The Impact of High Information Environments on Representation in the U.S. House of Representatives

By

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Dissertation

Submitted to the Faculty of the

Graduate School of Vanderbilt University

in partial fulfillment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

in

Political Science

August 31, 2019

Nashville, Tennessee

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For my father. “We’re not late yet.”

ACKNOWLEDGMENTS

Nobody does this alone. Many people – personal and professional – helped me to write this dissertation and complete my PhD. Such is the generosity of spirit in the community around me that I cannot list them all here. I hope to use the next few pages to give some measure of recognition to those that have made this possible.

My dissertation committee – Josh Clinton, Larry Bartels, Cindy Kam, and Yphtach Lelkes – contributed immensely through their guidance.

I came to Vanderbilt with a very narrow view of the topics I would study during my PhD. Josh – through the sheer force of his curiosity – caused me to rethink much of what I wanted to do in political science. In a field dominated by strict adherence to fields and sub-fields, Josh stands in defiance. He is driven only by an overarching desire to get the data and to ask interesting questions. This dissertation bridges the gap between political behavior and institutions; between political science, communications, and economics. It is directly because of Josh's influence that this is the case.

Larry has served as a constant reminder that the work we do, when we do it well, *matters*. All too often our field gets stuck in methodological squabbles and niche disagreements. Through his example, and through the feedback given for this work, Larry has always emphasized the real people who live inside our regression tables. One dissertation cannot make a positive impact on the world – and this one likely less than others – but to the extent that this work helps to address the very real concerns Americans have about their political system, much of the credit should go to Larry.

Cindy's work tackles the big ideas in political science while standing out for its high degree of lucidity and precision. The first time you receive feedback from her you will immediately know why. Cindy has a laser focus for clarity. That bit of hand-waving theory you figured you'd get to in a future draft? Cindy will find it. This approach can be disarming, but my writing and thinking in political science has benefited enormously through her feedback over the last 6 years.

Without Yphtach's path-breaking work on both polarization and the effects of broadband this dissertation would not have been possible. To have his advice and feedback on this project was a privilege. For many years there was a large gap between the public's assumption that media greatly affects politics, and the relative (lack of) prestige of Political Communication within the broader field of Political Science. Using data and methods previously unavailable, a large group of PolComm scholars is now changing that, and Yphtach is at its forefront. More-so than his scholarly contributions, Yph has shown that you can be both a top scholar and a truly nice person.

This work has also benefited substantially from insightful discussion from Dan Alexander, Allison Anoll, Brenton Kenkel, David Lewis, Kristin Michelitch, Bruce Oppenheimer (who also provided timely breaks to go watch the Predators), Alan Wiseman, and Elizabeth Zechmeister. Thanks as well to participants at Vanderbilt's RIPS lab group, Vanderbilt's CSDI group, and the APSA Political Communication section.

I was lucky to write this dissertation in an extremely collegial department, and many coworkers provided support and advice. Foremost amongst them was my office-mate for 6 years, Andrew Engelhardt, whose encyclopedic knowledge of the field is matched only by my utter inability to remember the names of anyone ever (he also chauffeured my stubborn, car-free, self around more times than I can count). Thank you also to Maggie Deichart, Claire Evans, Spencer Hall, Scott Limbocker, Bryan Rooney, Michael Shepherd, Brad Smith, Darrian Stacy, Steve Utych, Sheahan Virgin, and Keith Weghorst.

I would also like to thank the Social Science and Humanities Research Council of Canada for a generous Doctoral Fellowship, which allowed me additional time to work on these projects.

Tina Bembry, Darlene Davidson, Natasha Duncan, Shannon Meldon-Corney, and Melissa Vandewater formed the backbone of our department during my time at Vanderbilt. Without them this process would have been impossible to navigate.

Emily Macgregor was the light that shone the brightest in some of the toughest moments of my PhD. I could not have completed this work without her.

Though my family is now spread wide across several countries, they are my rock. My mother,

Chris, taught me that teaching is rooted in empathy: Who is my audience, and how do I work with what they have to bring them to what I know? I bring this teacher's mentality to all I do, and I hope the writing in this dissertation reflects that. My father, Jim, taught me bravery and tenacity. He's always reminded me that it is your hard work, not your brains, that will set you apart ("More chips, James! More chips!"). Through the stress of this process (and many long text chains), I've come to realize how much I take after my sister, Kate. What a gift it is to be alike to someone so funny, kind, and smart. She has taught me, no matter what life throws at you, to never lose my sense of humor. Finally my brother, Paul, has taught me the value of boundless optimism in the face of seemingly lost causes. I love the quote: "A ship is safe in harbor, but that's not what ships are for." That is the example my brother has set for me, and I hope to live up to it.

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INTRODUCTION

Legislative politics in the United States has become increasingly nationalized since the 1970s. The traditional view of Congressional politics holds that a member's non-partisan personal relationship to their constituents is crucial for re-election. Classic books like Mayhew's (1974) *Congress* and Fenno's (1978) *Home Style* describe a non-partisan constituency-service-orientated style of governing. This model of legislative behavior still dominates much of our understanding of how politics in Congress functions.

This picture is increasingly outdated. Consider, for example, the 2018 midterm elections. Far from focusing on local concerns, Republicans – eager to hold on to their House majority – instead decided to talk about hated *national* figures from the Democratic party. An NBC News article from February 7th 2018 discusses how "Republicans want to make 2018 all about Nancy Pelosi" (Todd et al. 2018):

> Are Democrats prepared for Pelosi – once again – to be used against their candidates? After all, Pelosi, the first and only woman to be House speaker, is more unpopular than President Trump is. According to last September's NBC/WSJ poll, 39 percent of Americans had a favorable view of the president, versus 25 percent for Pelosi. And in so-called "Trump Counties" — the places that fueled Trump's win in 2016 – Pelosi stands at 16 percent positive, 44 percent negative (-28), compared with Trump's 44 percent positive, 45 percent negative score (-1), per November's NBC/WSJ survey.

Instead of an image of Congressional politics where constituents are focused on legislators "bringing home the bacon", this article describes voters who know – and care deeply – about national political figures, and describes legislators who respond to those incentives by bringing national politics to bear in their re-election bids.

This is not an isolated story. The trends underlying this nationalization are plain to see in the data. Consider Figure 1, which demonstrates nationalization in voters and in legislators since the

1970s.

In the left panel the percentage of Americans splitting their tickets for the House and the President is displayed.[1] This is a parsimonious measure of nationalization in the electorate, as voters splitting their tickets demonstrates that they are making independent decisions across different political offices. In 1972 a full 30% of Americans voted for one party for the Presidency and another for the House. Since then, this number has declined precipitously, and by 2016 the American National Election Study recorded the lowest ever percentage of Americans splitting their tickets: 8%.

The right panel of Figure 1 shows how legislators responded to this change in voting behavior, displaying the average "Party Unity" score of legislators over time. This value captures the percent of time that legislators vote with their parties on party votes – votes where the majority of one party votes against the majority of the other party. The traditional view – supported by the version of legislative politics described by Fenno (1978) and Mayhew (1974) – is that Party Unity voting is an electoral liability, as it signals to the constituency that the legislator cares more about the party than their voters. Facing an electorate that increasingly made decisions on one plane of partisan conflict, however, legislators voted with their parties more often throughout this period. In the 93rd Congress (which was produced by the 1972 election), the average legislator voted with their party under 75% of the time. The rate of party voting grew steadily through this period, such that in the 113th Congress the average member voted with their parties nearly 95% of the time.

What can explain these trends? There is no simple answer to this question, and indeed, there is good evidence that ingredients to this trend towards nationalization include things like elite polarization (Hetherington 2001), the party re-alignment in the South (Bartels 2000), and geographic sorting (Sussell 2013).

However, in trying to ascertain what caused this trend towards nationalization, it is prudent to think about other dynamic forces during this period in time. By far, the most important dynamic piece of the relationship between legislators and their constituents over the last 50 years has been

[1] Data from the American National Election Study

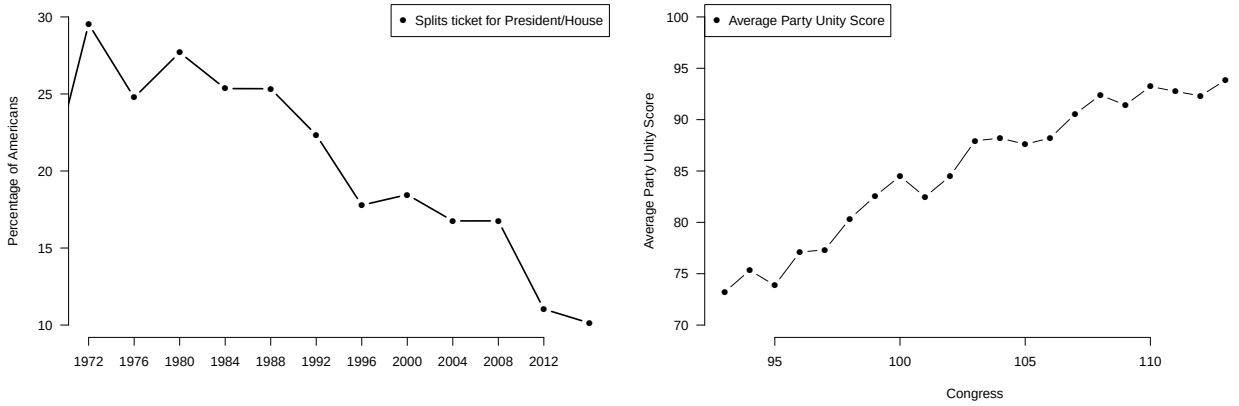


Figure 1: Trends in Political Nationalization

a rapidly changing communication environment. When Fenno (1978) and Mayhew (1974) wrote their classic works on Congressional behavior, they were facing an information environment that – in the majority of districts – was dominated by high quality local newspapers. These local newspapers have been shown to provide exactly the sort of voting considerations that allow voters to make independent decisions across different levels of the ballot – what Arnold (2013) calls the "evidentiary basis" for Congressional elections (see also: Darr et al. 2018; Hayes and Lawless 2015, 2018; Peterson 2017; Prior 2006; Schaffner 2006; Snyder and Strömberg 2008).

But this robust local news environment was rapidly eroding during this period. The left panel in Figure 2 displays the percentage of Americans who read a local newspaper every day over time. In the mid 1980s around 55% of Americans read their local newspaper every day, but this number has drastically declined since then. By 2008 that number was barely above 30%.

Given that local newspaper readership is vital to promoting a "local" version of Congressional politics, this steady decline in readership is a key candidate for increasingly political nationalization. Over time, Americans have been replacing their viewership of local news with viewership of more nationally focused mediums like cable news and nationally-syndicated talk radio (Hopkins 2018; Prior 2007). As such, a key hypothesis to test is whether this shift in the information environment is at all responsible for a shifting political environment, or whether taste in media has

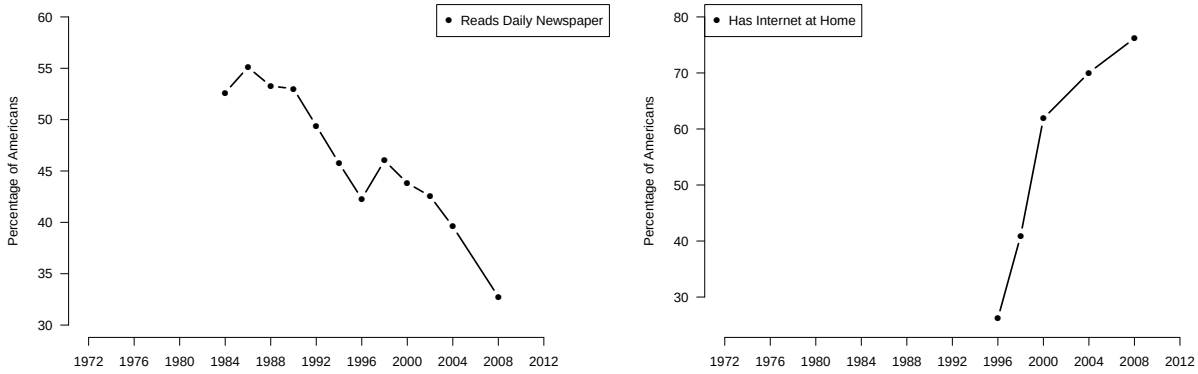


Figure 2: Trends in Media Nationalization

shifted *because* political attitudes have become more nationalized.

This is the question I tackle in this dissertation. To what degree is a changing media landscape responsible for political nationalization? This is a tough question to answer, because as Figures 1 and 2 show, the political and media worlds were nationalizing at the same time, at about the same rate, making a determination of causality difficult.

To help unpack this complicated relationship, I turn to perhaps the largest and most rapid change in the information environment during this period: the roll-out of high-speed broadband internet. The right panel of Figure 2 displays the percentage of Americans with home internet over time. Compared to the slow and steady changes in newspaper readership and voting rates, the expansion of broadband internet was a sudden shock to the information environment. As I discuss throughout the three chapters, the nature of this sudden (and geographically uneven) shock provides an opportunity to study the impact of a changing technological environment on politics, and to do so in a way that is unlikely to be explained by reverse causality.

I use this rapid expansion of broadband to examine the relationship between media and politics within three key groups: voters, legislators, and local newspapers. Figure 3 displays the causal path – from broadband to legislators – that I examine in the three chapters that follow. Broadband matters to politics because it changes the information voters have, and prioritize, in their decision

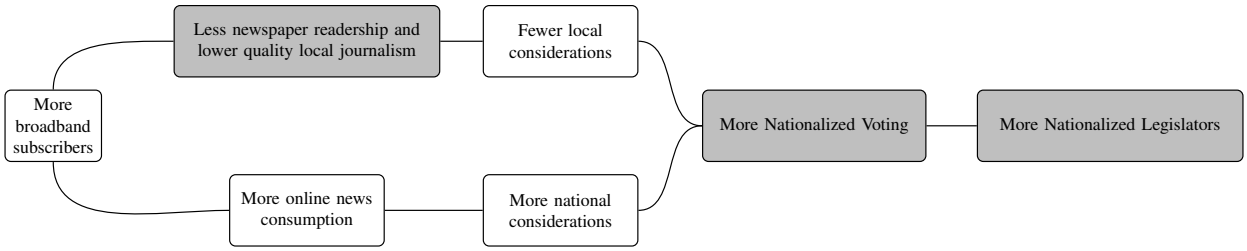


Figure 3: The Causal Path of the Dissertation

making. When individuals gain access to broadband two parallel paths unfold. First, there are important changes to the local news environment. Broadband serves as a replacement for more traditional local media. This exodus away from local media has the direct effect of less people reading these sources, and an indirect effect of a degradation in quality content. Second, when individuals access news online they are more likely to read news about national politics and less likely to read news about local politics. These two paths have a reinforcing effect on one another, and both lead to an environment where voters have, and prioritize, national considerations about politics instead of local considerations about politics.

I am not the first to work in this area, and as such, this dissertation does not tackle all the steps in the causal chain described in Figure 3. There is robust literature on how the availability of local newspapers structure citizen knowledge of legislative politics (Arnold 2013; Darr et al. 2018; Hayes and Lawless 2015, 2018; Snyder and Strömberg 2008), how broadband access changes consumption behavior (Lelkes et al. 2015), and how online news is biased towards national news outlets (Hindman 2008, 2011, 2018).

Instead of focusing on every step in the causal path, this dissertation focuses on the total effects of technological change on three key groups in the representation/accountability relationship: voters, legislators, and newspapers. My hope is that understanding the total effects of this one particular technology can help us to understand the effects other technologies – past and future – may have on our politics. In all research there is a specificity/generalizability trade-off. The more specific the main stimulus, the less generalizable the results of the study. The major benefit of studying the impact of a benign technology like broadband is generalizability. Compared to stud-

ies (all of which are excellent) that focus on specific media like the surge and decline of local news (Arnold 2013; Darr et al. 2018; Hayes and Lawless 2015, 2018; Snyder and Strömberg 2008), or specifically polarizing news channels (Arceneaux et al. 2016; Clinton and Enamorado 2014) and websites (Bakshy et al. 2015; Bessi et al. 2016), studying broadband gives us better leverage to understand the likely result of further technological change.

To understand what the effects of broadband are on politics – and what future technological change might therefore mean for politics – I have written three journal-style articles for this dissertation.

The first chapter, "Get Information or Get In-Formation: The Effects of Broadband Internet on the Incumbency Advantage and Partisan Voting", examines whether expansions in broadband access leads to voters who reward good behavior by legislative incumbents, or whether those voters instead increasingly rely on partisan labels and vote "straight" tickets. Arguing that broadband has eroded traditional media sources that provide an evidentiary basis for Congressional elections, I use FCC data on broadband roll-out to every Congressional district over a 6 year period to show that voters exposed to broadband cast more straight-tickets, provide a smaller incumbency advantage, and are less responsive to the legislative activity of their representatives. These findings highlight that new communication technologies, through their deleterious effects on traditional media, have the effect of 'flattening' politics to one national-partisan dimension. Voters are increasingly less likely to make voting decisions independent from their partisanship, and as such are unable to reward an incumbent for good behavior, or sanction them for bad behavior. This is important because it changes the electoral incentives for members to be less concerned with traditional non-partisan constituency service and more concerned with promoting the national party or ideological "brand".

The second chapter, "The Effects of High Information Environments on Legislative Behavior", examines whether members of the US House of Representatives respond to the new incentives uncovered in the first chapter. There is an assumed tension for legislators between supporting powerful national interests – their parties, the president, and ideologically aligned interest groups

– and the possibility of electoral sanction for taking sides with these national interests against the needs of their constituents. If broadband causes voters to increasingly use their partisanship to make all voting decisions, however, then this tension is removed. Voters cannot reward or punish their legislator if they are committed to voting a straight ticket. Using a specification that leverages exogenous changes in broadband levels due to the 2002 redistricting, I show that legislators react to increases in broadband connectivity by voting more often with their party, voting more in-line with the President, and receive higher scores from ideologically aligned interest groups. These results are important because they challenge expectations about legislative behavior that rely on untested assumptions about the information environment in constituencies.

The third chapter, "All the President's Papers: Broadband Roll-Out and the Nationalization of Newspaper Coverage", steps back in the causal chain, examining directly how the expansion of broadband influences local newspapers. America's local newsrooms underwent a great upheaval in the first decade of the 21st century, with economic challenges causing newsroom sizes to shrink and robust local coverage of politics to suffer. Conventional wisdom suggests that the shift to online consumption was at the heart of this upheaval, but little work has been done to show that expansion in the communication environment plays a causal role in altering the economic well-being and content of newspapers. I collect over-time data on both newspaper circulation and content to examine the effects of the roll-out of broadband on the local news environment. Consistent with expectations, the expansion of broadband leads to lower newspaper circulation in all but the largest American cities. Newspapers react to the economic threat of broadband by reducing their coverage of members of Congress relative to the President. This chapter shows that a crucial step in the causal chain between new technologies and changes in politics is the effect those new technologies have on traditional media. Without understanding the role that these traditional sources play – and how that role is disrupted by new technologies – than we will be unable to adequately reform the communication environment to improve local-accountability.

Together these articles paint a compelling picture that a crucial ingredient to political nationalization in the United States is a rapidly changing communication environment. Progressive re-

formers in the early 20th century held as one of their main political goals reducing the "distortions" caused by rampant partisanship (Schudson 2000: 190). Bimber (2003: 75-76) discusses how part of the power of large party organizations in the 19th century was the control they wielded over the flow of information. New information technologies like radio and television meant both that: grassroots groups of citizens could more effectively organize, and that candidates were no longer dependent on the central party structure to connect with voters. Reformers at the time saw information taking the place of parties: politics was moving from "outdoors to indoors and from the heart to the head" (Schudson 2000: 193-196). It is ironic, then, that the return to the partisan politics of the 19th century comes to us through the ultimate *freeing* of information represented by the internet. While strict control over the press allowed for partisan politics, so does an erosion of local media meant to hold politicians to account on important local issues, and a public who are more interested in national partisan news than local concerns.

Chapter 1

Get Information or Get in Formation: The Effects of High Information Environments on Legislative Elections

Leading into the 2018 United States legislative elections the Republican caucus settled on a unified strategy for keeping their House majority: talk about Nancy Pelosi[1]. While Pelosi's 25% approval rate marks her as even less popular than President Trump, incumbents focusing on vilifying a national opponent instead of their personal records of success as legislators is out of step with much of the literature on legislative elections. For someone reading Fenno (1978) – where legislative home-styles were defined by the careful cultivation of a non-partisan "personal" vote – today's legislative elections that feature substantially lower rates of both incumbency advantage and split-ticket voting would be hard to recognize.

I show that this change in politics, broadly defined as "nationalization", is partly a function of a changing media environment. The politics of the past – where citizens would more regularly cast split-ticket ballots in order to vote for their incumbent member of Congress based on a record of good service – was made possible by a robust local media. The expansion of the communication environment has the effect of eroding these local sources of information and replacing them with a more national information environment. In the language of Zaller (1992), voters receive a set of "considerations" from this new communication environment that are more national than local. In line with other recent work that has examined the effect of a changing media environment on politics, I show that this new set of considerations has fundamentally altered the politics of Congressional representation (Van Aelst et al. 2017; Darr and Dunaway 2017; Darr et al. 2018; Hayes and Lawless 2018; Peterson 2017). Using new data on the roll-out of broadband internet to all Congressional districts over 4 elections to identify the effects of these changes, I show that increasing broadband leads to a lower incumbency advantage, less split-ticket voting, and a smaller

[1] "Republicans Want To Make 2018 All About Nancy Pelosi. Are Democrats Ready?" *NBCNews.com* February 7, 2018.

penalty for legislators who vote in lock-step with their parties.

Split-ticket voting and the incumbency advantage are inherently linked. Measured in the traditional way (i.e. Gelman and King 1990), the incumbency advantage measures the additional votes a legislator receives from running as an incumbent versus running in an open district *above and beyond what is expected of that legislator based on the partisanship of the district*. As such, anything that causes individuals to cast straight-tickets will also lead to a decline in the incumbency advantage. By way of example, the 1972 election is a high-water mark for the incumbency advantage as many districts voted overwhelmingly to re-elect Republican President Richard Nixon while also voting to re-elect their Democratic members of Congress – evidence that these voters had considerations beyond pure partisanship.

The incumbency advantage occurs as a consequence of voters having these additional local considerations in mind when entering the voting booth – considerations that are received through their information environment. When more people in an area get access to broadband internet the types of considerations available changes in fundamental ways. This happens through two processes. First, access to broadband has important ramifications for local media, which in the past has provided the voting considerations vital to the incumbency advantage. Internet use negatively impacts the provision of local information directly through declining subscriptions, but also indirectly via a weaker product that has less resources available for political coverage. Second, when individuals read news online they are far more likely to view news about national politics compared to local politics, both as a consequence of their own choices and the architecture of the internet. These two processes work in tandem to generate voters who are much more likely than in the past to have considerations about national, as opposed to local, politics. As a consequence, they are less likely to split their tickets, and therefore produce a smaller advantage for incumbents. In the first section of the paper I discuss in more detail the accumulated evidence across disciplines for each of these steps in the causal chain.

To identify the effect of broadband on the nationalization of Congressional elections I merge FCC data on broadband internet availability with election results in all Congressional districts

from the 2002-2008 period. Using both cross-sectional within-state models and over time within-Congressional-district models I show a robust effect of broadband on the incumbency advantage. This decline in the incumbency advantage seems to be due to an increase in the power of national partisan politics in House elections: the electoral margins of incumbents facing re-election are increasingly affected by "down-ballot" effects from presidential elections in districts with higher levels of broadband internet connectivity. Citizens in districts with more access to broadband internet are also less likely to punish their incumbent for excessively partisan roll-call voting (and indeed, are increasingly likely to *reward* them). Taken together, these results provide evidence that the politics of now – where both Republicans and Democrats approach re-election with a message focused on vilifying the most hated *national* figures in the opposite party – is, at least in part, a function of this changing media environment.

By focusing on the aggregate information environment instead of individual self-reports, this paper avoids the well-known pitfalls of self-reported exposure to media, which often serves as little more than a proxy for political interest (Bartels 1993; Prior 2009a, b). Using unique data on the geographic roll-out of broadband internet, I focus on the real-world effects of a change in communication environment on election results. The designs I use rule out many potential confounders, such as broadband internet being endogenous to higher income areas, as well as concerns that the roll-out of broadband internet was happening at the same time as other contemporaneous media changes. Further, it is unlikely that these results are due to reverse causality, as this would involve broadband providers making distribution decisions based on changing levels of polarization in particular districts.[2]

I make no claims that broadband is the *sole* cause of polarization and a decreased incumbency advantage in American politics. Politics has been becoming more nationalized in America for decades (Hopkins 2018; Jacobson 2015a), and the causes range from elite polarization (Hetherington 2001) to geographic sorting (Sussell 2013). One major contributor to increasing nationalization, however, is thought to be a changing media system (Hopkins 2018); a system which

[2]I further show in Appendix section 4.3 that the roll-out of broadband is statistically unrelated to the politics of a district.

has *also* been becoming more nationalized since at least the 1980s (Clinton and Enamorado 2014; Prior 2007). As I discuss below, a key component of this media nationalization is the expansion of broadband internet, which was perhaps the most significant and rapid change during this period. This rapid (and geographically uneven) change provides an opportunity to identify the relationship between these two time series that are changing in parallel. Similar to a field experiment the reaction to "treatment" is important in-as-much as it helps us to understand how similar changes – from the first introduction of dial-up internet to the introduction of smart-phones – have impacted, and will continue to impact, the nationalization of politics. Broadband is not the whole story, but understanding the effects of this colossal shift in how Americans learn about politics is vital to understanding trends in politics since that shift, and what is likely to happen as communication technology continues to evolve along the same track.

These data and result are important because they highlight a crucial shift in accountability and representation. The incumbency advantage is not just a statistical regularity, but a representation of the role of local information in legislative elections. The increase in straight-ticket voting, and resulting decline in incumbency advantage, points to a shift in how representatives are held accountable; a shift from a model of legislators appealing directly to their constituencies to a version of accountability much more reliant on "responsible party government" (Schattschneider 1942). While reducing all voting decisions to one plane of partisan conflict makes choices easier for voters, it also complicates the lines of accountability in a system of checks-and-balances. In Federalist 51, Madison states that essential to preserving liberty is a system where "ambition [is made to] counteract ambition" (Madison 1788). The differing re-election constituencies and demands on members of Congress and the President are thought to generate two different sets of ambition that allow government to control itself. Evidence that an expanding communication environment leads to voters less able to separate their votes across their ballots generates concerns that House members and the President increasingly serve the *same* ambition.

Ultimately, the results I identify serve as a warning to those hoping these new communication media will democratize the flow of information, allowing thousands of small websites producing

local information about politics to thrive (Hindman 2008: 2-3). It does not seem to be the case that increased access to broadband internet helps individuals to "get information" about local politics. Instead, the pattern of results presented here makes it clear that the move online simply makes it easier for citizens to "get in formation".

1.1 The Role of Media in the (De)Nationalization of Voting

Whether political behavior is "nationalized" or not can be simplified to a basic question: What considerations does an individual have in mind when making their voting decisions (Zaller 1992)? Do voters have a great deal of information about the local incumbent member of Congress, their policies, and their performance? Or, do they instead have considerations about the policies of national parties, national political figures like the President, and affective feelings of antipathy towards members of the other party? In this latter case, voting behavior will be more nationalized: where political decisions are increasingly made on one plane of (partisan) conflict.

If the types of considerations held by voters is what is important in producing nationalized (or localized) voting outcomes, it is important to look at how a changing media environment may influence the considerations voters receive. Studies of media "priming" have consistently shown that topics made salient by an information environment will be easily accessible at the "top-of-the-head" when voters evaluate candidates (Iyengar and Kinder 1987). For example, when foreign policy is more salient in the news media, individuals place greater weight on their foreign policy attitudes when evaluating politicians (Iyengar and Simon 1993). This theory of political decision making is a natural out-growth of psychological models of memory-based information processing, where attitude formation stems from "the ease in which instances or associations [can] be brought to mind"(Tversky and Kahneman 1973: 208)(Scheufele and Tewksbury 2006). In a way similar to how the media drives the importance of foreign policy, a media environment that provides and prioritizes local information will produce voters who have local considerations at the "top-of-the-head" when making voting decisions. On the other hand, a media environment that provides and prioritizes information about *national* politics to voters – information which almost exclusively

centers around conflict between the two major parties (Arceneaux and Johnson 2015) – will generate individuals who will instead have national-partisan considerations that are more accessible when making decisions (Clinton and Enamorado 2014).

I provide evidence in this section that broadband, and technologies like it, creates an information environment that tilts the balance of information from local to national. It does so through two complementary routes. First, broadband draws viewers away from local news sources, which has the subsequent effect of causing a decline in the quality of local journalism. Second, when individuals read news online they are more likely to view information about national-partisan politics compared to local politics. The end result is citizens who go to the voting booth with fewer local considerations about Congress, and more national-partisan considerations.

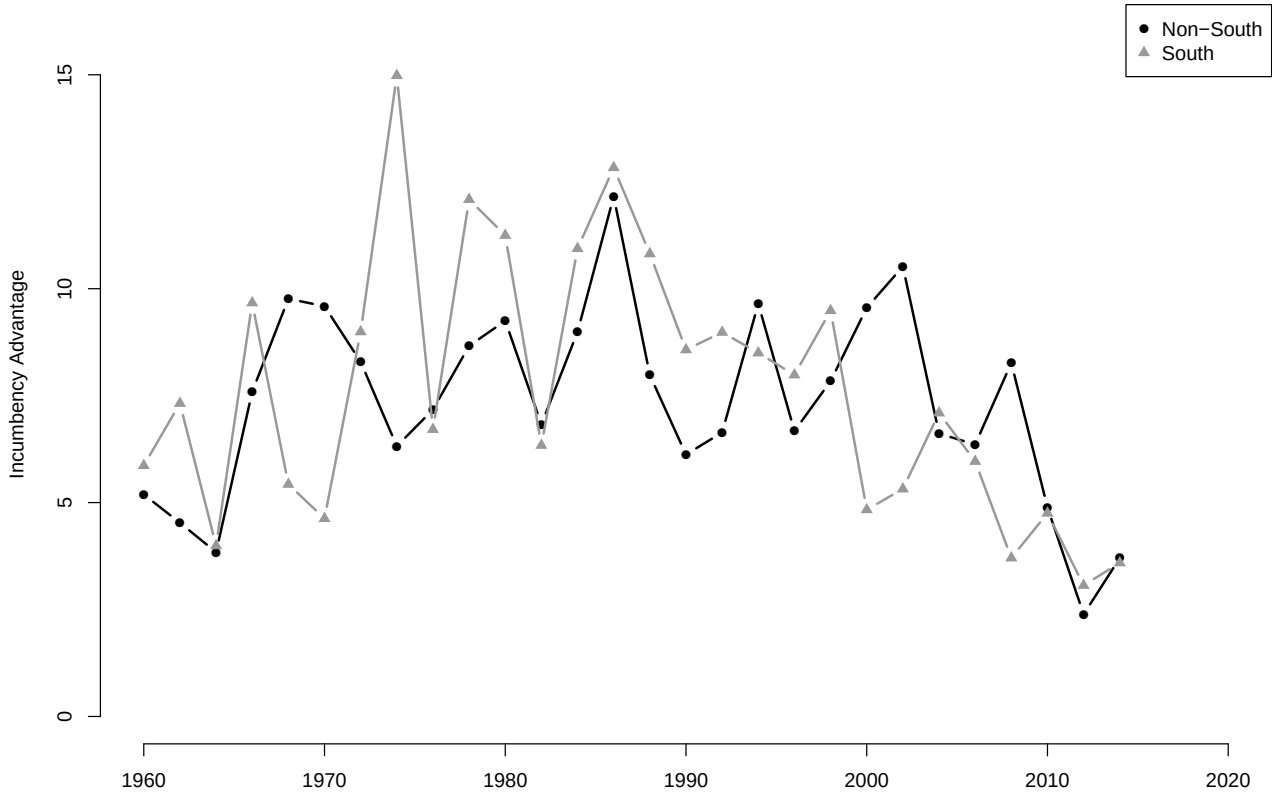


Figure 1.1: Incumbency Advantage: 1960-2014

The prominence of the incumbency advantage in the study of Congressional elections is testament to the degree to which voting behavior in the past has been driven by considerations above and beyond simple national-partisan considerations. The traditionally measured incumbency advantage (see e.g. Gelman and King 1990) is defined as the additional votes an incumbent receives above and beyond what they would have received if they were running in an open seat, controlling for how their party performed in the election overall, and the two-party presidential vote in their district.[3] Figure 1.1 displays the incumbency advantage from 1960 to 2014 calculated using this method. Incumbents gained somewhere between 5 and 15 percentage points compared to those running in open seats during this period, though this advantage has declined in all regions in recent decades.

The key variable in this calculation making the incumbency advantage an indicator for national versus local voting is the inclusion of the *district presidential vote*.[4] The incumbency advantage crucially does *not* include the advantage of being in a district that is filled with co-partisans. In order for incumbents to have an advantage over those running in open seats, they must regularly *exceed* the presidential vote for their party in their district. If every individual in a district votes a straight ticket, then there could not, by definition, be any advantage to running as an incumbent (as any individual with the same party affiliation would receive the same percent of the vote whether they were an incumbent or not). The existence of the incumbency advantage therefore provides evidence that local, non-partisan, considerations affect the election of members.

What are these local considerations? Scholars believe that there are both direct and indirect components (Cox and Katz 1996; Levitt and Wolfram 1997). The direct component includes ad-

[3]In the original Gelman and King (1990) specification this last term was identified by a member's lagged vote share in the previous election. Jacobson (2015a) replaces this term with the two-party presidential vote in the district. I follow this latter convention. Angrist and Pischke (2008: 243-246) discuss why one might choose to use a lagged dependent variable or a fixed-effects specification with panel data. Ultimately the choice comes down to whether the researcher believes the major source of omitted variation is time-varying or time-invariant. In the latter case, the recommendation is to use fixed-effects. In the roll-out of broadband, a much larger component of omitted variation is the enduring systematic differences between districts. As such, I prefer in this case the use of two-party presidential vote and fixed effects, particularly because the use of this alternative specification has been validated by Jacobson (2015a).

[4]For 2004 and 2008 this is the recorded presidential vote in the district. 2006 uses the values for 2004 for that district. The 2002 presidential vote is the 2000 presidential vote, recalculated for the area of the new district.

vantages like name recognition and the ability to use ones position in Congress to bring projects to the district[5]; the indirect component includes incumbents' tendency to be of higher-quality on average, and their ability to scare off high-quality challengers. A third, more temporally specific, component of the incumbency advantage is the slow progress of the Southern re-alignment. In much of the late 20th Century, Southerners regularly voted for Republican presidential candidates while also supporting their segregationist Democratic members of the House of Representatives (Bartels 2000). Voters prioritizing any of these components provides evidence of orthogonal, non-partisan, information driving voters' decision making. This is true whether that information is of the direct variety, such as voters rewarding an incumbent for good performance; the indirect variety, where voters know and care about the quality differential between incumbent and challenger; or due to Southern re-alignment, where state Democratic parties in the South were out-of-step with the national Democratic party.

Voters receive these additional considerations largely from local news media. Empirical evidence to this effect is abundant, with multiple studies showing that local newspaper and television coverage predicts local political knowledge, support for incumbents, and voters who rely less on partisan labels when making voting decisions (Arnold 2013; Peterson 2017; Prior 2006; Schaffner 2006; Snyder and Strömberg 2008). Snyder and Strömberg (2008) for example, use nearly 20 years of Newspaper data to show that having a quality newspaper in overlap with a Congressional district strongly drives the ability of individuals to identify and evaluate their incumbent House member, and ultimately leads to less partisan voting outcomes. This effect is not limited to local newspapers: Prior (2006) found that local television coverage in the mid-century was an important contribution to the rise of the incumbency advantage via increased citizen knowledge of their representatives. While voters could potentially receive information about their local candidates from

[5]Recent work has attempted to isolate this direct component using regression discontinuity designs (e.g. Lee 2001, 2008; Erikson and Titiunik 2015). My expectation is that both the direct and indirect components of the incumbency advantage will be affected by a change in the communication environment. The direct component relies on name recognition and the ability of incumbents to publicize their accomplishments. The indirect component relies on citizens knowing the quality differential between the incumbent and challenger. Both of these components require citizens to have local information and to weigh that information more than their national partisan attitudes. Because I expect both components to be affected by a changing media environment, I do not make an attempt to separate them in this paper.

national media, with 435 members of the House of Representatives, adequate coverage of all individual members is next to impossible. Indeed, Cook (1989) finds that in a typical year only 39% of House members appeared on a network newscast. Legislators (and challengers) can, and do, communicate directly with their constituents, but the local media – who serve a larger audience than that which can be reached by the politician directly, and who additionally offer the reputational benefit of a neutral third-party observer – offer the most in terms of localizing political decision making. The advantages gained from attention of local news media was made clear by at least one incumbent in Fenno's *Homestyle*, who remarked that the most "profitable thing politically" of the day was not any personal interaction with constituents, but the presence of the local newspaper at a press conference (Fenno 1978: 205).

The incumbency advantage requires voters to possess and prioritize local information. The empirical record is clear that when individuals have higher access to robust local media they gain independent, non-partisan, knowledge about their incumbents, and ultimately weigh that information against partisan considerations when making voting decisions. Examining the trends in Figure 1.1, the notion that the local media plays an important role in promoting the incumbency advantage seems plausible. The period where the incumbency advantage was the highest was also the period where the United States had a robust and independent local media infrastructure that could provide voters with the sort of non-partisan local considerations that supported the incumbency advantage. This incumbency advantage declined – both in the South and the rest of the country – as the media system became more nationalized (Prior 2007). As the media environment became less conducive to the provision of local, non-partisan, information about legislators – whether that information be about a record of good service, overall quality, or loyalty to the segregationist South – the incumbency advantage declined

The introduction of broadband represents a particularly large disruption to this relationship between voters, the local media, and their incumbents. This disruption is an opportunity to show the causality between more nationalized media and more nationalized voting. Broadband has disrupted this relationship in two ways. First, broadband has significant effects on the local media

itself. Second, the types of information voters view and have access to online is fundamentally different than news offline.

There is strong evidence that the use of the internet has negative effects on local media use – and as a consequence – local media itself. The aggregate trends away from local news sources is clear: in the mid 1990s 71% of Pew respondents reported regularly reading local daily newspapers and 72% reported regularly viewing the local television news. In 2008 the number of Pew respondents reading local daily newspapers dropped to 54%, and the number viewing local television news to 52% (Kohut 2008). Using panel data, Hopkins (2018) shows that these broad trends in media use away from local sources towards national sources like cable television and the internet are not simply the consequence of generational replacement, but rather due to *all* Americans shifting away from traditional media. Other researchers have confirmed that internet use displaces use of traditional media. Respondents report that accessing news online better satisfies their needs for variety and convenience, leading them to reduce their newspaper readership (De Waal and Schoenbach 2010; Gaskins and Jerit 2012; Ha and Fang 2012). As such, the first step in the causal chain between increased access to broadband and a reduced incumbency advantage is that those who have access to broadband are simply less likely to make use of local media.

This decline in local media viewership due to broadband has a secondary effect of eroding the profitability and quality of local media. The FCC's 2011 report on the information needs of local communities (Waldman 2011) lays out a litany of effects of how increased access to high speed internet has decimated the local news economy. Newspaper revenue dropped 47% from 2005 to 2009 and staffs have shrunk 25% since 2006. While the 2005-2009 period did see online traffic for local newspapers balloon from 43 million users a month to 70 million users a month, the $716 million in additional revenue generated online pales in comparison to the $22.6 billion in advertising losses to the print side (Waldman 2011: 17). Reporters are stretched thin, making it harder to report on complicated topics. As a result, topics like education, health care, and government are reported on less, at the expense of topics like weather and crime (Waldman 2011: 13).[6]

[6]It is important to note that this particular step in the causal chain – broadband causing local newspapers to shut down – is one which is not captured well by the analysis below, which looks at the effect of broadband on Congres-

This erosion of local news readership and quality has appreciable effects on Congressional elections. Just as there is a great deal of evidence that areas better served by a robust local news environment have citizens who are more knowledgeable about Congressional elections and vote in a less partisan manner, districts with faster eroding local news environments (for example, from newspapers closing, see Darr et al. (2018)) have citizens who are less knowledgeable about their members of Congress (Hayes and Lawless 2015, 2018), and are less likely to split their tickets across different levels of office (Darr et al. 2018). When local newspapers leave town citizens lose exactly the sort of knowledge and behavior necessary to sustain an incumbency advantage.

The first important effect of broadband is its impact on the local news environment. However, individuals are not simply reading less local news, but shifting their consumption to online sources, and it is therefore necessary to know what sort of political news individuals view online. Perhaps it is the case that individuals access a great deal of local information online, thus mitigating the concern that the expansion of broadband will lead to greater weight on national political attitudes. The evidence presented below, however suggests that this is not the case.

The second disrupting effect of broadband is that use of the internet as a way to gather news heavily skews the information citizens receive towards the national. Both Hindman (2011) and Tewksbury (2003) have conducted large-scale web-tracking studies that look at the balance of national and local news that is consumed online. Using comScore data on millions of users, Hindman (2011) estimates that of the time spent reading news online only 15% is spent on local sites, compared to 85% on national sites. Tewksbury (2003) similarly tracked the consumption patterns of online news readers from a representative sample provided by Nielsen/NetRatings, and found stories classified as "National" in focus made up 10% of all views, compared to 1.2% for stories classified as "Local".[7] Although, attention to different types of sites is not a measure of what infor-

sional districts. Newspapers serve broad areas, and in many cases, whole states. The expansion of broadband in one area may spell doom for a newspaper that serves districts that have *not* had the same advancements in technology. This being said, the other mechanisms discussed here – decreased viewership of local news (whatever its quality) and increased use of online sources which prioritize national content – are expected to happen in specific geographies where broadband expands. Further, while the wide-ranging areas of newspaper coverage are hard to control for, it is certainly true that any given area expanding access to broadband will increase the probability of any newspaper serving that area to be economically affected.

[7] Also clear from this finding is that the majority of time spent online is on *non-news* content. This raises the

mation individuals actually consume, a necessary condition for online news readership providing the sort of information needed to sustain the incumbency advantage is that individuals at least visit websites covering a local angle of politics. The evidence suggests that when citizens go online their news consumption becomes more heavily skewed towards national content.

The reasons for this uneven consumption of national and local news online seems to be due to both demand and supply.

In terms of demand, individuals gravitate to more national, and more partisan, news when given the choice. Hopkins (2018) uses an experiment to show voters are more likely to self select stories about the President compared to those about governors or mayors. Lelkes et al. (2015) compare online behavior of individuals with broadband internet versus those who have dial-up internet. Those with broadband internet were more than twice as likely to visit national-partisan websites like the Drudge Report and Huffington Post compared to those with dial-up internet, even after controlling for important covariates that may impact selection into broadband like age, country of origin, household size, and race. Both of these tendencies suggest a move online would produce both more national, and more partisan, considerations. This seems a clear prediction for the increase in propensity to read national-partisan websites, but even increased readership of *non*-partisan national news ought to increase partisan considerations, as national news of all types is known to cover politics as a conflict between the two parties (Arceneaux and Johnson 2015).[8]

possibility of what Prior has called "Polarization without Persuasion" (Prior 2007, 2013). It is possible that less interested political moderates may take the opportunity presented by the internet to opt-out of politics all together. This leaves the resulting electorate more extreme, despite the fact that no individual person has changed their attitudes. I investigate this in Appendix section 4.2. While the expansion of broadband is associated with a reduction in the size of the electorate for House races, controlling for turnout does not affect the relationships found below. In other words, there is not evidence that the smaller electorate is comprised of more partisan individuals in a way that would explain these results.

[8]Another feature of news online which may cause a lower incumbency advantage is selective exposure to partisan-consistent information, often referred to as "echo-chambers" or "filter-bubbles" (Pariser 2011; Sunstein 2001). This selective exposure may cause individuals to have stronger partisan attitudes, and therefore vote in more partisan-consistent ways across different levels of government (Lelkes et al. 2015). More recent behavioral evidence, however, has cast doubt on whether concerns about selective exposure generalize beyond a set of highly motivated news consumers (Barberá et al. 2015; Gentzkow and Shapiro 2011; Guess 2016). Regardless, the relationship between online use and nationalized politics does not require selective exposure to operate. Even a heterogeneous media diet which primarily focuses on national politics would cause individuals to access those national attitudes when making voting decisions, lowering the probability of split-ticket voting. If, instead, selective-exposure is a widespread phenomenon and individuals become more polarized after exposure to online news, then the relationships described here will be heightened.

Even if individuals did *not* have differential preferences for national versus local news, the online environment is still tilted towards national content due to the supply of information. The architecture of the internet prioritizes large national content providers and lowers the probability of local news garnering attention. Hindman (2008) uses web crawlers to determine the linking structure of websites. Websites with more in-links are more likely to be accessed, both directly through those links and, perhaps more importantly, due to Google using in-links as its primary method of ranking search results. Hindman finds that the distribution of in-links in all categories of websites approximates the "power-law", whereby the top websites on a given topic have *exponentially* more in-links than smaller sites. As such, naive searches for political information overwhelmingly lead consumers to national information – not to more specific local coverage of the same issues. This is true across political topics. One could imagine a world where the distribution of news about Congress is more decentralized than news about the presidency – a constellation of high-quality local blogs and news-sources providing in-depth coverage of local members – but this is not the case. Hindman shows that the link structure of websites covering Congress is equally concentrated among large national producers as the link structure of websites covering the presidency.

The collective evidence suggests that when broadband internet is expanded, the balance of information consumed by individuals tilts towards the national and the partisan. Those with access to broadband are less likely to view local news media. This has negative effects for their reception of local considerations, but also harms the community at large through eroding the resources available to local journalism. On top of these changes, when news consumers move online, the content that they both choose and have access to is predominantly about national partisan politics.

Taken together, these factors suggest that the considerations voters possess and give the most weight to in the voting booth will be national in nature. In the remainder of the paper I test three expectations about the impacts of these changes.

The first order question is whether the incumbency advantage rises or falls in areas exposed to broadband internet. The expectation is that Congressional districts that are exposed to more broadband internet will have a lower incumbency advantage than those with lower levels of broadband.

The second question is whether House incumbents are losing their advantage due to an increase in national forces in elections. The expectation is that incumbents facing higher levels of broadband internet in their districts will be more susceptible to national partisan forces. In previous time periods, local information about politics allowed voters to separate their votes for President from their votes for Congress. In an environment where national information about politics dominates this separation is less likely. As such, the expectation is that voting for members of Congress will be more strongly predicted by voting for President in areas with higher levels of broadband.

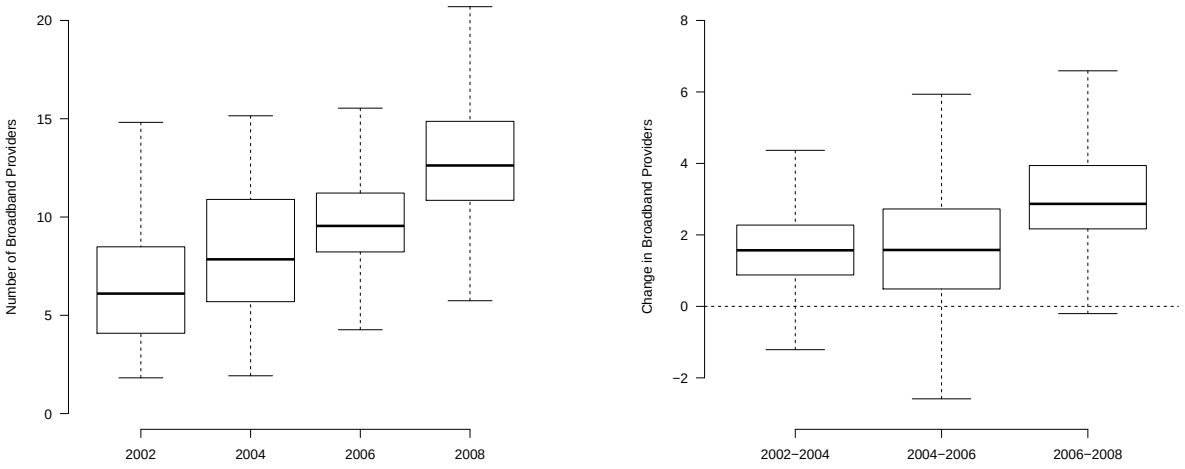
The third question is whether voters are decreasingly likely to punish incumbents for partisan voting. It is assumed that legislators displaying excessive fealty to their parties will be electorally sanctioned by their constituents. "There is no member of either house", reports Mayhew (1974: 99), "who would not be politically injured... by being made to toe a party line on all policies." This assumption has been borne out in data, where a strong negative link has been shown between party unity voting and re-election margins (Carson et al. 2010). This relationship, however, relies on voters having – and caring about – local information over national-partisan concerns. Indeed, evidence that expansion of broadband causes voters to be more affectively polarized (Lelkes et al. 2015), suggests that voters may increasingly *reward* members for being good partisan warriors. The expectation therefore is that voters exposed to broadband will be decreasingly likely to punish their incumbents for excessive partisanship, and indeed, may reward them.

1.2 Roll-out of Broadband Internet

The main independent variable used in this paper to determine the effect of an increasingly dense information environment on political nationalization is the roll-out of broadband internet providers to Congressional districts. I show in Appendix section 4.4 using individual level data from the Current Population Survey Internet Supplement that expansion of broadband providers strongly predicts the probability that individuals have a home broadband subscription. More broadly, this measure has the advantage of frequent across-time measurement while also being

unrelated to time-varying political characteristics of districts.[9]

The measure of broadband internet providers comes from the Federal Communications Commission, which collects bi-annual data from all broadband providers operating in the United States on where they have deployed service. From 1999-2008 the FCC tabulated these results into data listing the number of broadband providers[10] in each zip-code in the United States, which I transformed into Congressional district-year observations.[11] Figure 1.2 displays the levels and changes in the number of broadband providers in Congressional districts over this period, and Figure 1.3 displays the geographic density of broadband across the mainland United States in the year 2002.



(a) Levels of Broadband (b) Changes in Broadband

Figure 1.2: Broadband in House Districts, 2000-2008

The number of broadband internet providers is an indirect measure of the degree to which

[9] See Appendix section 4.3 for tests showing the non-relationship between change in broadband internet access and political characteristics of districts and incumbents.

[10] Broadband providers in this case are identified as the over-arching company which owns the service provider. That is, if two internet service providers have different names but are owned by the same corporation, they are treated as one "provider" in this dataset.

[11] Crossover information for each of the post-redistricting Congressional districts was generated from the Missouri Census Data Center's MABLE/Geocorr2k correspondence engine (http://mcdc.missouri.edu/websas/geocorr2k.html) which allowed transformation of zip-code data. This allowed the construction of a dataset which records the number of broadband providers in each Congressional district in each of the election years from 2000-2008. Note that because the level of broadband in each district is calculated as a weighted average of the number of providers in the zip codes that make up that district the number of providers is not an integer.

