent 8.2 percent of its GDP on education (data from the World Bank Development Indicators).

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TABLE 2
MAGNITUDE OF EFFECT OF CHANGE IN AVERAGE ROAD CONDITIONS[a]

	Incumbent Vote Share Change	*Lower*	*Upper*
Without time trends	1.433	0.485	2.382
With time trends	0.635	0.133	1.136

[a] Magnitude of *incumbent vote share change*, for one standard deviation increase in *average road condition change* (within 5-kilometer buffers). *Lower* and *Upper* are bounds of 95 percent confidence intervals.

deviation (by –2.67 percentage points as opposed to –4.24 percentage points, respectively). Second, replicating the statistical analyses on this restricted sample returns a much larger coefficient on the road-change variable; looking only at electoral areas where roads improved by at least one standard deviation, the implied effect of a one standard deviation improvement to road conditions (the minimum experienced by electoral areas in this subsample) is an increase in the incumbent's vote share of 1.77 percentage points (or 3.19 percentage points if district time trends are omitted from the model). Viewed in this way, the effect is even more substantial. The implied effect of a one standard deviation improvement to road conditions in these areas equates to almost 50 percent of the average change in vote shares across the sample and to almost one-third of a standard deviation of the total change in the incumbent's vote share.

CLOSEST ROAD CONDITIONS

Measuring road conditions using changes to the condition of the single *closest* road segment avoids dropping electoral areas. I use this variable to estimate equations 2 and 3, the results of which are presented in the first two columns of Table 3. The coefficient on *closest road condition change* is positive and significant at the 95 percent level when the time trends are omitted (column 1).

While this measure enables the inclusion of all the electoral areas for which election results were available, for some areas the closest road is not very close—for the most remote electoral areas in the sample, the closest road is as much as twenty-four kilometers away. Such wide variation in distance to the closest road raises the possibility of heterogeneous effects. The effect may vary with distance to the closest road, potentially decreasing as this distance increases, either because individuals are not concerned about distant roads or because they do

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TABLE 3
CHANGES TO CLOSEST ROAD CONDITIONS AND INCUMBENT VOTE SHARES

	1	*2*	*3*	*4*
Closest road condition change	0.030**	0.008	0.042***	0.021**
	(0.015)	(0.007)	(0.015)	(0.009)
Closest road condition change			−0.003	−0.003*
× Distance to closest road			(0.002)	(0.002)
District-specific time trends	no	yes	no	yes
Electoral areas	438	438	438	438
Districts	53	53	53	53

*** p<0.01, ** p<0.05, * p<0.1; dependent variable is *incumbent vote share change*; district-clustered robust standard errors in parentheses

not have good information about their condition. I investigate this possibility by estimating the equation

$$\Delta votes_{ijt} = \Delta\lambda_t + \beta\Delta roads_{ijt} + \lambda(\Delta roads_{ijt} * distance_{ijt}) + \Delta\mu_j + \Delta\varepsilon_{ijt}, \quad (4)$$

where an interaction term $\Delta roads_{ijt} * distance_{ijt}$ has been added to equation 2, with $distance_{ijt}$ equal to the distance from the centroid of the electoral area to the closest road segment.[58]

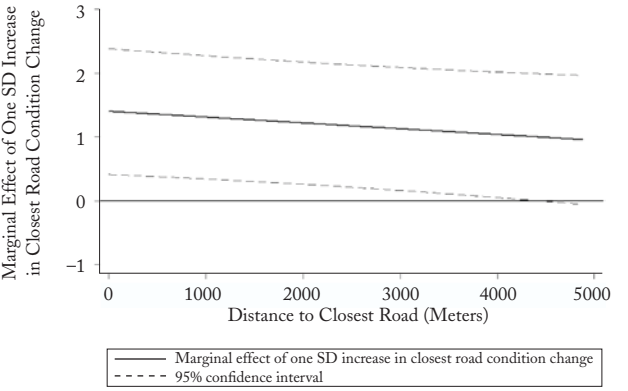
The results from estimating equation 4 are presented in columns 3 and 4 of Table 3. Accounting for distance, changes to the condition of the closest road significantly affect the incumbent's vote share. While the interaction term is only weakly significant in one of the specifications, this coefficient does not tell the whole story. Figure 3 plots the effect of a one standard deviation change in the condition of the closest road on the change in the incumbent's vote share, across different distances to the road.[59]