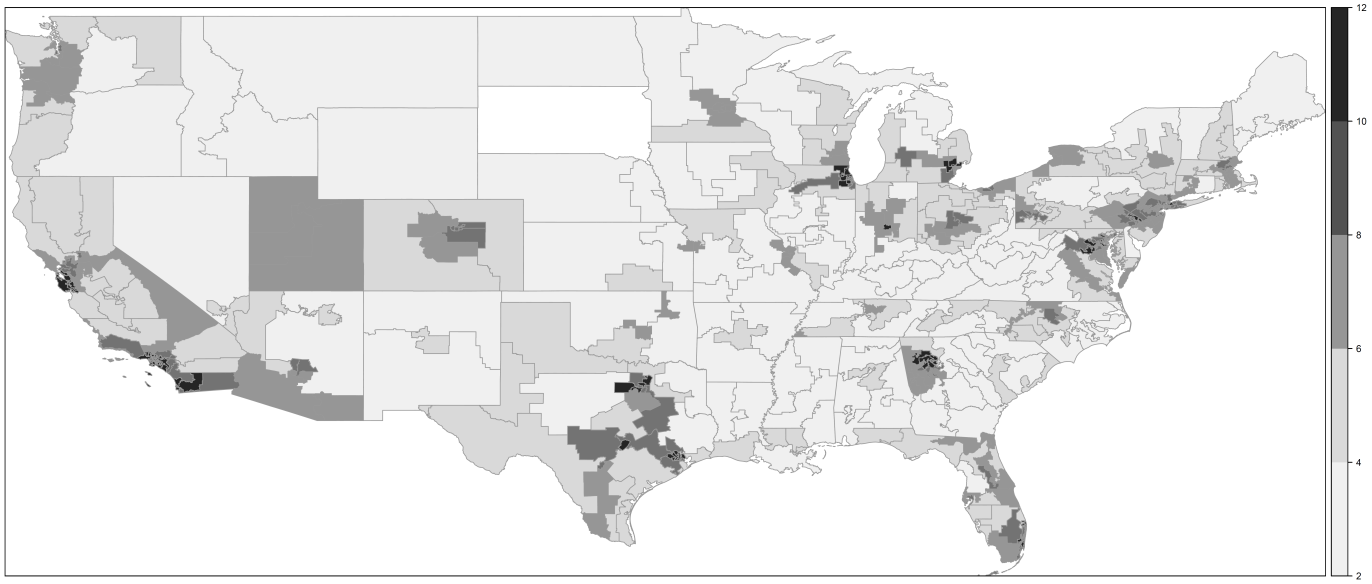


Figure 1.3: Geographic Density of Broadband Providers in Congressional Districts, 2002

people in an area have increased access to information. If a district has five broadband providers operating within it some individuals may have access to one provider, others may have access to three or four, while some may have access to none. At the same time, for a given district an *increase* in the number of broadband providers can only mean either increased competition or access for a new set of customers.

This paper is not the first to use broadband providers as an indicator for greater access to information, and previous research has done much to validate the measure. The number of broadband providers has been found to have the expected effect on the cost and quality of broadband available to an area. Wallsten and Mallahan (2010) analyzed a similar dataset and found that those areas with multiple broadband providers had on-average lower costs and higher internet speeds. Lelkes et al. (2015) show that the number of providers and number of subscribers correlate quite strongly at the cross-sectional county level, a result which has been validated in multiple other papers at differing levels of aggregation (Hitt and Tambe 2007; Kolko 2010). In Appendix section 4.4, I add further validation by matching these broadband data to individual level data from three waves of the Cur-

rent Population Survey Internet Supplement. Leveraging within-county[12] variation, I show that a 100% change in the number of broadband providers in an area is associated with an 11% increase in the probability an individual has a home broadband subscription.[13] We can be confident, in other words, that those areas with more broadband providers are those where more individuals have internet access, at a lower cost, and with higher speeds. As stated above, Lelkes et al. (2015) found that the number of broadband providers has a significant impact on online consumption behavior.

In the main body of the paper I use the broadband level measured in June of the election year as the "signal" affecting that election. In Appendix Section 4.11 I replicate all analyses using a lagged measure of broadband to help determine the time frame of the effects. The results are quite similar, if not slightly stronger, for both the cross-sectional and panel analyses, suggesting that the effect of broadband is persistent (and may even grow) over time.

1.3 Measuring and Identifying the Incumbency Advantage

I merge these data on broadband internet availability with bi-annual House of Representative election outcomes for the 4 elections from 2002-2008.[14] [15] The key election variables are: *% Democratic Vote for House*, the Democratic share of the two party vote for the House of Representatives in a given district-year; and *% Democratic Vote for President*, the Democratic share of the two party vote for President in a given district-year.[16] For all of the below specifications I omit cases where members ran unopposed.[17]

[12] Counties – which are in most cases smaller than Congressional districts – are the most precise geographic indicator available in these data.

[13] It is tempting to back out from this estimate a "compliance rate", which would allow the calculation of a Complier Average Causal Effect. However, to do so we would have to ignore the changes in the *quality* of broadband in an area that occur when more providers arrive. While one important effect of broadband coming to an area is more subscribers, among those who already subscribe additional providers means increasing competition and faster internet speeds (Wallsten and Mallahan 2010). These faster internet speeds will results in qualitatively different consumption patterns.

[14] Data from Jacobson (2015b).

[15] The choice of this time period reflects the period where broadband was going through its most substantial period of growth, where many Americans were getting broadband for the first time or were receiving the cost and speed gains of moving to multiple providers. While the broadband internet data stretches from 1999-2008, I did not want to stretch the panel across a redistricting and therefore use 2002 as a baseline.

[16] *% Democratic Vote for President* values for midterms are simply the value from the previous presidential election.

[17] I show in Appendix section 4.3 that there is no relationship between broadband expansion and whether a member runs unopposed.

The first hypothesis is that the incumbency advantage is expected to decline in areas with greater exposure to broadband. To estimate the incumbency advantage I use the Gelman and King (1990) method[18], which estimates the incumbency advantage by regressing *% Democratic Vote for House* on: an indicator for *Incumbency*, whether there is an incumbent Democrat (1), incumbent Republican (-1), or no incumbent (0); *Party*, whether the seat is held (at the time of the election) by a Democrat (1), Republican (-1), or is a new seat held by neither party (0) ; and *% Democratic Vote for President*, the Democratic share of the two party vote for President in a given district-year. Gelman and King (1990) show that the coefficient on *Incumbency* in such a setup is a consistent and unbiased estimator of the additional votes an incumbent receives over and above what that same candidate would receive in an open seat.

To see whether this relationship alters by the number of broadband providers, I interact *Incumbency* with *ln(Broadband Providers)*.

I first examine this relationship cross-sectionally, estimating the following equation for each district k in each election year (below I also estimate the impact of broadband using a panel design which pools all years):

$$\begin{aligned} \%\text{ Democratic Vote for House}_k &= \alpha_{state} + \beta_1 \text{Party}_k + \beta_2 \text{Incumbency}_k \\ &\quad + \beta_3 \%\text{ Democratic Vote for President}_k \\ &\quad + \beta_4 \ln(\text{Broadband Providers}_k) \\ &\quad + \beta_5 \text{Incumbency}_k * \ln(\text{Broadband Providers}_k) \\ &\quad + \beta_6 \ln(\text{Median Income}_k) + \beta_7 \ln(\text{Population}_k) + \varepsilon_{state} \end{aligned}$$

β_2 is the incumbency advantage when a district has 1 broadband provider, and β_5 is the change in the incumbency advantage for every additional (logged) broadband provider. The expectation is that β_5 will be negative and significant, that is, the incumbency advantage decreases in areas with

[18] As stated above, this measure of the incumbency advantage does not attempt to separate the direct and indirect components, which can be accomplished through a regression discontinuity design. My expectation is that both of these components will be equally affected by a change in the communication environment, so I make no attempt to separate them here.

more exposure to broadband.

The data structure is repeated observations across districts. There are two fundamental issues with these data that need to be resolved to accurately estimate the impact of broadband on elections.

The first is that broadband is non-randomly distributed across time. Specifically, the number of broadband providers increases in each district, across periods. Estimating the impact of broadband cross-sectionally – that is, separately for each election year – alleviates this problem.

The second is that broadband is non-randomly distributed across space. Looking at Figure 1.3, for example, shows clearly that broadband density is much higher in more populated areas. If more populated areas also have more nationalized politics, then not controlling for this factor would bias the results. The cross-sectional estimation strategy deals with this issue in two ways. First, I employ state fixed effects. Including an intercept for each state forces the model to only consider variation *within* states. This controls, for example, for states like California having generally higher levels of broadband than states like North Dakota. Second, I include demographic variables to control for observational differences in districts within states. In the models presented in the paper I control for population and income, the two most likely factors to drive broadband deployment. In Appendix Section 4.7 I further show that the results are unchanged by including a full range of control variables: median age of the district, the percent of the district living in poverty, the percent of the district identifying as white & black, as well as the percent of the district who have bachelor degrees.

Any remaining source of bias must be due to within-state differences in districts that both: (1) affect politics; and (2) are uncorrelated with the district demographics used in either the main models or in the appendix. Below, I present a more stringent test of the effect of broadband by pooling together the data across years and examining how within-district changes in broadband affect within-district changes in the incumbency advantage. The results are broadly consistent with those found by leveraging within-state cross-sectional variation.

1.4 Broadband Attenuates the Incumbency Advantage

Table 1.1 displays the results for the cross-sectional analyses of the effect of broadband on the incumbency advantage, by year. The coefficient on *Incumbency* indicates the impact of being an incumbent versus running in an open seat in districts where the number of broadband providers is 1. As expected, each of these coefficients is positive and statistically significant, indicating that incumbency does indeed increase vote share. The key coefficient is on the interaction between *Incumbency* and *Broadband Providers*. The expectation is that as the number of broadband providers increases, the impact of incumbency on vote share should decrease. This is just what we see. In each election year the effect of a district having more broadband providers is to decrease the incumbency advantage. From 2004-2008 this effect is of a magnitude to confidently reject the null hypothesis that broadband does not attenuate the impact of incumbency. In 2002 the effect is slightly weaker: there is a 10.1% chance of a result this extreme if the null hypothesis was true.

Table 1.1: Effect of Communication Environment on Incumbency Advantage

	% Democratic Vote for House$_k$			
	2002	**2004**	**2006**	**2008**
Party Now$_k$	4.50*	4.22*	4.04*	2.89*
	(1.50)	(1.30)	(1.16)	(1.05)
Incumbency$_k$	10.56*	11.24*	13.94*	20.61*
	(2.52)	(2.46)	(4.28)	(4.69)
% Democratic Vote for President$_k$	0.72*	0.72*	0.65*	0.70*
	(0.09)	(0.06)	(0.06)	(0.05)
log(Broadband Providers$_k$)	−3.04	−2.08	−3.28	0.26
	(2.51)	(1.95)	(3.39)	(3.15)
Incumbency$_k$*log(Broadband Providers$_k$)	**−1.92**	**−2.29***	**−3.56***	**−5.66***
	(1.17)	(0.87)	(1.74)	(1.82)
log(Median Income$_k$)	0.24	−1.42	−1.14	−4.21*
	(3.11)	(1.47)	(2.01)	(1.59)
log(Population$_k$)	−30.89	10.54	4.56	3.17
	(18.47)	(9.22)	(7.14)	(4.15)
State F.E.	Yes	Yes	Yes	Yes
N	333	360	371	369
R-squared	0.93	0.94	0.92	0.92
Residual Std. Error	5.69 (df = 277)	4.90 (df = 305)	5.25 (df = 314)	5.23 (df = 314)

*p $<$ .05; Cluster(State)-Robust Standard Errors

Given that the number of broadband providers is logged, and that the range of providers constantly shifts upwards in each election year, it is difficult to understand the substantive effects solely

from Table 1.1. I therefore visualize the effects of broadband in Figure 1.4. For each election year I plot the incumbency advantage (which is simply the marginal effect of incumbency from the models above) for two levels of broadband: the minimum number of providers in that year, and the median number of providers in that year.

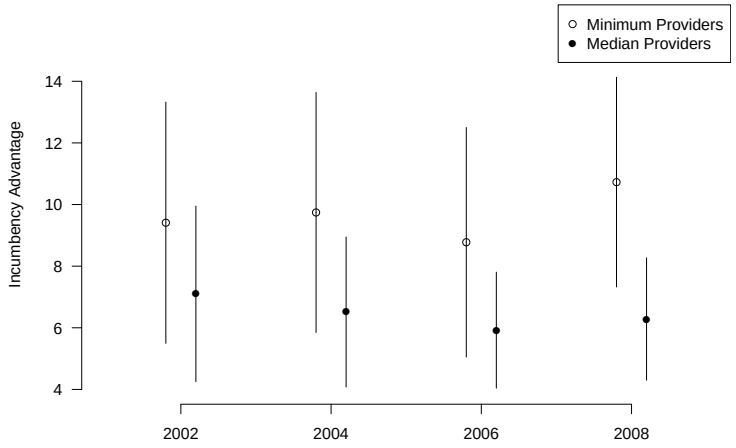


Figure 1.4: Effect of Broadband on Incumbency Advantage by Year

Given the weaker-result for 2002, it is unsurprising that the difference between the two estimates is smallest in that year. At the minimum number of broadband providers running as an incumbent versus running in an open seat is worth 9.41 percentage points, while at the median number of broadband providers the advantage is 7.10. In 2004, the incumbency advantage stays roughly the same for those at the minimum number of providers at 9.74 percentage points, but at the median number of providers the advantage drops substantially to 6.51 percentage points, a difference of 3.23. In 2006 all incumbents received less of a bump (likely due to the Democratic wave in that election), whereby incumbents at the minimum number of providers saw a 8.78 percentage point bump, and incumbents at the median number of providers saw a 5.92 percentage point jump. Finally, 2008 saw the largest impact of broadband. Districts at the minimum number of providers offered a 10.73 percentage point bump to incumbents, while districts at the median number of providers offered a 4.44 percentage point bump, a 6.3 point difference.

This estimation supports the hypothesis that the incumbency advantage is greatly diminished by exposure to broadband internet. The ability for incumbents to win a share of the vote greater than expected based on the partisan conditions in their districts relies, in part, on voters holding considerations about local conditions; whether those considerations are about the quality of the incumbent, or what that incumbent has done for the district (Arnold 2013; Prior 2006; Schaffner 2006; Snyder and Strömberg 2008). As broadband has eroded the local sources that provide those considerations, citizens go to the ballot box without the information needed to support the incumbency advantage. Areas with higher levels of broadband internet do not see the incumbency advantage attenuate to zero, but the reduction is substantively significant

Overall, these differences are quite stark and point to the information environment playing an increasingly large role in determining the degree to which incumbency drives elections. This result alone tells us that voters exposed to broadband internet are increasingly using a decision metric orthogonal to incumbency to make their voting decisions, not what that decision metric is. The next section investigates whether this may be attributable to individuals' national-partisan attitudes.

1.5 Measuring the Impact of Partisan Voting on Incumbent Re-Election

Voters increasingly using partisan cues to make their voting decisions is a strong candidate for why increasing broadband decreases the incumbency advantage. Recall that the incumbency advantage *requires* at least some voters to cast split-tickets: offering a personal vote to an incumbent despite that incumbent coming from their out-party. If individuals increasingly vote in-line with their partisan identities – a clear prediction from previous literature on the effects of broadband internet – then the incumbency advantage will be reduced.

To examine whether increasing partisan voting is behind the relationship between broadband internet and a decreasing incumbency advantage I test two hypotheses: whether an incumbent's re-election numbers are increasingly influenced by presidential politics in areas with high broadband connectivity; and whether an incumbent's re-election numbers are decreasingly influenced by their

partisan behavior in areas with high broadband connectivity. To answer these questions I confine the data to incumbents facing re-election, and examine the conditional impact of two variables: *Same Party Presidential Vote*, the presidential vote in an incumbent's district re-coded to be in the direction of the incumbent's party; and *Party Unity*, the incumbent's VoteView Party Unity score in the Congress previous to the election. This latter score calculates the percentage of roll-call votes a legislator voted with their party on "party-votes", votes where the majority of one party votes against the majority of the other party. The median member votes with their party 91% of the time on such votes, while the standard deviation is 10%.

There are clear unconditional expectations for both of these variables. A positive coefficient on *Same Party Presidential Vote* represents down-ballot effects. If a Republican member is running in a district with higher support for a Republican presidential candidate, then that member is expected to do better. The larger the coefficient on *Same Party Presidential Vote*, the more "nationalized" elections are, where the dynamics of the presidential race increasingly impact House races. For *Party Unity*, existing research suggests that frequently voting with one's party is an electoral liability (Carson et al. 2010). The expectation, therefore, is that the unconditional coefficient on this variable will be negative.

The main hypothesis is the degree to which these relationships are conditioned by the information environment. To test this I estimate the following two specifications in each election year for each incumbent j:

$$\begin{aligned}
\%\ \text{Incumbent Vote}_j \;=\; & \alpha_{state} + \beta_1 \text{Party}_j \\
& + \beta_2 \text{Same Party Presidential Vote}_j + \beta_3 \ln(\text{Broadband Providers}_j) \\
& + \beta_4 \text{Same Party Presidential Vote}_j * \ln(\text{Broadband Providers}_j) \\
& + \beta_5 \ln(\text{Median Income}_j) + \beta_6 \ln(\text{Population}_j) + \varepsilon_{state}
\end{aligned}$$

$$
\begin{aligned}
\%\ \text{Incumbent Vote}_j \quad = \quad & \alpha_{state} + \beta_1 \text{Party}_j \\
& + \beta_2 \text{Party Unity}_j + \beta_3 \ln(\text{Broadband Providers}_j) \\
& + \beta_4 \text{Party Unity}_j * \ln(\text{Broadband Providers}_j) \\
& + \beta_5 \ln(\text{Median Income}_j) + \beta_6 \ln(\text{Population}_j) + \varepsilon_{state}
\end{aligned}
$$

In each, a positive coefficient on the interaction term is expected. The impact of national electoral forces (represented by *Same Party Presidential Vote*) is expected to increase in districts with more broadband providers. Further, the impact of a legislator's personal partisan conduct is expected to cease to be a liability in districts with higher numbers of broadband providers. As above, these equations are estimated with state fixed-effects, such that incumbents are only being compared to other incumbents within their states. I also include a dummy variable for party, which controls for any differences in the electoral fortunes of parties in a given year. Finally, I include two demographic features which may effect both the level of broadband and politics: population and income. In Appendix section 4.7 I show that all of these relationships are robust to including a full range of demographics (age, education, race, and poverty status), as well as to omitting all demographics.

1.6 Broadband Increases the Impact of Party on House Elections

Table 1.2 presents the results for the conditional effects of presidential voting on House elections. The expectation here is that when the presidential candidate of the same party as the incumbent has a higher vote share, that incumbent will also do better in their election. Further, this relationship should be greater in areas better served by broadband. Put another way, in areas better served by broadband there should be less split-ticket voting and a greater "down-ballot" effect. In line with this expectation, the coefficient on the interaction between *Same-Party Presidential Vote* and *Broadband Providers* is uniformly positive across all years. From 2004-2008 the interaction

effect is statistically significant, however in 2002 I am unable to reject the null hypothesis that broadband does not moderate the impact of Presidential vote.

Table 1.2: Effect of Presidential Voting on Incumbent Vote Share

	% Incumbent Vote$_j$			
	2002	**2004**	**2006**	**2008**
log(Broadband Providers$_j$)	−2.34	−16.14*	−24.00*	−19.32
	(7.68)	(7.04)	(8.96)	(10.13)
% Same Party Presidential Vote$_j$	0.12	−0.02	−0.48	−0.21
	(0.24)	(0.27)	(0.34)	(0.42)
% Same Party Presidential Vote$_j$*log(Broadband Providers$_j$)	**0.10**	**0.28***	**0.45***	**0.31***
	(0.13)	(0.12)	(0.14)	(0.16)
Republican$_j$	1.27	−2.84*	−10.17*	−2.50*
	(1.07)	(0.99)	(1.39)	(0.94)
log(Population$_j$)	−11.93	−0.26	15.77	−5.22
	(22.70)	(9.35)	(11.79)	(5.34)
log(Median Income$_j$)	−9.33*	−3.75*	−7.14*	−5.15*
	(2.98)	(1.65)	(1.94)	(1.21)
State F.E.	Yes	Yes	Yes	Yes
N	296	329	340	334
R-squared	0.55	0.73	0.74	0.78
Residual Std. Error	6.01 (df = 242)	4.58 (df = 275)	5.37 (df = 285)	4.99 (df = 282)

*p $<$ .05; Cluster(State)-Robust Standard Errors

Once again to understand the substantive impact of different levels of broadband, Figure 1.5 displays the impact of Same Party Presidential vote on incumbent vote share in each election year, once for districts with the minimum number of providers and once for districts with the median number of providers.

Unsurprisingly, all of the estimates are positive. Whatever the level of broadband, when the presidential candidate of the same party as the incumbent has a higher vote share, that incumbent also does better in their election. However, it is also clear that in districts with more broadband providers this effect is stronger. In line with the null result in Table 1.2 the difference between the two estimates is smallest in 2002, with incumbents in districts with the minimum number of providers receiving .18 additional votes for every 1 additional vote cast for the presidential candidate of the same party, and incumbents in districts with the median number of providers receiving .3 additional votes. The moderating effect of broadband becomes much larger in subsequent years. In 2004, being an incumbent in a district with a median number of providers means receiving an additional .4 votes for every vote gained by the presidential candidate of your same party com-

pared to an incumbent in a district with a minimum number of providers. This difference declines in subsequent years to a still robust .35 in 2006 and .25 in 2008.[19]

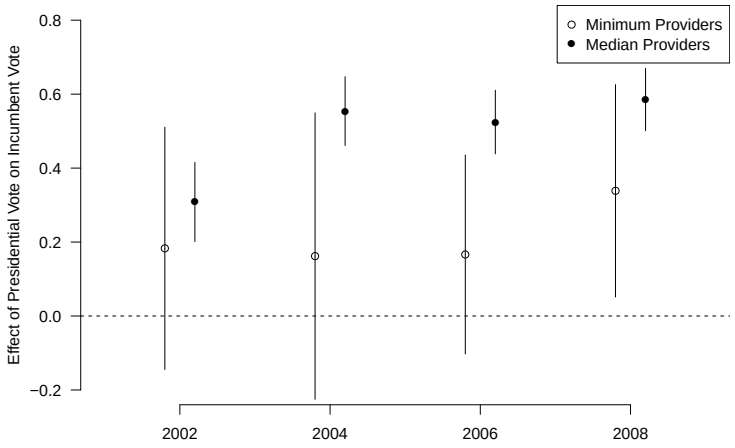


Figure 1.5: Effect of Broadband on Presidential Voting by Year

Overall the pattern of results is indicative of national politics more strongly driving Congressional elections in areas better served by broadband. While in the above I've discussed the impact of presidential vote as a positive – the candidate of the same party as the incumbent attracting more support and therefore boosting their re-election numbers – these effects are symmetrical, and also mean that if the presidential candidate of an incumbent's party does *worse* it will lower the odds of re-election. What is important is that these results indicate an electoral environment where decisions at the top of the ballot are driving results in lower races. As discussed above, when voters act in such a manner it means that they are no longer reacting to what their representative does – good or bad – and changing their vote accordingly.

In Table 1.3 we see one such example of how the expansion of broadband and subsequent

[19] In Appendix Section 4.10 I re-estimate these equations without the assumption that presidential vote affects House vote in a linear fashion. Doing so shows that the biggest impact of broadband is on the most marginal members. The expectation is that presidential vote should, in general, have less of an effect in marginal districts. These are elections where voters are paying the closest attention and are therefore the leas likely to use their partisanship/presidential vote as a heuristic for decision making. The results show that this is the case, but only in districts with a low number of broadband providers. As the number of broadband providers increases the effect of presidential vote on House vote becomes increasingly linear, operating in a similar fashion no matter the marginality of the election.

increase in nationalized voting can impact the incentives of politicians. Previous work suggest that when legislators vote more with their parties (i.e. when they have higher Party Unity Scores) they will face electoral sanction. Looking at the coefficients on Party Unity in the table – which represent the expected effect of Party Unity voting in a district with 1 provider – this seems to be the case, with coefficients in each model being negative. The expectation is that as the level of broadband increases this effect will attenuate to zero. The coefficients on the interaction between Party Unity and broadband confirm this. In each year the coefficient on the interaction term is positive and significant.

Table 1.3: Effect of Party Unity on Incumbent Vote Share

	% Incumbent Vote$_j$			
	2002	**2004**	**2006**	**2008**
log(Broadband Providers$_j$)	-25.13^*	-34.83	-58.00^*	-43.60
	(12.66)	(18.10)	(21.21)	(25.64)
Party Unity$_j$	-0.39	-0.56	-1.39^*	-1.23
	(0.25)	(0.37)	(0.51)	(0.64)
Party Unity$_j$*log(Broadband Providers$_j$)	**0.35***	**0.44***	**0.76***	**0.60***
	(0.14)	(0.19)	(0.23)	(0.27)
Republican$_j$	0.45	-1.66	-8.17^*	-3.26
	(1.40)	(1.10)	(1.39)	(1.90)
log(Population$_j$)	-18.18	-14.87	5.37	-15.72
	(28.38)	(17.39)	(13.93)	(10.65)
log(Median Income$_j$)	-14.55^*	-13.67^*	-14.59^*	-16.47^*
	(4.72)	(4.64)	(3.79)	(3.92)
State F.E.	Yes	Yes	Yes	Yes
N	296	329	340	334
R-squared	0.43	0.44	0.58	0.53
Residual Std. Error	6.77 (df = 242)	6.60 (df = 275)	6.87 (df = 285)	7.32 (df = 282)

$^*p < .05$; Cluster(State)-Robust Standard Errors

To understand the substantive impacts of these coefficients I again plot the marginal effect of Party Unity voting for incumbents in districts with the minimum and median levels of broadband providers in Figure 1.6. At the minimum number of broadband providers the effect of Party Unity voting on incumbent vote share is negative, though imprecisely estimated. At the median level of broadband providers, however, Party Unity voting not only ceases to be a liability but becomes a *benefit* for re-election. An additional point of Party Unity voting for incumbents living in districts with the median number of broadband providers is worth around .3 percentage points extra vote

share.

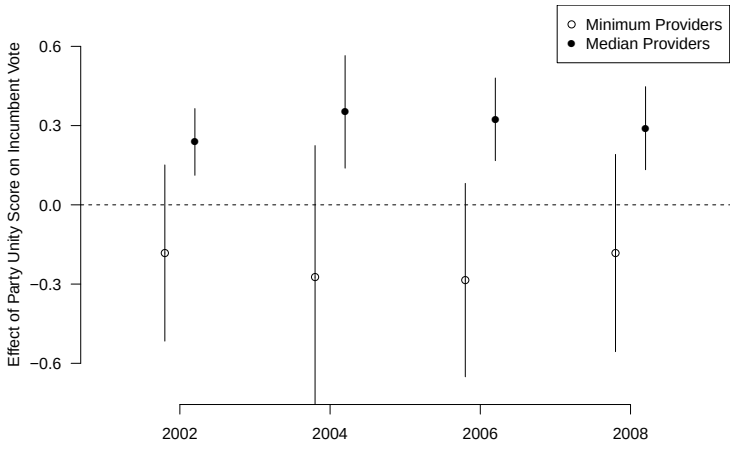


Figure 1.6: Effect of Broadband on Party Unity Voting by Year

Of course, this also operates in the opposite direction. The traditional view of the incumbency advantage is that it is cultivated, in-part, through non-partisan or bi-partisan activities which encourage cross-partisan support at home. For incumbents in districts with more broadband providers this strategy – voting against ones party to seek support at home – is likely to backfire. Members with lower Party Unity scores are expected to do worse in their re-election bids, all things being equal.[20]

Both of these results speak clearly to national politics more strongly driving races at the district level. The incumbency advantage relies on citizens having and using idiosyncratic local evidence to drive their voting decisions, evidence that has been eroded in the modern communication environment. As a result, elections at the district level are increasingly driven by Presidential elections. Further, where Party Unity scores ceased to be a liability, the expanding communication environment has attenuated this effect, and indeed, generated a situation where Party Unity voting may be seen as an electoral benefit.

[20]In Appendix Section 4.9 I examine the conditional effects by party. While I have no specific hypothesis about whether these effects should operate differently for Democrats and Republicans, I do find that these results are primarily driven by the changing electoral fortunes of Democratic members.

In sum, these effects have clearly altered the incentives for members. While in the past members were encouraged to go against their parties and "vote their constituency"(Mayhew 1974: 100) in order to secure re-election, they are instead increasingly incentivized to ensure the presidential candidate of their party has success, and to increasingly walk in lock-step with party leadership in the legislature.

1.7 Leveraging Over-Time Variation

While the above cross-sectional results rule out a great deal of confounding variation, there may remain unobservable confounding features of districts or members that are related to both the roll-out of broadband and political outcomes. An additional method to control for these unobserved factors is to pool all of the years together and include fixed-effects for both districts (or incumbents) and years.

To investigate the effect of incumbency conditional on the information environment using this setup I estimate the equation:

$$\begin{aligned} \%\text{ Democratic Vote for House}_{kt} &= \alpha_k + \alpha_t + \beta_1 \text{Party}_{kt} + \beta_2 \text{Incumbency}_{kt} \\ &\quad + \beta_3 \%\text{ Democratic Vote for President}_{kt} \\ &\quad + \beta_4 \ln(\text{Broadband Providers}_{kt}) \\ &\quad + \beta_5 \text{Incumbency}_{kt} * \ln(\text{Broadband Providers}_{kt}) \\ &\quad + \beta_6 \ln(\text{Median Income}_{kt}) + \beta_7 \ln(\text{Population}_{kt}) + \varepsilon_k \end{aligned}$$

By including fixed effects for districts (α_k) I omit all non-time-varying features of districts. That is, any fixed feature of a district is removed, meaning that variation comes from *within*-district changes in the number of broadband providers. Bias can no longer come from any feature of districts – such as urban or rural status – that does not change over time. By including fixed effects for years (α_t) I omit all non-district-varying features of years. Most importantly this controls for the time trend; but also for different political outcomes in each year. Together, these two sets

of fixed effects remove many of the possible sources of bias.

Any remaining source of bias must be due to systematic differences in within-district changes in broadband internet that are above and beyond what would be expected due to the national growth of broadband. To deal with such sources of bias, I control for two *time-varying* features of districts that could affect the results: (logged) population and (logged) median income.[21] I include these two simple economic controls for parsimony, but also show in Appendix section 4.6 that all relationships are robust to including time-varying controls for the median age of the district, the percent of the district living in poverty, the percent of the district identifying as white & black, as well as the percent of the district who have bachelor degrees. Appendix section 4.6 further shows that the results are robust to including no demographic covariates. Another possible source of bias is if certain types of politicians are able to encourage broadband internet to expand to their districts. I investigate this in Appendix section 4.3 and find no evidence of this possibility.[22]

I extend the same logic to examine the conditional effects of presidential voting and Party Unity scores, with the only difference being fixed effects for incumbents instead of districts:

$$\begin{aligned} \%\ \text{Incumbent Vote}_{jt} \quad = \quad & \alpha_j + \alpha_t * \text{Party}_{jt} \\ & + \beta_1 \text{Same Party Presidential Vote}_{jt} + \beta_2 \ln(\text{Broadband Providers}_{jt}) \\ & + \beta_3 \text{Same Party Presidential Vote}_{jt} * \ln(\text{Broadband Providers}_{jt}) \\ & + \beta_4 \ln(\text{Median Income}_{jt}) + \beta_5 \ln(\text{Population}_{jt}) + \varepsilon_j \end{aligned}$$

[21] Data for these variables – as well as the other demographic controls used in the Appendix – were generated from Census (2000) and American Community Survey 1-year estimates (2006,2008) data. Entries for 2002 and 2004 were linearly interpolated from these data. As such, these data capture the time-varying nature of these variables.

[22] In Appendix section 4.3, I discuss how the statutory rules of the FCC largely excludes this possibility, and that there is no relationship between the variation captured to identify the effect of broadband internet and legislator characteristics.

$$
\begin{aligned}
\%\ \text{Incumbent Vote}_{jt} \quad = \quad & \alpha_j + \alpha_t * \text{Party}_{jt} \\
& + \beta_1 \text{Party Unity}_{jt} + \beta_2 \ln(\text{Broadband Providers}_{jt}) \\
& + \beta_3 \text{Party Unity}_{jt} * \ln(\text{Broadband Providers}_{jt}) \\
& + \beta_4 \ln(\text{Median Income}_{jt}) + \beta_5 \ln(\text{Population}_{jt}) + \varepsilon_j
\end{aligned}
$$

These tests improve on the cross-sectional results above by better controlling for unobservable differences between districts and members, but they are not a panacea for all problems.

By forcing the model to look within units the models throw out both good and bad variation. It is true that some of the variation between units may be due to confounding variables, but other between-unit variation may represent important differences in outcomes that are the result of broadband. Squashing the variation being studied these models therefore increase the probability of type-2 errors.

Even with year fixed effects there is the possibility of bias caused by time trends. These tests assume assume "parallel trends" in the potential outcomes for treated and untreated units. That is, in the absence of treatment those districts more likely to receive broadband and those less likely to receive broadband would have equivalent outcomes. It is possible that this setup violates this assumption.

Further, while time fixed-effects effectively deal with the problem of a time-trend in levels, there is an additional potential problem with these data whereby the *effect* of variables like *Incumbency* and *Same Party Presidential Vote* also have an important trend. That is, the effects of both of these variables were changing monotonically in this period alongside broadband. A significant result for a moderating effect of broadband on this variable may be due to changes in the levels of broadband being related to changes in the effect of these variables through their mutual relation to a time trend.

I deal with these potential problems in three ways. First, in Appendix Section 4.5, I perform

a placebo test by merging the broadband data with election results from the 1990s. If problematic trends are driving the main panel results then future changes in broadband ought to drive past changes in nationalization. Nationalization was also increasing in the 90s (i.e. incumbency was becoming less impactful and presidential voting was increasingly driving House elections), so if the main results are invalid we would expect to see a significant result in the placebo test. This is not what I find, lending credibility to the main panel results. A second way I deal with this problem is to interact the time fixed effects with the potentially problematic variables in the above specifications. This conservative model brings overall weaker effects – particularly for the effect of presidential voting on House voting – which I discuss below. Third, in Appendix Section 4.8 I restrict the sample to years in which there is not a problematic trend in the effects of these variables. These tests produce similar results to the main analyses, again giving confidence to their validity.

1.8 Does Broadband Decrease the Incumbency Advantage?

The first column of Table 1.4 estimates the standard panel model for the incumbency advantage conditional on broadband levels. The coefficient on *Incumbency* represents the impact of running as an incumbent versus running in an open seat in a district with a low rate of broadband connectivity (1 broadband provider), and is quite high at around 12%. The coefficient on the interaction term represents how the incumbency bias changes as the number of broadband providers increases. Consistent with the cross-sectional results, this coefficient is negative, indicating that a 100% change in the number of broadband providers decreases the incumbency advantage by around 2.7 percentage points.[23]

The second column of Table 1.4 displays the results for the more conservative model where *Incumbency* is interacted with the time fixed-effects. Indeed, these *Incumbency*Year* interactions

[23]To understand the effect of broadband on the change in an individual's probability of supporting an incumbent, we would have to know the rate of compliance to treatment and calculate a Complier Average Causal Effect (CACE): the effect size divided by the proportion of the population who are compliers. It is tempting to back this out from the CPS validation above. However, using this estimate on the effect of the number of providers on subscription rates would ignore the changes in the *quality* of broadband in an area that occur when more providers arrive. While one important effect of broadband coming to an area is more subscribers, among those who already subscribe additional providers means increases competition and faster internet speeds (Wallsten and Mallahan 2010). These faster internet speeds mean qualitatively different consumption patterns.

show that the incumbency advantage became smaller in 2004 compared to 2002, and smaller again in 2006. Soaking up this variation attenuates the moderating impact of broadband, which was also growing during this period. The coefficient on the interaction term is in the expected negative direction, and indicates that a 100% increase in the number of broadband providers leads to a .69 percentage point decrease in the incumbency advantage. The probability of a result this extreme if the null result is true is 38%.

Turning to the estimation of the conditional effect of partisan forces on incumbent's re-election margins, Table 1.5 presents how the presidential vote in a district affects members' reelection chances, and how that effect is altered by the communication environment. Column 1 presents the traditional panel setup. The coefficient on *Same Party Presidential Vote* indicates the effect of that variable for incumbents with 1 broadband provider in their district. This coefficient is close to 0 and imprecisely estimated, indicating that at low levels of broadband internet connectivity there is no relationship between the presidential vote in a district and an incumbent's re-election margin. This suggests that nationalized politics – House incumbents whose fortunes are strongly tied to presidential politics – is not present in those districts with a low number of broadband providers.[24] The coefficient on the interaction term, however, is positive and has a standard error of a magnitude where I can reject the null hypothesis of a coefficient equal to zero. This indicates that as the number of broadband providers increases the impact of presidential vote on incumbent vote margins increases.

Column 2 presents the more conservative model where *Same Party Presidential Vote* is interacted with the time fixed effects. The interactions between this key variable and the time dummies indicate that the effect of this variable rises monotonically throughout the period. After removing this variation, the moderating effect of broadband moves past 0 and appears to operate in the opposite direction. The coefficient indicates that as the number of broadband providers increases

[24]While this finding may seem surprising, note that this relationship is for variation *within*-incumbent. While there is certainly a relationship between presidential vote and House vote cross-sectionally, under conditions favoring "local" voting it's not clear that there should be a within-incumbent relationship between presidential vote and their own re-election probabilities.

Table 1.4: Effect of Communication Environment on Incumbency Advantage

	% Democratic Vote for House$_{kt}$	
Incumbency$_k$	11.91*	9.03*
	(1.21)	(1.58)
log(Broadband Providers$_k$)	−0.08	−0.43
	(0.89)	(0.87)
Incumbency$_{kt}$*log(Broadband Providers$_k$)	**−2.68***	**−0.69**
	(0.46)	(0.78)
Party Now$_k$	0.67	0.68
	(0.77)	(0.78)
% Democratic Vote for President$_k$	0.53*	0.52*
	(0.08)	(0.08)
log(Median Income$_k$)	1.94	2.58
	(5.47)	(5.51)
log(Population$_k$)	4.76	−0.23
	(9.01)	(9.65)
2004	2.14*	2.32*
	(0.46)	(0.47)
2006	6.30*	6.60*
	(0.75)	(0.79)
2008	3.41*	4.06*
	(0.97)	(1.03)
Incumbency$_k$*2004		−0.91*
		(0.38)
Incumbency$_k$*2006		−2.37*
		(0.50)
Incumbency$_k$*2008		−2.10*
		(0.73)
District F.E.	Yes	Yes
N	1433	1433
R-squared	0.57	0.58

*p $<$ .05; Cluster(State)-Robust Standard Errors

the effect of presidential voting on House voting *decreases*. This result runs counter to the posited theory (and indeed, to much of the other results).

Table 1.5: Partisan Effects Conditional on Information Environment I

	% Incumbent Vote$_{jt}$	
Same Party Presidential Vote$_{jt}$	−0.03	0.43*
	(0.14)	(0.19)
log(Broadband Providers$_{jt}$)	−4.30	10.62*
	(2.84)	(5.31)
Same Party Presidential Vote$_{jt}$*log(Broadband Providers$_{jt}$)	**0.12***	**−0.13**
	(0.05)	(0.09)
log(Population$_{jt}$)	14.86	18.31*
	(9.58)	(9.13)
log(Median Income$_{jt}$)	−6.53*	−6.31*
	(3.21)	(2.82)
2004	−0.67	−10.86*
	(0.56)	(2.60)
2006	1.00	−10.43*
	(0.75)	(3.36)
2008	−1.03	−19.20*
	(0.93)	(4.82)
Republican$_{jt}$*2004	−3.52*	−3.40*
	(0.67)	(0.67)
Republican$_{jt}$*2006	−12.00*	−11.46*
	(0.74)	(0.75)
Republican$_{jt}$*2008	−9.53*	−8.09*
	(1.08)	(1.02)
Same Party Presidential Vote$_{jt}$*2004		0.17*
		(0.04)
Same Party Presidential Vote$_{jt}$*2006		0.19*
		(0.05)
Same Party Presidential Vote$_{jt}$*2008		0.29*
		(0.07)
Member F.E.	Yes	Yes
N	1299	1299
R-squared	0.43	0.45

*p $<$ .05; Cluster-Robust Standard Errors

Finally Table 1.6 displays the results for the conditional impact of Party Unity voting on incumbent vote margin. Here the expectation is that excessive Party Unity voting will be an electoral

liability, but this negative effect will be attenuated as the number of broadband providers increases. Column 1 presents the standard panel model. The coefficient on *Party Unity* is negative and significant, lending support – at least for districts with low broadband internet connectivity – to the hypothesis that incumbents pay an electoral cost for voting in lock-step with their parties in the legislature. The coefficient on the interaction term indicates that as the number of broadband providers increases the effect of Party Unity attenuates to zero. This relationship is displayed visually in Figure 1.7. While the effect of Party Unity is imprecisely estimated at all levels, the trend makes it clear that those incumbents facing increasing broadband connectivity are far less likely to face electoral sanctions for voting with their party. Indeed, there is an increasing probability that these legislators may gain a *reward* for their partisan behavior. [25]

Column 2 presents the results for the more conservative model where the coefficient for Party Unity is interacted with the time fixed effects. In this case there is no clear evidence of a time-trend in the effect of Party Unity. In line with this, the coefficient on the interaction term is relatively unchanged in this model (and indeed, becomes slightly stronger). The precision on this estimate is lower, however. The probability of observing a result this extreme if the null were true is 15%.

Taken together, these tests provide compelling additional evidence that an expansion of the information environment in Congressional districts had a negative effect on incumbency through increasing the weight of national considerations in legislative elections. Looking at the traditional panel results, areas with faster than expected rates of broadband internet growth saw a greatly reduced incumbency advantage. Electoral margins of incumbents in those areas were more affected by "down-ballot" effects, which necessarily reduces an incumbent's personal vote. Further, the electoral sanction for excessive partisanship erodes in districts with high broadband connectivity. The roll-out of broadband internet quite clearly had a significant role in nationalizing elections.

[25] One possible issue with these results is that they make use of an unbalanced panel. If incumbents lose re-election they are no longer represented in the data. To investigate the impact of this, I subset the data to representatives who have an observation in all 4 election years. This reduces the n from 1299 to 847, thus reducing the statistical power. Restricting the data in this way also truncates the dependent variable, as no electoral losers are represented. This being said, the point estimates remain approximately of the same magnitude, albeit with slightly inflated standard errors. The coefficient on the interaction term for presidential vote is 0.10(0.05), and for Party Unity the coefficient on the interaction is .12(.063).

Table 1.6: Partisan Effects Conditional on Information Environment II

	% Incumbent Vote$_{jt}$	
Party Unity$_{jt}$	-0.28^{*}	-0.34
	(0.14)	(0.19)
log(Broadband Providers$_{jt}$)	-8.66	-12.13
	(4.93)	(10.24)
Party Unity$_{jt}$*log(Broadband Providers$_{jt}$)	**0.12***	**0.16**
	(0.06)	(0.11)
log(Population$_{jt}$)	12.32	12.40
	(9.92)	(9.99)
log(Median Income$_{jt}$)	-6.83^{*}	-6.91^{*}
	(2.85)	(2.84)
2004	-0.12	-3.36
	(0.55)	(5.59)
2006	1.61^{*}	2.02
	(0.73)	(8.02)
2008	1.17	6.47
	(0.96)	(12.40)
Republican$_{jt}$*2004	-3.56^{*}	-3.64^{*}
	(0.70)	(0.69)
Republican$_{jt}$*2006	-11.94^{*}	-11.98^{*}
	(0.79)	(0.80)
Republican$_{jt}$*2008	-12.27^{*}	-12.40^{*}
	(1.18)	(1.24)
Party Unity$_{jt}$*2004		0.04
		(0.06)
Party Unity$_{jt}$*2006		-0.004
		(0.09)
Party Unity$_{jt}$*2008		-0.06
		(0.13)
Member F.E.	Yes	Yes
Election Year*Party F.E.	Yes	Yes
N	1299	1299
R-squared	0.39	0.39

$^{*}p < .05$; Cluster-Robust Standard Errors

The results were somewhat weaker when attempting to correct for the problematic trends in the effects of *Incumbency* and *Same Party Presidential Vote* by interacting these variables with the time trends. With a maximum of four observations for each legislator these models are asking a lot of the data, and it is difficult to conceptualize (1) what variation in broadband is being leveraged; and (2) what confounding variable exists as to flip the sign on *Same Party Presidential Vote*. There is a possibility, for example, that by including these fixed-effect interactions I am introducing post-treatment bias. By accounting for the ever decreasing impact of presidential voting *in* the model, it may make it impossible for broadband to moderate its effect, because that moderating effect is already captured in the *Year*Same Party Presidential Vote* coefficient.

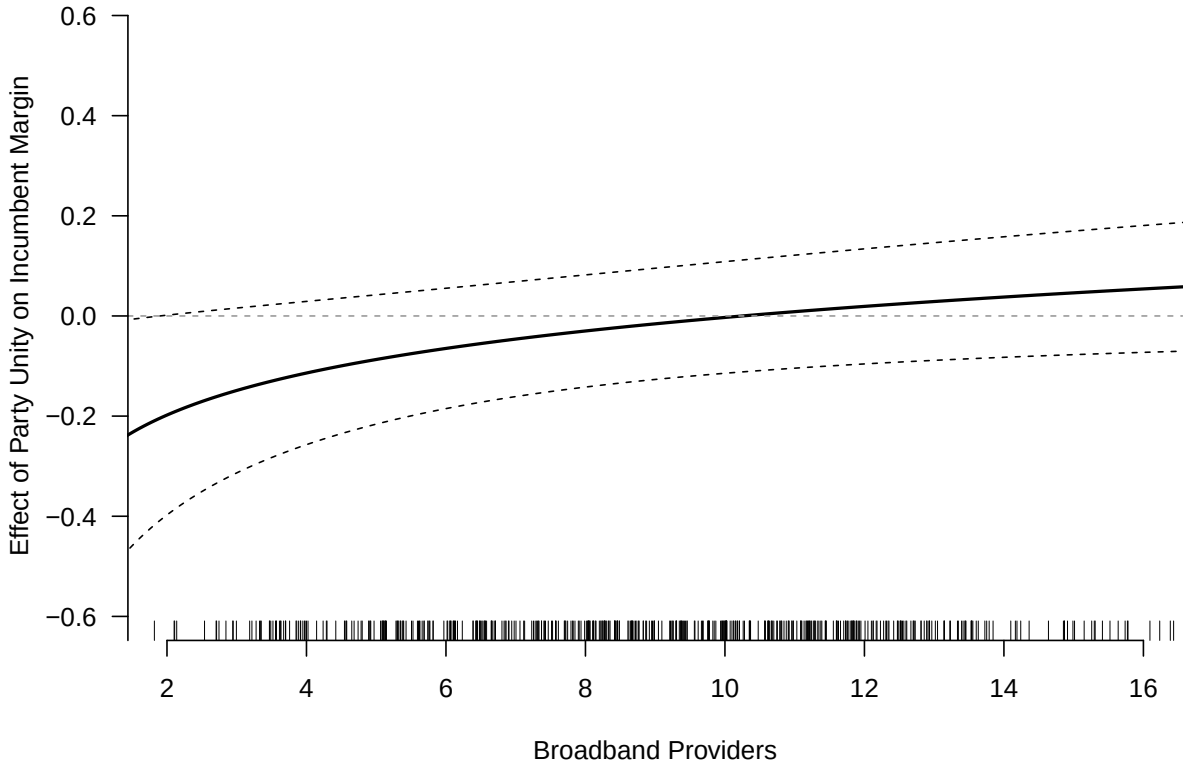


Figure 1.7: Marginal Effect of Party Unity Score

In Appendix Section 4.8 I take a different approach to this problem, by analyzing which years have problematic trends in the effects of these variables, and then restricting the sample to years

in which there is not a trend. This procedure returns results substantively similar to the traditional panel models. Further, as noted above, I also placebo-test the traditional panel models on 1992-1998 data, showing that predicting past changes in politics with future changes in broadband produces null results.

Finally, in Appendix Section 4.11 I replicate all of these analyses using a lagged measure of broadband. Because these models look *within* districts (or members, for the conditional effects of presidential voting and Party Unity) the use of a lagged independent variable in these models predicts, for example, change in 2004-2006 behavior with change in 2002-2004 broadband. These produce intriguing results. In nearly all cases the use of logged broadband produces somewhat *stronger* results then those found in the main models. This includes conservative models which include interactions between the political independent variables and the time trend (all of the coefficients in these models are in the expected direction and statistically significant). Substantively, this suggests that the effect of a change in the level of broadband in a district may be felt more strongly several years later, once individuals have responded to this change by changing their consumption habits. Lagged broadband has the effect of reducing the incumbency advantage, increasingly the importance of presidential voting on House voting, and attenuating the negative impact of Party Unity voting on incumbent vote share.

1.9 Conclusion

The incumbency advantage is the natural outflow of the type of retail politics described so colorfully by Fenno's classic work. The personal vote enjoyed by incumbents was in part a consequence of an information system that has been significantly eroded. This paper has shown that the expansion of broadband internet has a clear negative effect on the incumbency advantage. This decline seems to be due to an increase in partisan voting. The impact of a district's presidential vote on incumbent margins has increased in districts with high broadband connectivity, and these same districts dole out a smaller electoral punishment to representatives more concerned with Party Unity than moderating to the median voter.

For representatives facing this new information environment, assuming that incumbency alone is enough to guarantee re-election seems an increasingly bad bet. As internet access becomes cheaper and easier to use, the ability for incumbents to break through the tide of information becomes harder. As a consequence, incumbency advantage declines and rates of partisan voting increase. This seems to require a change in "home-styles" away from advertising constituency service and boosting name recognition, and towards promoting oneself as a partisan warrior. The continuing expansion of the information environment – and the concurrent erosion of local news resources – produces incentives for members of Congress to be less in-tune with the valence needs of the median voter in their district, and increasingly concerned with getting in-formation with the national party.

New communication technologies are not necessarily a one-way-street to more nationalization. Anything that allows individuals to make independent decisions across levels of their ballots will reduce nationalization. In the past, members of Congress fostered a personal connection to their constituency that was more powerful than partisanship. One trend that could counteract increasing nationalization is the use of social media by candidates to communicate directly with constituents. Several studies have highlighted the increasing use of platforms like twitter by members of Congress to form the sort of personal connections highlighted in the classic work of Fenno (1978) (Kreiss et al. 2018; Lassen and Brown 2011; Straus et al. 2013). Out-party voters may remember instances of social-media-facilitated connections when going to the ballot box, increasing instances of split-ticket voting. Interestingly, this development seems in-line with the hopes of Progressive reformers of the early 20th Century that new communication technology would break the monopoly party-machines had over the transmission of political information (Bimber 2003: 75-76). It is difficult, however, to determine the relative magnitude of such an effect versus the damage an increasingly online world has done to the traditional venues of these local considerations. The use of social-media by politicians to highlight differences (or alignment) with their parties will be an interesting avenue of research to watch over the coming years.