Figure 3(a) shows the effect without district-specific time trends, and Figure 3(b) shows the effect when they are included. The magnitude of the effect of *closest road condition change* diminishes with greater distance to that road. Without time trends, the effect remains significant at the 95 percent level up to a distance of about four kilometers. When time trends are included, the effect is significant for roads within one kilometer. These results further support the claim that changes to local road conditions have a significant effect on presidential vote shares

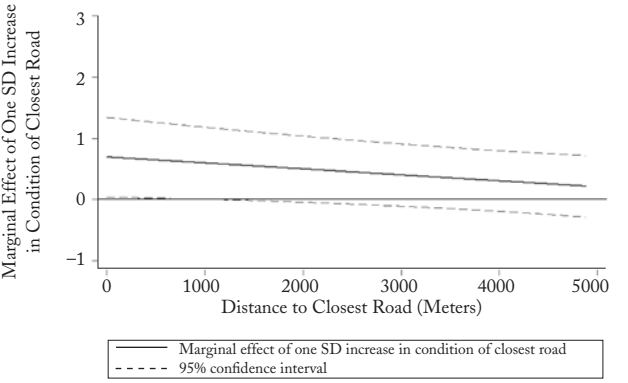
[58] It is not necessary to include the variable *distance to closest road* ($distance_{ijt}$) as a stem for the interaction, because this is already included in the fixed effects in equation 1 and differenced out in equations 2 and 3.

[59] On interaction effects see Brambor, Clark, and Golder 2006.

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Without District-Specific Time Trends
(a)



With District-Specific Time Trends
(b)

FIGURE 3
MARGINAL EFFECT OF INCREASE IN ROAD CONDITIONS, BY DISTANCE TO CLOSEST ROAD[a]

[a] Dependent variable is *incumbent vote share change*. Graphs show the marginal effect of a one standard deviation increase in the condition of the closest road segment to each electoral area, by the distance in meters from the centroid of the electoral area to the closest road segment.

in Ghana. Furthermore, it seems that distance matters—vote shares are significantly affected by changes to *local* roads.

ROBUSTNESS

CONTROLLING FOR WEALTH

An alternative explanation for the results in the first subsection above could be that vote shares are affected by wealth. If citizens become

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wealthier, they may reward the incumbent with greater electoral support. At the same time, greater wealth may increase their ability to lobby for improved roads. If this were the case, we might spuriously attribute a correlation between road conditions and vote shares to programmatic accountability. To control for this possibility, I include a time-varying measure of wealth using data on household wealth from the Demographic and Health Surveys (DHS).[60]

The DHS do not provide data over time for every electoral area in the sample, because a different sampling frame is drawn for each round of the survey and not all electoral areas are covered in each round. To overcome this variability, I average the wealth index data across clusters within constituencies, thereby constructing the constituency level indicator *wealth change*.[61] The DHS also capture information on access to water and electricity, making it possible to control for constituency-level measures of average changes in access to these utilities (*water change* and *electricity change*). The results are presented in Table 4.

Most important, the relationship between road conditions and vote shares is robust to the inclusion of the time-varying measure of wealth. This is true across all specifications. Although the coefficient for *wealth change* is negative, it is only weakly significant in one specification. Neither of the measures of changes in access to water or electricity are consistently significant.[62]

OUTLIERS

The summary statistics in Figure 1 demonstrate that in a small number of cases the changes to vote shares were fairly substantial. To check that the results are not driven by these extreme cases, I reestimated the main findings using two techniques that deal with outliers. The first is robust regression using iteratively reweighted least squares, which down weights outliers. The second is quantile regression, whereby coefficients are estimated by minimizing absolute deviations from the median rather than the mean, making them more resistant to outliers. The main findings all hold in both of these sets of estimates. The results are contained in the supplementary material.[63]

[60] This data measures household wealth through factor analysis of a variety of household assets.