The appendices extend the results found here and offer several robustness checks. Appendix

section 4.1 tests for these relationships at the individual level. Replicating the analysis completed by Snyder and Strömberg (2008) on newspaper coverage, I merge the data on broadband availability to respondents in the American National Election Study to determine the plausibility of the causal path specified here. A relatively small number of observations make the results tentative, but the pattern is broadly consistent with the theory presented: individuals exposed to broadband have less knowledge about their incumbents and more knowledge about national conditions. Another possible causal mechanism, Prior's (2007) "polarization without persuasion" hypothesis, is tested in Appendix section 4.2. Time spent online is primarily *not* spent viewing news of any sort. This has the possibility of leading to selective drop-out of the electorate: less interested individuals, who are more politically moderate, may take the opportunity to read less about politics and subsequently become less likely to participate. The resulting electorate will be more partisan, despite no individuals changing their political opinions. I test this theory by adding turnout data to my analysis. While the expansion of broadband is associated with a reduction in the size of the electorate for House races, controlling for turnout does not affect the relationships found here. In other words, there is not evidence that the smaller electorate is comprised of more partisan individuals in a way that would explain these results.

Observational studies can never fully rule out the possibility that results are due to spuriousness, but the analyses presented here do a great deal to account for potential confounding factors. The main cross-sectional analyses leverage within-state variation, so any differences in states in terms of broadband rollout and nationalization are controlled for. Further, the results are unchanged by controlling for demographic features of districts. Any possible remaining source of confounding variation would have to: (1) vary within states; (2) predict nationalization; and (3) not be correlated to the already-included demographic control variables. It is hard to conceive of such an alternative explanation.

The full panel results add additional validity by using fixed effects on repeated observations to deal with any observed or unobserved differences between districts. These results cannot be biased by any fixed feature of districts or legislators. I've also taken steps to rule out the impact of

many potential time-varying confounders, including changes in the population and median income of the districts (and additionally in Appendix section 4.6, changes in median age, poverty rates, race, and education). Nor is it the case that these results are a function of broadband roll-out being related to politician characteristics, as tested in Appendix section 4.3; or due to a violation of the parallel-trends assumption, as tested in Appendix section 4.5. This being said, a more conservative modeling strategy that accounts for over-time trends in the effects of political variables brings more equivocal results, particularly for the conditional effect of presidential voting. It should be noted, however, that these results become far less equivocal when using a lagged measure of broadband in Appendix section 4.11. Taken together, this set of results suggests that the effect of a change in broadband may be felt a few years after the initial expansion. On balance given the results of the cross-sectional analyses, the placebo-tested panel analyses, and the strong results which use a lagged measure of broadband, I am confident that broadband has the expected effect on politics.

For many years some scholars have found the incumbency advantage normatively troubling (Carson and Roberts 2011). The degree to which incumbents can take advantage of the good will afforded by their constituents to freely pursue their own personal agendas (or to get away with personal misconduct) is a potentially sub-optimal outcome that may be mitigated by nationalization. Further, if a more partisan electorate is receiving more partisan politicians then this ought to be considered successful representation. This being said, there are (at least) three reasons why this change may be normatively troubling.

First, just because more partisan districts are getting more partisan members does not does not mean that the *aggregate* output of the legislature is maximized. A declining incumbency advantage means a less experienced legislature, which is a key component to legislative productivity (Cox and Terry 2008). It is also likely to produce a less moderate chamber, which similarly is detrimental to policymaking. Grimmer (2013) discusses how members of Congress from marginal districts have an incentive to moderate their policy positions in order to win over opposing partisans. But an increasing reliance on party labels as a voting metric makes it less likely that opposing partisans voters can *ever* be won over by moderate policies and appropriations. As such, an increasingly

partisan electorate weakens this incentive for moderation. Districts may still get "representation" through replacement, although replacing one ideologically extreme member with another is a sub-optimal outcome for the median member of the district. Perhaps more consequentially, a less moderate chamber is seen as a key component of policy gridlock (Binder 1999). On a district-by-district level representation may be occurring, but this may come at the detriment of *collective* representation through efficient policy output.

Second, there is a difference between choosing to use different media to access news and choosing different sorts of political information directly. While individual proclivities for national information have been bolstered by the internet (Hindman 2011; Hopkins 2018), other changes to the media system were not "chosen". Voters have largely gravitated towards online news and away from local sources due to the convenience inherent in the former (De Waal and Schoenbach 2010; Gaskins and Jerit 2012; Ha and Fang 2012). The changes to the information they receive are a symptom of this more basic desire for convenience: both in their personal experience and through the weakening of journalistic resources through a collective decision to move away from traditional media sources. Part of the decline in local newspapers, for example, is due to a decline in revenue from classifieds ads as individuals increasingly utilize online peer-to-peer marketplaces (Seamans and Zhu 2010). When citizens list their couches on Craigslist they are (inadvertently) changing the political information environment and their own voting behavior. But they are not doing so consciously.

Third, as discussed in the introduction, voters increasingly voting on one plane of partisan conflict violates the assumption underlying a system of checks-and-balances: where politicians in different institutions will have competing interests such that "ambition counteracts ambition" (Madison 1788). The implications for accountability in a system where politicians in all branches of the federal system face the same electoral incentives are not simple to calculate. However, it seems clear that in such a system political parties bear a great deal of responsibility in curbing excesses of power. In particular, if Congressional politics is increasingly driven by national concerns and not characteristics of local candidates, it is crucial that parties take seriously their responsibility

to nominate suitable candidates for office – and to censure incumbents who act irresponsibly.

Chapter 2

The Effects of High-Information Environments on Legislative Behavior in the US House of Representatives

Members of the House of Representatives are often put at cross-pressures between what is best for their constituents and what is best for the powerful national interests with whom they aligned: their parties, the President, and interest groups. The traditional view is that constituency interests will win out in these conflicts, less a member face electoral sanction for being seen taking sides with these national groups: "Party 'pressure' to vote one way or another is minimal. Party 'whipping' hardly deserves the name. Leaders in both houses have a habit of counseling members to vote their constituencies" (Mayhew 1974: 100).

Despite this view, evidence suggests that legislators have increasingly sided with national interests in the last 40 years (Jacobson 2003). In the 1970s the average Party Unity scores in Congress regularly hovered around 70: meaning the average legislator voted with their party on party-line votes 70% of the time. In the 2000s the average legislator did so around 95% of the time. Why do legislators seem to no longer fear an electoral sanction for showing loyalty to national interests? In this paper, I argue that one reason for this change is a rapidly shifting communication environment.

The traditional view – that legislators are punished for excessively siding with national interests – is built on particular assumptions about both the media environment and voting behavior. Specifically, it assumes that: (1) constituents will get information about their member's activities and votes, and (2) that they will give significant weight to this information when making voting decisions.

The last 40 years, however, has brought parallel trends in media and politics towards 'nationalization'. In this time period, the media environment has seen an increase in the availability of national news sources and a decrease in the availability and quality of local news (Waldman 2011). This has eroded what Arnold (2013) calls the "evidentiary basis" for Congressional elections. This

shift has resulted in voters who know less about their representatives, cast far fewer split-tickets, and are less likely to reward good behavior or sanction bad behavior of incumbents (Arnold 2013; Hayes and Lawless 2015, 2018; Peterson 2017; Prior 2006; Schaffner 2006; Snyder and Strömberg 2008). This leads to the expectation that changes in the media environment that erode local media at the expense of national media will generate legislative behavior that is more in line with national interests.

In this paper I leverage one such change – the roll-out of broadband internet – to provide a direct test of how a changing media environment affects legislative behavior. Using a specification that leverages changes in the communication environment due to the 2002 redistricting (bolstered by a separate analysis that uses a longer panel of within-district changes) I show that the expansion of broadband caused legislators to vote more in-line with national interests: parties, the President, and ideologically aligned interest groups. This relationship is particularly strong for marginal members – who under previous conditions had the strongest electoral incentive to moderate their behavior to attract cross-partisan support.

Using broadband roll-out as the independent variable is advantageous for several reasons. First, it represents a particular large shift in the media environment. Second, the data exploited for this project provides frequent across time measurements for sub-district geographic areas. Third, this work builds on previous research showing that access to broadband affects the newspaper industry (De Waal and Schoenbach 2010; Gaskins and Jerit 2012; Ha and Fang 2012; Waldman 2011), causes voters to be more affectively polarized (Lelkes et al. 2015), and results in Congressional election outcomes that are increasingly driven by Presidential politics (Trussler 2018a).

I make no claims that broadband is the *sole* cause of more nationally focused legislators. Party Unity voting, for example, has been steadily increasing since reaching a low point in the early 1970s, far before the availability of the internet (Hopkins 2018; Jacobson 2015a).[1] The poten-

[1]The data for this paper comes from the 106th to 111th sessions of Congress. While nationalization in legislative behavior was in progress for a long time before this period, there is still a substantial amount of variation to explain. Taking Party Unity scores as an example, the average legislator in the 107th-111th sessions had a Party Unity score 12 points higher than the average legislator in the 81st to 106th sessions. Even compared to the 1990s, legislator's post-2000 had significantly higher loyalty to their party: with the average legislator in the 107th-111th sessions having a Party Unity score nearly 6 points higher than the average legislator in the 101st to 106th sessions.

tial causes for this increased nationalization are many and include: members being better sorted into parties (Aldrich and Rohde 2000), elite polarization (Hetherington 2001), and geographic sorting of constituents (Sussell 2013). I discuss below that, in addition to these explanations, a critical component for legislators to be independent from national forces is a robust local news environment. In other words, an important ingredient affecting the degree of nationalization is a changing media system; a system which has *also* been becoming more nationalized since at least 1980 (Clinton and Enamorado 2014; Prior 2007). The rapid expansion of broadband is simply one manifestation of this trend, continuing and deepening the effects of technologies that came before it: cable news and nationally syndicated talk-radio; and a precursor to later technologies which are likely continue to push politics in a nationalized direction: ubiquitous hand-held devices and homogeneous online social networks. Understanding the effects of broadband allows us to understand the effects of these technologies that have similar effects on the information environment. The benefit of studying broadband, in other words, is one of generalizability. Compared to studies which focus on the surge (Arnold 2013; Snyder and Strömberg 2008) or decline (Darr et al. 2018; Hayes and Lawless 2015, 2018) of local news, or on the impacts of specifically polarizing news channels (Arceneaux et al. 2016; Clinton and Enamorado 2014) and websites (Bakshy et al. 2015; Bessi et al. 2016), studying broadband gives us better leverage to understand the likely result of further technological change – without knowing the specific forms that change will take.

Information is the matter of politics, and as such understanding how a changing communication environment alters the types of information citizens receive is critical to understanding the nature of citizen representative relations (Bimber 2003). Far from early notions that the lower barriers to entry online would generate hyper-local politics (Hindman 2008, 2018), the present work suggests that this technological advancement will instead further the 'nationalization' of politics, and diminish the role that non-partisan constituency needs play in shaping the behavior of legislators.

2.1 Why Might Increasing Broadband Lead to More Nationalized Legislative Behavior?

National forces – like parties, the President, and interest groups – have goals that require the cooperation of legislators, and have substantial resources they can deploy to bring about that cooperation. Legislators, however, have traditionally resisted these national forces by appealing to the possibility that they may be electorally sanctioned for siding with these forces too often. Arceneaux et al. (2016: 8) sum up this balance: "Because toeing the party line helps members attain policy and career advancement goals, they must balance the need to demonstrate party loyalty with the need to be responsive to their constituents' desires for partisan independence". In his study of the "Electoral Connection", Mayhew (1974: 99) makes clear that the solution to this fundamental balance between acting in accordance with national or local issues is clear: "There is no member of either house who would not be politically injured...by being made to toe a party line on all policies." Particularly for marginal members – members whose re-election is often predicated on winning over moderate constituents of the opposite party – voting in an extremely partisan fashion is assumed to be a liability (Grimmer 2013). Indeed, there is empirical evidence for this assumption, with research finding that excessive Party Unity voting is an electoral liability for members (Canes-Wrone et al. 2002; Carson et al. 2010). As such, leaders have traditionally been hesitant to force members to go against their constituents for the good of the party or the President.

This electoral sanction for excessively voting with national forces at the expense of local issues is predicated on voters being able to make decisions about their vote for the House that are separate from their vote for President. In the time period when Mayhew (1974) was writing, voters often displayed this ability. In 1972, 192 members were elected in districts where the majority voted for the Presidential candidate of the opposite party (Jacobson 2015b). A Republican representative in that year, for example, had to govern with the knowledge that a Nixon voter in their district may sanction them for being excessively partisan, despite that voter's support for the President. Likewise, a Democratic representative in 1972 would govern with the knowledge that they could plausibly win over a Nixon voter with the right sort of moderate home style (Fenno 1978).

If, instead, that Nixon voter is expected to vote a straight ticket, there is little either representa-

tive could do to win – or lose – their vote. This is precisely the type of behavior that increasingly characterizes American voters. There is strong evidence of a trend towards "nationalization" in American politics, whereby voters are increasingly making all political decisions along one plane of partisan conflict (Hopkins 2018; Jacobson 2015a). Nationalization is a state where voters, according to Hopkins (2018), are "engaged with and knowledgeable about national politics to the exclusion of state or local politics".[2] When voters go to the ballot box with less information about idiosyncratic local politics and more information about national politics they are far less likely to split their tickets, and far more likely to let their decisions at the top of the ticket drive their votes for lower offices. Compared to the 192 members who were elected in districts where the majority voted for the presidential candidate of the opposite party, in 2008 only 60 members were elected from such split districts (Jacobson 2015b). According to the American National Election Study, in 1972 nearly 30% of Americans cast split tickets for the House and President.[3] In 2008 that number was 16%.[4]

It has long been thought that legislative behavior is, at least in part, a function of electoral incentives (Jacobson 1987, 2015b; Kingdon 1968; Stimson et al. 1995).[5] In previous periods where voters regularly split their tickets, legislators (correctly) intuited that if they voted too often with their parties or the President then they would be electorally sanctioned (Canes-Wrone et al. 2002; Carson et al. 2010). This relationship, however, should be sensitive to the degree to which national forces drive Congressional voting. When House election outcomes are strongly structured by Presidential elections then legislators ought to be more willing to accrue the benefits gained

[2]This conception of nationalization is distinct from polarization, which generally refers to a strengthening of attitudes about ideology or parties (Lelkes 2016). The type of nationalization referred to here – where voters simply lack the informational resources to make independent decisions at lower levels of office and therefore reduce the incentives for politicians to moderate – does not require voters to *change* their attitudes about parties or policies. This being said, if voters are polarized in addition to being nationalized then all the relationships described below would be heightened. Nationalized voters make *passively* partisan choices – voting straight tickets because they lack the informational resources to make independent decisions across the ballot. Polarized voters (in particular affectively polarized voters) make *actively* partisan choices – voting straight tickets because it is their expressed interest to do so.

[3]1972 was a high water mark for split ticket voting, but the level remained high in subsequent years. 24% of Americans split their tickets in 1976, and 27% did so in 1980.

[4]In 2016 only 10% of Americans split their tickets. A record low in the American National Election Study data.

[5]Particularly pertinent to this paper, researchers have also found that legislators alter their behavior in response to changes in their districts post-redistricting (Crespin 2010; Hayes et al. 2010).

from siding with national forces like their parties or the President. Indeed, in Appendix Section 5.9 I show that this is the case. Pairing 60 years of data on elections and legislative behavior, I show that legislators are significantly more likely to vote with their parties when elections in their districts are driven by national conditions.

There is a great deal of evidence that a key component in explaining this over time variation in nationalization is the availability and quality of local media. The ability for voters to make independent decisions on House races is predicated on those voters having considerations about that race in particular. For Arnold (2013: 12), "A rich information environment increases the chances that citizens will have an evidentiary basis for determining whether they approve or disapprove of a representative's performance in office." Previous research has shown that local newspaper and television coverage of Congressional politics supports greater political knowledge, higher rates of bipartisan support for incumbents, and voters who do not vote solely on the basis of partisanship (Arnold 2013; Peterson 2017; Prior 2006; Schaffner 2006; Snyder and Strömberg 2008). The more robust the local news environment, the more voters treat House races as independent from Presidential races. And this press-supported voting behavior is reflected in the legislative behavior of members. Snyder and Strömberg (2008) show that members facing a richer local news environment have lower Party Unity scores and serve on more constituency-focused committees.

The goal of this paper is to understand how new technologies like broadband influence this relationship between the press, the people, and their representatives. Accumulated evidence suggests that access to broadband (1) causes an erosion in local media availability, and (2) allows individuals to see more national focused information online. In other words, the roll-out of broadband has eroded the "evidentiary basis" for elections discussed by Arnold (2013), creating voters who are less likely to make independent decisions across their ballot and politicians who, as a result, prioritize national considerations in their legislative behavior.

There is persuasive evidence that use of online news resources has a displacing effect on the consumption local news. Using panel data, Hopkins (2018) demonstrates that Americans of all ages are shifting their viewership away from traditional sources and towards more nationally ori-

ented media like cable television and the internet. In other studies, individuals report that using the internet as a medium to gather news is more convenient and provides more variety than offline sources. This leads individuals to replace their use of offline media with online media (De Waal and Schoenbach 2010; Gaskins and Jerit 2012; Ha and Fang 2012). This decline in viewership has a secondary effect of reducing the resources available to local media organizations, and a result, their overall quality. Over the first decade of the 21st Century media organizations saw declining advertising revenues, reduced staffing, and an overall content shift away from topics like government, education, and health care, towards topics like weather and crime (Waldman 2011).

The second disrupting effect of broadband is that use of the internet as a way to gather news heavily skews the information citizens receive towards the national. Nationally focused news is different both for its absence of content about local members of Congress (Cook 1989), and for its emphasis on partisan conflict (Arceneaux and Johnson 2015). Together, these two features generate voters more likely to have strong partisan feelings and to cast straight tickets.

Both Hindman (2011) and Tewksbury (2003) have conducted large scale web-tracking studies that look at the balance of national and local news that is consumed online. The results of both studies show that users overwhelmingly view national news websites. Hindman (2011), for example, estimates that of the time spent reading news online only 15% is spent on local sites, compared to 85% on national sites. This disparity is due to a combination of supply and demand. In terms of supply Hindman (2008) uses web crawlers to map the architecture of the Internet and shows that national news websites have exponentially more "in-links" than local news websites, meaning that individuals will more likely be redirected there and, perhaps more importantly, Google will rank those national websites higher. Even holding constant the supply, individuals demonstrate a demand for national news. Using selection experiments Hopkins (2018) demonstrates that individuals are more likely to read stories about the President compared to stories about their Governor or Mayor. These demand effects are observable in the aggregate as well. Lelkes et al. (2015) use web tracking data to compare the online news readership of those with broadband versus those with dial-up internet, finding that those with faster internet were more than twice as likely to visit

national partisan websites like the Drudge Report and Huffington Post compared to those with dial-up internet.

When individuals get access to broadband they are less likely to view local media, and the quality of that local media is expected to decline. When they instead read news online they are more likely to see national news. Recall that at the heart of constituency oriented behavior is the expectation that voters have an "evidentiary basis" when voting in Congressional elections. The accumulated evidence suggests that when broadband expands and local news contracts, the local information vital for these elections will be eroded and replaced by more nationally-focused information. Hayes and Lawless (2015, 2018) show that individuals in districts where the local news environment is eroding are less likely to have accurate knowledge about their member of Congress and are less willing to evaluate candidates in Congressional elections. As a result of this lower levels of knowledge about Congressional elections, individuals in these districts with faster eroding news districts are also less likely to split their tickets across different levels of office (Darr et al. 2018).

Additional studies have explicitly linked these changes to the expansion of broadband. Using similar data to this paper, Trussler (2018a) finds that districts exposed to broadband have more "nationalized" voting. Districts with faster than expected roll-out of broadband have House elections that are more responsive to swings in Presidential voting, producing a smaller incumbency advantage for members of Congress. Perhaps most relevant to this paper, areas with better broadband connections had voters who did not punish incumbents for excessive partisan voting, a key finding in previous studies of electoral incentives (Canes-Wrone et al. 2002; Carson et al. 2010). In a similar paper, Lelkes et al. (2015) show that the expansion of broadband further leads to individuals who have higher levels of affective partisan polarization: having more positive feelings about ones own party and more negative feelings about the other party. Both of these papers directly link the roll-out of broadband to a pattern of voting that reduces the incentives for legislators to side with their constituents over national interests.

How do these changes in voting behavior alter the incentives for politicians? We saw above

that the tension for members between satisfying their constituencies and satisfying national interests is mitigated by appeals to possible electoral sanctions. The expansion of broadband changes this electoral calculus. In line with previous studies that have examined how a changing media environment affects legislative behavior (e.g. Arceneaux et al. 2016; Clinton and Enamorado 2014): "reelection-centered representatives may respond to changes in the media environment if they think their electoral environment is appreciably changed" (Clinton and Enamorado 2014: 930). Given the accumulated research on the effects of broadband (and the related research on the benefits of robust local news environments) representatives facing a district with increased access to broadband are undoubtedly facing a changed electoral environment. Areas that have been exposed to broadband are those that are likely to have less robust news environments, citizens who know less about local Congressional politics and more about national politics, and as a result, patterns of more nationalized voting. Witnessing this shift in constituent knowledge and voting behavior, representatives are likely to alter their own behavior.

Further, if the relationship between the media environment and legislative behavior operates through the electoral connection, then changes in behavior should be primarily driven by electorally marginal members. These members – under conditions where voters regularly cast split tickets – have the greatest incentive to court moderate voters of both parties with a non-partisan constituency focus (Grimmer 2013). As such, marginal members are expected to be most affected in a new electoral environment that no longer providers this incentive.[6]

In the proceeding sections I test two simple hypotheses: (1) Legislators facing districts with higher levels of broadband will vote more often with national forces – their parties, the President, and aligned interest groups; (2) This relationship will be stronger for more electorally marginal members.

The empirical goal is to relate changes in the information environment faced by legislators to their behavior in terms of voting with national interests. I first describe and provide validation for

[6]Expressed in the other direction, members in "safe" districts never had much of an incentive to moderate their behavior, as they did not need to build cross-partisan support to win elections. Moving to a communication environment that no longer incentivizes moderation would therefore not have as much effect on them.

the independent variable used: expansion of broadband. Next, I describe the dependent variables used to measure legislative behavior as well as the estimation strategy. In short, I use the 2002 redistricting to isolate variation in the number of broadband providers representatives have in their districts. I relate this variation in the number of providers to measures of legislative behavior that capture responsiveness to national forces – the parties, the President, and interest groups.

2.2 Data and Methods

To determine the degree to which the expansion of broadband influenced legislative behavior I focus in on the 107th and 108th Congresses. These were the Congresses separated by the 2002 midterm elections, the first election held with the new district lines generated from the 2000 Census. These sessions provide a unique opportunity to study this question. First, this was the period where broadband was undergoing rapid, yet geographically uneven, growth. Second, the redistricting process allows me to isolate variation in broadband that is not susceptible to endogenous changes (i.e. where certain areas may add broadband providers at faster or slower rates due to unobservable characteristics).

The results of the 2002 midterm elections were surprising due to the fact that the President's party gained 8 seats in the House of Representatives. Prior to 2002 this had happened only twice from 1866 to 1998. Buoyed by high approval following the September 11th attacks – and benefiting from the national conversation being focused on terrorism – President Bush's Republican party outperformed the Democrats in open seats and in newly created districts (Jacobson 2003). While the President gaining seats in a midterm is peculiar, the reason for these gains were not. The Republicans outperformed largely due to: (1) The President's high approval rating; (2) The increased importance of national considerations (like Presidential approval) driving House elections; (3) A robust economy; (4) the Republican advantage in gerrymandering newly created districts (Campbell 2003; Jacobson 2003). In line with the nationalized voters shaping these elections, the behavior of legislators in these two Congresses was increasingly shaped by national interests. Legislator's in the 107th Congress voted with their parties 90% of the time on average – 2 points higher

compared to the 106th Congress. This rate would jump another 2 points in the 108th Congress.

The 107th and 108th Congresses, and the 2002 election which split them, were all fairly typical in terms of what drove outcomes (even if those outcomes were atypical in the long run of Congressional history). These years therefore form a good case to study impact of a changing communication environment on legislative behavior.

2.2.1 Measure of Broadband Connectivity

Broadband connectivity is measured through the concentration of broadband providers in each Congressional District, data which comes from the Federal Communications Commission. From 1999-2008 the FCC tabulated bi-annual data listing the number of broadband providers[7] in each zip-code. These data do not measure the number of broadband providers each individual in an area has access to. If a zip code has 3 broadband providers operating within it, some individuals may have access to one provider, others may have access to all 3, while some may have access to none. At the same time, for a given area an increase in the number of broadband providers can only mean one of two things. First, it may be that individuals who already have a broadband provider now have more choice. Wallsten and Mallahan (2010) analyzed a similar dataset and found that individuals served by multiple broadband providers had on average lower costs and higher internet speeds. Second, the new broadband provider may be deploying to a new area without broadband, and as such new individuals are getting access. Lelkes et al. (2015) show that the number of providers and number of subscribers correlate quite strongly at the cross-sectional county level, a result borne out in other studies (Hitt and Tambe 2007; Kolko 2010). As stated above, Lelkes et al. (2015) has also found that the number of broadband providers has a significant impact on online consumption behavior and affective polarization.

I add my own validation of this measure in Appendix Section 5.4 by matching these broadband data to individual level data from three waves of the Current Population Survey Internet Supple-

[7]Broadband providers in this case are identified as the over-arching company which owns the service provider. That is, if two internet service providers have different names but are owned by the same corporation, they are treated as one "provider" in this dataset.

ment. Looking within counties, a 100% change in the number of broadband providers in an area is associated with an 11% increase in the probability an individual has a home broadband subscription.[8] We can be confident, in other words, that those areas with more broadband providers are those where more individuals have internet access, at a lower cost, and with higher speeds.

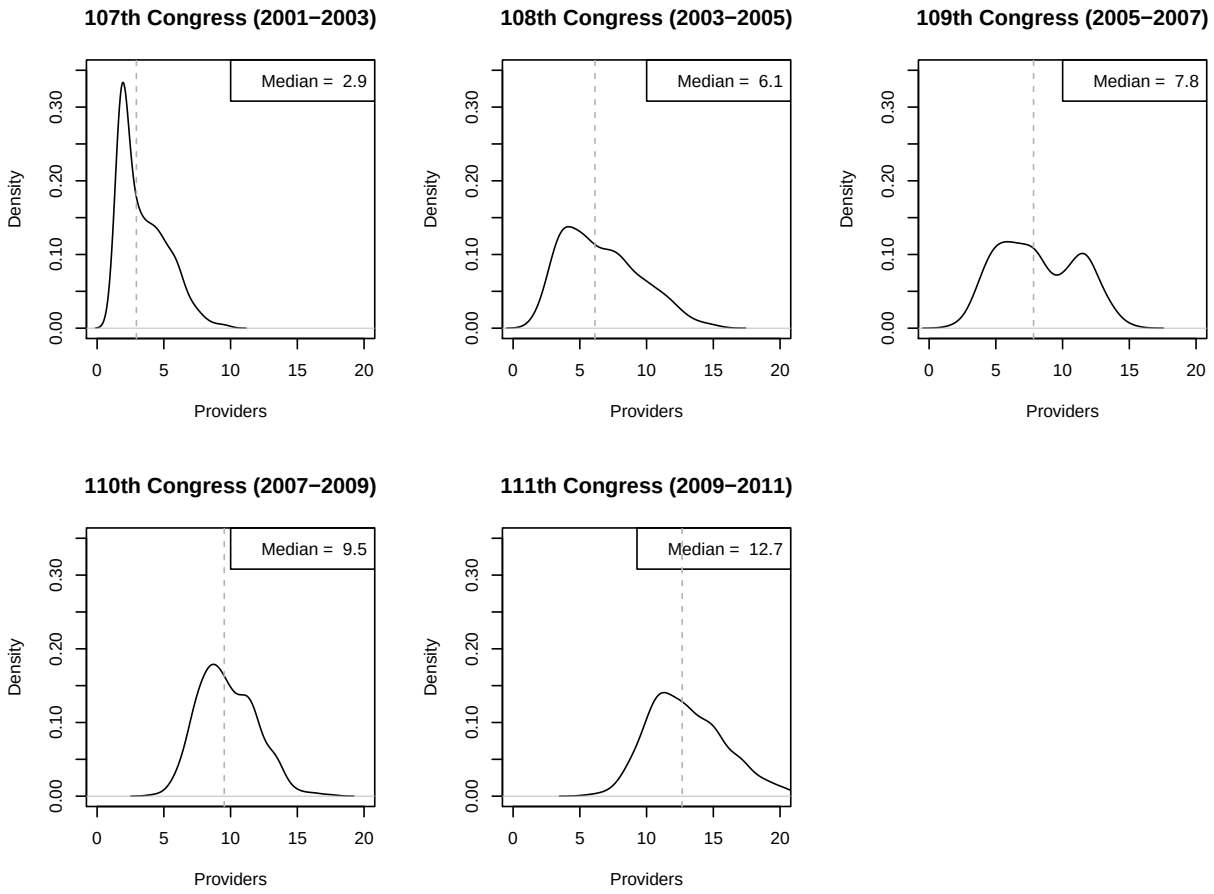


Figure 2.1: Number of Broadband Providers per Congressional District

There is good reason to believe that the effects of the number of broadband providers will be non-linear. Due to economic competition, a district going from 1-2 providers is likely to have a larger effect individuals than going from 7-8 providers. To capture this non-linearity I take the natural log of the number of providers in each specification such that the marginal effect decreases

[8]It should be noted that an increase in the probability of individuals having a broadband subscription is just one of the important effects of an increasing number of broadband providers. Even among those who already subscribe to broadband, an increase in the number of providers means increased competition, and therefore, increased *quality* of broadband (Wallsten and Mallahan 2010). These faster internet speeds will results in qualitatively different consumption patterns.

as the base rate of providers increases.

2.2.2 Identification through Redistricting

The empirical goal is to examine how the communication environment in a legislator's district affects their legislative behavior. Comparing variation in the number of providers cross-sectionally across districts to legislator behavior would lead to a biased relationship as districts with more providers may be systematically different than those with less providers. To deal with this problem of causal inference I use a redistricting specification similar to that employed by Snyder and Strömberg (2008) for newspaper congruence. In Appendix Section 5.3 I supplement this analysis with a longer panel of members of Congress. The panel analysis, which requires a different set of assumptions for causal identification, produces equivalent results.

To estimate the redistricting specification, I first assign the average number of broadband providers between 2000-2002 in each US zip-code. That is, each zip-code is assigned just one level of broadband for its whole period. I then use zip-code/Congressional district crossover files[9] to create the weighted average of broadband providers for both pre-redistricting (107th Congress) and post-redistricting (108th Congress) boundaries based on the percentage of the population of the Congressional district that lives in each zip-code in each time period. [10]

This gives two levels of broadband for each legislator who served in both sessions, with the difference in the two readings representing the change in broadband each legislator is exposed to that is due solely to redistricting. There are two main benefits to capturing variation in this way. First, this variation is wholly separate from the time trend in broadband. This analysis completely rules

[9] Crossover files from http://mcdc.missouri.edu/websas/geocorr2k.html.

[10] In a perfect world we would be able to determine the number of broadband providers available to every individual in a district and take an average to determine the level of coverage faced by a legislator. In lieu of this, error is minimized when starting with the smallest possible unit of aggregation. With a small unit of aggregation: (1) The probability that most individuals have the same level of coverage in the area is higher; and (2) fewer of the units of aggregation will cross District boundaries. Compared to a unit like counties, zip-codes perform much better on both of these metrics. The median zip-code in 2000 is quite small, containing only 2170 individuals. For the 107th Congress the vast majority (71%) of zip-codes have a population that is wholly contained in one Congressional District. 75% of zip-codes are at least 97.5% within one Congressional District. The mean zip-code has a population that is 85% in one District, indicating that these data have a large right-skew.

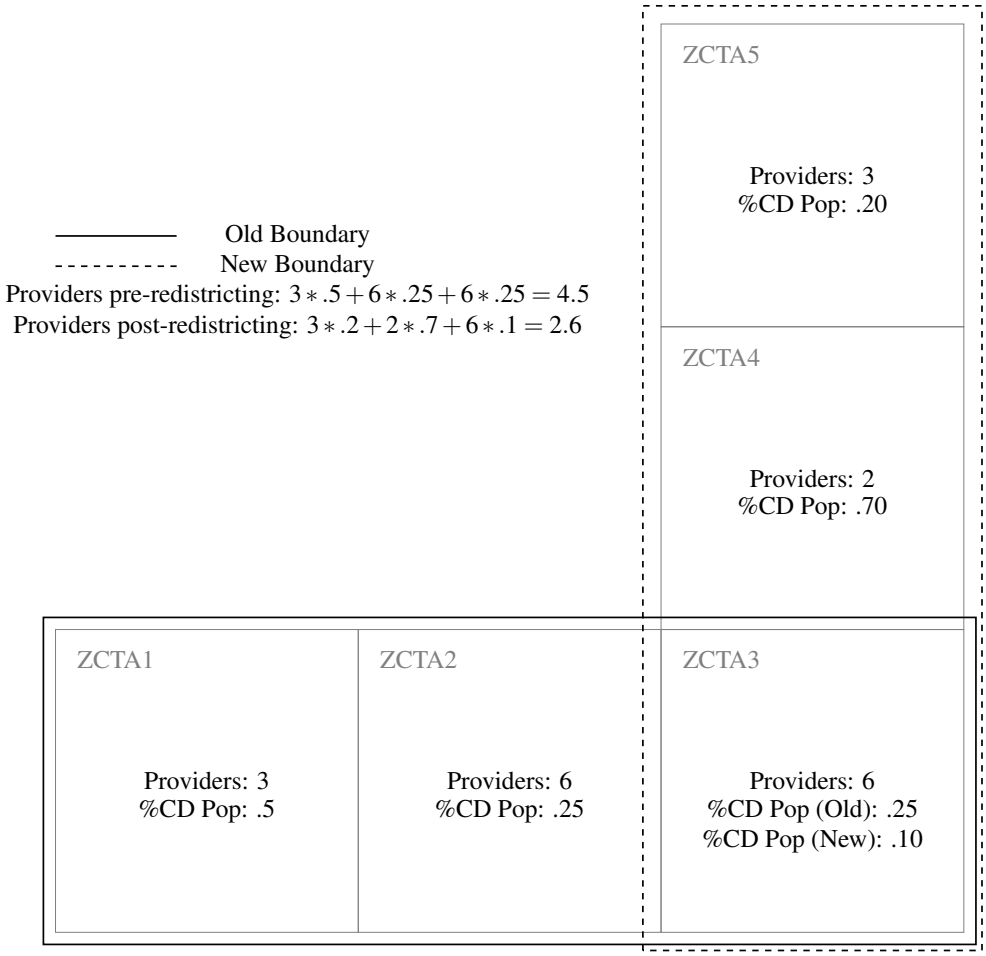


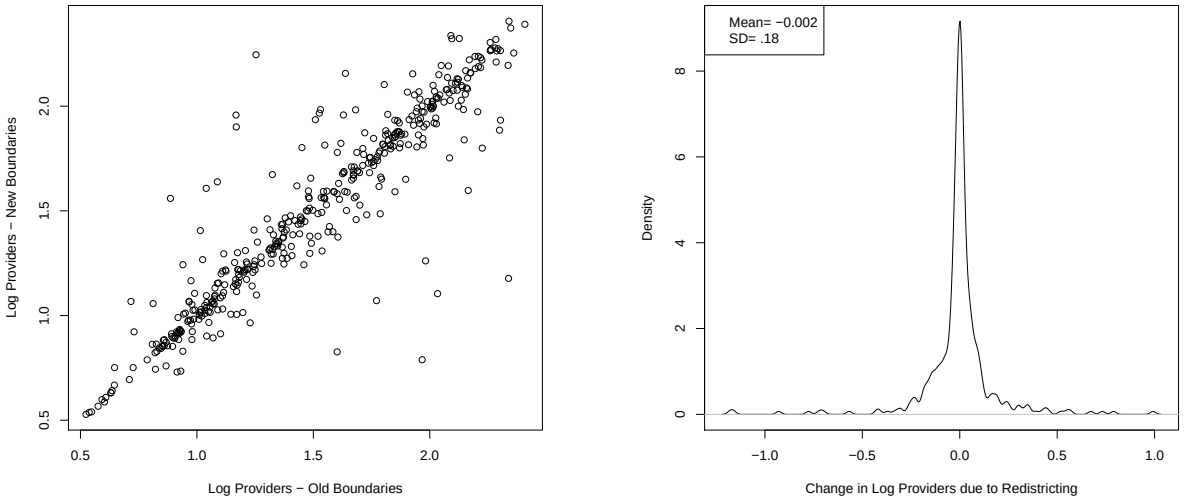
Figure 2.2: Example of Redistricting Procedure

out, in other words, that the relationships found below are due to another factor that was changing over time at the same rate of broadband (though this does not rule out all potential sources of endogeneity: see below for more discussion of how I account for confounding factors). Second, this analysis allows for both positive and *negative* variation in the information environment. Broadband was growing in one direction in all areas of the country during this period. As such, a conventional analysis (like the one found in Appendix Section 5.3) relies solely on positive changes in broadband. Because legislators can be redistricted to an area with a lower density of providers, negative variation is possible.

Figure 2.2 presents a stylized example of this process. In the first time period, this member's

district is made up of 3 zip codes, with a (weighted) average number of broadband providers of 4.5. The new district boundaries removes ZCTA1, and ZCTA2 from the members district, and adds ZCTA4 and ZCTA5. ZCTA3 is in the district in both the new and old boundaries, but has its weight changed to reflect the population distribution of the new boundaries. The member now faces a less dense information environment, with an average number of broadband providers of 2.6.

Figure 2.3 displays the relationship between the levels of broadband in the old and new district boundaries. The proximity to the 45 degree line makes it clear that while many districts have little change in the number of providers based on their new boundaries, there is substantial variation – both positive and negative – in the information environment due to redistricting.



(a) Levels of Broadband (b) Changes in Broadband

Figure 2.3: Levels and Changes in Broadband due to 2002 Redistricting

It is possible that legislators directly observe the number of broadband providers in their districts, but I do not think that this is the primary mechanism altering behavior. Instead, I believe the primary mechanism is the electoral connection. In line with previous work that has found that areas more exposed to broadband have more nationalized voting outcomes, when legislators are redistricted to an area with more broadband providers they will likely witness a change in how their constituents think and act in regard to politics. In other words, while legislators and their

staff are unlikely to be aware of the number of broadband providers operating in their districts, they will certainly be aware of how their new constituents have voted in the past, and more pressingly, how their re-election numbers changed in the 2002 midterms. In particular, when assessing how "nationalized" to make their behavior, legislators likely respond to the the degree to which partisanship versus local issues shaped their re-election.

Redistricting is a political, not random, process. While it is unlikely that new districts were redrawn to fit where broadband providers are located, it may be that that observable demographic and political characteristics that *are* used to draw new boundaries are correlated to the level of broadband and affect legislator behavior.[11] In particular, redistricting decisions are primarily driven by a desire to make safe districts (Masket et al. 2012). For this reason, in all specifications I control for the change in partisan composition of the district due to redistricting.[12] The 2000 two-party vote for President is used in both periods to measure partisan composition. I recode this value in line with the party of the member in question, such that a 100 on this scale means every vote for President in the district went to the same party as the member, while 0 means every vote in the district went to the presidential candidate of the party opposite the member in question. Variation in the measure is provided by the change in district boundaries between the two sessions. Further, I control for demographic features which may drive redistricting which are also correlated to levels of broadband: the median income of the district and the population. In Appendix Section 5.5 I show that the results do not change when also controlling for the percent of the district with bachelors degrees, the median age of the district, the percent of the district living in poverty, nor the percent of the district identifying as black and white.[13]

The dataset is organized in legislator-Congress format. Each member therefore has a maximum of two appearances in the data (for the 107th and 108th Congresses)[14]. The following equation is

[11] In Appendix Section 5.6 I provide one test of this potential source of bias. I separate the sample based on whether their co-partisans in the state legislature controlled the redistricting process. There is no significant difference in the results for those in new districts created by co-partisans versus those in districts that were not.

[12] Data from Jacobson (2015b).

[13] Demographic data from the 2000 Census, transformed to both pre (106th Congress) and post (110th Congress) boundaries

[14] These analyses omit two groups of legislators by design: (1) Legislators who only appear in either the 107th or 108th Congresses ; (2) Legislators that represent an entire state ("At Large" districts), and therefore cannot have

estimated for each dependent variable (DV), with Congress being subset by c and legislator by i:

$$\begin{aligned} DV_{ic} &= \alpha_i + \alpha_c * Party_{ic} + \beta_1 ln(Providers_{ic}) + \\ &\quad \beta_2 ln(Med.Income_{ic}) + \beta_3 ln(Population_{ic}) + \\ &\quad \beta_4 Partisan.Composition_{ic} + \varepsilon_i \end{aligned}$$

A member's score on each dependent variable is regressed on fixed effects for legislator and Congress-party, the level of broadband in each legislator's district according to district boundaries, the median income of their district in each Congress, the population of their district in each Congress, and the partisan composition of their district in each Congress.

This estimation strategy compares each legislator's behavior in the 108th Congress to their behavior in the 107th Congress, and asks whether a change in information infrastructure due to redistricting alters their representation style. By including fixed effects for legislator I control for all time-invariant features of legislators that could confound the estimation. Importantly, if a legislator has an ideological interest in voting with their party regardless of Congress, for example, then this is controlled for through the fixed effect. Fixed effects for Congress-party control for all within-party legislator-invariant features of the session that could influence the result: for example if all legislators of a certain party are facing increased pressure to vote with national interests due to an effective party whip. Because the Republicans were the majority party in both the 107th and 108th Congresses, there is no variation in majority-minority status within legislator. The variation in providers between the two Congresses is due only to the changes in a legislator's district boundaries, and β_1 captures the effect of a change in infrastructure on legislator style, controlling for changes in the partisan composition and demographics for each legislator due to redistricting.

variation due to redistricting. Appendix Section 5.7 tests for differences between those included in the sample and those excluded. Because I am looking at within-legislator differences the concern here is one of external validity. The substantive differences throughout are small. Those that remained in Congress in both periods were slightly more nationally focused then those who left following the 107th Session, and slightly less nationally focused then those who joined in the 108th. Legislators from states with multiple districts were slightly more nationally focused then those from states with At-Large districts.

I supplement the redistricting specification with a more traditional panel analysis of all legislators from 2002-2008 in Appendix Section 5.3. This supplementary analysis produces equivalent results to those found through the redistricting analysis. The two methods have similar, but not entirely overlapping, identification assumptions. Together, they rule out the most likely sources of confounding variation. The use of legislator and Congress-party fixed effects in each analysis rules out any time-invariant features of legislators or any legislator invariant features of sessions of Congress. The redistricting analysis has the additional benefit of removing the possibility of *changes* in broadband being endogenous to fixed features of legislators. Because the only source of variation is coming from redistricting, this method rules out, for example, the results being biased due to rich areas adding broadband providers at a faster rate than poor areas.[15]

The major threat to the redistricting specification is bias arising from changes in the geographic area each member represents before and after redistricting – that is, the new areas added to a members district may be different in ways that cannot be partialed out by controlling for income, population, poverty rates, age, education, or race. The benefit of the supplementary panel analysis is that it deals with just this problem. By restricting the panel to 2002-2008 each legislator represents a single geographic area, such that including legislator fixed effects effectively also controls for fixed features of the geographic area they represent. This longer panel, however, does not control for endogenous changes in the same way the redistricting specification does.[16] Each method, in other words, directly addresses the weakness of the other. Because both methods produce nearly equivalent results I am confident that the effect of broadband I uncover is not the result of some unobserved source of confounding variation.

As an additional test, in Appendix Section 5.10 I also placebo test the redistricting specification. Using the 1992 redistricting, I attempt to predict past changes in legislative behavior between the

[15]This method, in other words, rules out violations of the "Parallel Trends Assumption" necessary for unbiased panel estimation.

[16]During the period of the panel data (2002-2008) broadband expansion was "catching up" in places that were not well serviced in the initial expansion from 1996-2002. In Appendix Section 5.11 I run separate bivariate regressions of various demographics on $log(Providers)$ with district and year fixed effects. Areas with a greater than expected positive change in broadband were those with: a higher percentage of citizens living in poverty; fewer White individuals; more Black individuals; and a lower median age.

102nd and 103rd Congresses with *future* levels of broadband. If areas that will, in the future, have higher levels of broadband have fundamental differences which bias the result, then their inclusion in a new district in 1992 should also affect legislative behavior. I find that this is not the case: using future levels of broadband to predict past changes in behavior generates null results. This gives additional validity to the results of the redistricting specification.

2.2.3 Testing whether Effects Vary by Partisan Composition of District

The second hypothesis is that members in more marginal districts – districts which contain fewer voters who are co-partisans of the representative – will be more affected by the changing communication environment than members in safer districts. These marginal members are the most likely to suffer consequences from electoral sanctions, and are therefore the most likely to avoid reliably voting with national interests. If the changing communication environment lowers the probability of electoral sanctions then it is these marginal members who are most likely to modify their behavior. To test for this, I simply modify the original equation to interact the number of broadband providers with the partisan composition (as measured by the presidential vote in the district) of each member's district. Recall, this latter value is scaled so that 0 indicates a district that is filled with voters of the opposite party of the member, and 100 a district where every voter is of the same party as the member. When this value is low, the representative must convince at least some out-partisans to support them in order to be elected. When this value is high, representatives can safely rely on in-party support for re-election. In both the 107th and 108th Congress the median legislator was located in a district with a partisan composition of 58%.

$$\begin{aligned} DV_{ic} &= \alpha_i + \alpha_c * Party_{ic} \\ &\quad + \beta_1 ln(Providers_{ic}) + \beta_2 Partisan.Composition_{ic} \\ &\quad + \beta_3 ln(Providers_{ic}) * Partisan.Composition_{ic} \\ &\quad + \beta_4 ln(Med.Income_{ic}) + \beta_5 ln(Population_{ic}) + \varepsilon \end{aligned}$$

If the first hypothesis is correct β_1 is expected to be positive, indicating that increasing access to broadband leads to legislative behavior that is more in-line with national groups. The key coefficient is β_3, which is expected to be negatively signed. This would indicate that the effect of the number of providers is higher for members with less copartisans in their district – i.e. more marginal members. The safer the district becomes for the member, the less impactful a change in the communication environment ought to be.[17]

2.2.4 Dependent Variables

I relate these changes in the information environment due to redistricting to a pattern of legislative behavior that demonstrates allegiance to national groups. Specifically, I use the rate of voting along party lines, voting along presidential lines, as well as national interest group ratings. Each of these three actors are national in nature, and as such, consistently voting in-line with these organizations indicates a more national focus to legislative behavior.

To measure voting along party lines I use the Party Unity score from VoteView[18]. For each member in each Congress, this measure gives the percent of the time the member voted with their party on party votes, which are votes where the majority of each party votes against each other. In the 107th Congress the median member has a Party Unity score of 94% with a standard deviation of 9.84.

Presidential voting is measured in a similar fashion. For each session of Congress, Congressional Quarterly tallies how members voted on bills that the President has taken a known stance on. Each member in each session is thus assigned a percentage score for the frequency they voted for or against the President's wishes. Because I am interested in the degree to which presidential support of legislation influenced behavior, I reverse code the support scores for Democrats in both Congresses. If a member is a Republican, a score of 100 indicates they voted in accordance with

[17]This traditional modeling strategy for an interactive effect assumes that change in the effect of broadband due to partisan composition is monotonic. In Appendix Section 5.8 I test this assumption by running the main (non-interactive) model on a split sample of marginal (partisan composition $< 55\%$) and non-marginal members. The results are consistent with what is found using the traditional parametric model.

[18]https://legacy.voteview.com/Party_Unity.htm

the President's wishes on all bills he took a stand on, while if a member is a Democrat a score of 100 indicates they voted *against* the President on all bills he took a stand on. The median member in the 107th Congress voted in line with the President 79% of the time, and the measure has a standard deviation of 12.16.

Interest group voting is calculated by averaging the scores given to legislators by interest groups that have influence within their parties. These scores were obtained from Congressional Quarterly. For Democrats this means taking a member's average score (out of 100) within a session from the American Civil Liberties Union (ACLU), the Americans for Democratic Action (ADA), the AFL-CIO Committee on Public Education (COPE), the League of Conservation Voters (LCV), and the National Education Association (NEA). For Republican members, I take each members average score within a session from the American Conservative Union (ACU), the Chamber of Commerce of the United States (CCUS), and the National Taxpayers Union (NTU). Because I use the relevant interest groups for each party, a score of 100 for a member of either party indicates a member with a perfect score from all of the interest groups from their side. The median interest group score in the 107th Congress was 84%, with a standard deviation of 11.4.

2.3 Results

2.3.1 Increased Access to Broadband Leads to Increased Voting with National Groups

Table 2.1 displays the results for the effects of a change in the information environment on voting with national groups. The hypothesis is that members who are redistricted to more highly connected areas will have voting behavior more in line with their parties, the President, and the interest groups associated with their parties. As such, the expectation is that the coefficient on $ln(Providers_{ic})$ will be positive and significant, indicating that when legislators are redistricted to an area with a higher number of broadband providers they have behavior that is more in line with the wishes of national forces

The first column displays the results for Party Unity voting. The coefficient on $ln(Providers_{ic})$ indicates that a 100% increase in the number of broadband providers in a legislator's district leads

Table 2.1: Effect of Communication Environment on National Voting Metrics

	$Party.Unity_{ic}$	$Presidential.Voting_{ic}$	$Interest.Group.Score_{ic}$
$ln(Providers_{ic})$	2.42*	5.36*	1.31
	(0.82)	(1.80)	(1.44)
$ln(Med.Income_{ic})$	−2.26*	−8.10*	0.12
	(0.91)	(2.43)	(1.76)
$ln(Population_{ic})$	−0.52	−2.79	−2.01
	(0.82)	(1.53)	(1.43)
$Partisan.Composition_{ic}$	0.06*	−0.08*	0.05
	(0.02)	(0.04)	(0.06)
Legislator F.E.	Yes	Yes	Yes
Congress-Party F.E.	Yes	Yes	Yes
N	831	827	826
R-squared	0.36	0.30	0.02

*p $<$ .05; OLS regression with heteroskedastic-robust standard errors. Legislator-Congress observations for the 107th and 108th Congresses. Variation in each independent variable is due solely to changes in district boundaries from the 2002 redistricting.

to a 2.5 percentage point increase in Party Unity voting. The standard error on this coefficient is such that I reject the null hypothesis of no relationship between the information environment and Party Unity voting. This result confirms the hypothesis. Compared to their behavior in the 107th Congress, legislators who were redistricted to an area with a higher level of broadband voted with their parties on party-line votes more often.

The second column displays the results for presidential voting. This quantity measures the degree to which legislators vote with the President's policy positions (if they are a Republican) or against the President's policy positions (if they are a Democrat). The coefficient on $ln(Providers_{ic})$ again supports the hypothesis, indicating that a 100% increase in broadband providers in a legislators district leads to a 5.32 percentage point increase in voting with/against the President. Again, the standard error on this coefficient is such that I reject the null hypothesis of no relationship between the information environment and presidential voting.

Column three displays the results for the effect of a change in the information environment on interest group voting. While the coefficient on $ln(Providers_{ic})$ is positive, indicating that an

expansion of connectivity leads to voting that is more in line with these national organizations, the standard error on this estimate is such that I fail to reject the null hypothesis of no relationship between connectivity and interest group scores.

While the logged specification for broadband makes theoretical sense – each additional broadband provider should have a smaller impact on the probability of individuals having access to broadband then the previous – it makes it difficult to understand the real world predicted impact of broadband. Figure 2.4 is an attempt to communicate the substantive impact of broadband on legislators given the within-district variation in broadband between the 107th (2001) and 108th (2003) Congresses. Using the post-redistricting boundaries of districts, two sets of values were used to calculate these distributions of effects: the level of broadband for each legislator's district in the 107th Congress[19] (median = 3.15); and the real within-legislator change between the two sessions (median = 2.96). With these two sets of values we can calculate the predicted marginal effect of broadband for each legislator given the coefficients in Table 2.1 with the equation:

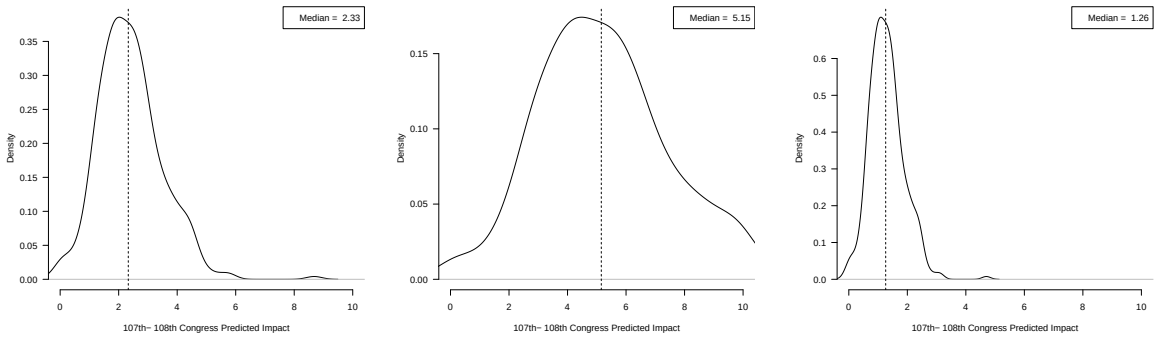
$$\textit{Predicted Impact of Broadband} = \Delta \textit{Providers 107-108} * \beta_1 * \frac{1}{\textit{Providers.107}}$$

Given that the within-legislator change in broadband during this period was nearly equal to the base rate (i.e. the average change in providers was nearly 100%) the median legislator experienced an impact of broadband approximately equal to the coefficients in Table 2.1: a 2.31 unit change in Party Unity; a 5.11 unit change in presidential voting; and a 1.25 unit change in Interest Group Voting.

Plainly, as the number of broadband providers rises in each district (and thus the denominator of the above equation gets larger), the substantive effect of broadband will fall. For the 108th Congress the median level of broadband is 6.2 and the median within-legislator change in level to the 109th Congress is 1.6. These numbers lead to much smaller predicted impacts on the three

[19]Because the boundaries of districts changed, to arrive at this number I used District/zip-code crossover files for the post-redistricting boundaries to construct what the level of broadband would have been in the 107th Congress given the new district lines. Put another way: Each legislator from the 108th Congress was assigned a level of broadband for the 107th Congress as if the new district boundaries had been in place at the time.

dependent variables: a median change of 0.63 units for Party Unity; a 1.4 median unit change for presidential voting; and a .34 median unit change in Interest Group Scores. The choice to log the number of providers was theoretically motivated, given that changes at the low end of the scale of providers are expected to bring larger gains in access to the internet compared to changes at the high end. This theoretical motivation is reflected mechanically here, whereby the largest effects of broadband are felt early in its expansion. [20]



(a) Party Unity (b) Presidential Support (c) Interest Group Scores

Figure 2.4: Predicted Effect of Broadband: 107th to 108th Congresses
Predicted effect of broadband given 107th Congress levels and within-legislator changes from 107th to 108th Congresses.

Overall, the results are consistent with the hypothesis that increased connectivity in a district leads to legislators who vote more in line with national interests. Being redistricted to an area with higher broadband – while also taking into account changes in demographics and partisanship – leads to legislators who vote with their parties more often and in line with the President.

2.3.2 Legislators in Marginal Districts are More Affected by the Communication Environment

The second hypothesis is that these results ought to be primarily driven by members in marginal districts. In a world where voters regularly cast split tickets to reward or punish unwanted legisla-

[20]The redistricting specification allows for positive and negative variation in broadband and therefore part of the effect of broadband is being driven by some legislators being exposed to less broadband and becoming less nationally focused in their behavior. When reporting the substantive impacts, however, I think it is appropriate to talk only about positive changes in broadband because, outside of redistricting, legislators practically never experience a negative change in broadband.

tive behavior it is marginal members who have the highest incentive to avoid displaying excessive loyalty to national interests.

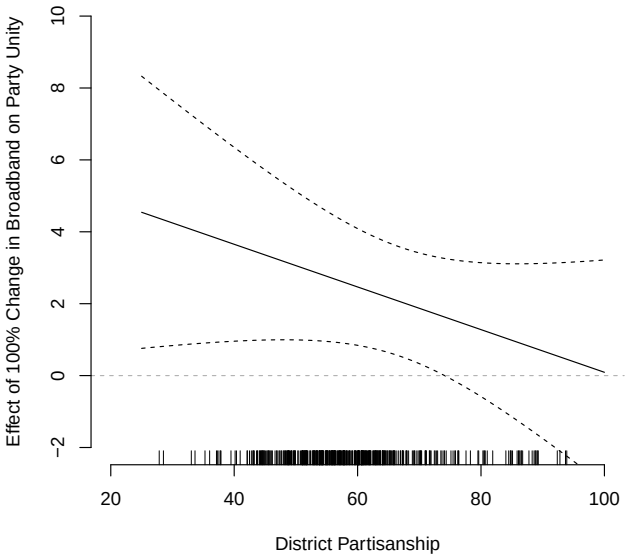
Figure 2.5 displays these results visually. These marginal effects plots are generated from a model where $ln(Providers)$ and $District.Partisanship$ are interacted. The full models can be found in Appendix Section 5.1.

In each figure the expected relationship can be seen. Members in more marginal districts – that is, those members representing districts with fewer co-partisan voters – are more affected by being redistricted into an area with higher broadband than members in safer districts.

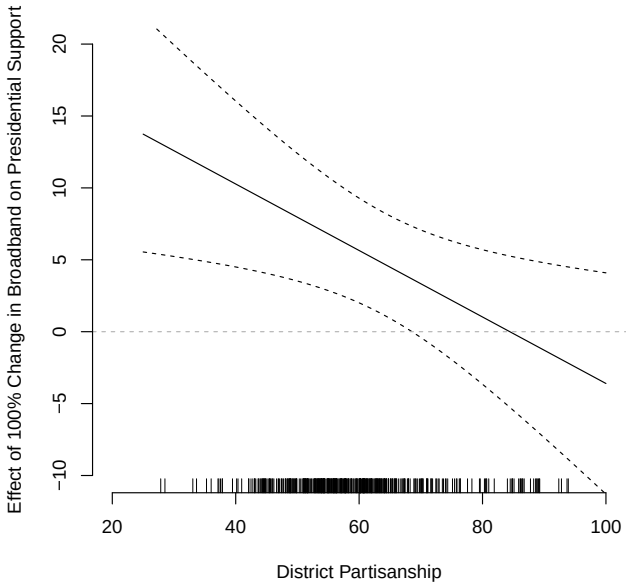
Panel A presents the marginal impact of expanding broadband on Party Unity voting. In this graph more marginal legislators are expected to be more impacted by expanding broadband than legislators from safe districts. However, the slope of the line (i.e. the coefficient on the interaction term), has a standard error of a size that we cannot be confident of rejecting the null hypothesis that the impact of broadband on Party Unity voting does not change across levels of partisan composition.

Panel B of Figure 2.5 displays the results for voting in line with the President. Broadband expansion in marginal districts has a positive and significant impact on the amount a member votes along presidential lines. A member in a district with an equal mix of co-partisans and out-party supporters is expected to vote with the President (if they are a Republican) or against the President (if they are a Democrat) at a rate 8.3 percentage points higher for every 100% increase in the number of broadband providers. Increasing the number of co-partisans to 75% decreases this marginal effect of broadband to 2.5 percentage points, while the effect of broadband for members living in districts with 90% co-partisans is indistinguishable from 0.

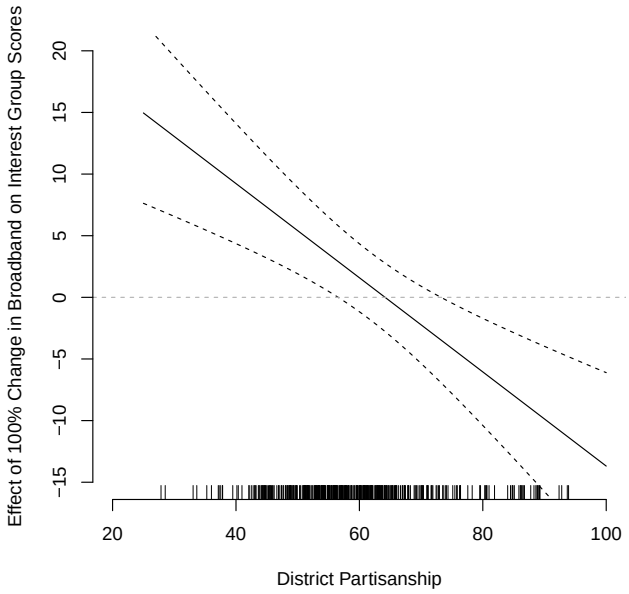
Panel C presents the marginal impact of expanding broadband on interest group scores across levels of partisan composition. Again, the relationship is negative. Those legislators in the most marginal districts see a strong, positive, impact of broadband. This effect diminishes – and indeed, becomes negative – as partisan composition increases. A member in a district with an equal mix of co-partisans and out-party supporters is expected to have an interest group score 5.5 percent-



(a) Party Unity



(b) Presidential Support



(c) Interest Group Scores

Figure 2.5: Marginal Effect of 100% Change in Broadband Providers

Marginal effects plots generated from OLS regression with heteroskedastic-robust standard errors and 95% Confidence Intervals. Legislator-Congress observations for the 107th and 108th Congresses. Variation in each independent variable is due solely to changes in district boundaries from the 2002 redistricting.

age points higher for every 100% increase in the number of broadband providers. Increasing the number of co-partisans to 75% decreases this marginal effect of broadband to -4 percentage points.

This analysis, which uses the traditional method of modeling an interaction hypothesis, makes the assumption that the change in the marginal impact of broadband due to partisan composition is monotonic. In Appendix Section 5.8 I provide a further test that does not make this assumption by running the non-interactive model separately for marginal (partisan composition $< 55\%$) and non-marginal members. The results point to the same conclusions: In all cases marginal members are more affected by broadband than non-marginal members. This split sample further allows a test of whether the results in this section are due to a "ceiling" effect. It is possible that non-marginal members are less affected by broadband simply because they are "maxed out" on the dependent variables and cannot be moved further. I test the interactive hypothesis on the split-sample and show that even among marginal members (who are far less likely to be at the ceiling of the dependent variables) increasing partisan composition attenuates the effect of broadband.

The evidence, therefore, confirms the hypothesis that broadband's positive effect on voting with national groups is conditional on the electoral marginality of members. Marginal members are those who – in the traditional account of legislator behavior – have the most to lose from voting with national groups. As broadband has expanded – and with it the erosion of the sort of information needed for voters to make independent decisions across different levels of government – these marginal members no longer face this disincentive.

In the Appendix I extend these analyses in several ways. First, in Appendix Section 5.2 I examine whether the logic represented here – that expanding broadband hurts the evidentiary basis for Congressional elections – affects committee selection by members. The expectation is that the expansion of broadband will remove the incentive for members to serve on constituency-orientated committees (Deering and Smith 1997; Fenno 1973). This hypothesis is confirmed: a 100% increase in the number of broadband providers is associated with a 25 percentage-point drop in the probability a member serves on a constituency-orientated committee.

Appendix Section 5.13 I examine whether these effects differ by party, looking at the moder-

ating impact of both Republican and Democratic party membership and in-party/out-party status. The results suggest that the positive impact of broadband on nationalized voting is largely driven by *out*-party members. Once this difference is accounted for their is no significant difference for the effect of broadband for Republicans and Democrats. Why might members in the out-party be more affected by broadband? It is difficult to speculate on this, but it may be that in-party members, faced with the prospect of governing, are simply less able to exercise discretion in whether they support national forces. That is, regardless of the communication environment, they are expected to vote with their parties, the president, and aligned interest groups, in order to push through policy. Out-group members, on the other hand, have far more discretion in their legislative home-styles and can respond to their communication environment by pursuing either a local or national agenda.

Finally, in Appendix Section 5.14 I use a lagged measure of broadband in the panel setup to examine the longevity of the effects of broadband. The results in this section are weaker than those in the main panel analyses, though still positive and significant. This indicates that broadband has its strongest effect after its initial expansion, but this expansion also affects legislative behavior several years later. It is not the case, in other words, that the main effect of broadband is felt further in the future than modeled here.

2.4 Discussion

How can we square the rising amount of loyalty members of Congress show to national interests with the notion that avoiding such a thing is an important component of re-election? The evidence presented here suggests that one reason for this apparent contradiction is a shifting media environment. The idea that constituents punish members of Congress for excessively siding with national interests is predicated on a communication environment that has been significantly eroded by technological change. We've transitioned from a media environment that provides an "evidentiary basis" for Congressional elections (Arnold 2013), to one in which national information plays a much larger role. These changes in the information environment lead to voters who have less information about Congressional elections, are more likely to vote in a partisan fashion, and are

less responsive to changes in their legislator's behavior (Hayes and Lawless 2015, 2018; Lelkes et al. 2015; Trussler 2018a).

Leveraging the rollout of broadband and the 2002 redistricting, I've shown that there are clear representational consequences to these changes. Legislators who are redistricted to districts with a higher concentration of broadband providers act more in line with national forces. Reinforcing the notion that this is due to changes in electoral incentives, this relationship is primarily driven by members in marginal districts.

The tests in this paper capture the total effect of broadband on legislative behavior. I have discussed what I believe to be the causal mechanism – an information deficit causing voters to act in a more nationalized way, changing the incentives for legislators – but I cannot offer a direct test. This being said, there is good evidence that broadband decreases the availability and quality of local news (Gaskins and Jerit 2012; Ha and Fang 2012; Hopkins 2018; De Waal and Schoenbach 2010; Waldman 2011), increases the availability of national news (Hindman 2008, 2011; Lelkes et al. 2015; Tewksbury 2003), and generates voters more motivated by partisanship and national concerns (Lelkes et al. 2015; Trussler 2018a).

While the proposed causal mechanism is well supported by evidence, this does not mean that it is the sole route of influence from broadband to legislative outcomes. Recent work has demonstrated a positive effect of the roll-out of broadband on populist movements in Europe (Campante et al. 2013; Schaub and Morisi 2019). Compared to mainstream parties, these movements are relatively extreme and resource poor. The internet affords such groups a low-cost mechanism for organizing, increasing their power relative to older information environments (Bimber 2003). A complimentary mechanism to the one discussed here may be the ability of extreme policy demanders within parties to have more voice, influencing legislators to have more extreme positions. Future work can look to ascertain the degree to which the expansion of new communication technologies plays a role in driving elite mis-perceptions of public opinion (Broockman and Skovron 2018).

The present study uses broadband roll-out as the main independent variable because it is mea-

sured nationally at a sub-district level, and because it represents a particularly large shift in the communication environment. This being said, this paper should not be read as a narrow case study of a particular moment in American political history. The move online is a continuation of existing trends. From the advent of cable news, through the rapid expansion of national talk-radio, to the proliferation of cross-national online social networks, the media environment increasingly paints a national picture. These movements together have played a large role in shaping the type of legislative behavior we see today. As discussed in the introduction, I believe these results have generalizability to technologies that have emerged since broadband and technologies that have yet to emerge. Any technology that provides easier access to national politics while drawing eyes from local sources are likely to have similar effects on legislative behavior.

I am not claiming in this paper that legislators are free to do what they wish. The expansion of broadband has not untethered legislators from electoral sanction. What I am arguing is that when citizens are going to the voting booth, they are armed with different information than what they had 50 years ago. Of course, voters are free to take into account whatever considerations they wish in voting; and if a more partisan electorate is receiving more partisan politicians then this ought to be considered successful representation. This being said, there are (at least) three reasons why this change may be normatively troubling.

First, voters did not wholly choose the media system that has led to this outcome. While individual proclivities for selective exposure of congruent information have been bolstered by the internet (Iyengar and Hahn 2009; Lelkes 2016), other changes were not "chosen". Citizens abandoning their local news sources is only partially a function of choice over political information. The fact that citizens prefer for example, to list their couches for sale on Craigslist instead of the local newspaper classified section has nothing to do with politics. Yet, the loss of classified revenue for newspapers due to individuals making use of online peer-to-peer marketplaces is significant (Seamans and Zhu 2010). It is problematic that non-political decisions – like using websites like Craigslist – alters the political information environment and (through a straight forward process of media priming) voting behavior.

Second, while dyadic representation may be satisfied by more partisan electorates choosing more partisan members, such a system may be detrimental to *collective* representation and policy output. I have discussed the effects of broadband in terms of a movement away from moderation. This movement away from moderation for the minority party is a movement towards delay and disruption (Layman et al. 2006). The electoral incentives facing members in new communication environments do not reward them for the type of moderation that allows for an efficient bipartisan legislature. Multiple studies have shown that a more polarized legislature results in more gridlock (Binder 1999; Jones 2001), as such, further nationalization of the media system is expected to result in a reduced policy output.

Third, legislators being forced to moderate their policy views away from the priorities of national interest groups is a key component of the US system of checks and balances. In Federalist 51, Madison wrote that "ambition must be made to counteract ambition" (Madison 1788). Members of Congress serve different constituencies than the President and Senators. These different constituencies – and the conflicting interests they generate – create a self-policing mechanism for government. In the new communication environment voters increasingly have information only on national politics. The result is that the electoral incentives for all politicians begin to align. When legislators respond to these new incentives by showing increased loyalty to national interests, they are no longer in a position to provide an adequate check on the other branches of government.

Chapter 3

All the President's Papers: Broadband Roll-Out and the Nationalization of Local Newspaper Coverage

A vital accountability mechanism for US members of Congress is coverage by local newspapers. These local sources of information are uniquely positioned in terms of resources, expertise, and incentives to provide the type of information that promotes accountability. A great deal of work shows that variations in local media quality strongly structure citizen attitudes and knowledge about local politics, and produces elected officials more responsive to those attitudes (Arnold 2013; Hayes and Lawless 2015, 2018; Snyder and Strömberg 2008).

The newspaper industry underwent great upheavals in the early 21st-Century, changes thought to emanate from the roll-out of high-speed broadband internet. How does the coverage of members of Congress by local newspapers change as newspapers react to the economic threat of a changing media environment? This change was occurring alongside an unprecedented "nationalization" of politics, where political decision making of both voters and legislators increasingly takes place on one plane of partisan conflict. While research has shown links between economic competition and newspaper coverage (Dunaway 2008, 2011; Dunaway and Lawrence 2015; Arnold 2013; Zaller 1999), and the effects of broadband on nationalizing politics (Trussler 2018b, a), there has not been research linking the two together. That is, does the effect of technologies like broadband on politics pass through – at least in part – changes to traditional media like newspapers?

I take on this question in this paper, merging together data on the geographic roll-out of broadband to data on both local newspaper circulation and content. My expectation is that the economic threat of broadband causes newspapers to shift their coverage towards the President and away from members of Congress, as this latter coverage is potentially less interesting to consumers and more expensive to produce. The results show mixed success for this hypothesis. Newspaper circulation did indeed decline in the face of broadband. I estimate that a 100% increase in broadband providers

in medium-sized cities to reduce newspaper circulation by around 75 newspapers for every 10,000 residents, and in small cities by around 142 newspapers for every 10,000 residents. This economic competition, however, does not cause newspapers to reduce their coverage of local members of Congress. Instead, newspapers appear to *increase* their coverage of the President while articles about local members are unaffected. As a result, a 100% increase in broadband providers leads to newspapers printing twice as many articles about the President relative to members of Congress.

These results show that a plausible route of influence from technological change to political outcomes is through the erosion of the traditional media environment. There has been excellent work discussing the ways in which new opportunities online for selective exposure and social network homophily can cause voters to become more nationalized and polarized in their attitudes (for an overview see Prior 2013). There is comparatively little work, however, on how new technologies like broadband affect politics *through* their effect on media sources which have traditionally formed the backbone of the informational relationship between representatives and citizens. These two routes are not mutually exclusive. However, these results suggest that any account of the effects of new technologies which does not examine their effects on old technologies is incomplete.

3.1 Why Might Broadband Affect Newspaper Content?

There is good reason to believe that the expansion of broadband affects newspaper content – and coverage of members of Congress in particular. In this section I first discuss previous literature showing that economic competition *within* the news industry affects content. Second, I present literature arguing that reading news online represents another form of economic competition for local news. As such, the expectation is that the roll-out of broadband internet – and with it easier access to online news – will similarly affect newspaper content.

There is a fundamental link between the economic circumstances of a paper and the content that it produces. Arnold (2013: 220) likens the newspaper industry to electricity providers, in that both industries subvert the usual expectation that competition produces a better product. "Better" products in both industries – high quality "hard" news for newspapers or spare transmission

capacity for electricity providers – are luxuries that can only be afforded when in a monopoly position. Economic competition therefore is thought to make newspapers focus on more popular, low-quality, content: "crime, violence, and bizarre occurrences" (Zaller 1999: 37), as well as commentary and opinion pieces (Hamilton 2004). The accumulated evidence discussed below suggests that when newspapers are economically threatened they will produce less straight-news public affairs coverage generally, and less coverage of local members of Congress specifically.

Zaller (1999) posits that there is a fundamental tension between the desires of journalists to produce high-quality content and market pressure for low-cost content. Like all professionals, journalists seek to produce a sophisticated product that effectively shows off their skills and "voice" (Zaller 1999: 30). Importantly, the high-quality work that journalists wish to produce is public-affairs programming that fulfills the media's role as the "fourth-estate". Evidence for this is found in emphasis placed on investigative public-affairs reporting in journalism textbooks and reporters' memoirs (Zaller 1999: 34). This content, while popular with journalists, is not what is demanded by the public. Zaller (1999) provides a good deal of evidence, both in terms of local TV news and local newspapers, that increases in market competition are associated with lower news quality. Dunaway and co-authors have further confirmed this intuition in a series of articles, showing that newspapers systematically produce lower-quality game-frame coverage of politics when under more market pressure (Dunaway 2008, 2011; Dunaway and Lawrence 2015).

This research suggests that all coverage of politics – whether that coverage takes a national or local perspective – is expected to suffer under economic competition. There is good reason to believe, however, that economic competition will affect coverage of members of Congress more negatively then coverage of the President. This is due to both supply and demand of such news.

A number of studies suggest that, when given a choice, consumers prefer national news. As far back as the early 2000s, Tewksbury (2003) tracked the consumption patterns of online news readers from a representative sample provided by Nielsen/NetRatings, and found stories classified as "National" in focus made up 10% of all views, compared to 1.2% for stories classified as "Local". This same pattern of results was found later in a web-tracking study by Hindman (2011), who esti-

mated that of the time spent reading news online only 15% is spent on local sites, compared to 85% on national sites. These large-scale observational findings are complimented by more recent experimental evidence from Hopkins (2018) In an experiment participants were asked to select from a number of news articles, one of which was political in nature. The subject of that article was experimentally manipulated to be either a mayor, governor, or the President. When the political article was about the President it was selected significantly more often by respondents.

Consumers seem to demand more national news. This demand will increasingly be a driving force for editors and owners under conditions of economic competition. But even if this was not true, *supplying* news about members of Congress is also less likely under such conditions. When newspapers write about Congress they are likely to do so in two ways: via reporting from Washington, or by reporting on the local-angle of Congressional activity. The former is clearly increasingly less-likely under conditions of economic conditions, and the empirical record shows that the number of Washington-based reporters from local newspapers has dropped precipitously since the mid-2000s (Lu and Holcomb 2016). But even a story or editorial covering the local angle requires reporters to ascertain how local members voted and to determine how those votes will affect the local constituency. This type of article takes many more resources to write compared to an article that simply talks about the passing of a bill in national terms.

Arnold (2013: 194:220) tests this notion directly. Using a dataset of coverage of members of Congress in local newspapers, Arnold looks to determine the degree to which economic competition (operationalized as whether there is a competing newspaper in the same city) affects coverage of local members of Congress. The results show that economic competition has a negative impact, whereby newspapers with a competitor publish around 80 fewer articles about members of Congress over the course of a year compared to papers that do not have a competitor.

Previous research has shown that high-quality news suffers when local news organizations face economic competition, and that one particular type of high-quality news is coverage of local members of Congress. This leads to the question: is the expansion of broadband a form of economic competition for local news organizations?

The timing of the expansion of broadband and the decline of the newspaper industry suggests a correlation. The FCC's 2011 report on the information needs of local communities (Waldman 2011) lays out a litany of effects of how increased access to high speed internet has decimated the local news economy. Newspaper revenue dropped 47% from 2005 to 2009 and staffs have shrunk 25% since 2006. While the 2005-2009 period did see online traffic for local newspapers balloon from 43 million users a month to 70 million users a month, the $716 million in additional revenue generated online pales in comparison to the $22.6 billion in advertising losses to the print side (Waldman 2011: 17). Reporters are stretched thin, making it harder to report on complicated topics. As a result, topics like education, health care, and government are reported on less, at the expense of topics like weather and crime (Waldman 2011: 13).

These intuitions about the relationship between the expansion of broadband and the decline of local news organizations are reflected in aggregate usage statistics. In the mid 1990s, 71% of PEW respondents reported regularly reading daily newspapers, and 72% reported regularly viewing the local television news. By 2008 the percentage reporting regularly reading a newspaper had dropped to 54%, while 52% reported viewing local television news (Kohut 2008). This drop occurred at the same time as the percentage of respondents reporting getting their news online rose from under 20% to nearly 60% (Hopkins 2018).

These broad trends, however, tell us little about causation. In particular it is difficult to determine to what degree these trends are due to individuals treating internet news reading as a substitute for offline news reading, and how much is explained by generational differences in media consumption (Hopkins 2018). Several authors have used panel studies that track the same individuals over time to see whether Americans are using online news as a substitute for offline news, which would suggest a causal relationship. Hopkins (2018) uses panel data from 2008 and 2012 to show that individuals remained constant in their viewership of online news across the time period while newspaper readership saw a statistically significant decline. Other researchers have confirmed that internet use displaces use of traditional media. Using data from the 2008 CCAP study, Gaskins and Jerit (2012) examine how respondents alter their use of offline sources once they begin to use the

internet as a source. A great deal more respondents reported online news reading as a substitute for offline reading, rather as a complement. For example, 33% of internet users reported reducing their newspaper readership since they started using the internet as a news source, compared to just 9% who reported increasing their newspaper readership (Gaskins and Jerit 2012: 197). In particular, in this and other studies respondents report that accessing news online better satisfies their needs for variety and convenience, leading them to reduce their newspaper readership (Gaskins and Jerit 2012; Ha and Fang 2012; De Waal and Schoenbach 2010).

As individuals get access to broadband they shift their consumption away from sources like local newspapers and towards online news. This shift brings economic pressure to news outlets, which multiple studies have shown influences the content of those outlets. This leads to three hypotheses:

H1: The expansion of broadband will lead to declines in local newspaper circulation.

Evidence suggests that reading news online is a substitute for reading news offline. As individuals gain easier and cheaper access to the internet they will be less likely to read local newspapers.

H2: The expansion of broadband will lead to less political coverage in local newspapers.

Political coverage is an example of high-quality news, which is known to decline under conditions of economic competition. As broadband is a form of economic competition for local newspapers, its expansion should lead to declines in political content.

H3: The expansion of broadband will lead to the ratio of articles mentioning the President to articles mentioning local members of Congress to increase.

Articles that look at the local-angle of national politics are less popular and are more resource intensive to produce than those that focus on the national angle. Again, as broadband is a form of economic competition for local newspapers, its expansion should lead to relatively more national versus local newspaper coverage.

Because the units of observation below are cities, one important consideration is how the size of a location affects the relationships found. Indeed, there is good reason to believe that all of the hypotheses will operate more strongly in smaller cities. Newspapers in small cities have fared relatively worse in the last 20 years than those in larger cities. While closures of major dailies generate a great deal of consternation, from 2004 to 2018 53 of the 62 dailies which closed had circulations of less than 50,000 (Abernathy 2018: 12). Gentzkow and Shapiro (2011) show that population is the key determinant of newspaper entry and exit: there are certain fixed costs to producing a newspaper that do not vary by population, making newspapers in small towns more vulnerable to economic changes. More specific to the threat faced by broadband, newspapers in small cities may also lack the resources needed to successfully transfer to digital news production (e.g. coders to build an effective website are more likely to be found in larger cities) (Heckman and Wihbey 2019).

The expectation is that newspaper circulation in smaller cities will be more negatively impacted by the competition from broadband than newspaper circulation in larger cities. As a consequence, changes in content should also be greater in smaller cities.

H4: Both circulation and content will be affected more in places with smaller populations.

3.2 Measuring the Roll-Out of Broadband

The main independent variable used in this paper to determine the effect of an increasingly dense information environment on political nationalization is the roll-out of broadband internet providers. I show in Appendix Section 6.2 using individual level data from the Current Population Study Internet Supplement that expansion of broadband providers strongly predicts the probability that individuals have a home broadband subscription.

The measure of broadband internet providers comes from the Federal Communications Commission, which collects bi-annual data from all broadband providers operating in the United States on where they have deployed service. From 1999-2008 the FCC tabulated these results into data

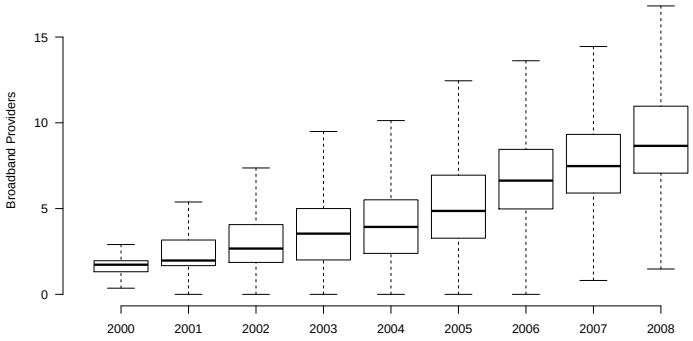
listing the number of broadband providers[1] in each zip-code in the United States, which I transformed into county-level data (for the analysis of newspaper circulation) and metropolitan statistical areas (for the newspaper content analysis).[2] Figure 3.1 displays the levels and changes in the number of broadband providers in counties in each year of this period. Note that because the level of broadband in each geographic area is calculated as a weighted average of the number of providers in the zip codes that make up that area, the number of providers is not an integer.

The number of broadband internet providers is an indirect measure of the degree to which people in an area have increased access to online information that will disrupt the newspaper industry. These data do not measure the number of broadband providers every individual in a geographic area has access to. If a district has five broadband providers operating within it, some individuals may have access to one provider, others may have access to three or four, while some may have access to none. At the same time, for a given district an increase in the number of broadband providers can only mean either (1) increased competition or (2) access for a new set of customers.

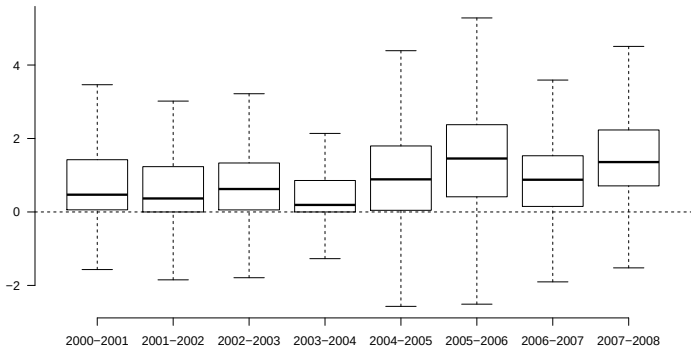
This paper is not the first to use broadband providers as an indicator for greater access to information, and previous research has done much to validate the measure. The number of broadband providers has been found to have the expected effect on the cost and quality of broadband available to an area. Wallsten and Mallahan (2010) analyzed a similar dataset and found that those areas with multiple broadband providers had on-average lower costs and higher internet speeds. Lelkes et al. (2015) show that the number of providers and number of subscribers correlate quite strongly at the cross-sectional county level, a result which has been validated in multiple other papers at differing levels of aggregation (Hitt and Tambe 2007; Kolko 2010). In Appendix Section 6.2, I add further validation by matching these broadband data to individual level data from three waves of

[1]Broadband providers in this case are identified as the over-arching company which owns the service provider. That is, if two internet service providers have different names but are owned by the same corporation, they are treated as one "provider" in this dataset.

[2]Crossover information for each of the counties and MSAs was generated from the Missouri Census Data Center's MABLE/Geocorr2k correspondence engine (http://mcdc.missouri.edu/websas/geocorr2k.html) which allowed transformation of zip-code data. This allowed the construction of a dataset which records the number of broadband providers in each geographic area for each 6 month period from 2000 to 2008.



(a) Levels of Broadband



(b) Changes in Broadband

Figure 3.1: Broadband in US Counties, 2000-2008

the Current Population Survey Internet Supplement. Leveraging within-county variation, I show that a 100% change in the number of broadband providers in an area is associated with an 11% increase in the probability an individual has a home broadband subscription.[3] We can be confident, in other words, that those areas with more broadband providers are those where more individuals have internet access, at a lower cost, and with higher speeds.

This measure has the substantial benefit of avoiding the well known problems with self-reported measures of media-use, which are often thought to be simple proxies for political interest (Prior

[3]This is an important point of validity, though it should be noted that increases in subscriber rates is just one important effect that increasing providers has on consumption patterns. Even for those that already subscribe to broadband, an increase in the number of providers leads to better *quality* internet, which will induce them to use it more.

2009b, a). This being said, there are two sources of bias endemic to the broadband measure: non-randomness in terms of geography, and non-randomness in terms of time. Broadband access is more likely in highly populated places and less likely in sparsely populated areas. Given that population density is also correlated with newspaper circulation and content, not correcting for this relationship would bias the results. Similarly, broadband access increased in every time period across the sample. Anything that changed in a similar way from 2000-2008 would be correlated with this time trend and bias the results.

Thankfully, there are clear ways to deal with these two problems. Fixed-effects for cities holds constant any non-time-varying features of geography. Adding an intercept for each city partials out the effects of the urban/rural split on *levels* of broadband, and instead forces the model to consider within-city *changes*. Similarly, fixed-effects for time allow the model to soak up the secular growth of broadband, removing the concern of endogeneity based on the time-trend. The variation that is exploited to estimate the impact of broadband effectively considers the level of broadband in a city-year that is above or below what is expected based on that city's baseline level of broadband, and the national growth from that baseline expected due to the time period.

3.3 Broadband Negatively Impacts Newspaper Circulation

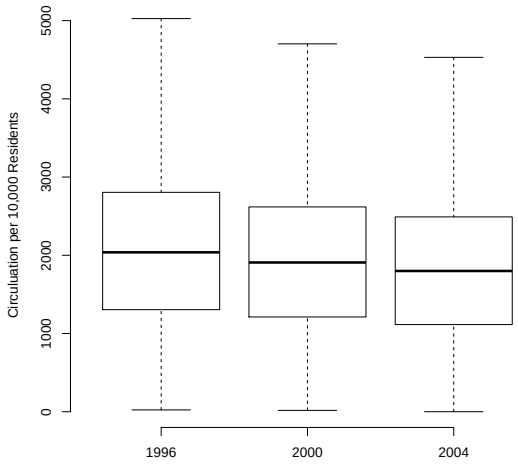
The first hypothesis is that the expansion of broadband internet negatively impacts newspaper circulation. Previous research has shown that individuals treat reading news online as substitute for news offline. Therefore, as more broadband providers enter an area (and therefore, more individuals get access to online news), newspaper circulation should decline.

I merge together the data on broadband discussed above with data on local newspaper circulation in 1245 cities in the years 1996[4], 2000, and 2004. (Unfortunately 2004 is the final year for which these newspaper data are available). These newspaper data were collected by Gentzkow

[4]The Broadband data begins in 1999. In order to have three time periods for this analysis, I conservatively set each city to have 1 broadband provider in 1996. This is a defensible assumption as there simply was not commercially available residential broadband at this time (Ehrlich 2014; Nuechterlein and Weiser 2005). Using 1 broadband provider in each district leads to more conservative changes in the first period, and works better better with the natural log specification used.

and Shapiro (2011) from the Editor and Publisher Yearbook and record, for a given city, the total circulation of daily newspapers. Only newspapers that are local to a city are included in its circulation count. Figure 3.2 displays the distribution of newspaper circulation in each year. The average city had newspaper circulation of 2264 papers per 10,000 residents in 1996. Average circulation dropped in each subsequent year to 2119 newspapers per 10,000 residents in 2000 ($p = .04$), and further to 1978 newspaper per 10,000 residents in 2004 ($p = .03$).

Figure 3.2: Newspaper Circulation Over Time



The question is whether this decline in newspaper circulation is affected by broadband. Specifically, in this section I ask whether areas with faster expanding broadband between periods saw a relatively sharper decline in newspaper circulation. To test this, I estimate the following model for cities k in time periods t:

$$\begin{aligned} Circulation/10,000Residents_{kt} &= \alpha_k + \alpha_t + \beta_1 ln(Providers_{kt}) + \\ &\quad \beta_2 ln(Med.Income_{kt}) + \beta_3 Number.of.Dailies_{kt} + \varepsilon_k \end{aligned}$$

The per-capita newspaper circulation in a city-year is modeled as a function of time and city

fixed effects, the logged number of broadband providers in the county which the city resides in each time period[5] as well as the (time variant) logged median income of the county. The city fixed effects remove all non-time-variant features of cities which may confound the relationship. The time fixed effects remove all city-invariant features of years that may confound the relationship, most importantly the fact that in nearly all cities the number of broadband providers rose while the the circulation fell between the two time periods. Time-variant (logged) median income controls for the possibility of some cities becoming more wealthy which ought to drive up demand for newspapers. Finally, there are some newspaper opening and closures during this period, so I also control for the number of daily newspapers operating in the city.

Table 3.1 displays the results. The first column pools all cities together. Because the expectation is that city population will moderate the effect of broadband on circulation, I then present the results for small, medium, and large cities[6]. In Appendix Section 6.5 I also present a traditional interaction to test this hypotheses, where I show that the effect of broadband on circulation is very negative at low levels of population, and attenuates to zero as population increases at a statistically significant rate.

The coefficient in the first column is negative, as expected, indicating that a positive change in the number of broadband providers in a city leads to a decrease in per-capita newspaper circulation. That being said, the standard error on this coefficient is of such a magnitude that I fail to reject the null hypothesis of no relationship between broadband roll-out and newspaper circulation. The probability of attaining a coefficient of this magnitude if the true relationship is zero is 25%. Breaking this relationship down by city-size, however, reveals substantial variation. In both small and medium-sized cities the relationship between broadband roll-out and newspaper circulation per capita is clearly negative and statistically distinguishable from 0. In small cities, a

[5]The newspaper data identifies cities by both name and county. The city names do not reliably line up with US Census "Place" names. Instead of attempting to merge these data to Census Places, I simply apply county characteristics to each city. By merging in broadband and demographic characteristics by county I am assuming that change in these features at the county level apply also to the city. This seems defensible as, in most cases, the cities make up the majority of the counties in which they reside.

[6]These three categories were determined by splitting the cities into population terciles.

Table 3.1: Effect of Broadband Rollout on Newspaper Circulation

	Newspaper Circulation per 10000 Residents			
	Full Sample	**Small Cities**	**Medium Cities**	**Large Cities**
ln(Providers)	−30.87	−142.05*	−74.27**	4.10
	(26.58)	(82.74)	(35.08)	(34.13)
ln(Median Income)	71.84	−79.81	3.47	553.68
	(157.37)	(264.50)	(196.27)	(402.24)
Number of Dailies	476.58**	1126.09	394.24**	451.37**
	(127.62)	(838.17)	(136.09)	(158.84)
2000	−147.80**	−126.02**	−116.18**	−150.46**
	(19.71)	(37.10)	(26.34)	(34.91)
2004	−244.28**	−103.80	−187.15**	−269.08**
	(43.41)	(118.94)	(62.46)	(60.46)
City F.E.	Yes	Yes	Yes	Yes
N	3637	1201	1238	1200
R-squared	0.99	0.99	0.99	0.99
Residual Std. Error	198.88 (df = 2388)	217.07 (df = 768)	144.51 (df = 783)	181.66 (df = 754)

*p $<$ .10 **p $<$ .05; Cluster-Robust Standard Errors

100% change in broadband providers leads to a reduction of 142 newspapers per 10,000 residents, and in medium cities the same change leads to an 74 unit decrease per 10,000 residents.[7]

Because the main variable of interest – the number of broadband providers – is logged, it is difficult to understand the substantive effects of broadband on newspaper circulation. In Figure 3.3 I address this by using the coefficients in Table 3.1 to predict the circulation in three different sized cities in Tennessee: Paris (pop. 9763 in 2000), Oak Ridge (pop. 27387 in 2000), and Memphis (pop. 650100 in 2000). Specifically, using the fixed-effect for each city, the year fixed-effects, and the real values in each city-year for median income and the number of dailies, I predict the circulation in each city in each year twice: once by using the real values of broadband, and again holding constant the number of broadband providers at 1. In other words, these figures display two predicted versions of reality: one where broadband grew at the same rate as observed in the world,

[7]It is curious in these analyses that the income of a city does not affect newspaper circulation. All things being equal an area becoming more prosperous ought to increase the number of subscribers to a luxury good like a newspaper. I believe there are two possibilities here. First, this analysis is looking *within* cities over a relatively short 8-year period. There simply may not be sufficient variation in the economic circumstances of cities during that period to produce a significant result. Second, there is likely a complex relationship between income and newspaper subscriptions. More disposable income may lead individuals to be more likely to subscribe in newspapers, but it may also lead them to increase their consumption of substitute goods instead, like cable and online news.

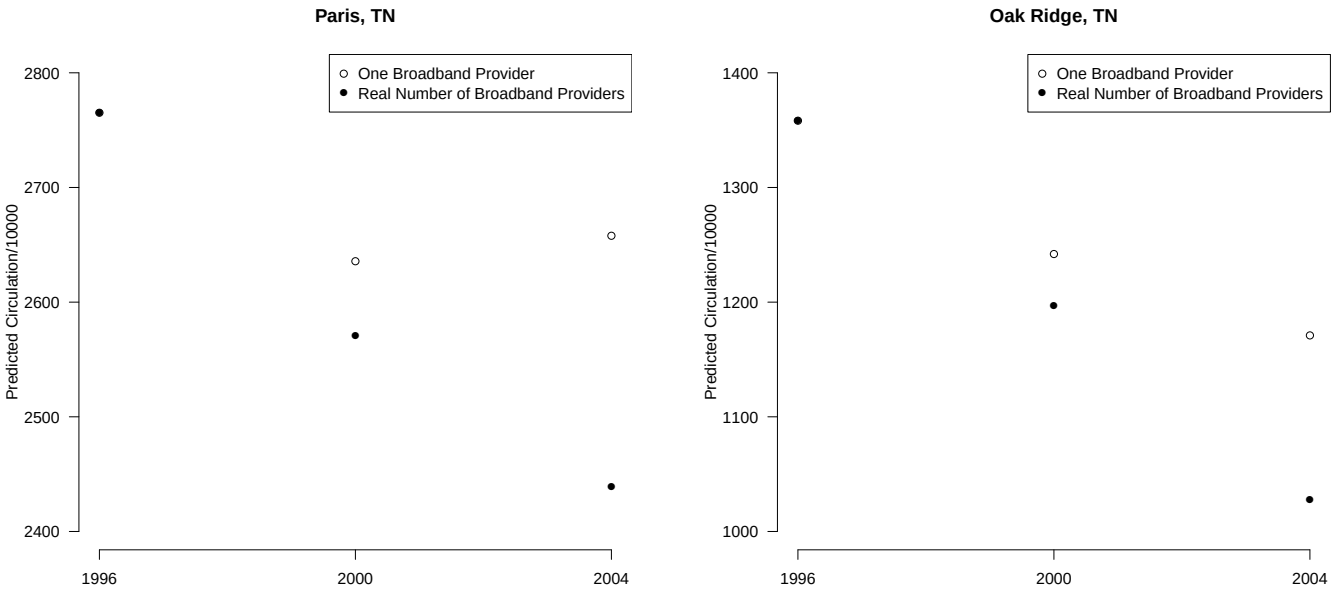
and the other where the level of broadband never grew past 1 provider.

The prediction for small towns is that circulation declines from 1996-2000, but has a small recovery to 2004. This can be seen in the prediction for Paris, TN that assumes a constant level of broadband providers. The growth of broadband in Paris – and its negative effect on circulation – offsets this predicted recovery in newspaper circulation. In 2000 the difference in circulation when Paris has one provider instead of its real number of providers (1.57) is 64 newspapers per 10,000 residents. In 2004, the difference in circulation between one provider and the real number of providers (4.67) is 218 newspapers per 10,000 residents.

Medium towns, in contrast, saw a steady decline in the number of newspaper subscriptions regardless of the number of providers, but the difference between what is expected with growth in broadband and without growth in broadband is much smaller. In Oak Ridge in 2000 the difference in circulation between one provider and the real number of providers (1.8) is 44 newspapers per 10,000 residents. In 2004, the difference in circulation between one provider and the real number of providers (6.8) is 143 newspapers per 10,000 residents.

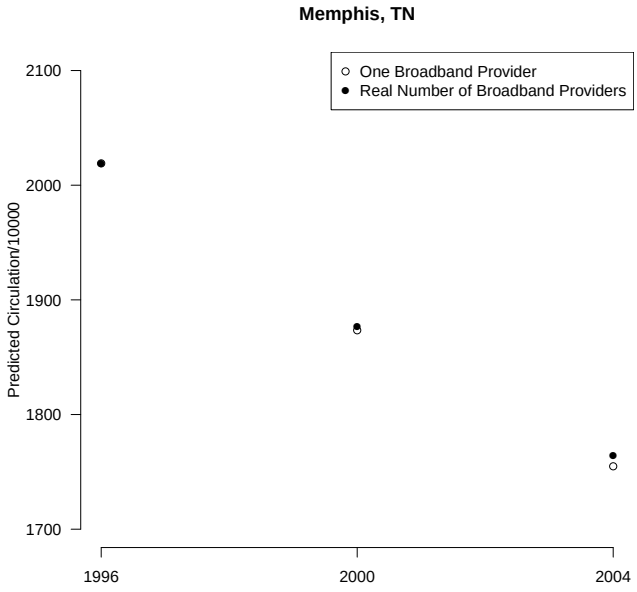
Given that the coefficient on the number of providers in large cities is close to zero, it is unsurprising that comparing the predicted number of broadband providers in Memphis when the number is held constant versus the real number of providers reveals little difference.

This test represents persuasive evidence that the introduction of broadband generated a statistically significant and substantively important change in newspaper circulation. When broadband expanded to new areas – particularly in small and medium cities where newspapers are more vulnerable – newspaper circulation declined. The next section focuses in on newspapers in 30 cities and examines how the content of these papers changes in response to this economic threat.



(a)

(b)



(c)

Figure 3.3: Predicted Effects of Broadband on Newspaper Circulation by City Size

Notes

3.4 Broadband Leads to More Coverage of the President

There is an expectation that under conditions of economic threat newspapers change their coverage away from less popular high-quality news (”hard” or ”straight” public affairs programming) and towards more popular low-quality news (”soft” news, weather, crime, commentary & opinion). I’ve argued above that in terms of coverage of Congress, this equates to both: reducing the coverage of politics overall (H2); and reducing the coverage of members of Congress relatively more than their coverage of the President (H3).

To investigate this, I performed a content analysis on newspapers in 30 randomly drawn US metropolitan areas. A list of municipalities and the newspaper used can be found in Appendix Section 6.3.[8] For each city I identified the largest daily newspaper and used the ProQuest database to determine content for each 6-month period between January 2000 and June 2008.[9]

For each paper in each of these 17 periods, I record three key pieces of data: the total number of articles in the ProQuest database for the period, the total number of articles mentioning members of Congress local to the area, and the total number of articles mentioning the President. To search for members within each 6 month period I first determined which Congressional districts overlapped with each metropolitan areas both before and after redistricting. Only districts with at least 10% of the metro area’s population were included. I then determined which members of Congress served in those districts across the period. I then performed a search that had both the title “Rep.”(or a derivative) and a name of any of the members and recorded the total number of results.[10] To record the number of articles mentioning the President I simply searched for “President Bush”, and in pre-2002, “President Bush” or “President Clinton”.

Using these three pieces of data I create four dependent variables: *Member Articles %*, the

[8] All metropolitan areas in the US were randomly sorted. The first 30 metropolitan areas whose major newspaper is available on ProQuest were used for this analysis

[9] 27 out of the 30 papers have data for all 17 periods. For three papers there were gaps in coverage (usually for the first half of 2000): The Detroit Free Press, the Dubuque World Herald, and the Eugene Register Guard.

[10] For example, for Cleveland post-2002 I searched in each time period the Cleveland Plain Dealer with the following search term: `("Rep." OR "Reps." OR "Representatives") AND ("Kucinich" OR "Tubbs Jones" OR "Sherrod Brown" OR "LaTourette")`. To maximize the number of hits in most cases I used the representatives last name, unless it clearly would create too many false positives, such as Sherrod Brown in the included example. Biasing the search towards false positives works against my expected findings. I felt for this reason a more permissive search was better than a more restricted search that would have false negatives.

percent of total articles for a period which mentioned any local member of Congress; *President Articles %*, the percent of total articles which mentioned the President; *Politics Articles %*, the percent of total articles which mentioned either the President or local members; *President:Member Articles*, the ratio of articles mentioning the President to articles mentioning local members of Congress. Expressing coverage of politics as a percentage of total coverage increases comparability between newspapers and also protects against any situation of newspapers systematically underreporting all coverage in a given period. This being said, this latter concern does not seem to be a significant problem. In Appendix Section 6.4 I report results using raw count variables instead of percentages and the conclusions are identical.

Following Arnold's (2013) foundational content analysis of coverage of members of Congress, I include all article types in this analysis: straight-news, commentary, editorials, and letters to the editor. In Appendix Section 6.1 I look closely at coverage in one paper and find that there are substantial differences in the types of articles written about members versus the President, with the latter being far more likely in editorials and letters.

Figure 3.4 displays the over-time trends in the newspaper content aggregated across all newspapers. The total amount of political coverage went through a period of surge and decline in this period, peaking at around 3% of all articles during the 2004 election before declining to around 2% in 2008. Looking at the constituent parts of politics coverage, this surge and decline pattern is attributable mostly to coverage of the President surging around the 2004 election, while coverage of members stayed relatively constant around 1%. There was not, in other words, a precipitous overall decline in coverage of members of Congress during this period. The final panel of Figure 3.4 displays the ratio of coverage of the President to coverage of members, with the average paper having between 2 and 5 times as much coverage of the President than coverage of members of Congress local to the area. Figure 3.5 displays this ratio for each of the 30 newspapers, and reveals that there is a good deal of between-newspaper variation in coverage.