[61] The sample shrinks when this measure is included, because not all constituencies are covered by both rounds of the surveys.

[62] Clustering the standard errors by constituency instead of district has no significant impact on the results.

[63] Harding 2015.

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TABLE 4
CHANGES TO ROAD CONDITIONS AND INCUMBENT VOTE SHARES: CONTROLLING FOR WEALTH

	1	*2*	*3*	*4*	*5*	*6*
Average road condition change (5 km)	0.046**	0.024**	0.038***	0.024**	0.039**	0.024**
	(0.017)	(0.009)	(0.014)	(0.009)	(0.016)	(0.009)
Wealth change			−2.129*	−0.038	−1.605	−0.425
			(1.161)	(0.184)	(1.179)	(0.254)
Water change					0.002	0.003***
					(0.002)	(0.0004)
Electricity change					−2.212	1.869
					(2.145)	(1.696)
District-specific time trends	no	yes	no	yes	no	yes
Electoral areas	256	256	256	256	256	256
Districts	44	44	44	44	44	44

*** p<0.01, ** p<0.05, * p<0.1; dependent variable is *incumbent vote share change*; district-clustered robust standard errors in parentheses

NONATTRIBUTABLE POLICIES: EDUCATION INPUTS AND VOTE SHARES

If roads affect votes because citizens can attribute changes in road conditions to executive actions, then voting should not be influenced by policy outcomes that are not attributable in this way. In Ghana, education inputs vary in the extent to which they can be attributed to executive action, so data on education inputs can be used to carry out a falsification test of the argument about attributability.

In Ghana the provision of some education inputs, including classrooms and textbooks, is determined by decentralized decision-making processes and fragmented funding flows, making it hard to attribute outcomes in these areas directly to the executive branch. Even if the amount of resources available locally is determined in part by central government transfers, resource allocation at the local level creates opportunities for corruption and "leakages," such that outcomes do not truly reflect inputs from the center.[64] Since responsibility for education in Ghana is divided between the central government and local authorities, some education inputs are attributable to executive actions, whereas others are not.[65]

[64] Reinikka and Svensson 2004 provide evidence of this in Uganda, where between 1991 and 1995 capture by local government officials and politicians meant that schools received only 13 percent of allocated central government spending.

[65] The division of responsibility dates back to 1951 and has been repeatedly reinforced by legislation. Darvas and Krauss 2011.

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More specifically, decentralization means that responsibility for classroom construction and the management of services, such as water and sanitation, lies at the district level. Funds for these inputs flow through the district assemblies and district education offices from various central government offices and from donors. Textbooks and other learning resources are provided centrally by the Ministry of Education and at the district level through donor funds. This decentralization of responsibility, and the fragmentation of funding sources, means that numbers of classrooms, textbooks, and seats, and school services and facilities should not be expected to affect votes because citizens cannot hold the executive directly accountable for providing them.

In contrast, the executive is directly responsible for supplying teachers and building new schools. Teachers in Ghana are hired, trained, deployed, and paid centrally, with no involvement at the district level. Likewise, the major investments required to fund new school construction are distributed centrally and are tightly controlled.[66] As a result, it is likely that citizens in Ghana can attribute pupil-teacher ratios and the number of schools directly to executive action.[67] Therefore, if voters do care about public services, we might reasonably expect these factors to affect presidential vote shares. Data from an annual schools census makes it possible to investigate these expectations. I use this data to estimate the first difference equation

$$\Delta votes_{jt} = \Delta\lambda_t + \beta\Delta roads_{jt} + \gamma\Delta X_{jt} + \Delta\varepsilon_{jt}, \quad (5)$$

where $votes_{jt}$ is the incumbent's vote share in district j; $roads_{jt}$ reflects road conditions in district j; and X_{jt} is a matrix of education inputs in district j, which includes the numbers of *primary schools* and *classrooms per school*, the proportions of *schools with toilets* and of *schools with drinking water*, the numbers of *books per pupil* and *seats per pupil*, and the *pupil-teacher ratio*. As in equation 2, the Δ prefix denotes the change from 2004 to 2007–8. Differencing over the two time periods estimates the coefficients of changes to road conditions and education inputs on changes in vote shares within districts. The *average road condition change by district* variable measures the change in the average condition of all road segments intersecting a district.