Figure 3.4: Summary of Newspaper Content

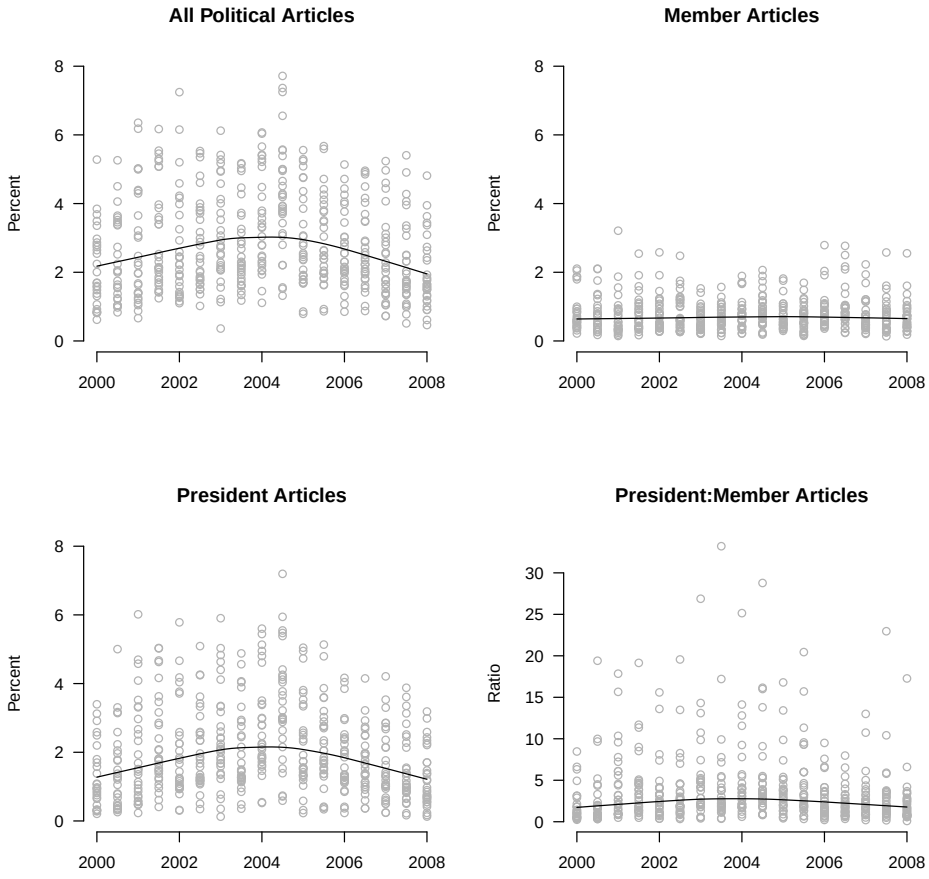
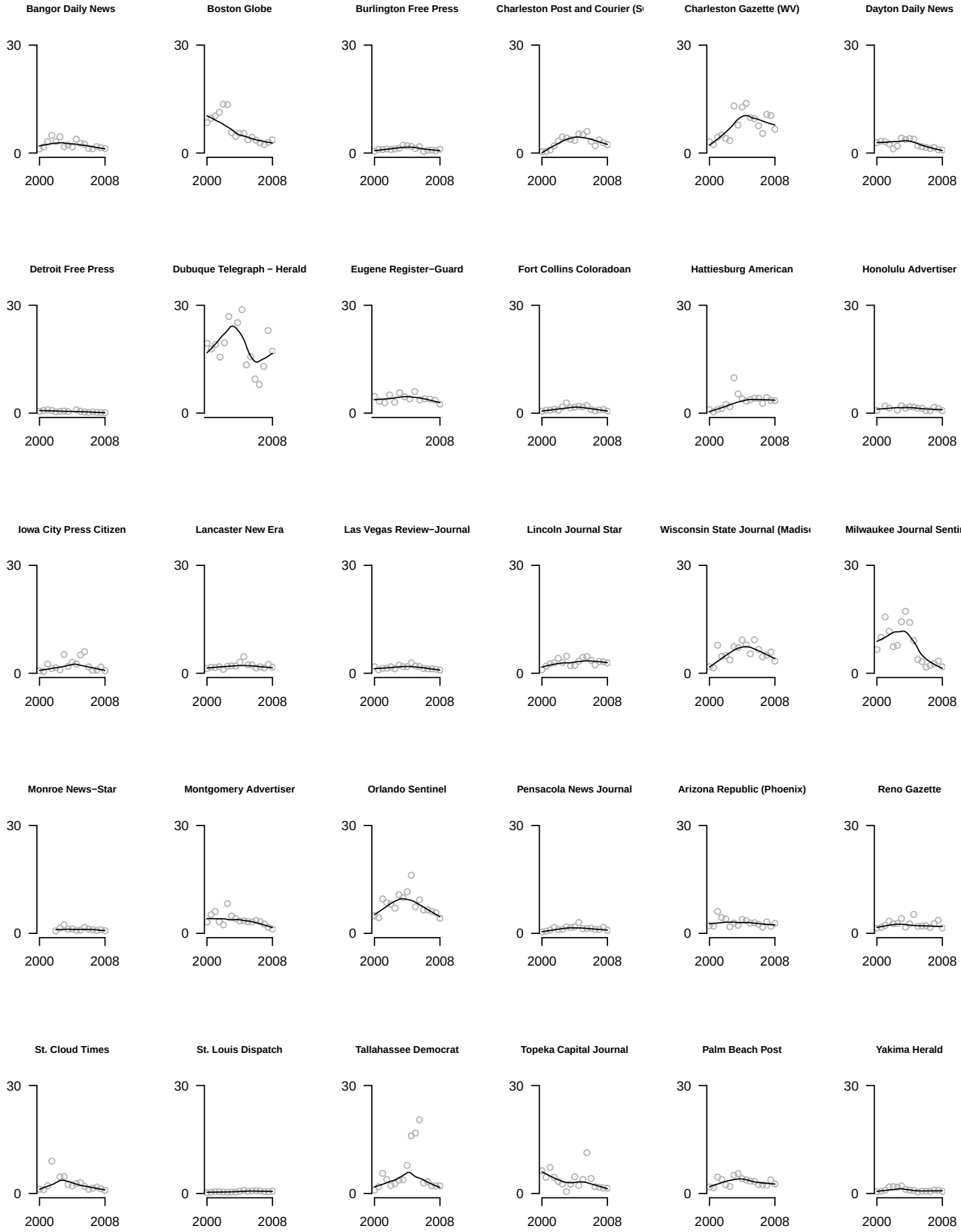


Figure 3.5: Relative Coverage in All Newspapers



To test these measures for validity in Appendix Section 6.6 I look to determine whether coverage varies in relation to the electoral marginality of districts. All things being equal, cities that intersect with Congressional districts that have more competitive elections should produce more coverage of their members of Congress relative to the President. This is precisely what I find. For each city I calculate the average margin of victory in Congressional elections for overlapping districts. Cities with Congressional elections that were above the median in competitiveness (i.e. more marginal districts) printed .19 percentage points more articles about local members ($p < .01$) and .26 percentage points less articles about the President ($p = .02$).

The main question of interest is how this content is related to changes in the levels of broadband in these metropolitan areas. To examine this I merged these collected newspaper data to the data on broadband providers in these areas and local demographics[11]. Repeated observations for each newspaper allows the estimation to take place within-paper using the following equation for each paper (p) in time period (t):

$$\begin{aligned} DV_{pt} &= \alpha_p + \alpha_t + ln(Providers_{pt}) + \\ &\quad ln(Population_{pt}) + ln(Med.Income_{pt}) + \varepsilon_p \end{aligned}$$

Each paper-year dependent variable is modeled as a function of both newspaper and time fixed effects, the (logged) number of broadband providers for the metropolitan area in which the paper resides in the time period, as well as the (logged) population and (logged) median income of that metropolitan area in that time period. The newspaper fixed effects remove all non-time-varying features of newspapers, including: non-varying features of the community that they serve, propensities to cover (or not) local members of Congress, and any systematic errors in the ProQuest archives. The time fixed effects remove all non-newspaper-varying features of certain time periods,

[11] To obtain demographic estimates for metropolitan areas I used Census Tract data from the 2000 Census and 2008 ACS. I determined which Tracts were contained in the Metropolitan area in the year 2000, calculating population weighted demographics and assigning them to the January-June 2000 observation. I then used the same crossover data to relate Census Tract demographics in 2008 to metropolitan areas, assigning this value to the January-June 2008 observation. The remaining observations were linearally interpolated from these two values.

including: increased coverage of members during mid-term elections and decreased coverage of President Bush in time periods proximate to the 2008 election. Including population and income controls for demographic changes that may be related to the level of broadband and newspaper content.

Effectively, this equation asks how a change in the number of broadband providers affects content compared to what would be expected in a given newspaper-year based on how that newspaper usually covers politics, and how *all* newspapers are covering politics in that time period.

The first model assesses H1 – that overall coverage of politics will decline in areas with faster expanding broadband – by looking at how coverage of both the President and members of Congress responds to changing levels of broadband. The next three models test H2 – that coverage of members of Congress will be more negatively affected than coverage of the President – by examining, in turn, how coverage of these two types of politicians responds differently, and how the ratio of coverage between these politicians changes.

Table 3.2: Effect of Communication Environment on Newspaper Content

	Politics Articles %	**Member Articles %**	**President Articles %**	**President:Member Articles**
$ln(Providers_{pt})$	0.75^{**}	0.04	0.70^{**}	1.95^{*}
	(0.28)	(0.15)	(0.24)	(1.03)
$ln(Population_{pt})$	1.30	1.36^{**}	-0.05	-3.28^{*}
	(1.40)	(0.65)	(0.94)	(1.95)
$ln(Median.Income_{pt})$	-2.37	-2.09	-0.22	-0.14
	(2.89)	(1.53)	(2.23)	(10.05)
Paper F.E.	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes
N	498	498	501	498
R-squared	0.74	0.65	0.80	0.74
Residual Std. Error	0.76 (df = 449)	0.31 (df = 449)	0.62 (df = 452)	2.31 (df = 449)

*p $<$ .10 **p $<$ .05; Cluster-Robust Standard Errors

Table 3.2 displays the results of these four estimations. The first dependent variable is the percent of total coverage that is about politics. The coefficient on $ln(Providers_{pt})$ is, surprisingly, positive and significant. A 100% change in broadband providers leads to a .75 percentage point increase in coverage of politics. When newspapers were faced by the economic threat of increasing broadband coverage, they *increased* the coverage of members of Congress and the President. In

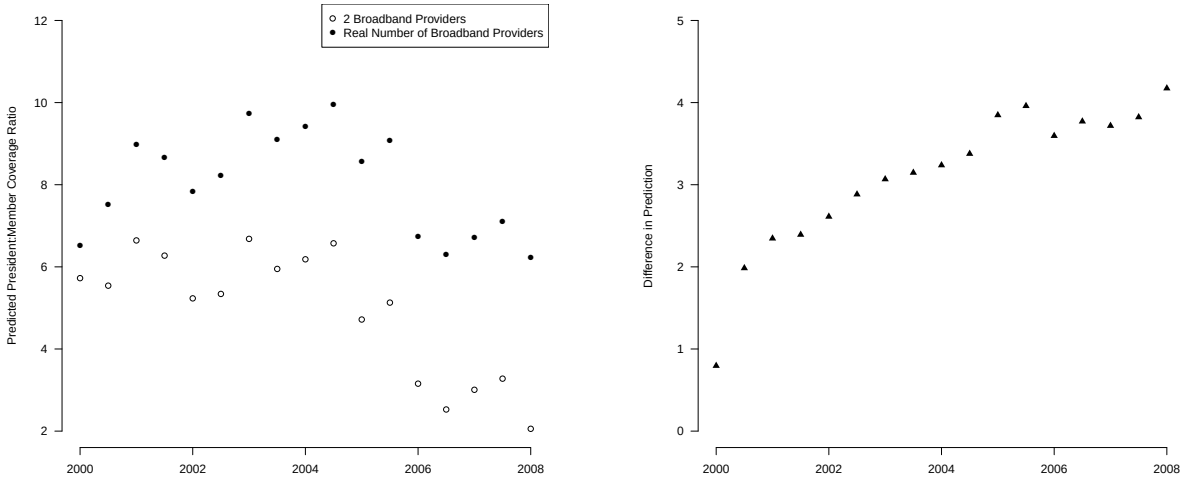
other words, an individual reading the same number of randomly selected articles before and after a positive growth in broadband would be more likely to come across a political article after the switch.

Columns 2 & 3 separate coverage for members of Congress and the President. In column 2 the dependent variable is the percent of newspaper articles that cover members of Congress local to the newspaper. The coefficient on the number of providers in this model is close to 0 and imprecisely estimated. Therefore I fail to reject the null hypothesis that changing levels of broadband have no effect on coverage of members of Congress. In Column 3, where the dependent variable is the percent of total coverage which mentions the President, the coefficient on the number of providers is positive and significant, suggesting that the percentage of articles mentioning the President increases when newspapers face the economic threat of broadband. A 100% change in broadband providers leads to a .7 percentage point increase in coverage of politics. It's clear from these two columns that the result in column 1 is not driven by *all* political coverage responding to the new economic incentives of broadband, but only articles about the President.

Column 4 restates this result by using as the dependent variable the ratio of articles about the President to articles about local members of Congress. Given the results in the other columns, it is not surprising that the coefficient on the number of providers is positive and significant, indicating that as the number of broadband providers increases the ratio of articles about the President to articles about local members of Congress increases. A 100% change in broadband leads to newspapers printing nearly 2 times as many articles about the President compared to members of Congress. This indicates that an individual reading the same number of randomly selected articles before and after a positive shift in broadband would be more likely to encounter an article about the President in the latter period.

As in the above analysis of circulation, understanding the substantive magnitude of these effects is important. To do so, I use the coefficients from the fourth column of Table 3.2 to predict the relative coverage in the Orlando Sentinel under two different broadband conditions: under the real level of broadband in Orlando in each time period, and a counter-factual condition where

broadband is held constant at two providers. In terms of overall trends, predicted coverage of the President compared to local members of Congress is expected to decline throughout the period. For example, looking at the counter-factual condition at the start of the series the paper is expected to print six articles mentioning the President for every 1 mentioning the member of Congress local to the area. At the end of the series, that ratio drops to 2:1.



(a) Predicted Political Coverage (b) Predicted Relative President Coverage

Figure 3.6: Predicted Relative Coverage in the Orlando Sentinel

More important than the overall trend, however, is the difference between the two sets of predictions based on the rate of broadband expansion in Orlando. Coverage of the President may have declined leading up to the 2008 election for many reasons. The comparison that helps us understand what continued impact of broadband is comparison to the counter-factual world represented by the prediction where broadband doesn't expand, which is presented in Panel B. Clearly, the prediction from the model is that the expansion of broadband has a substantively significant impact on content. When broadband deployment is low at the beginning of the period the difference in coverage in the two conditions is minimal, with the real world condition having less than 1 more article mentioning the President for every article mentioning local members of Congress, compared to counter-factual. The gap between the two conditions, however, becomes larger as broadband ex-

pands. Indeed, while in the counter-factual condition coverage remains relatively stable until 2005, in the real-world condition the cumulative impact of broadband led to an overall growth in relative coverage of the President, up to nearly 10 articles mentioning the President for every 1 mentioning local members of Congress. While the secular trend in coverage declined subsequently, the gap between the real-world prediction and the counter-factual continues to grow. In 2008 the model predicts that the paper in the real-world condition will print 4 more articles about the President for every 1 article about local members of Congress, compared to the counter-factual.

The final hypothesis is whether the trends uncovered in Figure 6.6 are conditional on the population size of the city. The economic impact of broadband was expected to be greater in smaller cities, and indeed, the effect of broadband on newspaper circulation was greater in small and medium-sized cities. If changes in content operate through changes in economic competition, then we should also see larger changes in content in smaller cities.

Table 3.3 presents the results of regressions where the number of broadband providers is interacted with the logged-population of each city in the sample. The expectation is that the coefficient on $ln(Providers)$ will be positive (or negative, when the dependent variable is Member Articles), representing the effect on content in a city of population 1. The interaction between providers and population should be negative (or positive, when the dependent variable is Member Articles), indicating that as population grows the effect of broadband decreases.

This is the general pattern that is observed. In Columns 1, 3, and 4, the coefficient on the number of broadband providers is positive, and the interaction term is negative. This indicates a relationship where broadband has a stronger effect on content in smaller cities. This being said, none of these coefficients reach conventional levels of statistical significance. As such, I fail to reject the null hypothesis that population does not moderate the effect of broadband on newspaper content.

Figure 3.7 displays these relationships visually, plotting the marginal effect of $ln(Providers)$ across levels of population. With the exception of the effect of broadband on Member coverage – which is near zero at all population levels – each of the figures shows the expected pattern (albeit

Table 3.3: Effect of Communication Environment on Newspaper Content

	Politics Articles %	**Member Articles %**	**President Articles %**	**President:Member Articles**
$ln(Providers_{pt})$	2.81	0.32	2.62	5.49
	(1.82)	(0.67)	(1.63)	(4.96)
$ln(Population_{pt})$	1.62	1.40**	0.25	−2.73
	(1.40)	(0.66)	(0.96)	(2.08)
$ln(Median.Income_{pt})$	−3.12	−2.19	−0.89	−1.43
	(2.90)	(1.63)	(2.14)	(10.49)
$ln(Providers_{pt}) * ln(Population_{pt})$	−0.17	−0.02	−0.16	−0.30
	(0.14)	(0.05)	(0.13)	(0.36)
Paper F.E.	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes
N	498	498	501	498
R-squared	0.75	0.65	0.80	0.74
Residual Std. Error	0.76 (df = 448)	0.31 (df = 448)	0.62 (df = 451)	2.31 (df = 448)

*p < .10 **p < .05; Cluster-Robust Standard Errors

with large confidence intervals), with the effect of broadband being the largest in the smallest cities. Along the horizontal axis of each graph a rug plot shows the population size of each of the cities in the sample. It is quite clear that even with 30 cities there is not support across the range of population. The majority of the sample comes from cities with less than 500,000 residents. This is a natural extension of the sampling procedure: randomly selecting cities will lead to a sample with many more small cities than large cities, simply because there are many more small cities. The sample would need to be increased substantially – and perhaps larger cities explicitly over-sampled – to produce the statistical power needed to properly test this moderation hypothesis. With these limitations in mind, I feel that these tests provide plausible evidence that the effect of broadband is moderated by population.

One concern with these analyses is that they expect an instantaneous reaction to broadband. The level of broadband applied to each period of content is measured at the start of that period (i.e. the level of broadband for December to June 2000 is measured in December 2000). It may be that the effect of broadband takes longer to be realized. To examine this, in Appendix Section 6.7 I use a 1-year lagged broadband variable. This produces somewhat weaker results than those found here. This suggests that broadband does have a strong impact directly following its expansion, and that effect dissipates over time. It is not the case, in other words, that the main effect of broadband is felt further in the future than modeled here.

To return to the hypotheses, these results bring mixed conclusions. H2, that the increased economic pressure from broadband would induce newspapers to slash their coverage of politics, is clearly not supported. Indeed, the exact opposite is true: newspapers facing economic pressure *increased* their coverage of politics. The results do support H3 – that coverage of the President would increase relative to local members of Congress – but not in the way expected. The expectation was that this ratio would increase due to both types of news declining, but news stories involving the President declining less. Instead, news stories mentioning local members of Congress are unaffected by increasing broadband, while news stories about the President are positively affected.

To better understand why this might be – and in particular how differences in the way newspaper cover legislators versus the President – in Appendix Section 6.1 I look more closely at how one newspaper – The Eugene *Register Guard* – chose to cover national versus local politics. This paper produced a fair amount of "traditional" coverage of their member of Congress, but this coverage was swamped by coverage of national politics. Importantly, the paper often made little effort to tie this coverage back to local politics. Indeed, the opposite was often true: particularly in 2007 the newspaper's coverage of their local member of Congress frequently made reference to where his actions lie in the balance of power in Washington. Further, much of the coverage of national politics in the *Register Guard* was through editorials, commentary, and letters. A plausible explanation for why broadband increases coverage of the President is that newspapers under economic duress turn to this sort of coverage (which is cheaper to produce and more popular) instead of traditional straight-news reporting.

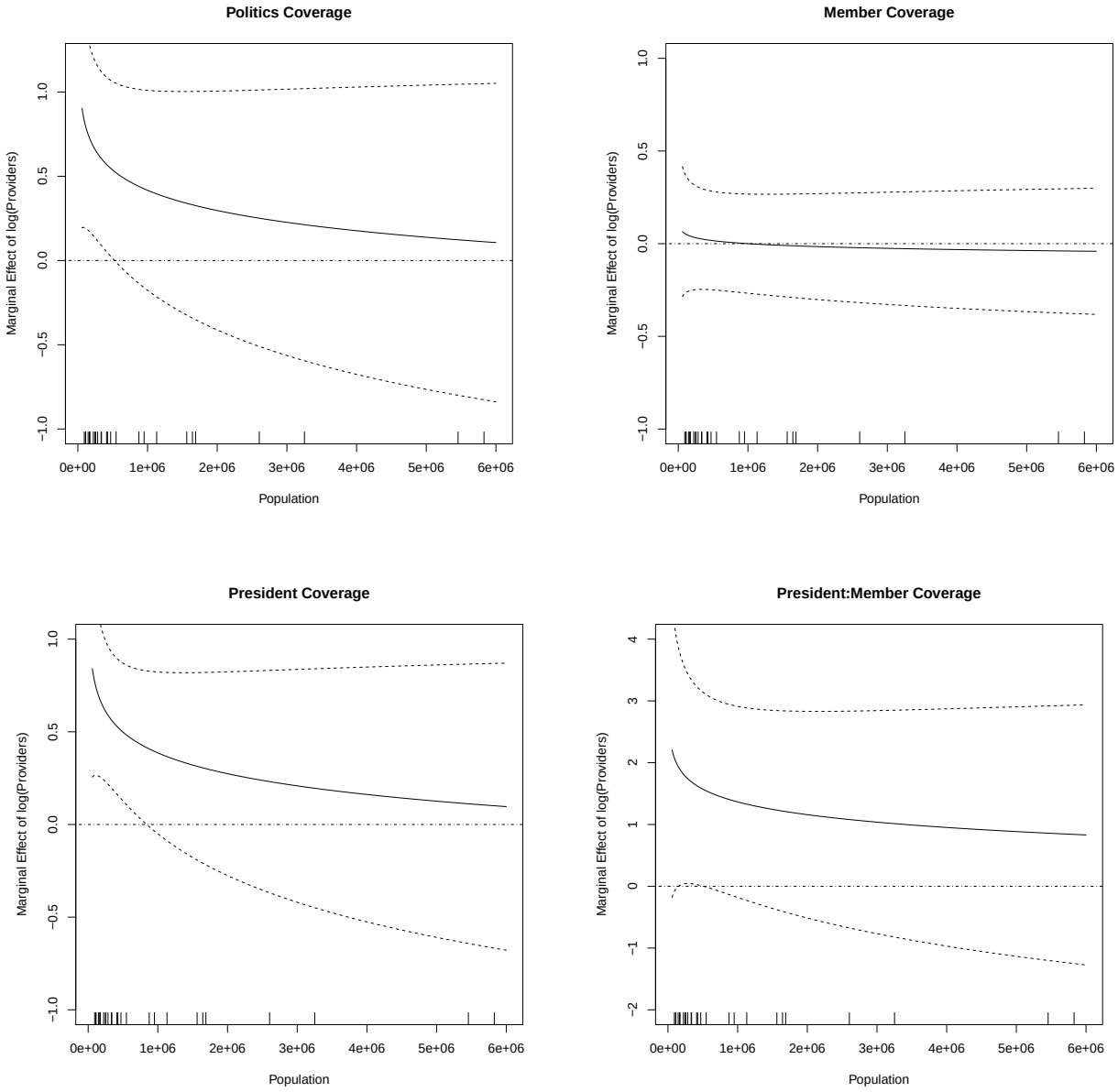


Figure 3.7: Marginal Effect of Broadband on Content by City Population

3.5 Conclusion

The motivation of this paper is to try and understand whether a plausible mechanism for the relationship between technologies like broadband and political nationalization is a changing local news environment. The traditional view is that local newspapers were vitally important in providing an "evidentiary basis" for local elections: giving voters the information they needed to make independent decisions across different levels of government. The expansion of broadband has long been thought to challenge the economic model of newspapers, and these economic challenges ought to show up in changes in content.

While the expansion of broadband does have an effect on newspaper circulation, the effects of the resulting economic pressure do not affect content in line with expectations. Political coverage in newspapers facing the economic threat of broadband *increased* their coverage of politics overall, but only due to an increase in coverage of the President. While this is not the expected outcome, in terms of substantive effects on politics the result has a similar outcome. The substantive concern that drives this research is how the changing media environment contributes, or not, to the "nationalization" of politics: the notion that politics at all levels is being fought on one plane of partisan conflict. All things being equal an increase in the number of articles about the President will lead to this outcome.

The net effects of these two changes are expected to reinforce one another to create political nationalization. Areas which have expanded broadband are likely to have lower circulation, and as a consequence of the resulting economic hardship, increased coverage of the President. Individuals opt out of local newspapers for online news, and when individuals view online news they are likely to read national information for reasons of both supply (Hindman 2008, 2011) and demand (Hopkins 2018; Tewksbury 2003). Importantly, even those who remain reading the newspaper will receive more considerations about national politics through changes in content. The result for both groups is that – compared to the counter-factual situation without broadband – they will have more considerations about national politics than local politics, changing their voting behavior (Trussler 2018a) and resulting incentives provided to legislators (Trussler 2018b).

These changes do not happen evenly across all municipalities. Given the fixed costs of newspaper production, small-town newspapers have been the most heavily affected by changes in the media environment over the last 20 years. In line with this expectation, newspapers in smaller cities had steeper declines in circulation when broadband expanded to their area, and there is suggestive evidence that papers in these cities also adjusted their content to a greater extent. This city-size pattern is important, as it suggests that the changes to newspaper content are being driven by changes in the economic viability of newspapers. This being said, that effects are being driven by small and medium sized cities means that a large (and ever growing) portion of Americans – those who live in large cities – will not have their newspapers affected. This is an important limitation to these findings. That being said, the American system of government gives disproportionate influence to small cities and rural areas through equal-representation of geographic areas (i.e. through the Senate and, relatedly, the Electoral College). As such, an effect that is more prominent in these over-represented areas is important.

Another plausible hypothesis for this shift is that economic competition is causing newspapers to increasingly make use of wire services to fill their pages, and those wire services are more likely to report on national politics. This does not explain these results, however, as wire-service stories are not included in databases like ProQuest (see for more information Ridout et al. 2012). There is not, to my knowledge, a way to systematically view the totality of content (i.e. including wire stories) printed on a certain newspaper on a certain day. However, if such a method was developed it would be interesting to know the degree to which the economic competition fostered by broadband caused newspapers to make use of wire services.

A large portion of attention on the links between new media and political nationalization have been focused on the impact of new media and technologies (Pariser 2011). While these new innovations are important, a substantial number of individuals still turn to traditional media to inform themselves about politics (Kohut 2008). These traditional outlets, however, are being changed in subtle ways by increased economic competition, such that traditional assumptions about their impacts can no longer be trusted. Understanding how these changes are impacting the types of po-

litical information individuals have – and thus the considerations they take with them to the ballot booth – is critical to understanding changes in representation and accountability.

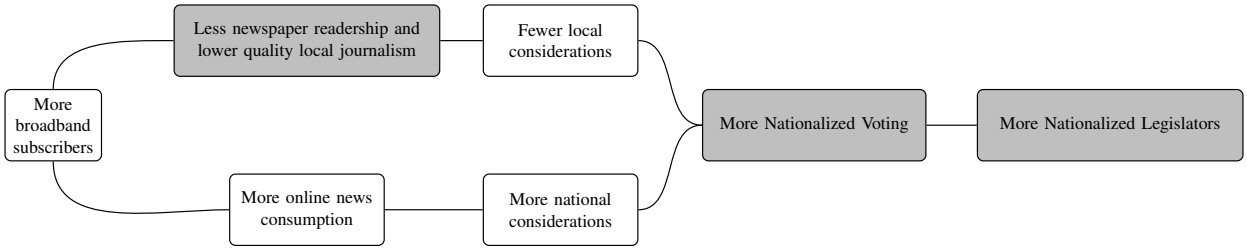
CONCLUSION

These three chapters have shown how a changing communication environment is a plausible component driving political nationalization in the United States. Returning to the original causal path below, I have provided evidence that Broadband has a causal effect on three key groups: voters, legislators, and newspapers.

In Chapter 1 I showed how the expansion of broadband causes voters to cast more straight-tickets, provide a smaller incumbency advantage, and become less responsive to the legislative activity of their representatives. In Chapter 2 I demonstrated how legislators react to this by voting more often with their party, voting more in-line with the President, and receiving higher scores from ideologically aligned interest groups. Finally, in Chapter 3 I went back in the causal chain to examine whether these effects operate in part through a changing news environment, demonstrating that the expansion of broadband leads to lower newspaper circulation and a reduction of coverage of members of Congress relative to the President.

This dissertation (like all dissertations) has perhaps produced more questions than it has answered. In each chapter I have highlighted potential avenues for future research. Here I offer what I believe to be the three most important questions to answer.

Is the effect of broadband primarily nationalization or polarization? My hypothesis in this dissertation is that broadband causes voters to become more *nationalized*. The conception of nationalization I describe is distinct from polarization, which generally refers to a strengthening of attitudes about ideology or parties (Lelkes 2016). Instead of claiming polarization, I instead make



The Causal Path of the Dissertation

the more minimal assumption that voters simply lack the informational resources to make independent decisions at lower levels of the ballot, and therefore reduce the incentives for politicians to moderate. Nationalization, in other words, does not require voters to *change* their attitudes about parties or policies, but simply give more weight to their national-partisan considerations when making decisions. This being said, there is good reason to believe that activity online will also heighten voters' polarization (Bessi et al. 2016; Lelkes et al. 2015). How can we sort out which is happening here? Nationalized voters make *passively* partisan choices – voting straight tickets because they lack the informational resources to make independent decisions across the ballot. Polarized voters (in particular affectively polarized voters) make *actively* partisan choices – voting straight tickets because it is their expressed interest to do so. In Chapter 1 I found, counter to expectations, that the expansion of broadband didn't just remove the negative effect of Party Unity scores on incumbent vote share, but actually turned it into a *positive* effect. This may be a sign that what is occurring here is actually polarization, and is worth further investigation. Specifically: are voter preferences changing for how often they wish for their legislators to vote along party lines, and are these changes caused by the media environment?

Does broadband change Congressional politics more through within-legislator change or replacement? In Chapter 2 I focused primarily on within-legislator effects of broadband. This is an important statistical control, but rules out the possibility of broadband influencing legislator replacement. Recent work has demonstrated a positive effect of the roll-out of broadband on populist movements in Europe (Campante et al. 2013; Schaub and Morisi 2019). Compared to mainstream parties, these movements are relatively extreme and resource poor. The internet affords such groups a low-cost mechanism for organizing, increasing their power relative to older information environments (Bimber 2003). If broadband emboldens extreme policy demanders, one place where they may be particularly powerful is in House primary elections, which have typically been the domain of more moderate party insiders. Indeed, an important component of the over-time shift in nationalization is replacement of moderate legislators with more extreme members (Aldrich et al. 2014). Future research can, for example, examine the role broadband and other new technologies played

in the Tea Party insurgency in 2010.

Finally Chapter 3 left many open questions as to why newspapers *increased* their coverage of the President in response to the roll-out of broadband. In Appendix 6.1 I take a deep dive into one paper's coverage and find that many of the article's mentioning the president are editorials, commentary, and letters. A plausible explanation for why broadband increases coverage of the President is that newspapers under economic duress turn to this sort of coverage (which is cheaper to produce and more popular) instead of traditional straight-news reporting. I hope to better understand this relationship using a follow-up study. In particular answering the question: is increasing coverage of the President in response to broadband primarily occurring in the commentary section? Another plausible hypothesis for this shift is that economic competition is causing newspapers to increasingly make use of wire services to fill their pages, and those wire services are more likely to report on national politics. This does not explain the results of Chapter 3, however, as wire-service stories are not included in databases like ProQuest (see for more information Ridout et al. 2012). There is not, to my knowledge, a way to systematically view the totality of content (i.e. including wire stories) printed on a certain newspaper on a certain day. However, if such a method was developed it would be interesting to know the degree to which the economic competition fostered by broadband caused newspapers to make use of wire services.

Throughout this dissertation I have attempted to remain largely non-judgmental about this turn in politics towards nationalization. Is nationalization just a different representational style to which we should grow accustomed; or is there something normatively troubling about this turn?

In trying to determine the normative outcome of these findings, it's important to remember that the mid-century period of hyper-localism was heavily criticized as well. While 1970s-style retail politics put the focus on legislator-constituent relationships, it was also blamed for blurring accountability (as parties didn't have clear platforms) and for producing outcomes counter to collective public opinion. Congressman Richard Bolling – a member of the Democratic Study Group who led calls for a more robust role for party in the legislature – stated that in the mid-century the House was "negative in its approach to national tasks, generally unresponsive to any but parochial

economic interests" (quoted in Rohde 2010).

The move towards nationalization has meant that voters are faced with two parties with coherent ideological agendas that are focused on big national problems. Compared to the period where many decisions were made across party lines through logrolling, seniority, and committee agreements (Fenno 1973), voters have a much better sense of who is responsible, and parties are much more focused on a national popular will.

But as I have mentioned throughout the three chapters, I do believe there is a normatively troubling side to this move to nationalization. To highlight what I believe to be the two most important issues: nationalization has hurt inter-branch accountability, and the changes to the information environment were not "chosen".

One of the foundations of the American constitutional system is checks and balances. Less so than formal rules, the system of dividing power devised in the constitution generates accountability because of natural conflict between the branches. To quote Madison in Federalist 51:

> It is equally evident, that the members of each department should be as little dependent as possible on those of the others, for the emoluments annexed to their offices. Were the executive magistrate, or the judges, not independent of the legislature in this particular, their independence in every other would be merely nominal. But the great security against a gradual concentration of the several powers in the same department, consists in giving to those who administer each department the necessary constitutional means and **personal motives** to resist encroachments of the others. (Madison 1788; emphasis added)

In this nationalized era of politics, do legislators have the necessary "personal motives" to resist the encroachments of the executive branch? While it was previously the case that legislators faced an electoral environment that prioritized constituency service (Fenno 1978) and punished excessive party loyalty (Carson et al. 2010), this is increasingly not the case. Partly as a function of a changing media environment, voters increasingly care only about partisanship in their voting decisions, decreasing the incentives to moderate away from party extremism. The results of these

changing incentives are clear in Chapter 2: legislators exposed to more broadband are more likely to vote with their parties and the president. While this party unity certainly provides clear lines of accountability for voters, what happens when a President needs to be held to account by members of their own party? If legislators understand (as they surely do) that their personal electoral fortunes are deeply, and increasingly, tied to the electoral fortunes of their co-partisans, what incentive do they have to "counteract the ambition" of a co-partisan president?

Studies of media effects often (and increasingly) focus in on the role *choice* plays in shaping the information environments (and thus attitudes) of Americans (Arceneaux and Johnson 2013; Prior 2007). This work is vital, particularly in the modern communication environment where the panoply of options increases the role of preference on individual outcomes. Many of the effects discussed in this dissertation, however, are not caused by clear *choices* for political information. The roll-out of broadband has made it so that individuals consume more information about national politics and less information about local politics. *Some* of this shift is because of explicit choices individuals make to view national political information (Lelkes et al. 2015), but many of the changes are not. For example, the loss of classified revenue for newspapers due to individuals making use of online peer-to-peer marketplaces is significant (Seamans and Zhu 2010). It is problematic that non-political decisions – like using websites like Craigslist – so alters the political information environment. Work by Hindman (2008, 2011, 2018) has shown that the very architecture of the internet prioritizes large content providers (like national newspapers and television networks), such that their content is more likely to be seen regardless of consumer preference. There are secondary effects too: while many Americans never read the local newspaper, they may have relied on people in their social networks having that information (Lazarsfeld et al. 1948). Though many individuals in society may make no specific choices to change their consumption habits, an expansion of broadband may nevertheless lead them to lose the evidentiary basis from which to make decisions in House elections.

A partisanship-first politics, not wholly chosen by the populace, presents a clear normative problem for democracy. Between hyper-localism and excessive nationalism there is an appropriate

balance-point – one where parties are accountable and present clear platforms to voters, but not so powerful as to be unable to hold co-partisans to account. One of the issues emanating from this dissertation, however, is a lack of a clear counter-balancing force that would help us to reach this point of maximized accountability. Several studies have highlighted the increasing use of platforms like Twitter by members of Congress to form the sort of personal connections highlighted in the classic work of Fenno (1978) (Kreiss et al. 2018; Lassen and Brown 2011; Straus et al. 2013). It is difficult, however, to determine the relative magnitude of such an effect versus the damage an increasingly online world has done to the traditional venues of these local considerations. As things stand now, these social networks do not seem to be an effective counterbalance to the overwhelming influence of broadband in eroding traditional information networks.

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Chapter 4

Supplemental Appendix to Chapter 1

4.1 Individual Level Observational Data

The following analysis uses a combination of the aggregate measure of broadband used above and individual level data from the American National Election Study (NES) to determine whether the causal path specified in the paper – that the expansion of broadband causes individuals to become less knowledgeable about local politics and cast more straight tickets – is plausible.

Snyder and Strömberg (2008) present a similar analysis to determine whether local newspaper coverage allows for better local accountability. Merging individuals in the NES to their measure of how "congruent" local newspaper coverage is to congressional districts, Snyder and Strömberg (2008) find that individuals living in the districts of better covered members are better informed about their incumbents. The authors further placebo test this result, finding that increased coverage has no effect on *national* political knowledge

I use a similar methodology here. However, the newspaper data used by Snyder and Strömberg (2008) are available for a much longer period of time. As such, they are able to match their data to a far greater number of participants in the *NES*. The broadband data from the FCC used for this paper is only available from 2000-2008, and therefore the *n* of my analysis is much lower. This restricts my ability to saturate the model with all of the control variables used by Snyder and Strömberg (2008), and leads to generally large standard errors. As such, the results presented here should be considered tentative and suggestive, at best.

The expectation is that the effect of broadband will be exactly the opposite of that found by Snyder and Strömberg (2008): increased access should lead to lower local political knowledge, and either no effect or a positive effect on national political knowledge. I analyze the effect of access to Broadband on the following variables capturing knowledge of Congressional Incumbents: *Rate Incumbent - Ideology*, which is equal to 1 if a respondent elected to rate their House incumbent

on the 7-point ideological scale and 0 if they replied that they did not know where to rate them; and *Rate Incumbent - Thermometer*, which is equal to 1 if a respondent elected to rate their House incumbent on a 0-100 feeling thermometer and 0 if they did not know where to rate them. Both these variables capture the sort of knowledge and willingness to rate local candidates that is thought to be supported by a robust local media.[1] Indeed, Snyder and Strömberg (2008) find that the probability of being coded a 1 on these these variables is strongly structured by the local newspaper environment an individual is exposed to. My expectation is that expansion of broadband should have a negative effect on the probability of being coded a 1 on these questions.

I also include two variables to determine whether the introduction of broadband affects more nationally focused knowledge: *Know House Majority* and *Know Senate Majority* are equal to 1 if individuals correctly identify the party with a majority in the House and the Senate, respectively, and 0 otherwise. My expectation is that the expansion of broadband will either have no effect on being coded a 1 on this measure, or a positive effect.

Finally, I include variables capturing changes in voting behavior and attitudes. The literature suggests that the informational changes caused by broadband will make individuals less likely to split their tickets. An information environment that prioritizes national over local information will make it less likely that individuals will make independent decisions across different levels of government. *Vote Split Ticket* is equal to 1 if individuals voted for different parties for President and the House of Representatives, and equal to 0 if they voted for the same party for these offices. The expectation is that increased exposure to broadband will cause individuals to split their tickets less. Finally, I include a measure of *affective polarization*. According to Lelkes et al. (2015) a key feature of the internet is that individuals – through a process of selective exposure – come to like their own party more and the out-party less. Such a change in attitudes would serve to strengthen the impact of party overriding local considerations when voting. Affective polarization is measured as an individual's feeling thermometer rating of their in-party minus their feeling thermometer rating of their out-party. So for example: an individual who rates both parties the same would have

[1] (Snyder and Strömberg 2008) also use the ability of individuals to recall the name of theis House incumbent as a key variable. Unfortunately the NES ceased asking this question after 2000.

a score of 0 for *affective polarization*, while an individual who rates their in-party as 100 and the out-party as 0 would have a score of 100.

To isolate the effect of broadband I include several important control variables. At the individual level, I include controls for party identification, age, gender, race, education, and income. At the district level, I include controls for median income and population. In each specification I include year fixed effects, such that individuals are only compared to others interviewed in the same year. Following (Snyder and Strömberg 2008), I also specify models with state-year fixed effects, such that individuals are compared to other individuals in the same state in the same year.

The *n* for this analysis varies a great deal based on the frequency in which the *NES* fields each question, and ranges from 1836 to 4015. While this is a good number of people, the degrees of freedom become quite small when estimating $50 * 5$ state-year fixed effects. As we shall see, the result is quite large standard errors.

The full results are presented in tables 4.1 and 4.2. For parsimony, Figure 4.1 presents the coefficients on $log(Providers)$ on each dependent variable, with 90% and 95% confidence intervals. All of the binary dependent variables are coded (0) or (1). Affective polarization is recoded to range from -1 (an individual who rates the out-party as 100 on a feeling thermometer and rates their in-party as 0), to 1 (an individual who rates the out-party as 0 and their in-party as 100).

While the standard errors on the estimates are large, the pattern of results is broadly in-line with expectations.

The expansion of broadband has a clear, negative, effect on the ability for individuals to rate incumbents on a 7-point ideology scale. Every 100% increase in the number of broadband providers in an area leads individuals to become around 10% less likely to offer an ideological ranking of the incumbent. Looking both within years and within state-years there is sufficient evidence to overturn the null hypothesis of no relationship. However, looking within state-years the standard error of this relationship increases to a level where I am less confident overturning the null ($p = 0.057$). The ability for individuals to rate incumbents on a feeling thermometer is less affected by broadband. While the coefficients are negative, the standard errors are quite large. As such, I fail to

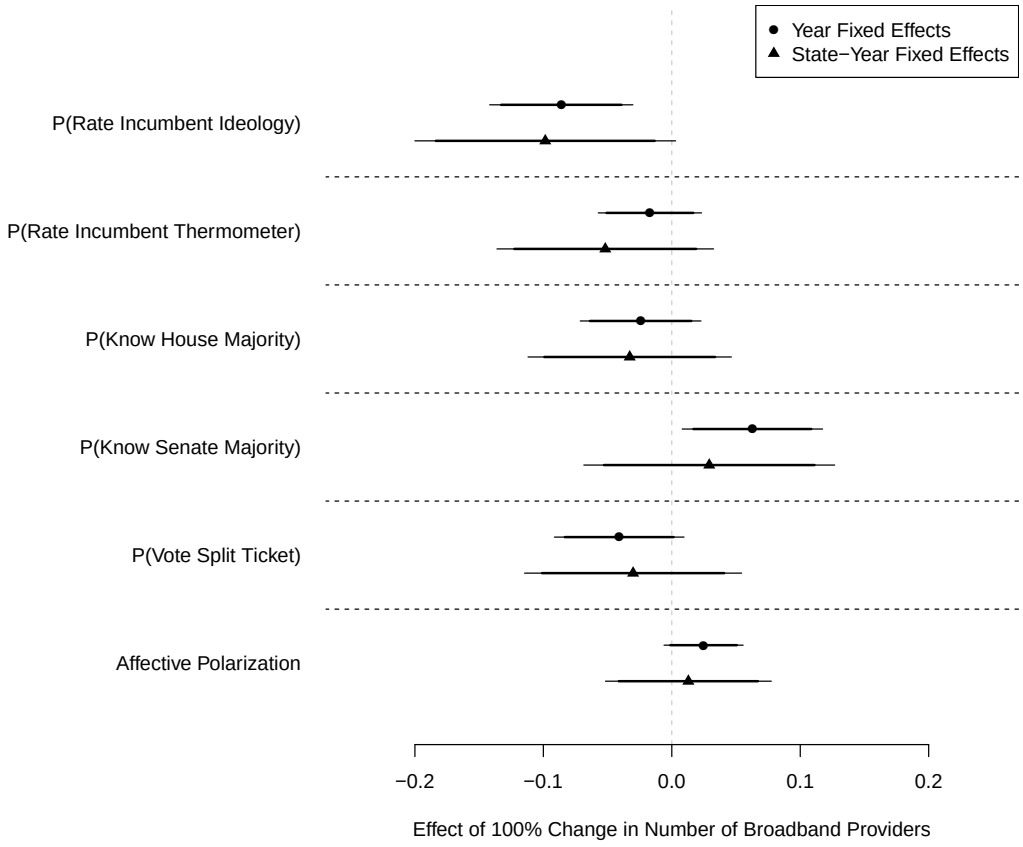


Figure 4.1: Individual Level Effects

reject the null hypothesis of no relationship for this dependent variable.

The next two coefficients deal with the effects of broadband on more national political knowledge. The expectation here is that knowledge of national politics will either be unaffected, or positively affected, by the roll-out of high-speed broadband internet. The coefficients for these two dependent variables reflect these expectations. The coefficients on knowledge of which party holds the majority in the House are negative, with large standard errors such that I fail to reject the null hypothesis of no relationship. The coefficients for providers on knowledge of which party holds the majority in the Senate, on other hand, are positive. Looking within-years, individuals exposed to a 100% change in the number of broadband providers become 6 percentage points more likely

to know which party has the majority in the Senate. This relationship, however, becomes much weaker when looking within state-years.

Turning to attitudinal and behavioral changes, the relationships here also move in the expected direction, though the size of the standard errors on all coefficients make it difficult to form conclusions about relationships. The coefficients on the number of broadband providers on the probability an individual splits their ticket is negative, as expected, though the standard errors are large. The story is similar for affective polarization. An increase in the number of broadband providers does seem to be related to having warmer feelings about ones in-party and cooler feelings about ones out-party, but again, these relationships are not precise enough to firmly reject the null-hypothesis.

Table 4.1: Effect of Communication Environment on Political Knowledge

	P(Rate Incumbent Ideology		**P(Rate Incumbent Thermometer)**		**P(Know House Majority)**		**P(Know Senate Majority)**	
log(Providers)	−0.09*	−0.10	−0.02	−0.05	−0.02	−0.03	0.06*	0.03
	(0.03)	(0.05)	(0.02)	(0.04)	(0.02)	(0.04)	(0.03)	(0.05)
Independent	−0.17*	−0.18*	−0.10*	−0.10*	−0.17*	−0.17*	−0.18*	−0.18*
	(0.04)	(0.04)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.04)
Republican	0.02	0.04	−0.003	0.01	0.03	0.04	0.01	0.01
	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Age	0.01*	0.005*	0.004*	0.004*	0.005*	0.005*	0.005*	0.01*
	(0.001)	(0.001)	(0.0004)	(0.0004)	(0.0004)	(0.001)	(0.001)	(0.001)
Woman	0.10*	0.11*	0.03*	0.03*	0.14*	0.14*	0.20*	0.20*
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Race-Other	−0.12*	−0.13*	−0.03	−0.03	0.01	−0.003	0.06	0.06
	(0.04)	(0.06)	(0.03)	(0.04)	(0.03)	(0.04)	(0.04)	(0.06)
Race-White	−0.05	−0.07	0.02	0.01	0.01	−0.01	0.04	0.04
	(0.04)	(0.05)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.04)
Education - Grade School or Less	−0.34*	−0.31*	−0.21*	−0.17*	−0.40*	−0.40*	−0.42*	−0.44*
	(0.07)	(0.10)	(0.04)	(0.06)	(0.05)	(0.05)	(0.06)	(0.07)
Education - High School	−0.14*	−0.14*	−0.12*	−0.12*	−0.26*	−0.24*	−0.25*	−0.24*
	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
Education - Some College	−0.08*	−0.08*	−0.02	−0.01	−0.14*	−0.14*	−0.12*	−0.11*
	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
Income - 17-33 Percentile	0.12*	0.09*	0.01	0.01	0.01	0.01	−0.01	−0.02
	(0.04)	(0.04)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
Income - 23-67 Percentile	0.09*	0.07	0.04	0.05	0.05*	0.05	0.003	−0.003
	(0.04)	(0.05)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.04)
Income - 68-95 Percentile	0.16*	0.14*	0.12*	0.13*	0.12*	0.11*	0.06	0.05
	(0.04)	(0.05)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)
Income - 96-100 Percentile	0.15*	0.15*	0.09*	0.10*	0.09*	0.07	0.11*	0.10
	(0.05)	(0.06)	(0.03)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)
log(Median Income)	−0.01	0.04	−0.12*	−0.08	0.08*	0.12	−0.09	−0.01
	(0.05)	(0.09)	(0.03)	(0.06)	(0.04)	(0.06)	(0.05)	(0.07)
log(Population)	−0.27	−1.39*	−0.35*	−0.49*	−0.08	−0.20	0.34	−0.49
	(0.23)	(0.62)	(0.08)	(0.19)	(0.09)	(0.21)	(0.21)	(0.61)
Constant	4.30		6.57*		0.60		−3.35	
	(3.04)		(1.02)		(1.18)		(2.77)	
Year F.E.	Yes	No	Yes	No	Yes	No	Yes	No
State-Year F.E.	No	Yes	No	Yes	No	Yes	No	Yes
N	1836	1836	3546	3546	4015	4015	2169	2169
R-squared	0.12	0.18	0.09	0.15	0.17	0.20	0.16	0.20
Residual Std. Error	0.43 (df = 1818)	0.43 (df = 1748)	0.38 (df = 3527)	0.37 (df = 3428)	0.46 (df = 3996)	0.45 (df = 3891)	0.45 (df = 2151)	0.45 (df = 2078)

*p < .05; Cluster-Robust Standard Errors

Table 4.2: Effect of Communication Environment on Voting and Attitudes

	P(Split Ticket)		**Affective Polarization**	
log(Providers)	−0.04	−0.03	0.02	0.01
	(0.03)	(0.04)	(0.02)	(0.03)
Independent	−0.01	−0.01	−0.05*	−0.05*
	(0.02)	(0.03)	(0.01)	(0.02)
Republican	−0.0001	−0.0002	0.002*	0.002*
	(0.0005)	(0.001)	(0.0003)	(0.0003)
Age	−0.001	−0.004	−0.02*	−0.02*
	(0.02)	(0.02)	(0.01)	(0.01)
Woman	0.02	0.03	−0.06*	−0.06*
	(0.03)	(0.04)	(0.02)	(0.02)
Race-Other	0.08*	0.09*	−0.04*	−0.03
	(0.03)	(0.04)	(0.02)	(0.02)
Race-White	0.01	0.01	−0.07*	−0.07
	(0.06)	(0.08)	(0.03)	(0.05)
Education - Grade School or Less	−0.01	−0.01	−0.03*	−0.02
	(0.02)	(0.03)	(0.01)	(0.01)
Education - High School	−0.01	−0.01	−0.02	−0.01
	(0.02)	(0.02)	(0.01)	(0.02)
Education - Some College	0.03	0.04	−0.005	−0.004
	(0.03)	(0.04)	(0.02)	(0.02)
Income - 17-33 Percentile	−0.001	0.01	−0.02	−0.02
	(0.03)	(0.03)	(0.02)	(0.02)
Income - 23-67 Percentile	0.03	0.04	−0.004	0.005
	(0.03)	(0.03)	(0.02)	(0.02)
Income - 68-95 Percentile	−0.02	−0.01	0.01	0.02
	(0.04)	(0.04)	(0.02)	(0.03)
Income - 96-100 Percentile	−0.08*	−0.08	−0.06*	0.03
	(0.04)	(0.06)	(0.02)	(0.04)
log(Median Income)	−0.02	0.02	0.07	−0.21
	(0.09)	(0.17)	(0.06)	(0.13)
log(Population)	1.21		0.09	
	(1.23)		(0.80)	
Year F.E.	Yes	No	Yes	No
State-Year F.E.	No	Yes	No	Yes
N	2327	2327	3939	3939
R-squared	0.01	0.08	0.03	0.07
Residual Std. Error	0.36 (df = 2309)	0.36 (df = 2205)	0.30 (df = 3921)	0.30 (df = 3816)

*$p < .05$; Cluster-Robust Standard Errors

4.2 Broadband and Turnout

A plausible alternative causal path is that broadband does not cause a shift in what voters care about (from local to national politics), but instead shifts *who* votes. Prior (2013) discusses a phenomeon of "polarization without persuasion", whereby the post-broadcast environment unevenly depresses turnout among those who are less interested in politics. A high choice media environment offers ample opportunity for individuals to "opt-out" of viewing political media, and those less interested in politics are thought to take this oppotunity. Subsequently, those individual become less likely to turn out to vote. Because these individuals are also more moderate on average, the resulting electorate will be more polarized.

I investigate this possible causal mechanism in two steps below. First, I determine whether changes in the number of broadband providers in a district impacts the size of the electorate. Second, I determine whether taking into account changes in the size of the electorate impacts the relationship between the communication environment and political outcomes. The results indicate that increases in broadband are related to decreases in the size of the electorate. However, it does not appear that this decline unevenly depresses turnout in a way that explains the relationship between broadband and more national political outcomes.

In Table 4.3 I present the results of a regression predicting the level turnout in Congressional elections on the communication environment. Data on the number of votes for the House in each Congressional district in each election year 2002-2008 was gathered from the MIT Election Lab, and the voting age population (VAP) from the 2000 and 2010 Census[2]. The outcome variable is the percent of the voting age population voting in each election-year. The equation is estimated in the same way as the main analysis above. Fixed effects for districts and year are included, as well as time-varying measurements for the median income and population of the districts.

The coefficient on $\log(\text{Providers}_{kt})$ indicates that as the number of broadband providers in a district grows the turnout in that district declines. For a 100% change in the number of providers, voter turnout declines 1.61 percentage points. The standard error on this estimate is of a size that I

[2]Values for each election year 2002-2008 were linearlly interpolated.

reject the null hypothesis of no relationship between the communication environment and turnout.

Table 4.3: Effect of Communication Environment on Congressional Election Turnout

	% VAP Turnout$_{kt}$
log(Providers$_{kt}$)	-1.44^{*}
	(0.64)
log(Median Income$_{kt}$)	-4.65
	(4.41)
log(Population$_{kt}$)	3.51
	(4.28)
District F.E.	Yes
Election Year F.E.	Yes
N	1677
R-squared	0.85

$^{*}p < .05$; Cluster-Robust Standard Errors

The next step in the analysis is to determine whether this drop in turnout changes the composition of the electorate in a way that explains the relationship between broadband and more nationalized voting. To determine this, I add voter turnout as a control variable to the models above. If declining turnout is the mechanism that creates more nationalized elections, the expectation is that the relationship between broadband and nationalized would not be present looking *within* levels of turnout. That is, there should not be a relationship between broadband and nationalized voting just among districts that declined in turnout. I add turnout as a direct control variable, and also interacted with log(Providers$_{kt}$).

The results, regardless of the specification, generate the same conclusion. Controlling for changes in turnout does not explain-away, or even attenuate, the relationship between the number of broadband providers and nationalized voting outcomes. The key variables in each of the equations are effectively unchanged from the analysis above. This leads me to the conclusion that broadband depresses overall turnout, but does not do so in an uneven way consistent with Prior's "Polarization without Persuasion" hypothesis.

Table 4.4: Effect of Communication Environment on Incumbency Advantage

	% Democratic Vote for House$_{kt}$	
Party Now$_{kt}$	0.63	0.59
	(0.76)	(0.76)
% Democratic Vote for President$_{kt}$	0.54*	0.51*
	(0.08)	(0.09)
Incumbency$_{kt}$	12.29*	12.13*
	(1.19)	(1.19)
log(Broadband Providers$_{kt}$)	0.001	−4.82*
	(0.89)	(1.67)
log(Median Income$_{kt}$)	11.67*	11.08*
	(4.88)	(4.89)
log(Population$_{kt}$)	−0.69	−0.79
	(1.82)	(1.81)
% VAP Turnout$_{kt}$	0.02	−0.22*
	(0.04)	(0.08)
Incumbency$_{kt}$*log(Broadband Providers$_{kt}$)	**−2.88***	**−2.81***
	(0.45)	(0.45)
% VAP Turnout$_{kt}$*log(Broadband Providers$_{kt}$)		0.11*
		(0.03)
District F.E.	Yes	Yes
Election Year F.E.	Yes	Yes
N	1433	1433
R-squared	0.57	0.58

*p $<$ .05; Cluster-Robust Standard Errors

Table 4.5: Effect of Communication Environment on Incumbency Advantage

	% Incumbent Vote$_{jt}$			
Same Party Presidential Vote$_{jt}$	−0.03	−0.03		
	(0.14)	(0.14)		
Same Party Presidential Vote$_{jt}$*log(Broadband Providers$_{jt}$)	**0.12***	**0.12***		
	(0.05)	(0.05)		
Party Unity$_{jt}$			−0.29*	−0.29*
			(0.13)	(0.13)
Party Unity$_{jt}$*log(Broadband Providers$_{jt}$)			**0.13***	**0.13***
			(0.06)	(0.06)
log(Broadband Providers$_{jt}$)	−4.33	−5.21	−9.18	−9.56
	(2.82)	(3.62)	(4.91)	(5.18)
log(Population$_{jt}$)	14.38	14.38	11.83	11.81
	(9.88)	(9.86)	(10.23)	(10.21)
log(Median Income$_{jt}$)	−5.10	−5.02	−5.41	−5.36
	(3.50)	(3.52)	(3.26)	(3.27)
% VAP Turnout$_{jt}$	−0.08	−0.12	−0.08	−0.10
	(0.05)	(0.10)	(0.05)	(0.10)
% VAP Turnout$_{jt}$*log(Broadband Providers$_{jt}$)		0.02		0.01
		(0.04)		(0.04)
Member F.E.	Yes	Yes	Yes	Yes
Election Year*Party F.E.	Yes	Yes	Yes	Yes
N	1299	1299	1299	1299
R-squared	0.43	0.43	0.39	0.39

*p $<$ .05; Cluster-Robust Standard Errors

4.3 Strategic Behavior by Politicians

Though the identification strategy used in the paper rules out many potentially confounding variables that could bias the estimates, one possible source of endogeneity is strategic behavior by politicians in guiding the roll-out of broadband. While the roll-out of broadband is primarily an economic decision made by providers, there exist government programs for the expansion of broadband that could be used strategically by politicians. In particular, following the 1996 Telecommunications Act, $40 billion for this purpose was distributed by the federal government through the Schools and Libraries Universal Service Programs. Distribution of these funds, however, followed the statutory process of the FCC under the "Davis Amendment" (Coase 2013) whereby funds were distributed in near perfect proportion to state k-12 population.[3]

To show that broadband was distributed in a way orthogonal to politics, I go through an exercise below that shows broadband did not grow faster or slower based on the strategic incentives of politicians.

If certain politicians can aide the expansion of broadband, then this may be confounding the relationship between roll-out and election outcomes. There are three possible scenarios that could bias the results. First, politicians who may be more uncertain of re-election may want to produce infrastructure projects for their districts. If this is the case, positive changes in broadband hurting the incumbency advantage may just be the results of these marginal politicians acting strategically. Another possibility is that this same relationship exists between those members with major-party opposition and those who run uncontested. Recall that members running in uncontested seats are not included in the data above. A third possible source of bias is if politicians are able to obtain federal grants to their districts through partisan favors in the legislature. If senior members in the party are responsible for infrastructure contracts that produce higher levels of broadband, members may gain providers in their district through appeasing the leadership by voting along with the party agenda.

To investigate whether these strategic incentives are related to expanding broadband, I under-

[3] See 47 U.S. Code §307

take the following procedure. I first regress the logged number of broadband providers on member and year fixed effects, as well as controls for the logged population of each district and the logged median income of each member's district:

$$ln(Providers_{it}) = \alpha_i + \alpha_t + ln(Pop_{it}) + ln(Med.Income_{it}) + \varepsilon_i$$

The right hand side variables in this equation are the controls that I use throughout the specification in the main analysis. The results of this regression can be found in column 1 of Figure 4.6 The residual variation from this regression is the remaining variation in broadband left-over after taking into account an intercept for each district, an intercept for each year, and the endogenous changes in population and income that may drive distribution. In other words, this residual variation is exactly the variation being leveraged to identify the effects above. I can then test to see whether these residuals are systematically related to characteristics using the following specification:

$$ln(Providers_{it}) - ln(\widehat{Providers_{it}}) = \alpha_i + \alpha_t + Politician.Charecteristic_{it} + \varepsilon_i$$

This equation estimates whether the residual variation used to identify the effect of broadband is related to changes in political characteristics of politicians. For example, do members who become more electorally marginal have more than expected broadband providers in their district compared to what would be expected given the modeling above. I determine in the last three columns whether this residual variation is related to an incumbent's electoral margin, whether they faced a challenge from a major party opposition candidate, and their party unity score. The resulting coefficients are all close to zero and imprecisely estimated. This indicates that there is little support for the notion that politicians are systematically affecting where broadband is rolling out to in a way that would bias the above results.

Table 4.6: Relation of Residual Variation to Electoral Marginality

	$ln(Providers_{it})$	$ln(Providers_{it}) - ln(\widehat{Providers_{it}})$		
$ln(Med.Income_{it}$	0.53*			
	(0.12)			
$ln(Pop_{it})$	−0.09			
	(0.24)			
$Inc.Vote_{it}$		−0.001		
		(0.001)		
$Seat.Uncontested_{it}$			−0.0003	
			(0.01)	
$Party.Unity_{it}$				0.001
				(0.001)
Incumbent F.E.	Yes	Yes	Yes	Yes
Election Year F.E.	Yes	Yes	Yes	Yes
N	1700	1299	1690	1700
R-squared	0.75	0.002	0.0000	0.0003

*p $<$ .05; Cluster-Robust Standard Errors

4.4 Validation of Broadband Measure

To further validate the use of the number of broadband providers in an area as a proxy for access to high-speed internet, I merge the FCC data on the number of broadband providers used in the main analysis to individual level data from the Current Population Study Internet Supplement for the 2001, 2003, and 2007 years [4]. These data have two main benefits. First, they include a respondent's county, which allows in most cases a closer mapping of number of providers the respondent is exposed to compared to Congressional districts. Second, the number of people interviewed is large: nearly 100,000 individuals across these three years.

I relate the logged number of broadband providers in each individual's county to a variable indicating whether that person has a home broadband subscription (1) or has dial-up or no internet (0). As with the specifications above, I control for county fixed effects, year fixed effects, and controls for population and income. Once again, this strategy rules out confounders based on stable characteristics of counties and confounders correlated with the time trend.

The results are presented in table 4.7. A 100% increase in the number of broadband providers in an individual's county is associated with an 11% increase in the probability that individual has a home broadband subscription. The standard error on this coefficient is of a size that I reject the null hypothesis of no relationship between broadband providers and home broadband subscriptions.

[4] Data collected from the Integrated Public Use Microdata Series: Version 6.0 (Flood et al. 2015)

Table 4.7: Effect of Broadband on Home Broadband Subscription

	P(Home Broadband)
ln(Providers$_{ict}$)	**0.11***
	(0.03)
ln(Population$_{ict}$)	-0.28^{*}
	(0.13)
ln(Med.Income$_{ict}$)	0.003
	(0.003)
County F.E.	Yes
Year F.E.	Yes
N	99928
R-squared	0.34
Residual Std. Error	19.95 (df = 99594)

*p $<$ .05; Cluster-Robust Standard Errors. Weighted using CPS `wtsupp` variable.

4.5 Parallel Trends Assumption

An important assumption to meet for the specification strategy above is that the potential outcomes of districts that received more than expected broadband and those that received less than expected broadband are equivalent. That is, in the absence of treatment the outcomes of the two groups would be equivalent.

The next two sections produce two tests of that assumption. I first test this by seeing whether rural and urban districts differ in the degree to which they were affected by broadband. Second, I use electoral outcome data from the 1990s to placebo test the relationships found above.

4.5.1 Rural and Urban Districts

One sort of violation of the parallel trends assumption is if the rate of uptake of broadband is endogenous to the type of district. While fixed effects evens out the effects of different *levels* of broadband in each district, it can't control for some districts gaining broadband at faster rates due to fixed characteristics. In particular, even after accounting for the fact that rural areas start with a lower level of broadband, those districts may add broadband at a slower rate.

To test this possibility I classify districts as urban or rural using the 2000 census.[5] I then interact this variable with the relationship of interest in each of the three main tests. This produces a triple interaction, where the coefficient on the triple interaction term represents the degree to which the main coefficient is altered in urban versus rural contexts.

The expectation is that the coefficient on the triple interaction term will be 0: that is, we fail to reject the null hypothesis that the main relationship is different in urban and rural areas. We see that in Tables 4.8 and 4.9 that this is the case for all relationships.

[5]Each districts has a % rural score. Districts with greater than 50% rural households are classified as rural.

Table 4.8: Effect of Communication Environment on Incumbency Advantage, by Urban/Rural

	$D.House_{jt}$
$Party_{jt}$	0.65
	(0.77)
$D.Pres_{jt}$	0.53*
	(0.08)
$Incumbency_{jt}$	11.46*
	(1.33)
$ln(Providers_{jt})$	0.04
	(0.97)
$ln(Med.Income_{jt})$	2.01
	(5.44)
$ln(Population_{jt}$	4.98
	(9.09)
$Incumbency_{jt} * ln(Providers_{jt})$	−2.57*
	(0.52)
$Incumbency_{jt} * Rural_j$	2.34
	(2.57)
$ln(Providers_{jt}) * Rural_j$	−0.67
	(1.04)
Incumbency$_{jt}$*ln(Providers$_{jt}$)*Rural$_j$	**0.04**
	(0.98)
District F.E.	Yes
Election Year F.E.	Yes
N	1433
R-squared	0.57

*p $<$ .05; Cluster-Robust Standard Errors

Table 4.9: Effect of Communication Environment on Incumbency Advantage, by Urban/Rural

	% Incumbent Vote$_{jt}$	
Same Party Presidential Vote$_{jt}$	−0.03	
	(0.15)	
Same Party Presidential Vote$_{jt}$*log(Broadband Providers$_{jt}$)	0.12*	
	(0.06)	
Same Party Presidential Vote$_{jt}$*Rural$_{j}$	−0.04	
	(0.27)	
Same Party Presidential Vote$_{jt}$*log(Broadband Providers$_{jt}$)*Rural$_{j}$	**0.02**	
	(0.11)	
Party Unity$_{jt}$		−0.32
		(0.19)
Party Unity$_{jt}$*log(Broadband Providers$_{jt}$)		0.14*
		(0.07)
Party Unity$_{jt}$*Rural$_{j}$		0.19
		(0.26)
Party Unity$_{jt}$*log(Broadband Providers$_{jt}$)*Rural$_{j}$		**−0.17**
		(0.12)
log(Broadband Providers$_{jt}$)	−4.38	−11.01
	(3.38)	(6.56)
Rural$_{j}$	1.75	−16.20
	(15.39)	(23.66)
log(Population$_{jt}$)	14.91	12.75
	(9.66)	(9.89)
log(Median Income$_{jt}$)	−6.44*	−6.85*
	(3.23)	(2.85)
log(Broadband Providers$_{jt}$)*Rural$_{j}$	−0.90	15.68
	(6.47)	(10.40)
Member F.E.	Yes	Yes
Election Year*Party F.E.	Yes	Yes
N	1299	1299
R-squared	0.43	0.39

*p $<$ .05; Cluster-Robust Standard Errors

4.5.2 Placebo Tests

A common method for testing the parallel trends assumption is to placebo test results against a previous period. I merge the same broadband data with election and demographic data from the 1990s to perform such a test (i.e. broadband data from 2002 with election and demographic data from 1992, broadband data from 2004 with data from 1994, and so on). To do so I used geographic cross-over data to determine which zip codes were in which congressional district during this period, and determined the level of broadband in the 1992-2002 district boundaries for each election-year. I then used these data (future changes in broadband predicting past changes in election outcomes) to run the same hypotheses tests as in the main analysis. If the main results are significant in such a specification is in an indication that units that were more likely to receive a greater than expected number of broadband providers in the early 2000s were simply those that were trending in a more nationalistic direction already.

Figure 4.2 & 4.3 display the results of these tests visually, comparing the marginal effects of incumbency, district presidential vote, and party unity across levels of broadband providers for both the main and placebo data. In each case the slope for the placebo data is closer to 0. Indeed, as Tables 4.10 and 4.11 show, in all cases I fail to reject the null hypothesis of a relationship between (future) broadband and nationalization. It is no the case, in other words, that those districts with faster changes in the broadband in the 2000s were those that were trending towards broadband in previous time periods.

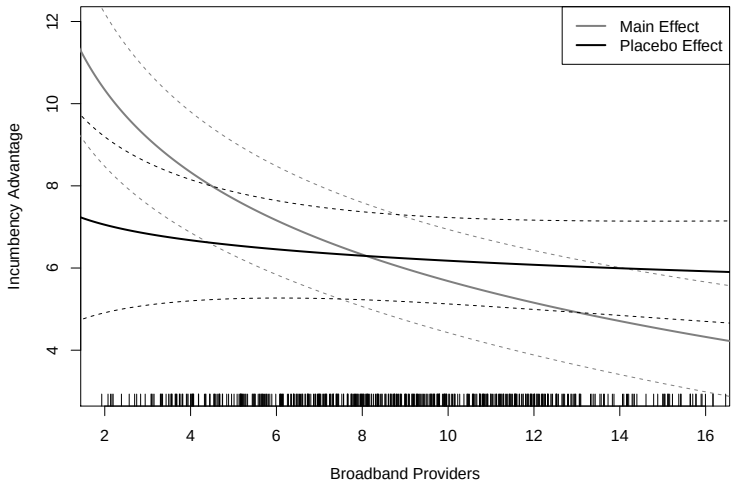
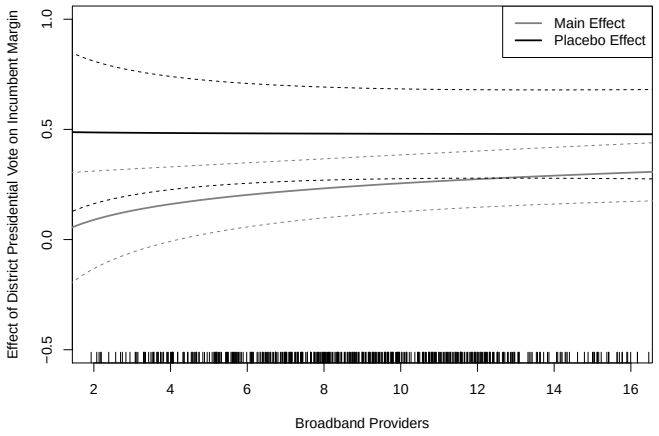
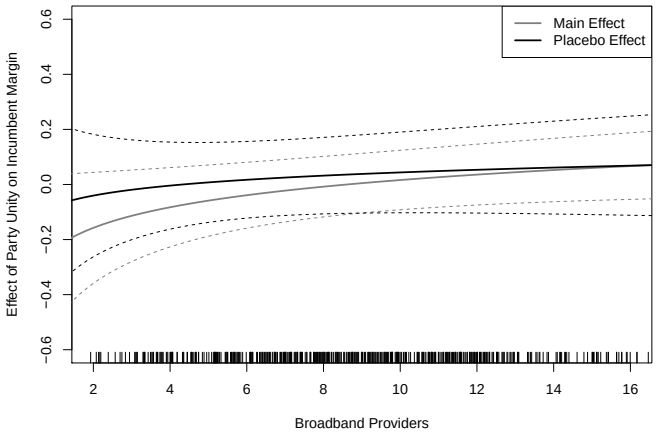


Figure 4.2: Marginal Effect of Incumbency



(a) Marginal Effect of District Presidential Vote



(b) Marginal Effect of Party Unity Score

Figure 4.3: Conditional Effects

Table 4.10: Effect of Communication Environment on Incumbency Advantage, Placebo Data

	% Democratic Vote for House$_{kt}$	
Party Now$_{kt}$	−0.11	−0.42
	(0.49)	(0.49)
% Democratic Vote for President$_{kt}$	0.56*	0.49*
	(0.08)	(0.08)
Incumbency$_{kt}$	6.16*	7.43*
	(0.56)	(1.47)
Incumbency$_{kt}$*log(Broadband Providers$_{kt}$)		**−0.54**
		(0.61)
log(Broadband Providers$_{kt}$)		−3.66*
		(1.37)
log(Median Income$_{kt}$)		−0.13
		(2.47)
log(Population$_{kt}$)		−16.17
		(9.06)
District F.E.	Yes	Yes
Election Year F.E.	Yes	Yes
N	1509	1493
R-squared	0.44	0.46

*p $<$ .05; Cluster-Robust Standard Errors

Table 4.11: Effect of Communication Environment on Incumbency Advantage, Placebo Data

	% Incumbent Vote$_{jt}$			
Same Party Presidential Vote$_{jt}$	0.48*	0.49*		
	(0.10)	(0.20)		
Same Party Presidential Vote$_{jt}$*log(Broadband Providers$_{jt}$)		**−0.004**		
		(0.07)		
Party Unity$_{jt}$			0.03	−0.08
			(0.07)	(0.16)
Party Unity$_{jt}$*log(Broadband Providers$_{jt}$)				**0.05**
				(0.07)
log(Broadband Providers$_{jt}$)		−0.60		−4.77
		(4.15)		(6.16)
log(Population$_{jt}$)	−5.12	−5.52	−4.40	−4.60
	(3.48)	(3.53)	(3.67)	(3.72)
log(Median Income$_{jt}$)	0.25	2.41	−7.30	−5.92
	(11.64)	(12.65)	(11.81)	(12.46)
Member F.E.	Yes	Yes	Yes	Yes
Election Year*Party F.E.	Yes	Yes	Yes	Yes
N	1274	1274	1274	1274
R-squared	0.25	0.25	0.22	0.22

*p $<$ .05; Cluster-Robust Standard Errors

4.6 Alternative Specifications for Panel Analyses

4.6.1 Models with Full Demographics

The tables below replicate the main results while including a full battery of demographics. The results remain consistent with those found above. The standard errors on the interaction terms in table 4.13 are slightly inflated (likely due to the multi-colinearity between these demographics), but the magnitude of the effects are equivalent to those found in the main analyses.

Table 4.12: Effect of Communication Environment on Incumbency Advantage

	% Democratic Vote for House$_{kt}$	
Party Now$_{kt}$	0.38	0.58
	(0.77)	(0.77)
% Democratic Vote for President$_{kt}$	0.52*	0.53*
	(0.08)	(0.08)
Incumbency$_{kt}$	6.35*	11.96*
	(0.67)	(1.21)
log(Broadband Providers$_{kt}$)		−0.12
		(0.90)
log(Median Income$_{kt}$)		14.55
		(7.60)
log(Population$_{kt}$)		6.87
		(9.29)
Median Age$_{kt}$		0.54
		(0.41)
% Living in Poverty$_{kt}$		0.14
		(0.20)
% White$_{kt}$		0.01
		(0.07)
% Black$_{kt}$		0.46*
		(0.18)
% Bachelor Degrees$_{kt}$		−0.22
		(0.19)
Incumbency$_{kt}$*log(Broadband Providers$_{kt}$)		**−2.67***
		(0.46)
District F.E.	Yes	Yes
Election Year F.E.	Yes	Yes
N	1433	1433
R-squared	0.55	0.58

*p $<$ .05; Cluster-Robust Standard Errors

Table 4.13: Effect of Communication Environment on Incumbency Advantage

	% Incumbent Vote$_{jt}$			
Same Party Presidential Vote$_{jt}$	0.23*	−0.08		
	(0.07)	(0.14)		
Same Party Presidential Vote$_{jt}$*log(Broadband Providers$_{jt}$)		**0.14***		
		(0.05)		
Party Unity$_{jt}$			−0.02	−0.29*
			(0.05)	(0.14)
Party Unity$_{jt}$*log(Broadband Providers$_{jt}$)				**0.12***
				(0.06)
log(Broadband Providers$_{jt}$)		−5.01		−8.63
		(2.83)		(4.92)
log(Population$_{jt}$)	15.81	19.93*	15.05	16.70
	(9.74)	(9.77)	(10.11)	(10.07)
log(Median Income$_{jt}$)	0.15	0.30	0.08	0.16
	(0.34)	(0.33)	(0.31)	(0.30)
Median Age$_{jt}$	0.23	0.26	0.16	0.13
	(0.25)	(0.24)	(0.24)	(0.25)
% Living in Poverty$_{jt}$	−0.01	−0.01	0.01	0.03
	(0.06)	(0.06)	(0.07)	(0.07)
% White$_{jt}$	0.11	0.13	0.21	0.24*
	(0.12)	(0.12)	(0.11)	(0.11)
% Black$_{jt}$	0.11	0.07	0.12	0.09
	(0.13)	(0.13)	(0.13)	(0.13)
% Bachelor Degrees$_{jt}$	−4.01	−4.07	−4.62	−6.06
	(7.01)	(6.99)	(6.99)	(6.89)
Member F.E.	Yes	Yes	Yes	Yes
Election Year*Party F.E.	Yes	Yes	Yes	Yes
N	1299	1299	1299	1299
R-squared	0.42	0.44	0.39	0.40

*$p < .05$; Cluster-Robust Standard Errors

4.6.2 Models with No Demographics

The following two tables replicate the main results with models that include no demographic covariates. The results remain unchanged.

Table 4.14: Effect of Communication Environment on Incumbency Advantage

	% Democratic Vote for House$_{kt}$	
Party Now$_{kt}$	0.38	0.65
	(0.77)	(0.77)
% Democratic Vote for President$_{kt}$	0.52*	0.52*
	(0.08)	(0.08)
Incumbency$_{kt}$	6.35*	12.08*
	(0.67)	(1.18)
log(Broadband Providers$_{kt}$)		-0.09
		(0.89)
Incumbency$_{kt}$*log(Broadband Providers$_{kt}$)		**-2.76^{*}**
		(0.44)
District F.E.	Yes	Yes
Election Year F.E.	Yes	Yes
N	1433	1433
R-squared	0.55	0.57

$^{*}p < .05$; Cluster-Robust Standard Errors

Table 4.15: Effect of Communication Environment on Incumbency Advantage

	% Incumbent Vote$_{jt}$			
Same Party Presidential Vote$_{jt}$	0.24*	−0.004		
	(0.08)	(0.15)		
Same Party Presidential Vote$_{jt}$*log(Broadband Providers$_{jt}$)		**0.11***		
		(0.05)		
Party Unity$_{jt}$			0.001	−0.24
			(0.06)	(0.13)
Party Unity$_{jt}$*log(Broadband Providers$_{jt}$)				**0.11***
				(0.05)
log(Providers)		−4.25		−8.37
		(2.97)		(4.87)
Member F.E.	Yes	Yes	Yes	Yes
Election Year*Party F.E.	Yes	Yes	Yes	Yes
N	1299	1299	1299	1299
R-squared	0.40	0.41	0.37	0.38

*p $<$ .05; Cluster-Robust Standard Errors

4.7 Alternative Specifications for Cross-Section Analyses

4.7.1 Models with Full Demographics

Table 4.16: Effect of Communication Environment on Incumbency Advantage

	% Democratic Vote for House$_{kt}$			
	2002	**2004**	**2006**	**2008**
Incumbency$_k$	10.92*	12.17*	15.13*	21.03*
	(2.91)	(2.58)	(4.53)	(4.63)
Party Now$_k$	4.51*	3.98*	4.13*	2.86*
	(1.59)	(1.29)	(1.35)	(1.01)
% Democratic Vote for President$_k$	0.70*	0.72*	0.74*	0.64*
	(0.14)	(0.09)	(0.07)	(0.05)
log(Broadband Providers$_k$)	−3.66	−3.47	−2.47	−1.55
	(2.31)	(1.98)	(3.79)	(3.42)
log(Median Income$_k$)	−2.45	1.24	−4.10	−3.88
	(4.87)	(3.73)	(3.54)	(3.56)
log(Population$_k$)	−25.97	2.62	5.12	−0.49
	(20.41)	(8.53)	(8.35)	(5.62)
% White$_k$	−0.17*	−0.10	−0.02	−0.13*
	(0.08)	(0.05)	(0.05)	(0.04)
% Black$_k$	−0.13	−0.10	−0.10	−0.10*
	(0.07)	(0.05)	(0.05)	(0.05)
% Poverty$_k$	−0.15	−0.05	−0.15	−0.04
	(0.28)	(0.13)	(0.16)	(0.19)
% Bachelor Degree$_k$	0.01	−0.04	−0.04	0.02
	(0.07)	(0.08)	(0.06)	(0.06)
Median Age$_k$	0.24	−0.17	0.06	−0.18
	(0.27)	(0.22)	(0.21)	(0.28)
Incumbency$_{kt}$*log(Broadband Providers$_k$)	−2.16	−2.70*	−4.27*	−5.78*
	(1.34)	(0.94)	(1.80)	(1.80)
State F.E.	Yes	Yes	Yes	Yes
N	333	360	371	369
R-squared	0.93	0.94	0.92	0.93
Residual Std. Error	5.68 (df = 272)	4.87 (df = 300)	5.23 (df = 309)	5.21 (df = 309)

*p $<$ .05; Cluster(State)-Robust Standard Errors

Table 4.17: Effect of Same Party Presidential Vote on Incumbent Vote Share

	% Incumbent Vote$_{kt}$			
	2002	**2004**	**2006**	**2008**
Republican$_k$	1.45	-3.22^*	-10.72^*	-2.40^*
	(1.04)	(1.01)	(1.50)	(0.98)
log(Broadband Providers$_k$)	-2.65	-15.51^*	-16.13	-19.23^*
	(8.13)	(6.68)	(10.28)	(9.71)
% Same Party Presidential Vote$_k$	0.10	-0.04	-0.32	-0.25
	(0.25)	(0.26)	(0.36)	(0.41)
log(Population$_k$)	-9.21	2.09	20.97	-5.31
	(22.05)	(10.21)	(12.77)	(5.45)
log(Median Income$_k$)	-4.60	1.14	-0.81	0.46
	(7.37)	(3.63)	(4.56)	(4.42)
% White$_k$	0.01	0.03	0.005	-0.07^*
	(0.07)	(0.04)	(0.04)	(0.03)
% Black$_k$	0.004	-0.05	-0.09^*	-0.11^*
	(0.06)	(0.04)	(0.04)	(0.04)
% Poverty$_k$	0.23	0.27^*	0.37	0.16
	(0.27)	(0.13)	(0.24)	(0.19)
% Bachelor Degree$_k$	-0.02	-0.09	-0.14^*	-0.12
	(0.10)	(0.06)	(0.07)	(0.08)
Median Age$_k$	0.16	0.31	0.60^*	0.20
	(0.22)	(0.19)	(0.24)	(0.17)
% Same Party Presidential Vote$_k$*log(Broadband Providers$_k$)	0.11	0.30^*	0.39^*	0.34^*
	(0.14)	(0.12)	(0.16)	(0.16)
State F.E.	Yes	Yes	Yes	Yes
N	296	329	340	334
R-squared	0.55	0.74	0.76	0.79
Residual Std. Error	6.06 (df = 237)	4.55 (df = 270)	5.26 (df = 280)	4.97 (df = 277)

$^*p < .05$; Cluster(State)-Robust Standard Errors

Table 4.18: Effect of Party Unity Score on Incumbent Vote Share

	% Incumbent Vote$_{kt}$			
	2002	**2004**	**2006**	**2008**
Republican$_k$	1.75	−0.03	−6.97*	−1.79
	(1.23)	(1.22)	(1.33)	(1.81)
log(Broadband Providers$_k$)	−29.73*	−31.16	−52.61*	−41.58
	(14.17)	(17.48)	(20.57)	(27.25)
Party Unity$_k$	−0.44	−0.45	−1.22*	−0.98
	(0.26)	(0.36)	(0.49)	(0.74)
log(Population$_k$)	5.56	1.58	16.66	−12.07
	(25.60)	(11.37)	(12.14)	(8.66)
log(Median Income$_k$)	−8.53	−6.47	−3.60	−8.56
	(5.96)	(4.18)	(4.82)	(7.17)
% White$_k$	−0.12*	−0.22*	−0.16*	−0.26*
	(0.06)	(0.06)	(0.04)	(0.05)
% Black$_k$	−0.01	−0.10	−0.08	−0.10
	(0.06)	(0.06)	(0.06)	(0.07)
% Poverty$_k$	0.35	0.46*	0.62*	0.32
	(0.21)	(0.19)	(0.29)	(0.30)
% Bachelor Degree$_k$	0.11	0.12	−0.06	0.04
	(0.10)	(0.10)	(0.12)	(0.17)
Median Age$_k$	0.48*	0.56*	0.95*	0.32
	(0.19)	(0.25)	(0.25)	(0.27)
Party Unity$_k$*log(Broadband Providers$_k$)	0.37*	0.35	0.68*	0.49
	(0.15)	(0.19)	(0.22)	(0.30)
State F.E.	Yes	Yes	Yes	Yes
N	296	329	340	334
R-squared	0.46	0.50	0.61	0.57
Residual Std. Error	6.65 (df = 237)	6.31 (df = 270)	6.65 (df = 280)	7.08 (df = 277)

*p $<$ .05; Cluster(State)-Robust Standard Errors

4.7.2 Models with No Demographics

Table 4.19: Effect of Communication Environment on Incumbency Advantage

	% Democratic Vote for House$_{kt}$			
	2002	**2004**	**2006**	**2008**
Incumbency$_k$	10.32*	11.19*	13.99*	19.52*
	(2.76)	(2.46)	(4.19)	(4.71)
Party Now$_k$	4.58*	4.21*	4.00*	2.80*
	(1.56)	(1.27)	(1.14)	(1.08)
% Democratic Vote for President$_k$	0.74*	0.72*	0.65*	0.73*
	(0.07)	(0.05)	(0.06)	(0.05)
log(Broadband Providers$_k$)	−3.14	−2.58	−3.89	−2.60
	(1.60)	(1.49)	(2.76)	(2.48)
Incumbency$_{kt}$*log(Broadband Providers$_k$)	−1.79	−2.28*	−3.57*	−5.22*
	(1.30)	(0.89)	(1.71)	(1.85)
State F.E.	Yes	Yes	Yes	Yes
N	333	360	371	369
R-squared	0.92	0.94	0.92	0.92
Residual Std. Error	5.70 (df = 279)	4.90 (df = 307)	5.24 (df = 316)	5.26 (df = 316)

*p < .05; Cluster(State)-Robust Standard Errors

Table 4.20: Effect of Same Party Presidential Vote on Incumbent Vote Share

	% Incumbent Vote$_{kt}$			
	2002	**2004**	**2006**	**2008**
Republican$_k$	−0.12	−3.47*	−10.60*	−3.09*
	(0.87)	(0.81)	(1.20)	(0.82)
log(Broadband Providers$_k$)	−2.95	−19.02*	−28.88*	−27.79*
	(8.24)	(6.69)	(8.73)	(9.05)
% Same Party Presidential Vote$_k$	0.28	−0.04	−0.48	−0.39
	(0.25)	(0.27)	(0.33)	(0.40)
% Same Party Presidential Vote$_k$*log(Broadband Providers$_k$)	0.05	0.30*	0.46*	0.40*
	(0.14)	(0.12)	(0.14)	(0.15)
State F.E.	Yes	Yes	Yes	Yes
N	296	329	340	334
R-squared	0.51	0.73	0.73	0.77
Residual Std. Error	6.23 (df = 244)	4.61 (df = 277)	5.51 (df = 287)	5.09 (df = 284)

*p < .05; Cluster(State)-Robust Standard Errors

Table 4.21: Effect of Party Unity Score on Incumbent Vote Share

	% Incumbent Vote$_{kt}$			
	2002	**2004**	**2006**	**2008**
Republican$_k$	-2.21^*	-4.91^*	-10.66^*	-6.21^*
	(1.04)	(1.25)	(1.46)	(1.87)
log(Broadband Providers$_k$)	-30.31^*	-47.96^*	-68.23^*	-73.62^*
	(13.54)	(18.25)	(21.84)	(32.84)
Party Unity$_k$	-0.30	-0.64	-1.39^*	-1.78
	(0.26)	(0.38)	(0.53)	(0.91)
Party Unity$_k$*log(Broadband Providers$_k$)	0.35^*	0.53^*	0.78^*	0.84^*
	(0.15)	(0.20)	(0.24)	(0.37)
State F.E.	Yes	Yes	Yes	Yes
N	296	329	340	334
R-squared	0.33	0.36	0.52	0.41
Residual Std. Error	7.32 (df = 244)	7.08 (df = 277)	7.30 (df = 287)	8.20 (df = 284)

$^*p < .05$; Cluster(State)-Robust Standard Errors

4.8 Problematic Trends

While time fixed-effects effectively deal with the problem of a time-trend in levels, there is an additional potential problem with these data whereby the *effect* of variables like *Incumbency* and *Same Party Presidential Vote* has a trend. That is, the effects of both of these variables were changing monotonically in this period alongside broadband.

This is demonstrated clearly in Table 4.22. The first column simply predicts the number of broadband providers in each district-year as a function of year and district fixed effects. The coefficients on the year fixed effects show that the level of broadband has a clear trend: a district in a latter year almost certainly has a higher number of broadband providers then a district in a previous year. This is a problem of bias in the *level* of broadband

Columns 2 & 3 demonstrate a trend in the *effect* of *Incumbency* and *Same Party Presidential Vote* on political outcomes. In each case I interact these variables with the time fixed-effects to show the trend. The incumbency advantage in 2002 is 7.9 points. In 2004 this drops a further 1 point, and drops a further 1.6 points in 2006, where it bottoms out. The impact of Same Party Presidential Vote on electoral outcomes in 2002 is .16. This effect becomes .13 points higher in 2004, drops .4 points in 2006, before rising .7 points in 2008. (There is no such trend in Party Unity voting, so I omit it here).

My solution in the paper to this problem is threefold. (1) I focus on cross-sectional results by year. By definition these results cannot be biased by a problematic time trend. (2) I include a placebo test which uses future broadband to predict past political changes. This test returns null results with gives confidence to the results. (3) I interact the time fixed effects with the problematic variables. This strategy produces weaker results for *Incumbency* and reverses the sign on *Same Party Presidential* voting.

I take a separate approach here. Based on the coefficients in Table 4.22 there is a clear directional trend to the effects of these variables across the period. However, within each series there are time periods which do *not* have such a trend. In table 4.23 I exploit this by reducing my sample to only those years where there is not a clear monotonic trend in the effect of *Incumbency* (2006

& 2008) and *Same Party Presidential Vote* (2004-2008). In both cases, restricting the sample to non-trend years produces results in-line with the main panel results. This being said, the results in each case are smaller and less precisely estimated compared to the main analysis. This is likely due to: (1) focusing on latter years where the variation in (logged) providers is much smaller. This was, in other words, a less impactful period of within-unit broadband growth; and (2) a reduced n.

In the first column, the interaction between broadband providers and *Incumbency* is in the negative expected direction, indicating that a 100% increase in broadband providers leads to a 1.45 reduction in the incumbency advantage. The probability of getting a result this extreme if the null were true is .08. In column 2 the coefficient on the interaction term is in the expected positive direction, with the magnitude indicating that presidential vote in a district become more impactful as the number of broadband providers increases. The probably of getting a result this extreme if the null were true is .42.

Table 4.22: Problematic Trends

	Dependent variable:		
	log(providers)	Democratic Vote for House	Incumbent Vote for House
	(1)	(2)	(3)
2004	0.250***		
	(0.012)		
2006	0.474***		
	(0.012)		
2008	0.755***		
	(0.012)		
Incumbency		7.822***	
		(0.509)	
2004*Incumbency		−1.077***	
		(0.346)	
2006*Incumbency		−2.667***	
		(0.349)	
2008*Incumbency		−2.569***	
		(0.357)	
Party Now		0.678	
		(0.521)	
Democratic Vote for President		0.523***	
		(0.047)	
Presidential Vote			0.166***
			(0.040)
2004*Presidential Vote			0.132***
			(0.031)
2006*Presidential Vote			0.091***
			(0.031)
2008*Presidential Vote			0.162***
			(0.031)
F.E.	District and Year	District and Year	Incumbent Year*Party
Observations	1,700	1,433	1,299
R^2	0.777	0.581	0.425
Adjusted R^2	0.700	0.398	0.038
F Statistic	1,468.704*** (df = 3; 1262)	153.613*** (df = 9; 998)	57.303*** (df = 10; 776)
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 4.23: Non-Problematic Years

	Democratic Vote Share for House 2006,2008	**Incumbent Vote Share for House 2004,2006,2008**
log(Providers)	−3.46	−1.04
	(2.10)	(2.88)
Party Now	−3.16*	
	(0.96)	
Democratic Vote for President	0.46*	
	(0.08)	
Incumbency	9.29*	
	(2.26)	
log(Providers)*Incumbency	−1.45	
	(0.83)	
Same Party Presidential Vote		0.47*
		(0.16)
log(Providers)*Same Party Presidential Vote		0.04
		(0.05)
log(Median Income)	−6.77	−13.90*
	(4.74)	(6.20)
log(Population)	−0.48	14.83
	(9.24)	(10.04)
F.E.	District & Year	District & Year*Party
N	740	1003
R-squared	0.32	0.43

*p < .05; Cluster-Robust Standard Errors

4.9 Conditional Effect of Party Unity, by Party

The table below replicates the cross-sectional analysis of the conditional effect of Party Unity scores, but allows this moderating effect to be different between the two parties. I have no specific hypotheses about how this effect should differ between two parties as work discussing the electoral ramifications of Party Unity voting has not made this distinction(i.e. Carson et al. 2010).

Table 4.24 performs this analysis with a triple interaction between broadband providers, Party Unity scores, and a dummy for Republican Incumbents. The coefficient on the triple interaction indicates how the conditional relationship between providers and Party Unity changes for Republicans and Democrats. In all years this coefficient is negative, indicating that the moderating impact of broadband on the effect of Party Unity is smaller for Republicans.

In Table 4.25 is calculate the marginal effect of Party Unity on incumbent vote for each party in each year, once for the minimum number of broadband providers in that year and once for the median number. The results indicate that the expected relationship of the number of providers moving the effect of Party Unity from negative to positive is happening much more regularly among Democrats. Indeed, Republicans' re-election numbers seem generally unaffected by Party Unity scores regardless of the level of broadband.

With the limitations of these data it is hard to know whether this pattern of results is something particular to how Democrats are received by voters generally, something specific to this time, or something due to the party being in the minority leading into all of these elections. More research with additional years would have to be completed to better understand why this effect differs, and whether that difference is persistent.

Table 4.24: Effect of Party Unity Score on Incumbent Vote Share

	% Incumbent Vote$_{kt}$			
	2002	**2004**	**2006**	**2008**
log(Broadband Providers$_k$)	−43.19*	−64.26*	−102.11*	−184.54*
	(16.04)	(16.97)	(22.02)	(47.11)
Party Unity$_k$	−0.73*	−1.22*	−2.39*	−4.48*
	(0.32)	(0.41)	(0.54)	(1.17)
Republican$_k$	−35.00	−108.65	−162.71	−456.16*
	(68.43)	(68.59)	(138.13)	(156.07)
log(Population$_k$)	−2.01	−4.26	10.02	−11.76
	(29.83)	(18.97)	(13.00)	(9.58)
log(Median Income$_k$)	−14.68*	−12.47*	−14.53*	−12.83*
	(4.46)	(4.39)	(3.33)	(3.97)
Party Unity$_k$*log(Broadband Providers$_k$)	0.57*	0.80*	1.27*	2.08*
	(0.17)	(0.20)	(0.24)	(0.49)
Republican$_k$*log(Broadband Providers$_k$)	29.67	66.94	81.85	205.51*
	(40.13)	(36.46)	(62.42)	(63.28)
Party Unity$_k$*Republican$_k$	0.47	1.31	1.85	5.18*
	(0.75)	(0.78)	(1.51)	(1.74)
Party Unity$_k$*Republican$_k$*log(Broadband Providers$_k$)	−0.37	−0.80	−0.96	−2.33*
	(0.43)	(0.41)	(0.68)	(0.70)
State F.E.	Yes	Yes	Yes	Yes
N	296	329	340	334
R-squared	0.45	0.47	0.59	0.59
Residual Std. Error	6.71 (df = 239)	6.46 (df = 272)	6.77 (df = 282)	6.86 (df = 279)

*p $<$ .05; Cluster(State)-Robust Standard Errors

Table 4.25: Marginal Effects of Party Unity at Different Broadband Levels, By Party

	Democrats			**Republicans**		
	Minimum	*Median*	*Difference*	*Minimum*	*Median*	*Difference*
2002	-0.39	0.30	0.69	-0.13	0.11	0.24
2004	-0.69	0.43	1.12	0.10	0.10	0
2006	-0.55	0.47	1.02	-0.10	0.14	0.24
2008	-0.84	0.79	1.63	0.27	0.07	-0.2

4.10 Non-Linearity of Presidential Vote on House Vote

It is possible that Presidential vote operates a non-linear fashion. In particular, the degree to which presidential vote drives House may depend on the competitiveness of the election. More competitive elections may mean more attention paid to the sort of idiosyncratic features of races that can drive the incumbency advantage. In comparison when races are un-competitive voters may pay less attention and rely on their partianship/vote-choice for president to drive their voting decision.

To understand the degree to which this is true I re-run my analysis of the impact of *Same Party Presidential Vote* on *Incumbent Vote* conditional on the information environment, adding a squared term for *Same Party Presidential Vote*. The results of this analyses are presented in Table 4.26. It is difficult to interpret the coefficients in the model, but it is clear from the interaction terms that broadband moderates the effect of *Same Party Presidential Vote* from 2004-2008 in similar ways, but does not do so to the same extent in 2002.

Figure 4.4 interprets these coefficients by estimating the predicted *Incumbent Vote* across levels of *Same Party Presidential Vote* for 2002 and 2008. In each year I estimate the predicted effects once for the minimum level of broadband providers in the year, and once for the median level. In 2002 the two curves are quite similar: the slope on presidential vote is shallow for the most marginal members (indicating more localized, idiosyncratic elections) and steeper for less marginal members. This relationship changes in 2008 (and based off the coefficients, in 2004 and 2006 as well). Districts with low levels of broadband providers display this conditional relationship, but for districts with the median number of providers the effect is much more linear. That is, when broadband is higher the effect of presidential vote on house vote is similar no matter the marginality of the district.

Table 4.26: Effect of Same Party Presidential Vote on Incumbent Vote Share

	% Incumbent Vote$_{kt}$			
	2002	**2004**	**2006**	**2008**
Republican$_k$	1.20	−2.70*	−9.81*	−2.31*
	(1.17)	(0.96)	(1.42)	(1.05)
log(Broadband Providers$_k$)	12.40	−40.96	−47.55	−56.99
	(21.98)	(34.47)	(38.36)	(37.56)
Same Party Presidential Vote$_k$	0.02	−2.56	−3.79	−4.21
	(1.33)	(3.00)	(2.97)	(2.93)
% Same Party Presidential Vote$_k^2$	0.002	0.02	0.03	0.04
	(0.01)	(0.03)	(0.03)	(0.02)
log(Population$_k$)	−6.90	0.10	16.78	−4.16
	(19.08)	(8.95)	(11.44)	(5.10)
log(Median Income$_k$)	−4.80	−3.57*	−5.58*	−4.94*
	(3.87)	(1.76)	(2.16)	(1.31)
% Same Party Presidential Vote$_k$*log(Broadband Providers$_k$)	−0.40	1.26	1.46	1.69
	(0.69)	(1.22)	(1.28)	(1.16)
% Same Party Presidential Vote$_k^2$*log(Broadband Providers$_k$)	0.004	−0.01	−0.01	−0.01
	(0.01)	(0.01)	(0.01)	(0.01)
State F.E.	Yes	Yes	Yes	Yes
N	296	329	340	334
R-squared	0.60	0.74	0.75	0.79
Residual Std. Error	5.74 (df = 240)	4.56 (df = 273)	5.27 (df = 283)	4.95 (df = 280)

*p $<$ .05; Cluster(State)-Robust Standard Errors

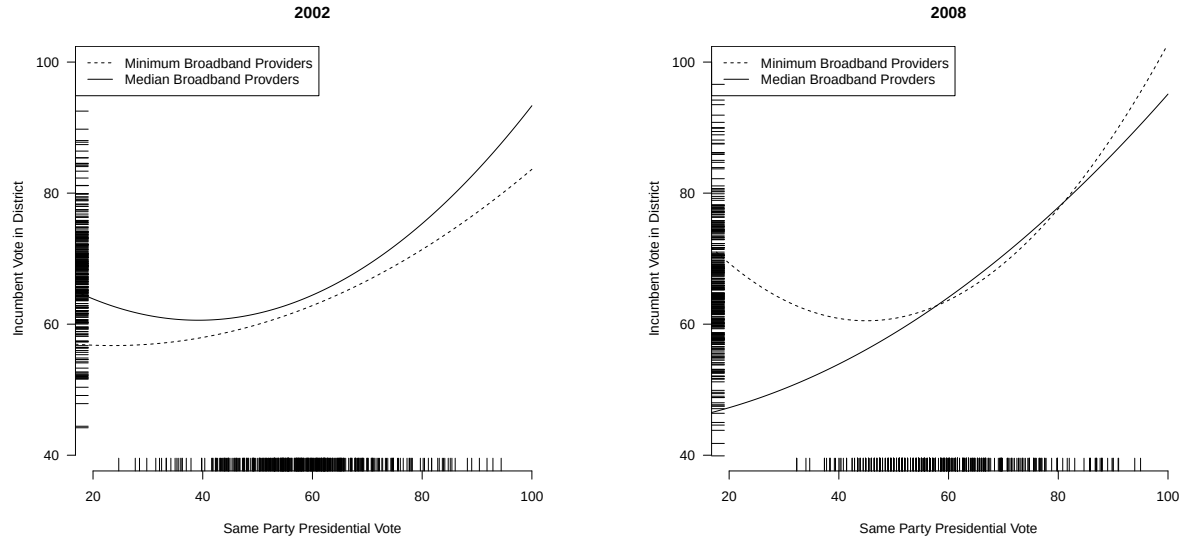


Figure 4.4: Conditional Effect of Presidential Vote on House Vote, by Year

4.11 Predicting Voting Patterns with Lagged Broadband

In this section I replicate the main analyses in the paper using a lagged measure of broadband. In the main analyses the level of broadband for a year is measured in June, some 5 months before the election. It may be that the effect of broadband is fully realized at a date beyond this. Alternatively, if the lagged variable produces null results, it suggests that broadband causes a quick impact that later dissipates. To investigate this, I replace the measure of broadband in each district-year with the level of broadband from the *previous* election year, such that 2004 election outcomes are predicted with 2002 levels of broadband, and so on.