Table 5 presents results from four different estimates of *incumbent*

[66] Steffensen 2006.

[67] Reports from the 2004 presidential campaign suggest that the incumbent specifically tried to cultivate such attribution by reminding voters of new schools that the government had built. *Ghanaian Chronicle* 2004a; *Ghanaian Chronicle* 2004d.

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TABLE 5
EDUCATION INPUTS AND INCUMBENT VOTE SHARES: DISTRICT LEVEL DATA

Investments/Infrastructure	*1*	*2*	*3*	*4*
Primary schools	0.096***			0.070*
	(0.035)			(0.036)
Classrooms per school	1.085			1.628
	(0.807)			(1.082)
Facilities/Services				
Schools with toilets		−0.296		0.319
		(1.930)		(1.737)
School with drinking water		6.060*		2.931
		(3.291)		(3.000)
Leaning Inputs				
Pupil-teacher ratio			−0.266***	−0.292***
			(0.089)	(0.073)
Books per pupil			0.443	−0.473
			(1.626)	(1.691)
Seats per pupil			2.979	2.089
			(2.784)	(2.756)
Roads				
Average road condition change by district				0.069***
				(0.023)
N	109	109	109	109

*** p<0.01, ** p<0.05, * p<0.1; dependent variable is *incumbent vote share change by district*; robust standard errors in parentheses

vote share change by district. As expected, only outcomes that can be attributed to executive actions are significantly related to changes in vote shares. The results in column 1 demonstrate that the number of primary schools, an outcome tightly controlled by the central government, is significantly related to incumbent vote shares. By contrast, outcomes for which responsibility is diffused and funding is fragmented, such as the number of classrooms and the provision of drinking water and toilets, have no significant effect on vote shares (column 2).

This pattern is repeated for learning inputs (column 3); whereas less attributable inputs such as textbooks and seats have no effect on votes, that which is the responsibility of the central government (pupil-teacher ratios) is significantly related to vote shares. When the road condition variable is included (column 4), the coefficient for pupil-teacher ra-

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tios remains significant and the coefficient for the number of primary schools is almost significant at the 95 percent level ($p = 0.054$).[68] These results support the argument about attributability. Just like roads, education is important to voters in Ghana, but only education inputs that can be directly attributed to executive actions have any bearing on presidential vote shares.

VI. Conclusion

Through competitive elections, democracy provides institutional structures for citizens to hold their governments accountable. But the presence of these institutions alone does not mean accountability will be realized, and the general expectation in regard to African elections is that it has not been. Rather, elections in Africa have been widely depicted as little more than exercises in vote buying and ethnic mobilization. While this impression is not without foundation, these practices are not the whole story. This article presents robust, microlevel evidence that voters in Africa do use elections to hold their governments accountable; evidence that road conditions affect vote shares in Ghana strengthens the small but burgeoning body of scholarship that suggests elections in Africa are more than contests in corruption and ethnic loyalties.

To advance our understanding of electoral competition in Africa, and in low-information contexts more generally, it is important to recognize that attribution matters. The evidence presented here concerns a single good (roads) in a single country (Ghana). Although roads may indeed have similar effects elsewhere, this should only be expected in cases in which, like Ghana, road conditions can be attributed to political action. As the analysis of education inputs demonstrates, voters in Ghana condition their support only on attributable outcomes; in other countries the range of attributable outcomes may be different. This research highlights the fact that any conclusions we make about electoral competition may be sensitive to the outcomes we choose to investigate. Although voters in Africa may care about a wide array of public goods, in a low-information environment the range of outcomes that can be attributed to political action is limited. This requires the researcher to think carefully about the particular context and the nature of the public goods under investigation.

[68] Including all education inputs without the road condition variable returns almost identical results except the coefficient for the primary schools variable, which is significant at the 95 percent level.

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Supplementary Material

Supplementary material for this article can be found at http://dx.doi.org. 10.1017/S0043887115000209.

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