4.11.1 Cross Sectional Models

The following three models replicate the cross-sectional results in the paper with the lagged measure of broadband. There is less reason to believe that the results of these models will provide fundamentally different results than the main models, as broadband levels between two periods are likely to be highly correlated (indeed, the correlation between *Providers* and *Lagged Providers* is .87). In line with that expectation, the main results using a lagged measure of broadband differ only somewhat from the main models, and not in any systematic direction.

Table 4.27: Effect of Lagged Communication Environment on Incumbency Advantage

	% Democratic Vote for House$_{kt}$		
	2004	**2006**	**2008**
Incumbency$_k$	11.15*	11.23*	20.05*
	(2.26)	(2.24)	(4.73)
Party Now$_k$	4.39*	4.35*	2.75*
	(1.29)	(1.24)	(1.05)
% Democratic Vote for President$_k$	0.68*	0.70*	0.69*
	(0.06)	(0.06)	(0.05)
log(Lagged Broadband Providers$_k$)	−0.01	−5.29*	1.41
	(1.79)	(1.75)	(3.04)
log(Median Income$_k$)	−3.22	0.94	−4.71*
	(1.96)	(1.64)	(1.48)
log(Population$_k$)	9.09	5.20	1.09
	(9.06)	(7.71)	(4.84)
Incumbency$_{kt}$*log(Lagged Broadband providers$_k$)	−2.46*	−2.70*	−5.94*
	(0.79)	(0.95)	(2.07)
State F.E.	Yes	Yes	Yes
N	341	350	342
R-squared	0.94	0.92	0.93
Residual Std. Error	4.91 (df = 286)	5.19 (df = 294)	5.16 (df = 288)

*p $<$ .05; Cluster(State)-Robust Standard Errors

Table 4.28: Effect of Same Party Presidential Vote on Incumbent Vote Share

	% Incumbent Vote$_{kt}$		
	2004	**2006**	**2008**
Republican$_k$	−2.76*	−10.34*	−2.26*
	(1.00)	(1.56)	(1.02)
log(Lagged Broadband Providers$_k$)	−9.93	−20.03*	−26.84*
	(6.33)	(6.55)	(10.46)
% Same Party Presidential Vote$_k$	0.20	−0.18	−0.40
	(0.22)	(0.26)	(0.40)
log(Population$_k$)	3.96	15.55	−3.40
	(10.17)	(12.27)	(5.69)
log(Median Income$_k$)	−5.59*	−5.96*	−4.99*
	(2.01)	(2.02)	(1.27)
% Same Party Presidential Vote$_k$*log(Lagged Broadband Providers$_k$)	0.19	0.35*	0.43*
	(0.10)	(0.11)	(0.17)
State F.E.	Yes	Yes	Yes
N	310	321	307
R-squared	0.73	0.76	0.79
Residual Std. Error	4.66 (df = 256)	5.33 (df = 267)	4.94 (df = 256)

*p $<$ .05; Cluster(State)-Robust Standard Errors

Table 4.29: Effect of Same Party Presidential Vote on Incumbent Vote Share

	% Incumbent Vote$_{kt}$		
	2004	**2006**	**2008**
Republican$_k$	−1.21	−8.42*	−2.98
	(1.18)	(1.44)	(1.78)
log(Lagged Broadband Providers$_k$)	−20.75	−43.44*	−75.17*
	(15.34)	(15.69)	(23.55)
Party Unity$_k$	−0.25	−0.76*	−1.91*
	(0.27)	(0.35)	(0.48)
log(Population$_k$)	−8.85	3.67	−13.26
	(19.07)	(16.19)	(10.58)
log(Median Income$_k$)	−16.93*	−14.31*	−17.69*
	(4.68)	(4.61)	(3.15)
Party Unity$_k$*log(Lagged Broadband Providers$_k$)	0.31	0.54*	0.97*
	(0.16)	(0.17)	(0.23)
State F.E.	Yes	Yes	Yes
N	310	321	307
R-squared	0.48	0.58	0.55
Residual Std. Error	6.46 (df = 256)	6.95 (df = 267)	7.22 (df = 256)

*p $<$ .05; Cluster(State)-Robust Standard Errors

4.11.2 Panel Models

The panel models present a much more interesting test for lagged broadband. Because these models look *within* districts (or within members, for the conditional effects of presidential voting and Party Unity) the use of a lagged independent variable here means that the models are predicting change in, for example, 2004-2006 behavior with a change in 2002-2004 broadband.

As in the main paper, I estimate each model with and without an interaction between the main independent variable of interest and the time fixed effects.

The models produce intriguing results. In nearly all cases the use of logged broadband produces *stronger* results then those found in the main models. This includes models with interactions between the political independent variables and the time trend. Substantively, this suggests that the effect of a change in the level of broadband in a district may be felt more strongly several years later, once individuals have responded to this change by changing their consumption habits. Lagged broadband has the effect of reducing the incumbency advantage, increasingly the importance of presidential voting on House voting, and attenuating the negative impact of Party Unity voting on incumbent vote share.

Overall, these results provide confidence in the proposed effects of broadband, and indicate that the effects of broadband may peak sometime after the initial expansion.

Table 4.30: Effect of Communication Environment on Incumbency Advantage

	% Democratic Vote for House$_{kt}$	
Incumbency$_k$	11.59*	10.88*
	(1.57)	(1.95)
log(Lagged Broadband Providers$_k$)	0.34	0.49
	(0.92)	(0.90)
Incumbency$_{kt}$*log(Lagged Broadband Providers$_k$)	−2.94*	−2.29*
	(0.64)	(0.93)
Party Now$_k$	−0.01	−0.04
	(0.93)	(0.94)
% Democratic Vote for President$_k$	0.67*	0.67*
	(0.09)	(0.09)
log(Median Income$_k$)	−4.78	−4.25
	(5.52)	(5.68)
log(Population$_k$)	0.77	−1.15
	(10.85)	(10.91)
2006	4.16*	4.06*
	(0.46)	(0.46)
2008	0.50	0.48
	(0.69)	(0.71)
Incumbency$_k$*2006		−1.24*
		(0.33)
Incumbency$_k$*2008		−0.50
		(0.49)
District F.E.	Yes	Yes
N	1033	1033
R-squared	0.56	0.56

*p $<$ .05; Cluster(State)-Robust Standard Errors

Table 4.31: Partisan Effects Conditional on Information Environment I

	% Incumbent Vote$_{jt}$	
Same Party Presidential Vote$_{jt}$	0.24	0.14
	(0.16)	(0.19)
log(Lagged Broadband Providers$_{jt}$)	-8.50^{*}	-12.46^{*}
	(2.97)	(4.72)
Same Party Presidential Vote$_{jt}$*log(Lagged Broadband Providers$_{jt}$)	0.14^{*}	0.21^{*}
	(0.05)	(0.08)
log(Population$_{jt}$)	15.95	14.41
	(12.50)	(12.31)
log(Median Income$_{jt}$)	-12.63^{*}	-11.98^{*}
	(6.29)	(6.04)
2006	1.60^{*}	5.40^{*}
	(0.48)	(1.98)
2008	-1.00	2.64
	(0.63)	(2.74)
Republican$_{jt}$*2004	-8.09^{*}	-8.16^{*}
	(0.56)	(0.56)
Republican$_{jt}$*2006	-3.06^{*}	-3.29^{*}
	(1.04)	(1.09)
Same Party Presidential Vote$_{jt}$*2006		-0.06^{*}
		(0.03)
Same Party Presidential Vote$_{jt}$*2008		-0.06
		(0.04)
Member F.E.	Yes	Yes
N	856	856
R-squared	0.47	0.47

$^{*}p < .05$; Cluster-Robust Standard Errors

Table 4.32: Partisan Effects Conditional on Information Environment II

	% Incumbent Vote$_{jt}$	
Party Unity$_{jt}$	−0.28	−0.45*
	(0.18)	(0.21)
log(Lagged Broadband Providers$_{jt}$)	−9.18	−22.40*
	(7.52)	(10.50)
Party Unity$_{jt}$*log(Lagged Broadband Providers$_{jt}$)	0.11	0.25*
	(0.08)	(0.12)
log(Population$_{jt}$)	15.70	15.63
	(12.97)	(12.96)
log(Median Income$_{jt}$)	−7.50	−8.23
	(6.51)	(6.34)
2006	1.62*	9.38*
	(0.51)	(4.53)
2008	2.06*	16.85*
	(0.60)	(6.93)
Republican$_{jt}$*2004	−8.47*	−8.44*
	(0.58)	(0.58)
Republican$_{jt}$*2006	−9.80*	−9.94*
	(0.87)	(0.91)
Party Unity$_{jt}$*2006		−0.08
		(0.05)
Party Unity$_{jt}$*2008		−0.16*
		(0.07)
Member F.E.	Yes	Yes
Election Year*Party F.E.	Yes	Yes
N	856	856
R-squared	0.39	0.40

*p $<$ .05; Cluster-Robust Standard Errors

Chapter 5

Supplemental Appendix to Chapter 2

5.1 Full Model Results for Interactive Hypothesis

The following table displays the full regression results underlying the marginal effects plots in the results section of the paper. They show that the effect of broadband is strongest for the most marginal members, and declines to 0 for members in safe districts.

Table 5.1: Effect of Communication Environment Conditional on Marginality

	$Party.Unity_{ic}$	$Presidential.Voting_{ic}$	$Interest.Group.Score_{ic}$
$ln(Providers_{ic})$	6.51^{*}	20.21^{*}	24.67^{*}
	(3.31)	(6.52)	(5.99)
$Partisan.Composition_{ic}$	0.11	0.29	0.69^{*}
	(0.09)	(0.18)	(0.17)
$ln(Med.Income_{ic})$	-5.21^{*}	-10.71^{*}	-1.48
	(1.12)	(2.47)	(1.68)
$ln(Population_{ic})$	2.61^{*}	-0.18	-0.62
	(0.91)	(1.55)	(1.29)
$ln(Providers_{ic}) * Partisan.Composition_{ic}$	-0.06	-0.24^{*}	-0.38^{*}
	(0.05)	(0.10)	(0.09)
Legislator F.E.	Yes	Yes	Yes
Congress-Party F.E.	Yes	Yes	Yes
N	831	827	826
R-squared	0.16	0.27	0.02

$^{*}p < .05$; OLS regression with heteroskedastic-robust standard errors. Legislator-Congress observations for the 107th and 108th Congresses. Variation in each independent variable is due solely to changes in district boundaries from the 2002 redistricting.

5.2 Analysis of committee choice

Through his interviews with members during the 1950s and 1960s, Fenno (1973) found that different goals of members – for re-election, public policy, and influence – were reflected in their choice of committees. For members whose goals tilted more strongly towards re-election, certain committees offered better opportunities for them to secure lucrative projects for their districts. As such, membership on these committees is evidence of a legislator who feels a relatively greater need to satisfy their constituency, as opposed to using committees to seek policy change or to gain influence in the house. If broadband has the effect of removing an "evidentary basis" (Arnold 2013) for electing members, its expansion should dull the incentive to serve on constituency-focused committees. Just as members are no longer expected to be punished for partisanship or rewarded for moderation, their choice of committee should be relatively less impactful when voters are not making independent decisions across their ballot.

I use the more modern classification system from Deering and Smith (1997) to classify committees as having either a constituency focus, policy focus, prestige focus, or as being undesired. I match these committee classifications to data on each legislator's committee assignments in the 107th and 108th Congress (Stewart 2017). I then compute, for each legislator in each Congress, the percentage of committees they served on that were constituency focused [1]. For the median legislator in the 107th Congress 33% of committee assignments are to constituency orientated committees, while the inter-quartile range is 67%.

I use the same model as above to calculate the effect on committee selection of changes in broadband.

Table 5.2 displays the results. The coefficient for the logged number of broadband providers indicates the expected negative relationship. The standard error of this coefficient is such that I reject the null hypothesis that the true effect of providers on committee choice is zero. In terms of effect size, a 100% increase in the number of broadband providers in a representative's district reduces the number of constituency orientated committees served on by 26 percentage points.

[1] Constituency focused committees are: Agriculture, Armed Services, Interior, Merchant Marine, Public Works, Science, Small Business, Veterans' Affairs.

Table 5.2: Effect of Communication Environment on Committee Selection

	$Perc.Constituency.Committees_{ic}$
$ln(Providers_{ic})$	-26.25^{*}
	(7.11)
$ln(Med.Income_{ic})$	22.74
	(14.82)
$Perc.Poverty_{ic}$	34.69
	(55.45)
$ln(Population_{ic}$	-5.49
	(5.66)
$Partisan.Composition_{ic}$	-0.11
	(0.14)
Legislator F.E.	Yes
Congress-Party F.E.	Yes
N	826
R-squared	0.10

$^{*}p < .05$; OLS regression with heteroskedastic-robust standard errors. Legislator-Congress observations for the 107th and 108th Congresses. Variation in each independent variable is due solely to changes in district boundaries from the 2002 redistricting.

5.3 Replication with Full Panel

To check the redistricting specification results for robustness, I replicate using a fixed-effects panel design. The following analysis uses data from the 108th-111th Congresses. The variables used are the same as above. The number of broadband providers in each district in each Congress comes from FCC data. Demographic data – the median income of the district, the % living in poverty, and the population – come from the 2000 Census and the 2004-2008 American Community Survey.[2] I do not control for partisan composition in these specifications: variation in partisan composition in the redistricting specification came only from that redistricting. Here, however, there is "real" variation in partisan composition, which may itself be affected by changes in the level of broadband. Finally, the same outcome variables are used as above: party unity voting, presidential voting, interest group scores, and committee assignments.

I estimate the following for each outcome variable for legislator(i)-Congress(c) observations:

$$\begin{aligned} DV_{ic} &= \alpha_i + \alpha_c * Party_{ic} + \beta_1 ln(Providers_{ic}) + \\ &\quad \beta_2 ln(Med.Income_{ic}) + \beta_3 Perc.Poverty_{ic} + \\ &\quad \beta_4 ln(Population_{ic}) + \varepsilon_i \end{aligned}$$

The legislator fixed effects (α_i) control for all time-invariant omitted variables, which include both district and legislator characteristics. The Congress-by-party fixed effects ($\alpha_c * Party_{ic}$) detrend the data, and control for all legislator-invariant omitted variables, by party. The major threat to inference in this design is endogeneity in the changes in broadband between sessions of Congress. The demographic controls are time-varying, and rule out endogenous changes in broadband that are driven by changes in income, poverty, race, or population. The following appendix section shows the robustness of these models when adding a full battery of demographic

[2] Because Congressional districts change their shapes (particularly in the 2002 redistricting), I collected these data at the census track level and then used Census track/CD crossover data from the Missouri Census Data Center's MABLE/Geocorr2k correspondence engine to construct estimates for the 107th, 108th, 110th and 111th Congresses. For the 109th Congress I linearly interpolated census track demographics from the 2002 and 2005 data, and then constructed the demographics for the CDs from those values.

controls.

As changes from the 107th-108th Congresses are due to both real changes in levels and changes due to redistricting, I omit the 107th Congress from this analyses. Doing so also allows me to test the relationships found above on a separate set of data.

Table 5.3 presents regressions on party unity voting, presidential voting, and interest group scores. The expectation is that legislators in districts with more growth in the number of broadband providers in their district would vote more in line with these three national forces. The coefficient on $ln(Providers_{ic})$ in the first column indicates the expected positive relationship between expansion of communication infrastructure and party line voting. A one-hundred percent increase in the number of broadband providers leads to a 4 percentage point increase in party unity voting by legislators. The second column indicates a positive relationship between expansion of communication technology and presidential voting. A one-hundred percent increase in the number of broadband providers increases presidential voting by nearly 8 percentage points. Similarly, the third column indicates a positive relationship between the expansion of communication technology and interest group scores, where a 100% increase in the communication environment leads to a 3 percentage point increase in interest group scores. The standard error on all three of these coefficients are of such a size that I reject the null hypothesis of no relationship.

The pattern of results is slightly different than above, but leads to the same substantive conclusion. Legislators in districts who had increases in the number of broadband providers above-and-beyond what is expected through the secular growth of broadband exhibited behavior that was more in line with national forces. Legislators exposed to this shock of broadband voted in a more responsive way to the president's policy positions, more in line with the majority of their parties, and received higher scores from aligned interest groups.

Table 5.4 and Figure 5.1 tests whether these relationships are stronger for more marginal members.

Each of the interaction terms is negative, which indicates that the positive effect of broadband

Table 5.3: Effect of Communication Environment on National Voting Metrics

	$Party.Unity_{ic}$	$Presidential.Voting_{ic}$	$Interest.Group.Score_{ic}$
$ln(Providers_{ic})$	3.81^{*}	7.52^{*}	2.92^{*}
	(0.88)	(1.56)	(0.85)
$ln(Med.Income_{ic})$	-7.82^{*}	-12.38^{*}	-3.89
	(3.14)	(6.04)	(3.44)
$ln(Population_{ic})$	1.88	2.69	0.78
	(2.65)	(5.00)	(3.21)
Legislator F.E.	Yes	Yes	Yes
Congress-Party F.E.	Yes	Yes	Yes
N	1653	1647	1645
R-squared	0.39	0.68	0.32

$^{*}p < .05$; OLS regression with heteroskedastic-robust standard errors. Legislator-Congress observations for the 108th to 111th Congresses.

Table 5.4: Effect of Communication Environment Conditional on Electoral Marginality

	$Party.Unity_{ic}$	$Presidential.Voting_{ic}$	$Interest.Group.Score_{ic}$
$ln(Providers_{ic})$	9.52^{*}	18.32^{*}	5.75^{*}
	(3.47)	(4.99)	(2.61)
$Partisan.Composition_{ic}$	0.22	0.42^{*}	0.24^{*}
	(0.13)	(0.20)	(0.12)
$ln(Med.Income_{ic})$	-7.85^{*}	-12.44^{*}	-3.78
	(3.02)	(5.78)	(3.38)
$ln(Population_{ic})$	1.85	2.63	0.99
	(2.61)	(4.93)	(3.22)
$ln(Providers_{ic}) * Partisan.Composition_{ic}$	-0.10	-0.19^{*}	-0.05
	(0.05)	(0.08)	(0.04)
Legislator F.E.	Yes	Yes	Yes
Congress-Party F.E.	Yes	Yes	Yes
N	1653	1647	1645
R-squared	0.40	0.69	0.33

$^{*}p < .05$; OLS regression with heteroskedastic-robust standard errors. Legislator-Congress observations for the 108th to 111th Congresses.

on voting with these national groups as incumbents move into safer districts. However, This being said, only the ineraction term for presidential voting is significant at a conventional level. The standard error on the coefficient for party unity voting, however, has a standard error half the size of the coefficient. The probability of observing a coefficient this large if the true parameter was 0 is 5.9%. (For interest group scores this probability is 19%).

Figure 5.1 displays these relationships visually, showing how as the number of broadband providers rise, the positive effect of broadband attenuates to 0. In other words, the relationship between broadband and nationalized voting is particularly strong among marginal members.

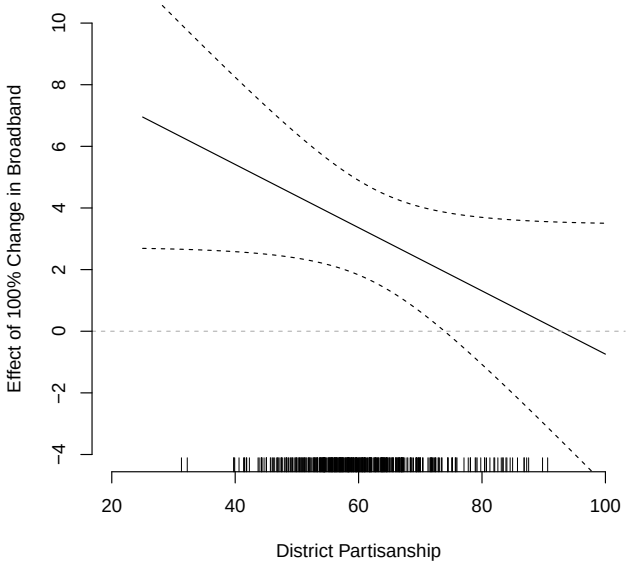
Moving to the effects on a changing communication environment on committee selection behavior, Table 5.5 displays the results for a regression on the percent of committee assignments for legislators that are constituency focused. Here the results are much more equivocal. The coefficient on $ln(Providers_{ic})$ is in the expected negative direction – indicating that an expansion of broadband in a legislators district leads to that legislator serving on less constituency orientated committees – but the standard error is of a magnitude that I fail to reject the null hypothesis of no relationship. In other words, I cannot be confident that there is a relationship between the communication technology and committee selection.

5.4 Validation of Broadband Measure

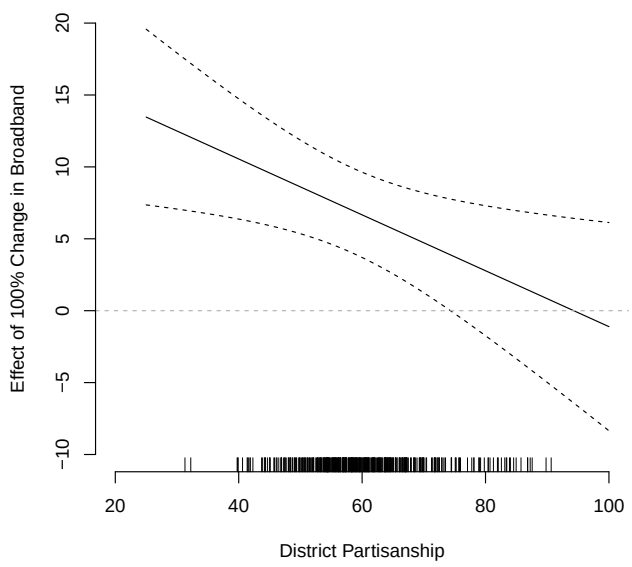
To further validate the use of the number of broadband providers in an area as a proxy for access to high-speed internet, I merged the FCC data on broadband availability from the Current Population Study Internet Supplement for the 2001, 2003, and 2007 years [3]. These data have two main benefits. First, they include a respondent's county, which allows in most cases a closer mapping of number of providers the respondent is exposed to compared to Congressional districts. Second, the number of people interviewed is large: nearly 100,000 individuals across these three years.

I relate the logged number of broadband providers in each individual's county to a variable

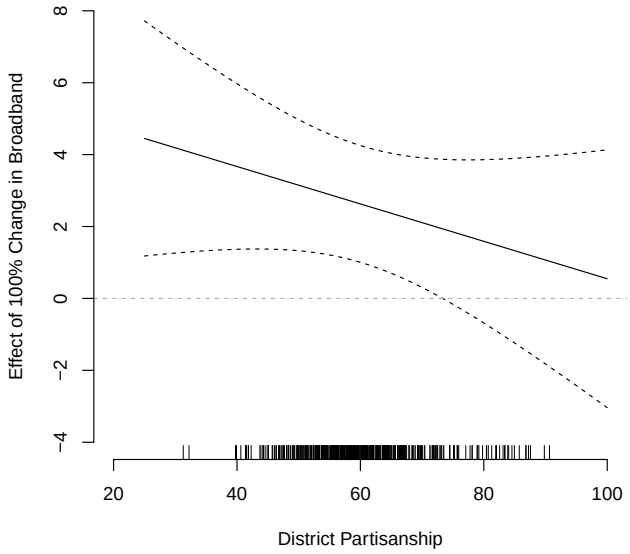
[3] Data collected from the Integrated Public Use Microdata Series: Version 6.0 (Flood et al. 2015)



(a) Party Unity



(b) Presidential Support



(c) Interest Group Scores

Figure 5.1: Marginal Effect of 10% Change in Partisan Composition of District on DV

indicating whether that person has a home broadband subscription (1) or has dial-up or no internet (0). As with the specifications above, I control for county fixed effects, year fixed effects, and

Table 5.5: Effect of Communication Environment on Committee Selection

	$Perc.Constituency.Committees_{ic}$
$ln(Providers_{ic})$	−3.01
	(4.20)
$ln(Med.Income_{ic})$	−19.24
	(27.71)
$Perc.Poverty_{ic}$	−0.93
	(0.92)
$ln(Population_{ic}$	−23.21
	(11.99)
Legislator F.E.	Yes
Congress-Party F.E.	Yes
N	1650
R-squared	0.04

*p < .05; OLS regression with heteroskedastic-robust standard errors. Legislator-Congress observations for the 108th to 111th Congresses.

controls for population and income. Once again, this strategy rules out confounders based on stable characteristics of counties and confounders correlated with the time trend.

The results are presented in table 5.6. A 100% increase in the number of broadband providers in an individual's county is associated with an 11% increase in the probability that individual has a home broadband subscription. The standard error on this coefficient is of a size that I reject the null hypothesis of no relationship between broadband providers and home broadband subscriptions.

It should be noted that an increase in the probability of individuals having a broadband subscription is just one of the important effects of an increasing number of broadband providers. Even among those who already subscribe to broadband, an increase in the number of providers means increased competition, and therefore, increased *quality* of broadband (Wallsten and Mallahan 2010). These faster internet speeds will results in qualitatively different consumption patterns. As such, the 11% increase in subscribers does not represent the sole route of influence from broadband providers to political outcomes.

Table 5.6: Effect of Broadband on Home Broadband Subscription

	P(Home Broadband)
$ln(Providers_{ict})$	0.11^{*}
	(0.03)
$ln(Population_{ict}$	-0.28^{*}
	(0.13)
$ln(Med.Income_{ict})$	0.003
	(0.003)
County F.E.	Yes
Year F.E.	Yes
N	99928
R-squared	0.34
Residual Std. Error	19.95 (df = 99594)

*p $<$ .05; OLS with heteroskedastic-robust standard errors. Weighted using CPS `wtsupp` variable.

5.5 Results with Full Demographic Covariates

Redistricting Analysis

The following tables replicate the redistricting analysis with a full set of demographic covariates. The results are unchanged.

Table 5.7: Effect of Communication Environment on National Voting Metrics

	$Party.Unity_{ic}$	$Presidential.Voting_{ic}$	$Interest.Group.Score_{ic}$
$ln(Providers_{ic})$	2.40*	6.63*	0.50
	(0.87)	(2.02)	(1.64)
$ln(Med.Income_{ic})$	−1.90	−2.27	−3.22
	(3.02)	(6.89)	(5.06)
$Perc.Poverty_{ic}$	−3.66	24.78	−30.23
	(12.46)	(26.87)	(21.80)
$ln(Population_{ic})$	−0.63	−3.76*	−2.88
	(0.83)	(1.58)	(1.48)
$Perc.White_{ic}$	−5.33	4.36	−5.93
	(3.77)	(8.55)	(5.55)
$Perc.Black_{ic}$	−4.80	−7.28	−8.98
	(3.73)	(8.28)	(6.98)
$Perc.Bachelor_{ic}$	−3.67	−31.57	−6.72
	(7.89)	(16.48)	(16.44)
$Med.Age_{ic}$	0.05	−0.20	−0.47*
	(0.11)	(0.29)	(0.23)
$Partisan.Composition_{ic}$	0.06*	−0.08*	0.04
	(0.02)	(0.04)	(0.06)
Legislator F.E.	Yes	Yes	Yes
Congress-Party F.E.	Yes	Yes	Yes
N	831	827	826
R-squared	0.36	0.31	0.03

*$p < .05$; OLS regression with heteroskedastic-robust standard errors. Legislator-Congress observations for the 107th and 108th Congresses. Variation in each independent variable is due solely to changes in district boundaries from the 2002 redistricting.

Table 5.8: Effect of Communication Environment Conditional on District Marginality

	$Party.Unity_{ic}$	$Presidential.Voting_{ic}$	$Interest.Group.Score_{ic}$
$ln(Providers_{ic})$	6.56*	20.91*	23.77*
	(3.29)	(6.69)	(5.44)
$Partisan.Composition_{ic}$	0.11	0.27	0.69*
	(0.09)	(0.19)	(0.15)
$ln(Med.Income_{ic})$	−2.52	−2.20	−2.51
	(3.33)	(7.01)	(4.99)
$Perc.Poverty_{ic}$	0.07	29.66	−24.62
	(12.68)	(26.90)	(21.55)
$ln(Population_{ic})$	2.32*	−1.32	−1.61
	(0.93)	(1.57)	(1.36)
$Perc.White_{ic}$	−8.73*	1.38	−7.53
	(3.89)	(8.44)	(5.18)
$Perc.Black_{ic}$	−5.77	−7.29	−7.76
	(3.69)	(8.47)	(6.08)
$Perc.Bachelor_{ic}$	−7.86	−36.32*	−8.99
	(8.44)	(17.14)	(15.57)
$Med.Age_{ic}$	0.06	−0.19	−0.46*
	(0.12)	(0.28)	(0.22)
$ln(Providers_{ic}) * Partisan.Composition_{ic}$	−0.07	−0.23*	−0.38*
	(0.05)	(0.10)	(0.08)
Legislator F.E.	Yes	Yes	Yes
Congress-Party F.E.	Yes	Yes	Yes
N	831	827	826
R-squared	0.16	0.27	0.04

*p $<$ .05; OLS regression with heteroskedastic-robust standard errors. Legislator-Congress observations for the 107th and 108th Congresses. Variation in each independent variable is due solely to changes in district boundaries from the 2002 redistricting.

Table 5.9: Effect of Communication Environment on Committee Selection

	$Perc.Constituency.Committees_{ic}$
$ln(Providers_{ic})$	-27.23^{*}
	(7.63)
$ln(Med.Income_{ic})$	57.78^{*}
	(18.39)
$Perc.Poverty_{ic}$	137.54^{*}
	(68.72)
$ln(Population_{ic}$	-8.55
	(6.11)
$Perc.White_{ic}$	-105.32^{*}
	(29.57)
$Perc.Black_{ic}$	-112.76^{*}
	(28.73)
$Perc.Bachelor_{ic}$	-52.45
	(67.18)
$Med.Age_{ic}$	1.78^{*}
	(0.82)
$Partisan.Composition_{ic}$	-0.09
	(0.14)
Legislator F.E.	Yes
Congress-Party F.E.	Yes
N	826
R-squared	0.12

$^{*}p < .05$; OLS regression with heteroskedastic-robust standard errors. Legislator-Congress observations for the 107th and 108th Congresses. Variation in each independent variable is due solely to changes in district boundaries from the 2002 redistricting.

Panel Analysis

The following tables replicate the panel analysis with a full set of demographic covariates. The results are unchanged.

Table 5.10: Effect of Communication Environment on National Voting Metrics

	$Party.Unity_{ic}$	$Presidential.Voting_{ic}$	$Interest.Group.Score_{ic}$
$ln(Providers_{ic})$	3.76*	7.21*	2.98*
	(0.60)	(1.10)	(0.75)
$ln(Med.Income_{ic})$	1.33	13.01	0.48
	(6.43)	(14.44)	(7.73)
$Perc.Poverty_{ic}$	0.16	0.33	−0.04
	(0.18)	(0.38)	(0.22)
$ln(Population_{ic})$	2.10	3.14	1.22
	(1.87)	(3.60)	(2.45)
$Perc.White_{ic}$	0.11	0.12	0.21*
	(0.07)	(0.14)	(0.08)
$Perc.Black_{ic}$	0.11	0.14	0.25
	(0.11)	(0.24)	(0.16)
$Perc.Bachelor_{ic}$	−0.22*	−0.71*	−0.19
	(0.09)	(0.19)	(0.11)
$Med.Age_{ic}$	0.27	0.39	0.09
	(0.20)	(0.46)	(0.23)
Legislator F.E.	Yes	Yes	Yes
Congress-Party F.E.	Yes	Yes	Yes
N	1653	1647	1645
R-squared	0.39	0.69	0.33

*p < .05; OLS regression with heteroskedastic-robust standard errors. Legislator-Congress observations for the 108th to 111th Congresses.

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5.6 Testing Sensitivity to Partisan Control of Redistricting

One possible concern with the use of redistricting is that there may be important differences in outcomes for legislators whose co-partisans control the redistricting process versus those in states where the other party controls the process or the legislature is split.

Table 5.11: Effect of Communication Environment Conditional on District Marginality

	$Party.Unity_{ic}$	$Presidential.Voting_{ic}$	$Interest.Group.Score_{ic}$
$ln(Providers_{ic})$	10.57*	19.86*	6.49*
	(2.91)	(6.31)	(2.76)
$Partisan.Composition_{ic}$	0.51*	1.51*	−0.03
	(0.12)	(0.27)	(0.11)
$ln(Med.Income_{ic})$	−0.90	14.76	−5.12
	(7.26)	(19.33)	(8.28)
$Perc.Poverty_{ic}$	−0.32	−1.13*	−0.36
	(0.21)	(0.56)	(0.24)
$ln(Population_{ic})$	3.30	7.95	1.42
	(2.33)	(6.28)	(2.64)
$Perc.White_{ic}$	0.32*	0.86*	0.33*
	(0.07)	(0.19)	(0.08)
$Perc.Black_{ic}$	0.52*	1.66*	0.47*
	(0.11)	(0.31)	(0.16)
$Perc.Bachelor_{ic}$	−0.01	0.0000	−0.03
	(0.10)	(0.29)	(0.12)
$Med.Age_{ic}$	−0.40	−1.49*	−0.26
	(0.22)	(0.63)	(0.23)
$ln(Providers_{ic}) * Partisan.Composition_{ic}$	−0.16*	−0.37*	−0.07
	(0.05)	(0.10)	(0.04)
Legislator F.E.	Yes	Yes	Yes
Congress-Party F.E.	Yes	Yes	Yes
N	1653	1647	1645
R-squared	0.08	0.10	0.18

*p $<$ .05; OLS regression with heteroskedastic-robust standard errors. Legislator-Congress observations for the 108th to 111th Congresses.

Table 5.12: Effect of Communication Environment on Committee Selection

	$Perc.Constituency.Committees_{ic}$
$ln(Providers_{ic})$	−3.19
	(2.99)
$ln(Med.Income_{ic})$	−23.17
	(22.68)
$Perc.Poverty_{ic}$	−1.09
	(0.71)
$ln(Population_{ic}$	−24.31*
	(8.54)
$Perc.White_{ic}$	−0.58
	(0.35)
$Perc.Black_{ic}$	−0.90
	(0.47)
$Perc.Bachelor_{ic}$	−0.24
	(0.48)
$Med.Age_{ic}$	−1.05
	(0.87)
Legislator F.E.	Yes
Congress-Party F.E.	Yes
N	1650
R-squared	0.05

*p < .05; OLS regression with heteroskedastic-robust standard errors. Legislator-Congress observations for the 108th to 111th Congresses.

To determine this, I coded each member of congress as either: (1) Their party controlled the redistricting process in their state; (0) Their party did not control the redistricting process or the legislature was split so that no party controlled the entire process.

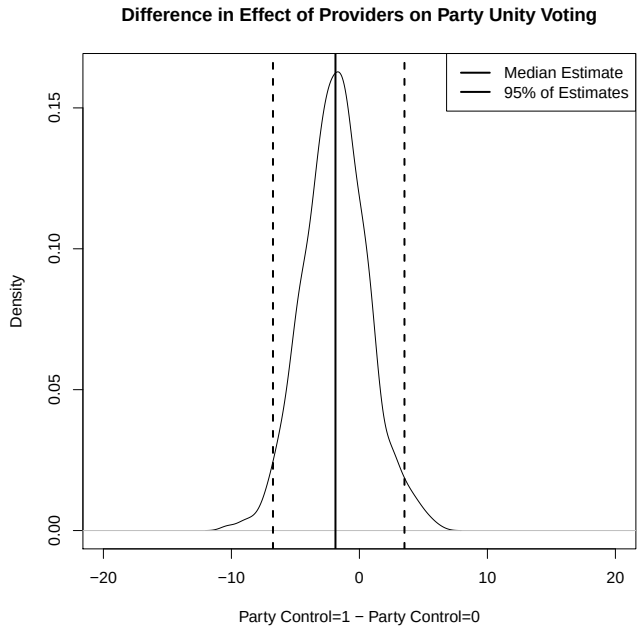
I then ran seperate regressions on these two groups. The results of this regression are presented in Table 5.13. All of the coefficients are in the expected direction. The quantity of interest is the difference in the coefficients on *(log)Providers* for legislators whose party controlled the legislature versus those that did not. Looking across the rows there does seem to be some difference, but it's not clear if those differences are reliably different from zero. To determine this I used a bootstrap procedure. I randomly sampled legislators with replacement such to produce a dataset with the same number of legislators in the party control and non-party control datasets. I then recalculated the difference in coefficients in this new dataset. I then repeated this procedure 1000 times. The resulting distribution of differences can be found in Figure 5.2. In each case the range which contains 95% of the bootstrap estimates contains zero.

While there are differences in the effect of providers for legislators whose party controlled the redistricting process, those differences are not reliably different from zero.

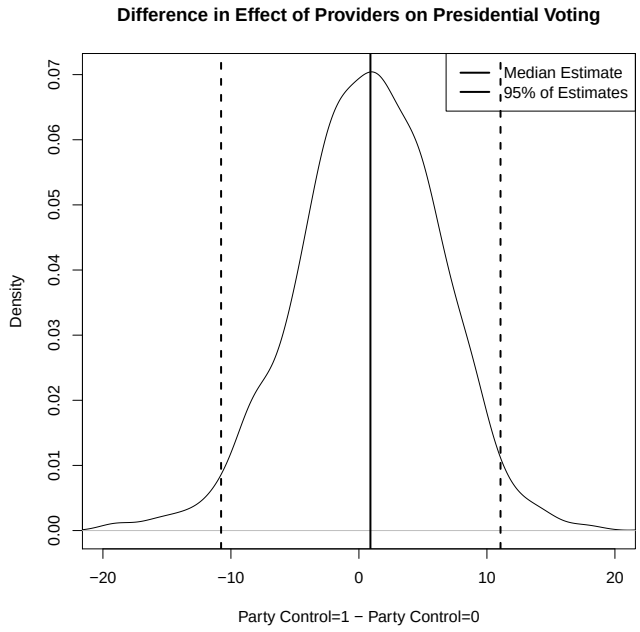
Table 5.13: Effect of Communication Environment on National Voting Metrics, by Party Control of Redistricting

	$Party.Unity_{ic}$		$Presidential.Voting_{ic}$		$Interest.Group.Score_{ic}$	
$ln(Providers_{ic})$	2.95*	1.18	4.82*	6.10*	0.65	2.20
	(1.21)	(1.06)	(2.39)	(2.48)	(1.97)	(1.91)
$ln(Med.Income_{ic})$	−2.15*	−3.68*	−7.88*	−7.90	2.03	−4.63
	(1.09)	(1.52)	(3.00)	(4.51)	(2.27)	(2.58)
$ln(Population_{ic})$	−2.06	3.41*	−2.85	−2.70	−1.52	−2.08
	(1.07)	(1.29)	(1.89)	(2.69)	(1.82)	(2.49)
$Partisan.Composition_{ic}$	0.03	0.13*	−0.10*	−0.03	−0.001	0.17*
	(0.02)	(0.03)	(0.04)	(0.08)	(0.07)	(0.06)
Legislator's Party Controls Redistricting	No	Yes	No	Yes	No	Yes
Legislator F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Congress-Party F.E.	Yes	Yes	Yes	Yes	Yes	Yes
N	494	331	490	331	491	329
R-squared	0.35	0.40	0.29	0.31	0.01	0.08

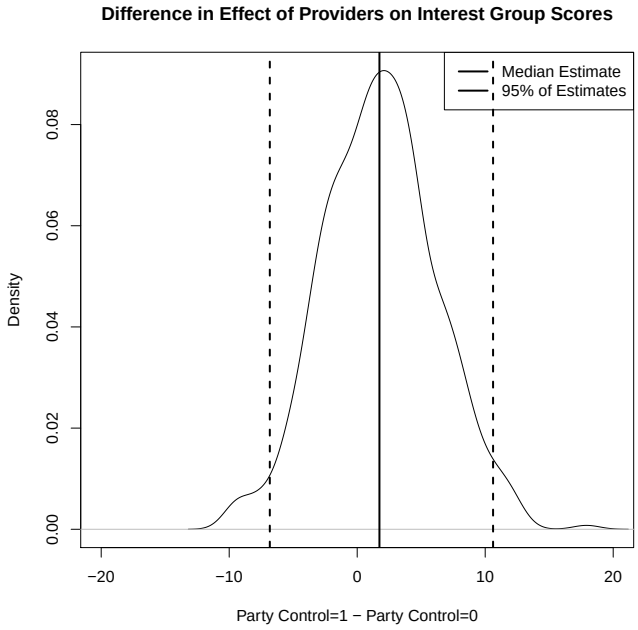
*p $<$ .05; Heteroskedastic-Robust Standard Errors



(a) Party Unity



(b) Presidential Support



(c) Interest Group Scores

Figure 5.2: Bootstrap Differences in Coefficient on *(log)Providers* by Party Control of Redistricting

5.7 Balance Tests on Sample Inclusion

The redistricting analysis excludes two groups from the analysis: (1) Legislators who only appear in either the 107th or 108th Congresses ; (2) Legislators that represent an entire state ("At Large" districts), and therefore cannot have variation due to redistricting.

Becuase all of the analysis looks at variation within legislators, the threat to inference is one of external validity. That is, significant differences in who is and is not included in the sample indicate a limitation of the results to speak to all legislators.

Balance with Remainers and Leavers

The first two tables present difference in means tests for those that remain in Congress versus those that either leave or join Congress.

Table 5.14 examines the difference in legislator characteristics in the 107th Congress for those that won re-election versus those that left Congress. Those that remained were slightly more nationally focused then those that left: with higher levels of Party Unity voting, Presidential Voting, and Interest Group Scores. Further, remainers came from districts that had a slightly higher percentage of co-partisans then those who left Congress.

Table 5.14: Mean Values for Leavers and Remainers, 107th Congress

	Leavers	Remainers	P Value of Difference
Party Unity	86.96	91.16	0.07
Presidential Voting	74.31	77.17	0.26
Interest Group Scores	78.79	83.17	0.06
District Partisanship	57.37	59.49	0.17

The differences are largely reversed in the 108th Congress. Those joining in this session were slightly more nationally focused then the legislators who remained from the 107th, despite coming from districts that were filled with less co-partisans.

This pattern demonstrates that part of the trend towards nationalization was coming through replacement of legislators: the outgoing cohort of legislators was less extreme then those who remained, and the incoming cohort more extreme then those who remained. Again, because the

Table 5.15: Mean Values for Joiners and Remainers, 107th Congress

	Joiners	Remainers	P Value of Difference
Party Unity	93.1	92.27	0.42
Presidential Voting	82.77	80.03	0.17
Interest Group Scores	84.09	83.1	0.39
District Partisanship	58.04	59.97	0.09

analysis in this paper looks at relationship within legislators, these differences do not bias the results. This being said, It is likely important in future work to understand how this dynamic of replacement might be affected by the communication environment as well.

Balance with Redistricted and At-Large Members

The other group not represented in the re-districting analysis are members from states that have one "At-Large" member and therefore cannot be redistricted. In this period states with only one member were : Alaska, Delaware, Montana, North Dakota, South Dakota, Vermont and Wyoming. Tables 5.16 & 5.17 display difference in means tests for legislators from these states.

In both sessions, legislators from states with multiple legislators were more nationally focused in their behavior and came from districts with more co-partisans. However, in all cases these differences do not reach any conventional levels of statistical significant.

Table 5.16: Mean Values for Redistricted and At-Large, 107th Congress

	Redistricted	At-Large	P Value of Difference
Party Unity	90.63	90.09	0.88
Presidential Voting	76.93	69.18	0.46
Interest Group Scores	82.66	78.47	0.14
District Partisanship	59.26	56.88	0.65

Table 5.17: Mean Values for Redistricted and At-Large, 108th Congress

	Redistricted	At-Large	P Value of Difference
Party Unity	92.42	90.27	0.6
Presidential Voting	80.59	67.97	0.32
Interest Group Scores	83.32	76.45	0.24
District Partisanship	59.75	56.08	0.56

5.8 Testing Non-Linearity in District Partisanship

The second set of hypotheses in the paper posit that the effect of broadband should be stronger among more marginal members. These are the individuals that, under previous information environments, were most cross-pressured between the electoral incentives of moderation and pressure from leadership to nationalize. The specification used in the main paper assumes a constant linear moderating effect.

To test the sensitivity of that assumption I estimate models in this section for marginal (districts with less than 55% co-partisans) and non-marginal (districts with greater than or equal to 55% co-partisans). There are two sets of expectations here. First: The effect of broadband will be higher for marginal members as opposed to non-marginal members. Second: Even looking within marginal and non-marginal members, the effect of the partisan composition will decline across levels of broadband providers.

To test the first expectation I separate marginal and non-marginal members and run the main specification on each group. As expected, Table 5.18 shows that in each case the effect of broadband in marginal districts is greater than the effect found in non-marginal districts. For Party Unity voting moving from non-marginal to marginal districts increases the effect size by 2.65 points. For Presidential Voting the increase is even larger at 7.52 points. Finally for Interest Group Scores, moving from non-marginal to marginal districts increases the impact of logged broadband providers by 7.61 points. While the lower statistical power in these models leads to lower significance numbers, the results largely confirm those found in the main paper: while in nearly all cases broadband increases nationalized voting, it's effects are stronger among more marginal members.

The same approach can be applied to the interactive model from the paper. One possibility for the finding that more marginal members are most strongly affected by broadband are ceiling effects: less marginal members (who are also those with relatively extreme values for the three dependent variable) may experience a smaller impact from broadband simply because they cannot become more extreme than they already are. By looking at the interaction effects separately for marginal and non-marginal members it can be shown that ceiling effects cannot account for all of

Table 5.18: Effect of Communication Environment on Dyadic Representation

	$Party.Unity_{ic}$		$Presidential.Voting_{ic}$		$Interest.Group.Score_{ic}$	
$ln(Providers_{ic})$	4.10	1.45	10.75*	3.23	5.73	−1.89
	(2.69)	(0.92)	(4.79)	(2.09)	(4.26)	(1.80)
$Partisan.Composition_{ic}$	−1.93	−1.62	−10.57*	−6.03*	−6.57	5.56*
	(2.26)	(1.14)	(4.41)	(3.00)	(3.96)	(2.65)
$ln(Med.Income_{ic})$	2.29	−0.62	−13.01*	−0.53	−3.50	0.88
	(2.23)	(0.90)	(3.87)	(1.62)	(3.53)	(1.47)
$ln(Population_{ic})$	0.12	0.03	0.45*	−0.11*	0.30*	0.12*
	(0.10)	(0.02)	(0.19)	(0.05)	(0.15)	(0.06)
Marginal District	Yes	No	Yes	No	Yes	No
Legislator F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Congress-Party F.E.	Yes	Yes	Yes	Yes	Yes	Yes
N	293	538	291	536	292	534
R-squared	0.34	0.36	0.11	0.43	0.09	0.03

*p $<$ .05; Heteroskedastic-Robust Standard Errors

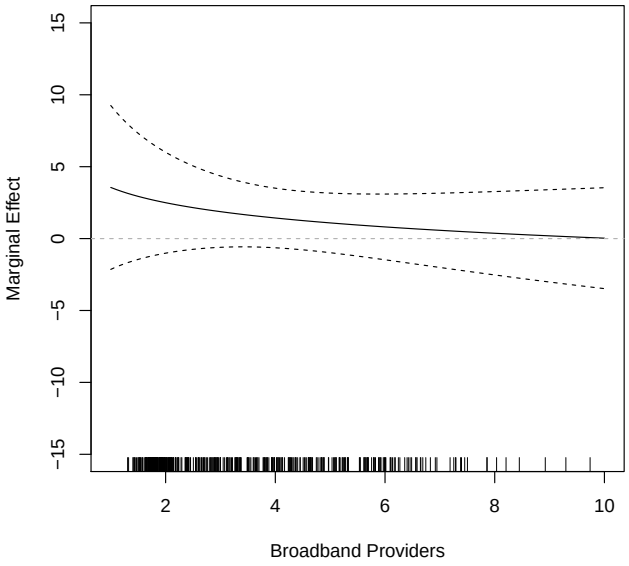
the differences in effect sizes.

Table 5.19 presents these results, and as above, Figures 5.3 & 5.4 display the marginal effect of a 10% unit change in partisan composition at different levels of broadband service. In nearly all the tests the interactive variable is in the expected negative direction. If ceiling effects were driving the main interactive results we would not find this. In particular, the key finding is that the number of broadband providers moderates the effect of partisan composition even among marginal members.

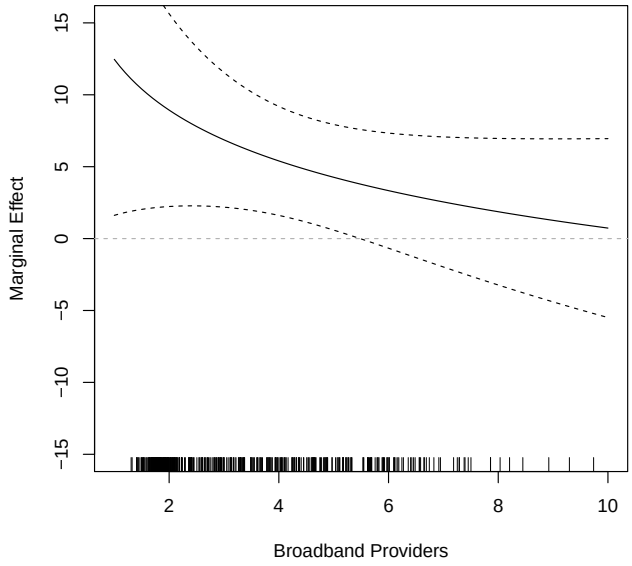
Table 5.19: Effect of Communication Environment on Dyadic Representation

	$Party.Unity_{ic}$		$Presidential.Voting_{ic}$		$Interest.Group.Score_{ic}$	
$ln(Providers_{ic})$	11.19	−1.63	35.04*	14.43	25.98*	23.15*
	(8.44)	(4.12)	(16.73)	(7.96)	(12.63)	(7.77)
$Partisan.Composition_{ic}$	0.36	−0.05	1.25*	0.18	0.96*	0.77*
	(0.29)	(0.10)	(0.55)	(0.19)	(0.40)	(0.23)
$ln(Providers_{ic}) * Partisan.Composition_{ic}$	−0.15	0.05	−0.51	−0.17	−0.44	−0.37*
	(0.18)	(0.06)	(0.33)	(0.11)	(0.27)	(0.12)
$ln(Med.Income_{ic})$	−1.03	−1.33	−7.70	−7.09*	−4.00	3.21
	(2.56)	(1.19)	(4.65)	(3.13)	(4.08)	(2.31)
$ln(Population_{ic})$	2.20	−0.71	−13.34*	−0.19	−3.73	1.64
	(2.25)	(0.89)	(3.90)	(1.63)	(3.47)	(1.51)
Marginal District	Yes	No	Yes	No	Yes	No
Legislator F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Congress-Party F.E.	Yes	Yes	Yes	Yes	Yes	Yes
N	293	538	291	536	292	534
R-squared	0.34	0.36	0.12	0.44	0.10	0.05

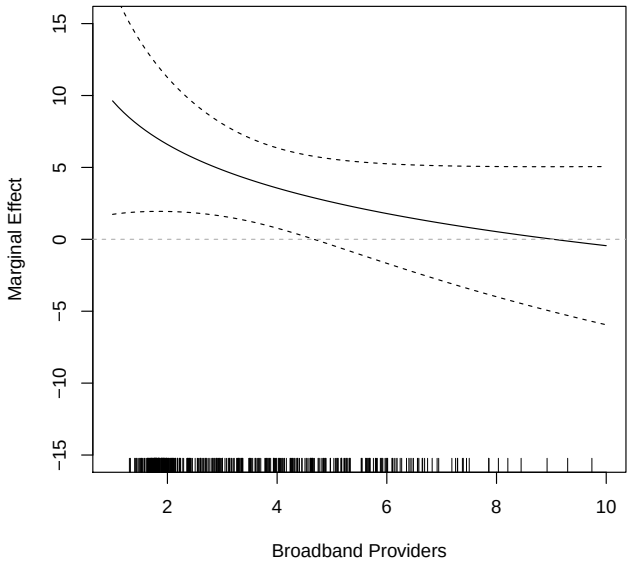
*p $<$ .05; Heteroskedastic-Robust Standard Errors



(a) Party Unity

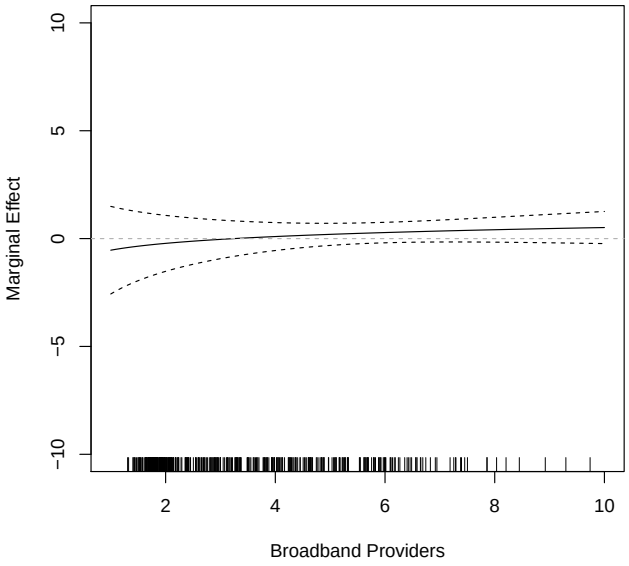


(b) Presidential Support

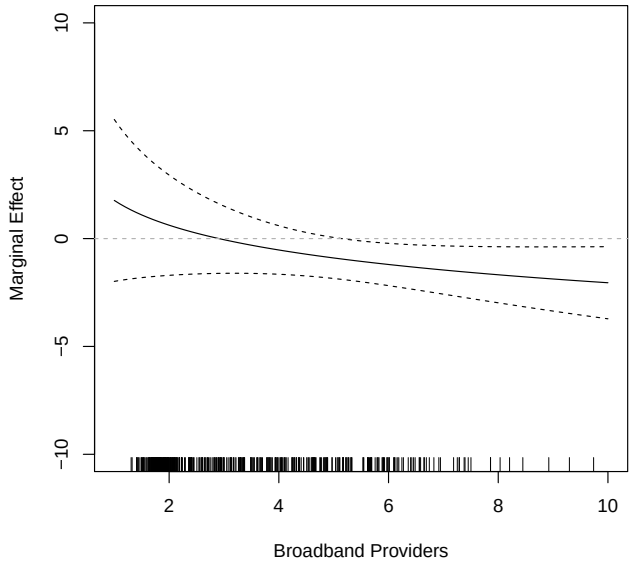


(c) Interest Group Scores

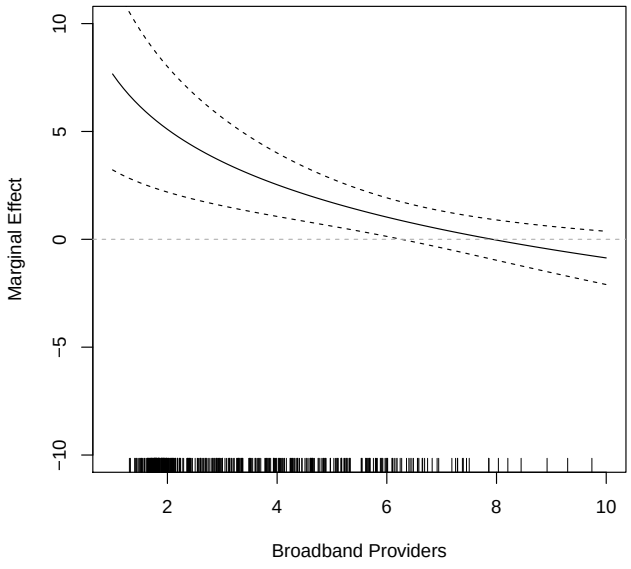
Figure 5.3: Marginal Effect of 10% Change in Partisan Composition of District on DV, Marginal Legislators



(a) Party Unity



(b) Presidential Support



(c) Interest Group Scores

Figure 5.4: Marginal Effect of 10% Change in Partisan Composition of District on DV, Non-Marginal Legislators

5.9 Testing the Electoral Connection

A key claim in the paper is that the effect of broadband operates through the electoral connection. The expansion of broadband and technologies like it erode local information environments, and with them, an evidentiary basis for Congressional elections. In this information vacuum voters increasingly rely on their national political attitudes to make voting decisions. Using similar data to this paper Trussler (2018a) shows that increasing levels of broadband leads to voters who cast less split-tickets, return incumbents to office with a smaller advantage, and cease to punish legislators for excessively partisan role call voting.

The causal mechanism in this paper is based on the expectation that this change in voting behavior will precipitate a change in representational style by legislators. This is in line with past work that considers legislative behavior to be, at least in part, a function of electoral incentives (Jacobson 1987, 2015b; Kingdon 1968; Stimson et al. 1995).

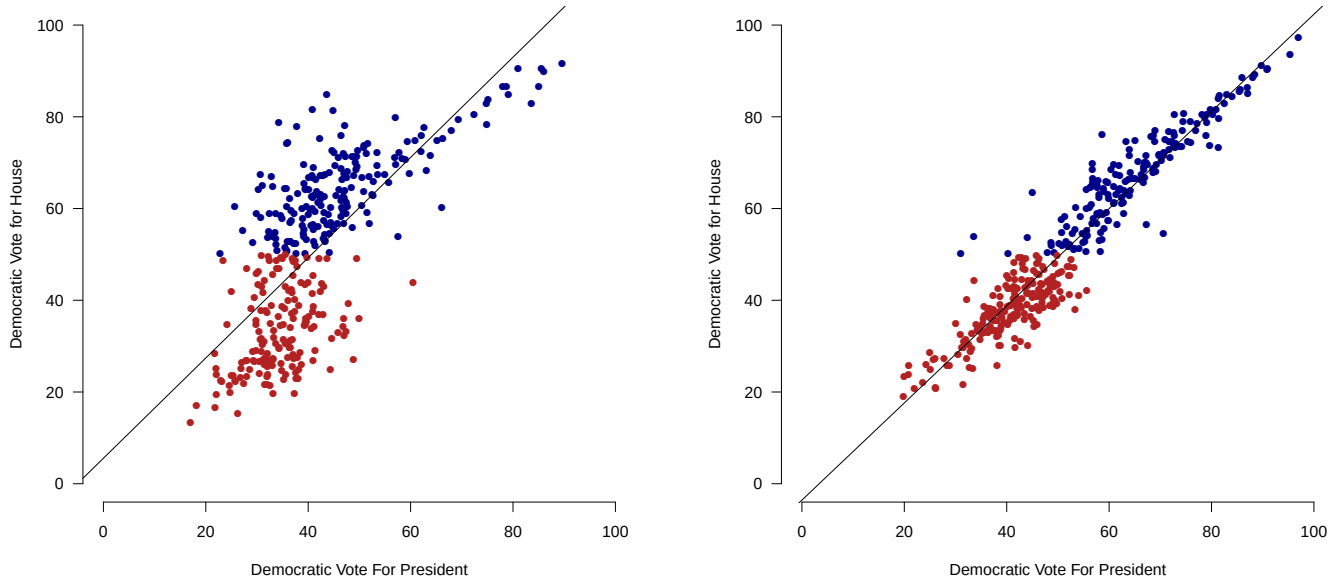
I add my own evidence of this effect here. I combine data on legislator's party unity voting (which is available for the longest period of the three dependent variables) and election results from the 83rd to 113th sessions of Congress (which correspond to the the 1952 and 2012 elections, respectively)[4]. I use these data to show that when districts vote in a more "national" way legislators respond by voting more with their parties.

The first step is to determine the degree to which, in a given election, each legislator's district was voting in a more "national" or "local" fashion. To determine this, in each election year I regress the Democratic vote for President on the Democratic vote for Congress.[5] This gives, for each district in each election year, a predicted vote for Congress given national conditions. I then calculate the absolute value of the residual variation for each district.

For each member in each year I therefore have have a value, $Local.Residual$, that is the variation in their vote that is not explained by national conditions. The smaller this value, the more a representative's district voted in line with national expectations. The larger this value, the more a

[4] Data from Jacobson (2015b)

[5] As with other analyses of this fashion (see e.g. Jacobson (2015a)), I omit districts where members run unopposed. These members receive 100% of the two party vote, but this is not their "true" level of support in the district.



(a) 99th Congress (1984 Election)

(b) 113th Congress (2012 Election)

Figure 5.5: Vote for President versus Vote for House

representative's district voted with local, idiosyncratic, considerations in mind.

Take, for example, the elections that generated the 99th and 113th sessions of Congress, displayed in Figure 5.5. For each district in these years the residual variation not explained by national conditions is represented by the vertical distance from the observation to the regression line. It is plain to see in these two examples that the 1984 election had far more idiosyncratic local features than the 2012 election. Concordantly, legislators in the 2012 case ought to be far more responsive to national concerns.

Figure 5.6 displays the distribution of these residuals over time. As is expected, these distributions show that elections in the last half of the 20th Century became more local-focused into the 1980s (larger local residuals), and have subsequently become more nationally focused (smaller local residuals).

Using these values, I calculate the following equation for legislator i in sessions of Congress c:

$$Party.Unity_{ic} = \alpha_i + \alpha_c + \beta_1 Local.Residual_{ic} + \varepsilon_i$$

Each legislator's level of Party Unity voting in each session of Congress is modeled as a function of legislator fixed effects, Congress fixed effects, and the amount of residual variation in their vote share from the previous election not explained by national conditions. As in models above, using legislator fixed effects ensures that we are looking at how *changes* in the electoral conditions of members influences *changes* in their behavior. Further, by including Congressional fixed effects we are controlling for the overall trend in nationalization throughout this period.

The results are presented in the first column of Table 5.20. We see that the coefficient is in the expected negative direction. As the vote for Congress in a district strays further from what is expected of that district given national conditions, a legislator votes less often with their party. Looked at the opposite way, as voting in a district becomes closer to what is expected given national conditions, the more a legislator votes with their party. For each additional percentage-point a districts vote for Congress differs from what is expected based on national conditions, a legislator votes with their party 0.6 percentage points less often.

In the second column of Table 5.20 I add further robustness to this finding by calculating the equation with $Congress * Party$ fixed effects, such that legislators are only compared to members of their same party. Adding this additional restriction only attenuates the predicted effect slightly.

This analysis builds on previous work that shows legislators alter their voting behavior in response to the electoral conditions they face. This provides a crucial link in the causal chain of this paper. The roll-out of broadband influenced the information environment which altered the way in which people voted. In response to this change in electoral incentives, legislators in turn changed their behavior.

Table 5.20: Effect of Local Residual on Party Unity Voting

	$Party.Unity_{ic}$	
$Local.Residual_{ic}$	-0.06^{*}	-0.04^{*}
	(0.02)	(0.02)
Legislator F.E.	Yes	Yes
Congress F.E.	Yes	No
Congress-Party F.E	No	Yes
N	10942	10942
R-squared	0.87	0.88
Residual Std. Error	6.15 (df = 8524)	5.72 (df = 8494)

*p $<$ .05; Cluster-Robust Standard Errors

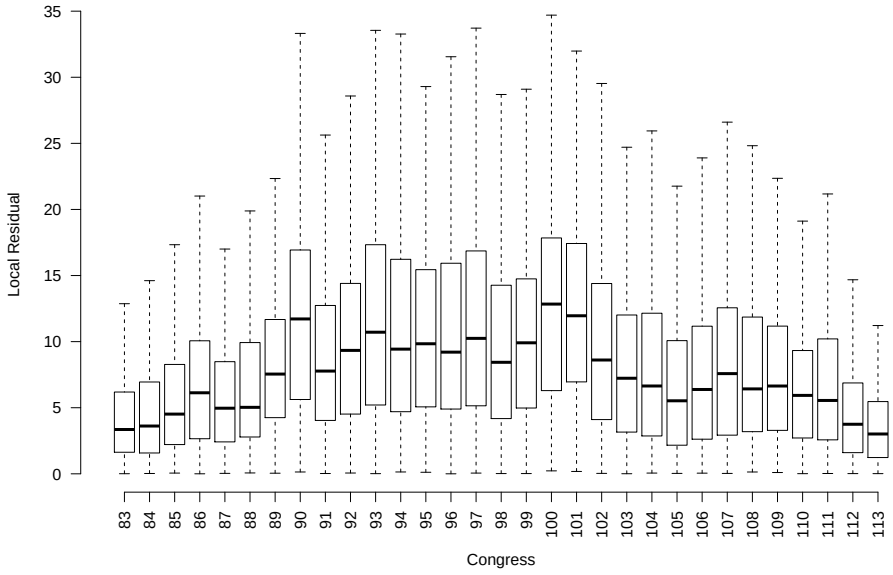


Figure 5.6: Distribution of Local Residual Over Time

5.10 Placebo Test

A remaining source of potential bias for the main results is if changes in broadband due to redistricting are related to unobserved district characteristics in ways that bias the results.

A common method of checking this bias is to perform a placebo test. In short, in this section I re-create the main results from the paper by using *future* changes in broadband to predict *past* changes in legislator behavior. If the main results are being affected by broadband being related to enduring (and unobserved) characteristics of district then this test will result in statistically significant results. If the results are null then this gives confidence to the validity of the main results.

To perform this test I collected data on the legislator characteristics from the 102nd and 103rd Congresses – the sessions of Congress directly before and after the 1992 redistricting. I then assign, to every zip-code, the average number of providers in the 2000-2002 period, and then assign this level of broadband to the zip-codes in the past. Put another way, each zip code in 1990-1992 is assigned the level of broadband it will come to have 10 years in the future. Using Zip-Code/Census Track crossover data for the 102nd and 103rd sessions of Congress, I then determine the change in the number of broadband providers that will occur in the future due to changes in the district boundaries. To these data, I add population and median income levels from the 1990 census, and partisan composition from the 1990 Election. Like in the main analysis, changes in all independent variables are due solely to redistricting.

The results of this placebo analysis can be found in Table 5.21. The key coefficients are those predicting the effect of future changes in broadband on past changes in legislator behavior. Crucially, each of these variables is substantially smaller (or indeed, in an opposite direction) then the results in the paper, and are all imprecisely estimated. The probability of these results given the null hypothesis are: 40% for Party Unity voting; 50% for Presidential Voting; and 50% for Interest Group scores.

These null results gives further confidence that the test in the paper is picking up on meaningful variation in the information environment that is affecting legislative behavior.

Table 5.21: Placebo Test of the Effect of Communication Environment on National Voting Metrics

	$Party.Unity_{ic}$	$Presidential.Voting_{ic}$	$Interest.Group.Score_{ic}$
$Future.ln(Providers_{ic})$	-0.74	-2.37	0.79
	(0.87)	(3.47)	(1.19)
$ln(Med.Income_{ic})$	-1.51	-20.94^{*}	0.85
	(0.94)	(3.24)	(1.49)
$ln(Population_{ic})$	-1.59	13.12^{*}	-0.22
	(0.96)	(4.36)	(1.76)
$Partisan.Composition_{ic}$	0.09^{*}	0.10	0.003
	(0.03)	(0.09)	(0.04)
Legislator F.E.	Yes	Yes	Yes
Congress-Party F.E.	Yes	Yes	Yes
N	793	793	792
R-squared	0.28	0.51	0.44

$^{*}p < .05$; Heteroskedastic-Robust Standard Errors

5.11 District Correlates of Broadband Roll-Out

Table 5.22 presents a serious of bivariate regressions of district demographics on the number of broadband providers in a district, with Congress and District fixed effects, using the Panel data from the 108th to 111th sessions of Congress. Areas with a greater than expected positive change in broadband were those with: a higher percentage of citizens living in poverty; fewer White individuals; more Black individuals; and a lower median age.

Table 5.22: District Correlates of Broadband Change

	$Providers_{jc}$							
$ln(Med.Income_{jc})$	−1.81							
	(1.66)							
$ln(Population_{jc})$		−0.06						
		(0.97)						
$Perc.Poverty_{jc}$			0.13*					
			(0.05)					
$Perc.White_{jc}$				−0.10*				
				(0.03)				
$Perc.Black_{jc}$					0.21*			
					(0.05)			
$Perc.Bachelor_{jc}$						−0.01		
						(0.06)		
$Med.Age_{jc}$							−0.22*	
							(0.10)	
$Perc.Democrat.President_{jc}$								−0.03
								(0.02)
District F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Congress F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1680	1680	1680	1680	1680	1680	1680	1680
R-squared	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Residual Std. Error (df = 1245)	1.18	1.19	1.18	1.16	1.15	1.19	1.18	1.18

*p $<$ .05; Cluster-Robust Standard Errors

5.12 Sensitivity to Population Density

Another possible source of error for the redistricting analysis is the use of population as a control variable. Because districts are changing both their population and their geographic area, population alone may miss important changes in the district and its demand for broadband. To test for sensitivity to this, Table 5.23 repeats the main analysis, subbing in Population Density (population per 100 sq. miles) for $log(Population)$. The results are unchanged.

Table 5.23: Effect of Communication Environment on National Voting Metrics

	$Party.Unity_{ic}$	$Presidential.Voting_{ic}$	$Interest.Group.Score_{ic}$
$ln(Providers_{ic})$	2.31*	5.97*	1.33
	(0.84)	(1.92)	(1.46)
$ln(Med.Income_{ic})$	−2.09*	−9.09*	0.10
	(0.92)	(2.54)	(1.78)
Population Density (per 100 sq. mile)$_{ic}$	0.003	−0.01	0.003
	(0.01)	(0.01)	(0.01)
$Partisan.Composition_{ic}$	0.05*	−0.06	0.05
	(0.02)	(0.04)	(0.06)
Legislator F.E.	Yes	Yes	Yes
Congress-Party F.E.	Yes	Yes	Yes
N	831	827	826
R-squared	0.36	0.30	0.01

*p $<$ .05; Heteroskedastic-Robust Standard Errors

5.13 Results Moderated by Party

In this section I reproduce the main panel analysis interacting the effect of broadband with the political party of the representative. To fully understand this effect I first examine the degree to which the effect of broadband is moderated by political party of the representative, and then by whether the representative is in the in-party or out-party in Congress. Ultimately in-party/out-party status is a stronger moderator of the effect of broadband.

To understand the moderating effect of party members I modify the panel models used above. Using the panel specifications (as opposed to the re-districting specifications) has the benefit of: (a) better integrating the results of Trussler (2018a), who found that the the effects of broadband on voters was somewhat stronger for Democratic members in the elections producing these sessions of Congress; and (b) allowing within-member variation in in-party/out-party status.

Table 5.24 first displays the results of an equation which simply moderates the effect of broadband by whether a member is a Democrat or Republican, and Figure 5.7 displays the marginal effect of *ln(Providers)* for both parties. The effect of broadband on legislative behavior seems to be driven primarily by Democrats. In each case, the marginal impact of broadband for Democrats is highly positive and significant, while for Republicans it is near zero and imprecisely estimated.

There is no a-priori theoretical reason to expect that Democratic members will be more affected by a changing communication environment compared to Republicans. And indeed, it is not at all clear that this moderation is occurring because of party, or due to some other factor that is merely correlated with party.

In Table 5.25 I additionally add an interaction between the number of broadband providers and whether an incumbent is in the in-party or the out-party. The coefficient on the number of providers now indicates the effect of broadband for a Democrat who is in the out-party, and is positive and statistically significant, indicating that these members respond to increase in broadband by becoming more nationalized. The interaction between the number of broadband providers and in-party status has a negative coefficient, which indicates that out-party members are affected by broadband to a much greater extent. In this model, the interaction between the number of broad-

Table 5.24: Effect of Communication Environment on National Voting Metrics, by Party

	$Party.Unity_{ic}$	$Presidential.Voting_{ic}$	$Interest.Group.Score_{ic}$
$ln(Providers_{ic})$	5.40*	7.95*	3.28*
	(0.67)	(1.05)	(0.82)
$ln(Med.Income_{ic})$	−4.87*	−6.19*	−2.77
	(1.36)	(2.60)	(1.76)
$ln(Population_{ic})$	0.77	1.25	0.02
	(1.66)	(3.13)	(2.08)
$ln(Providers_{ic}) * Republican$	−4.85*	−6.91*	−3.05*
	(0.91)	(1.70)	(1.08)
Legislator F.E.	Yes	Yes	Yes
Congress-Party F.E.	Yes	Yes	Yes
N	2099	2091	2086
R-squared	0.43	0.69	0.30

*p $<$ .05; Heteroskedastic-Robust Standard Errors

band providers and party is imprecisely estimated and close to zero, indicating that once the effect of in-party status is accounted for political party no longer has an effect. Figure 5.8 displays these results visually and shows that, with the exception of presidential support, the marginal effect of broadband is only significant among out-party members.

Why might members in the out-party be more affected by broadband? It is difficult to speculate on this, but it may be that in-party members, faced with the prospect of governing and passing laws, are simply less able to exercise discretion in whether they support national forces. That is, regardless of the communication environment, they are expected to vote with their parties, the president, and aligned interest groups, in order to push through policy. Out-group members, on the other hand, have far more discretion in their legislative home-styles and can respond to their communication environment by either pursuing a local or national agenda.

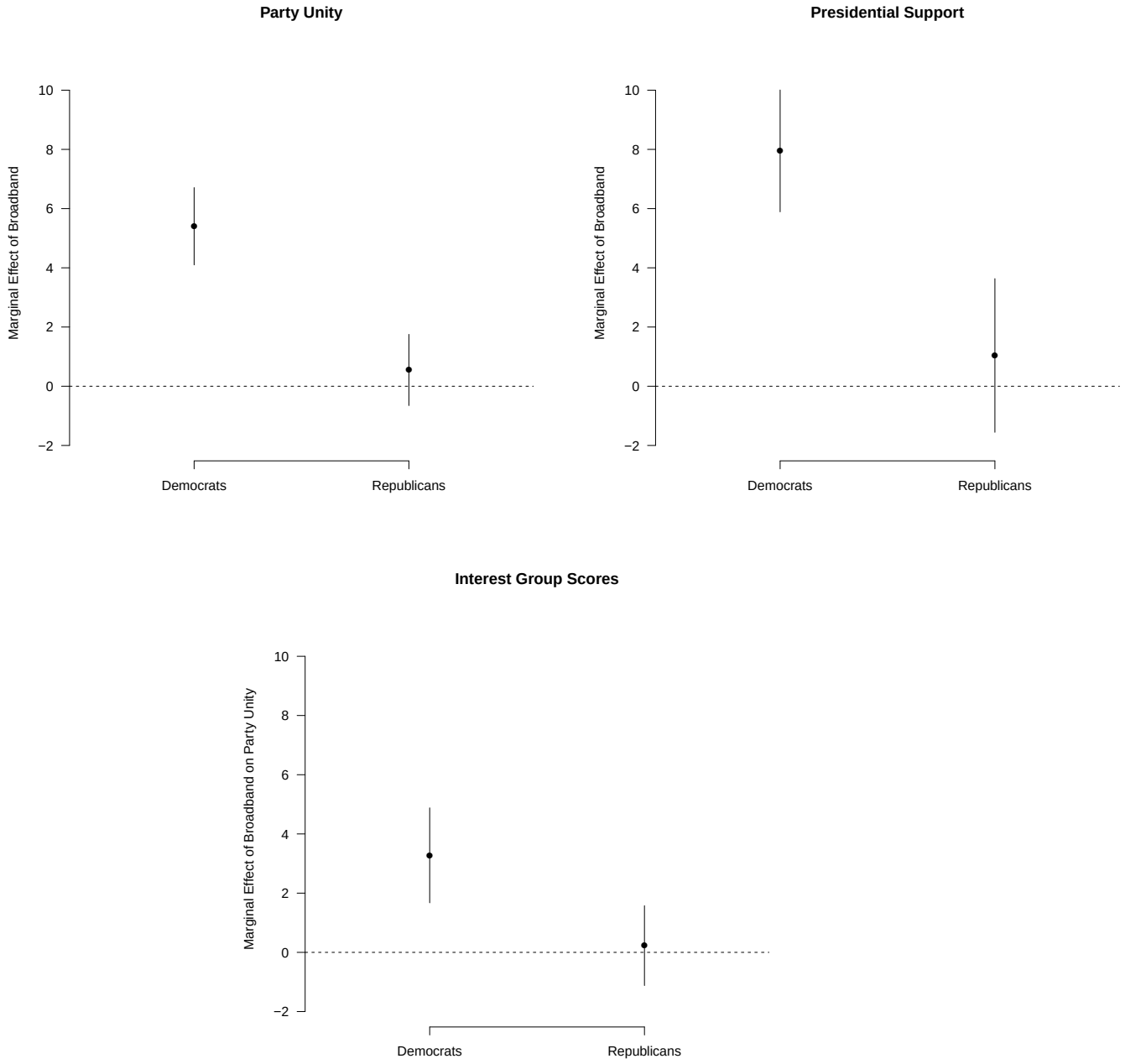


Figure 5.7: Effect of Broadband on Nationalized Legislative Behavior, by Party

Table 5.25: Effect of Communication Environment on National Voting Metrics, by In/Out Party

	$Party.Unity_{ic}$	$Presidential.Voting_{ic}$	$Interest.Group.Score_{ic}$
$ln(Providers_{ic})$	5.81*	11.69*	4.34*
	(0.85)	(1.42)	(1.08)
$In.Party_{ic}$	15.28*	32.87*	7.12*
	(2.18)	(3.91)	(2.54)
$ln(Med.Income_{ic})$	−6.83*	−9.93*	−3.46
	(2.02)	(3.95)	(2.84)
$ln(Population_{ic})$	2.43	3.27	1.18
	(1.77)	(3.47)	(2.41)
$ln(Providers_{ic}) * In.party_{ic}$	−4.75*	−6.74*	−3.37*
	(0.79)	(1.41)	(0.93)
$ln(Providers_{ic}) * Republican$	0.04	−3.03	−0.19
	(1.58)	(2.89)	(1.82)
Legislator F.E.	Yes	Yes	Yes
Congress-Party F.E.	Yes	Yes	Yes
N	1678	1672	1670
R-squared	0.43	0.70	0.34

*p $<$ .05; Heteroskedastic-Robust Standard Errors

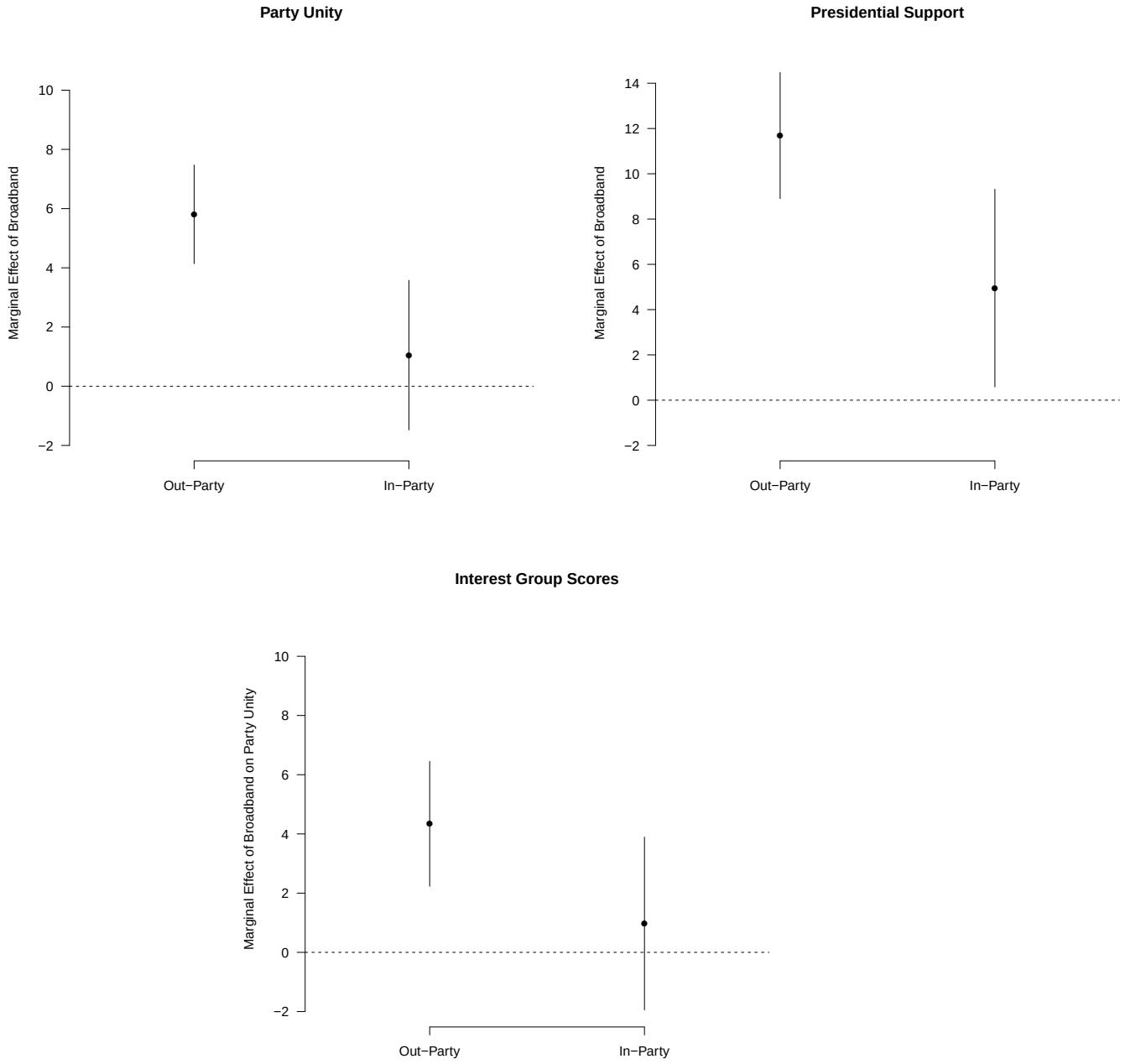


Figure 5.8: Effect of Broadband on Nationalized Legislative Behavior, by In/Out Party

5.14 Results With Lagged Measure of Broadband

In this section I replicate the panel analyses in the paper using a lagged measure of broadband. In the main analyses the level of broadband for a Congress is measured contemporaneously with the session. In this section I apply the level of broadband from the *previous* session to each member. It may be that the effect of broadband is fully realized on a longer time scale, in which case the magnitude of the effects here will be larger than those found in the panel analyses above. Alternatively, if the lagged variable produces null results, it suggests that broadband causes a quick impact on legislative behavior that later dissipates.

Because these models include incumbent fixed effects this means that it is looking at how a change in the level of broadband from, for example, the 109th-110th session affects a change in behavior from the 110th to 111th session.

The results are presented in Table 5.26. Compared to the main panel results in Appendix Section 3, the results are weaker. The effect on *Party Unity* drops from 3.81 to 2.22, on *Presidential Voting* from 7.52 to 6.28, and on *Interest Group Score* from 2.92 to 0.04. Therefore, for two of the three dependent variables there is a slightly diminished, but still significant, effect 2 years after an expansion of broadband. For interest group scores, however, the effect of broadband seems to be more short lived. It is not the case, in other words, that the main effect of broadband is felt further in the future than what is modeled above.

Table 5.26: Effect of Communication Environment on National Voting Metrics

	$Party.Unity_{ic}$	$Presidential.Voting_{ic}$	$Interest.Group.Score_{ic}$
$ln(LaggedProviders_{ic})$	2.22*	6.28*	0.04
	(1.10)	(1.86)	(1.20)
$ln(Med.Income_{ic})$	−9.05	−14.91	−1.50
	(5.24)	(10.22)	(5.17)
$ln(Population_{ic})$	4.71	5.45	3.67
	(3.01)	(6.10)	(3.85)
Legislator F.E.	Yes	Yes	Yes
Congress-Party F.E.	Yes	Yes	Yes
N	1083	1079	1077
R-squared	0.38	0.65	0.35

*p $<$ .05; Cluster-Robust Standard Errors

Chapter 6

Supplemental Appendix to Chapter 3

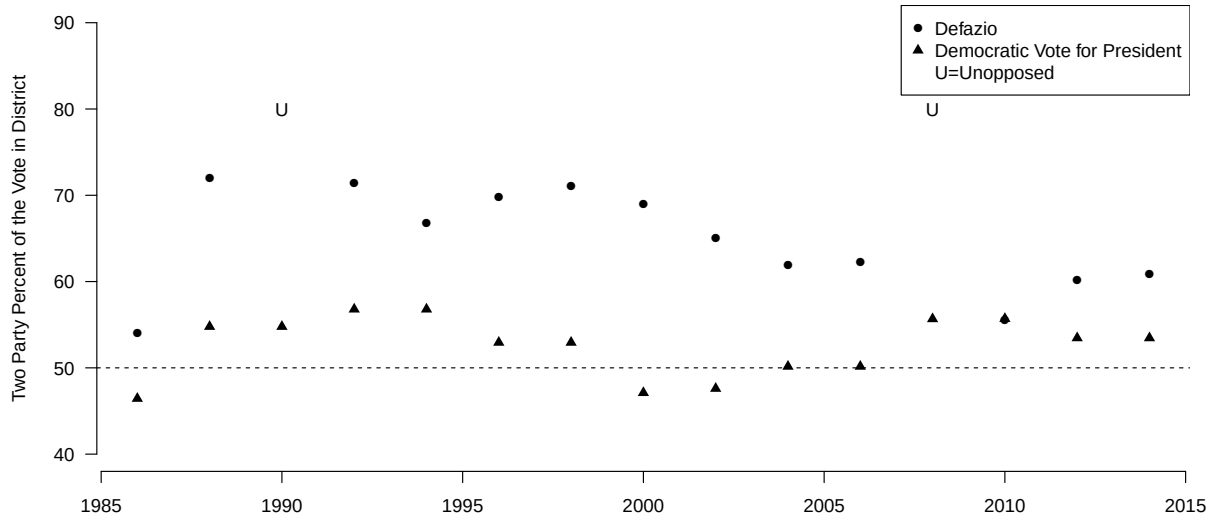
6.1 Survey of Content in the Eugene *Register Guard*

To better understand trends in coverage I take a deep dive into coverage of Congress and the President in the Eugene *Register Guard*. This paper is a good choice to study more closely for three reasons. First, the paper was independently owned at the time of study (it has since been sold to the corporate conglomerate *GateHouse Media*), which means that if national coverage is found to dominate it is due to editorial decision making and not pressure from a parent company. Second, Eugene had just one Congressional Representative for the entire period, so differences in coverage cannot be attributed to a different member's home-style. Third, with an average president to member coverage ratio of 3.3:1, the *Register Guard* sits squarely in the middle (15/30) in terms of how it divides its coverage.

Eugene itself is a small university city in the central-western region of Oregon. All of Eugene is contained in Oregon's 4th Congressional District, and has been represented since 1986 by Rep. Peter DeFazio, a Democrat. Figure 6.1 displays the electoral history of the district during DeFazio's term in office. As is clear by his 32 year (and still ongoing) term, DeFazio enjoys strong support in the district. The closest election he faced was his first, winning with fairly wide margins since. He has twice run without a Republican challenger, in 1990 and 2008. In general, he has run ahead of Presidential voting in his district (though that gap seems to be dwindling), which is an indicator that Defazio enjoys a robust incumbency advantage.

The incumbency advantage enjoyed by Representatives like DeFazio is thought to stem, in part, from newspaper coverage that portrays the Congressman as working hard for the community in non-partisan, constituency service, type efforts (Arnold 2013; Darr and Dunaway 2017; Hayes and Lawless 2015, 2018). The overall effect of broadband coverage, however, is to reduce coverage that mentions members of Congress relative to coverage that mentions the President. Below, by

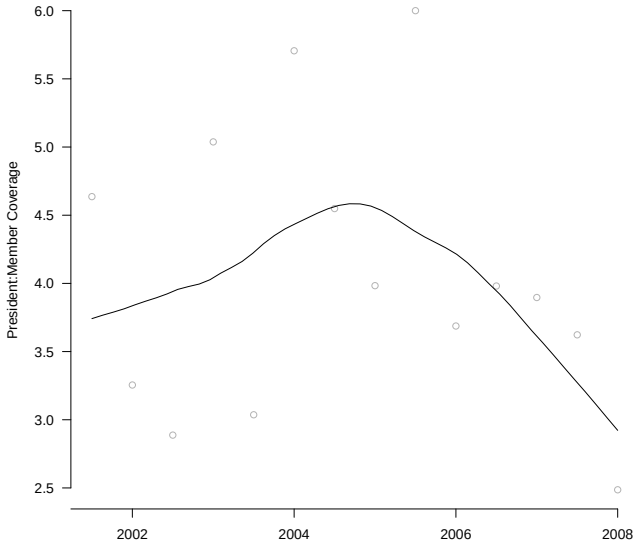
Figure 6.1: Election Results in Oregon's 4th Congressional District



looking at four months of coverage (split across 2 years), I hope to better understand whether: (1) The coverage of DeFazio is of a nature that supports the incumbency advantage; (2) What coverage of the President in this small-town newspaper looks like, and whether that coverage is likely to increase the propensity of voters to act in a partisan fashion. In particular, while there has been great work on coverage of local members in local newspapers (e.g. Arnold 2013), there is little which looks at how this coverage compares to coverage of *national* figures in those same outlets. Given the limited resources of these newspapers (and certainly a lack of resources to have a reporter in Washington), an important unknown is the type of articles that mention the President (i.e. straight-news, commentary, editorials, letters to the editor), and whether the newspaper ties this coverage back to local issues.

The *Register Guard* in general provided a fair amount of coverage of their local Congressman, though Figure 6.2 does make clear that the President consistently received 2-6 times more coverage in the paper, peaking at the start of Bush's second term in office.

Figure 6.2: Relative Coverage of DeFazio and President in Eugene *Register Guard*



To better understand the nature of this coverage, I examined the articles mentioning either Representative DeFazio or President Bush in two 2-month periods. March-April 2003, and March-April 2007. In each period I keep track of the headlines, the topics of the pieces, and what section the article appeared in: straight-news ("staff" authors), commentary, editorials, or letters to the editor.

6.1.1 2003 Coverage

Tables 6.1 & 6.2 summarize political coverage in the *Register Guard* for this period. March to April 2003 marked the start of the Iraq War. Unsurprisingly, coverage (and particularly coverage of the President) focused almost exclusively on this. In these two months the *Register Guard* wrote 101 articles that mentioned President Bush, and only 14 that mentioned DeFazio.

Of the 14 articles which mentioned DeFazio, 11 were straight-news pieces, while 3 were letters to the editor from the public. While DeFazio served on the newly formed Select Committee on

Homeland Security, he was not able to work this appointment into news coverage on the Iraq War. Indeed, only two of the 11 news stories tied DeFazio to the main news story of the day: both of which only briefly mention that the Congressman would be introducing a weapons expert before a talk at the University of Oregon.

In this small number of articles about the Congressman there were several that highlighted DeFazio's constituency service, and in particular, how his committee memberships help him to serve the community. For example, DeFazio's role on the Transportation committee gave him special expertise when dealing with the closing of two interstate bridges to heavy trucks. In the article "DeFazio urges less road weight", the Congressman is able to show: (1) His expertise in transportation policy, by discussing the specifics and legal history of interstate weight requirements; and (2) His actionable commitment to the issue, specifically how he "hand-delivered" a letter to the Oregon Department of Transportation addressing the problem.

The article "Spending security funds not so easy" is an even better example of the sort of article thought to be beneficial to local members of Congress. It speaks directly to DeFazio's work on the Select Committee for Homeland Security, and how he is doing what he can to bring Federal counter-terrorism money to Eugene. For example the article goes into detail on how DeFazio is engaging with the community:

> DeFazio spent two hours talking with members of Lane County's county-wide preparedness group Tuesday morning at the Eugene Water & Electric Board building. He called the meeting a "fishing expedition" - one of several planned in his district to learn what local jurisdictions consider their most urgent needs and to gauge how well the system of distributing funds is working.

These sorts of articles are exactly those which are thought to support the incumbency advantage. When voters go to make their decisions, remembering that DeFazio used his committee membership (and worked with local stakeholders) to bring expertise, problem solving, and money to the district is the type of information that may lead Republicans to split their tickets and to vote for him.

That is, of course, if this information is not drowned out by a sea of discussion about the President, national politics, and partisan conflict. While DeFazio was fighting for Homeland Security funding and better transportation regulation the country was marching to war. In this same time period 101 articles were printed by the *Register Guard* mentioning President Bush – the majority of which focus on Iraq.

Perhaps most tellingly, the editors of the *Register Guard* were pre-occupied with the War: writing 17 editorials on the topic during this time period. They also used their editorial discretion to print a full 48 letters about the Iraq War.[1] While the small newspaper clearly did not have resources to have a reporter on the ground in the Middle East (or even Washington), on their news pages they did cover local angles on the war: reporting on protests in Eugene, locals involved in the effort, and debates on the war within the local school system.

This latter article ("It's a hot topic, but teacher's trial by media a rush to judgment") – an opinion piece by Bob Welch – exemplifies national politics becoming localized. It discusses a situation where an anatomy teacher at the local High School opened her class with a debate about the war. One self-professed conservative student took exception, saying that the teacher segued into, "a unilateral speech dissing president Bush and his decision to wage war against Iraq". He took his concerns not to the school administration, but to a Portland-based talk-radio host. This seemed to alight a great deal more controversy, and the story –according to Welch – was told and re-told with ever-greater distance from the facts.

Compared to the benign coverage of DeFazio – which focused on his non-partisan efforts to address Eugene's problems – coverage of the President is fraught with partisan politics. Taking the example of the school-debate gone wrong: individuals in the story are identified as liberals and conservatives. Battle lines are drawn between the sides and the truth is distorted in a he-said-she-said fashion. In this way, the coverage of the President translates the national conversation about

[1]The prevailing notion in the literature is that letters to the editor are a function of editorial discretion and gatekeeping, not a direct reflection of public opinion (Hill 1981; Renfro 1979; Richardson and Franklin 2004). This being said, there is an obvious question of causality here – whether a nationalized public writes more letters about the President or whether more letters about the President creates a more nationalized public – which I return to in the discussion of this section.

the war – one which was bitterly divided by partisanship – into the local context.

These are the sorts of articles that lead to voters thinking of politics as primarily a contest between two-opposing sides. Less thought will be given to how local members of Congress act for the good of the community, and instead they will be seen only as vessels for the national conflict which the press gives the majority of attention.

Table 6.1: Articles on Rep. DeFazio, 2003

Title	**Author**	**Topic**
Letter to the Editor (3)	Public	Iraq War (3)
Patron opens door to D.C. for seven Eugene artists	Staff	Arts and Culture
Visas hard for students to come by	Staff	Constituency Issue
Briefly	Staff	Constituency opportunity
Spending security funds not so easy	Staff	Federal Funding
Weapons expert presents case for peace	Staff	Iraq War
This week at the UO	Staff	Iraq War
63000 acres of forest may go to tribes	Staff	Land Management
Advocates for disabled urge change in courthouse plan	Staff	Local codes
DeFazio urges less road weight	Staff	Local transportation
Inventor envisions trucks on trains	Staff	Local transportation
Portland patient not thought to have SARS, but testing continues	Staff	SARS

Table 6.2: Articles on President Bush, 2003

Title	Author	Topic
In 1918....	Commentary	Abortion
No "loser" mentality in this state	Commentary	Education
It's a hot topic, but teacher's trial by media a rush to judgment	Staff	Iraq War
Mideast crisis shouldn't be ignored	Commentary	Iraq War
Even future warriors harbor doubts about war	Commentary	Iraq War
Sound off	Commentary	Iraq War
Founders envisioned church state relationship	Commentary	Religion Church/State
Re-focus abortion debate	Editorial	Abortion
A better primary plan	Editorial	Elections
Disclose health problems	Editorial	Elections
North Korea budges	Editorial	Foreign Affairs
Pass global AIDS bill	Editorial	HIV/AIDS
RIP INS	Editorial	Immigration
A ratings coup	Editorial	Iraq War
A sad silence	Editorial	Iraq War
A whistle blows- again	Editorial	Iraq War
America at war	Editorial	Iraq War
Beyond Regime Change	Editorial	Iraq War
Blair's predicament	Editorial	Iraq War
Bush's Ultimatum	Editorial	Iraq War
Congressional fog of war	Editorial	Iraq War
Just plain Saddam	Editorial	Iraq War
No backlash, please	Editorial	Iraq War
No vindication in victory	Editorial	Iraq War
Protecting POWs	Editorial	Iraq War
Searching for Saddam	Editorial	Iraq War
The Damascus dilemma	Editorial	Iraq War
The dogs that didn't bark	Editorial	Iraq War
U.N. should rebuild Iraq	Editorial	Iraq War
Who's pessimistic?	Editorial	Iraq War
A call for clarification	Editorial	Judiciary
Letter to the Editor (48)	Public	Iraq War (48)
Professor to address power of presidents	Staff	Administration Malfeasance
Local punk band gets ready to detonate all over again	Staff	Arts and Culture
Briefly	Staff	Church/State
Last call for next edition of "Oregon No Call" list	Staff	Federal Law
Head Start seeks to stop changes in federal funding	Staff	Government programs
Anti-War sentiment strong in India	Staff	Iraq War
At home, cheers mix with wariness	Staff	Iraq War
Bush's words stir passion and dissent	Staff	Iraq War
Capitol rally supports troops	Staff	Iraq War
Debate more than academic	Staff	Iraq War
Eugene police officer sole city employee called up so far	Staff	Iraq War
Former R-G photographer grabs front-row seat to history in Iraq	Staff	Iraq War
Many cling to routine while protesters gather	Staff	Iraq War
March for peace, March toward war	Staff	Iraq War
Rally promotes dissent as essential	Staff	Iraq War
Teachers use varied methods to discuss issue of war in class	Staff	Iraq War
With hearts in their throats, soldiers' families watch, wait	Staff	Iraq War
Woman wishes U.S. hadn't used violence to deal with Saddam	Staff	Iraq War
Portland patient not thought to have SARS, but testing continues	Staff	SARS
April 15 taxes taxpayers' good humor	Staff	Taxes/Economy
Briefly	Staff	Taxes/Economy

6.1.2 2007 Coverage

Tables 6.3 & 6.4 summarize political coverage in the *Register Guard* for this period. By 2007, coverage of the ongoing war in Iraq made up far less of the coverage of both DeFazio and the President. Far more coverage of politics focused on various "Culture War" battles, the upcoming election, and investigations into the Bush administration (in particular the commutation of Scooter Libby's sentence and the conduct of Attorney General Alberto Gonzalez).

A topic particular to coverage in Eugene, however, was the cessation of Federal payments to counties with Federal forest land. Based on the Secure Rural Schools and Communities Self-Determination Act of 2000, counties which provided services to these areas received subsidies. Lane County (in which Eugene is located) received $40 million in aid under the program. Facing the end of the program under a Congressional spending bill, the county chose to implement an income tax in order to avoid job and service losses.

On the one hand, this problem seems a prime opportunity for Representative DeFazio to show his ability to work for his district in a non-partisan way. Indeed, several articles discuss DeFazio working across party lines with the other representatives from Oregon to attach funding for the program to an emergency spending bill. Five straight-news articles on the topic gave DeFazio credit for trying to save the program, and 3 editorials on the topic also brought his efforts to the attention of his constituents.

On the other hand, the quest to get this Federal funding was deeply tied to national politics and the ideological divide over the war. Funding to save the program was attached to a $100-billion emergency spending bill which provided funding for the war in Iraq, but also stipulated that all troops be withdrawn from that country by the end of 2008. This put Representative Defazio in a clear conflict between national and local concerns. The loss of federal funds (and the proposed replacement by a county income tax) would be a clear loss on the local stage. However, the party chose to attach the troop pull-out stipulation to the spending bill with full knowledge that it would lead to a Presidential veto. As an additional consideration, the possibility that Bush might bluff and actually sign the bill would mean that DeFazio would be on record funding the deeply unpopular

war.

DeFazio ultimately decided to support the bill, and the *Register Guard* afforded him commentary space to explain his decision ("Spending bill is best option for ending war"). Traditional views of constituency service might suggest that DeFazio express first and foremost why he thinks that the emergency spending bill is the best route to recover the Federal forestry aid money. This is not the route he takes, however. The majority of the piece is a defense of the military funding portion of the bill, arguing that the pull-out clause – and a potential end to the war – is worth the sacrifice. Other benefits of the bill that DeFazio touts are: increased funding for health-care for military personnel, a ban of U.S. control of Iraqi oil, a prohibition on U.S. personnel engaging in torture, refocusing the fight to Afghanistan, a crack-down on no-bid military contracts, and $2-billion for homeland security funding.

Only after listing all these national issues – 667 words into a 745 page article – does DeFazio say "Finally, the bill will extend funding for Oregon counties under the Secure Rural School and Community Self-Determination Act, which I requested." DeFazio's direct and very real efforts to save jobs and services in his districts is included as almost an afterthought in this piece, buried underneath a large number of considerations that have far more to do with national partisan politics.

Perhaps a reason for this attention to national politics was, in part, a reaction to how the *Register Guard* was covering politics in this period more generally. The paper certainly covered – in both the news and opinion pages – the pressing need to regain Federal funding to the county. But, for example, the three editorials written about Federal forestry subsidies during this time were swamped by 5 on administrative malfeasance, 7 on the war, and a further 5 on the hot-button topics of immigration, gun control, abortion, and the military's "Don't ask, don't tell" policy. Once again, the staff at the *Register Guard* used the editorial pages to deliver content about national political conflict to their readers without the pretense of a local angle. Even in straight-news articles about recovering funding, the coverage makes clear the role national partisan politics are playing. For example in the article "Senate considers county aid":

> Republicans and Democrats have scuffled for several years over how to fund any con-

tinuation of the aid. President Bush has proposed selling 270,000 acres of National Forest lands to partially fund the program and phase it out in four years, Wyden and other Senate officials said. Democrats have proposed cutting tax loopholes or improving collections of tax revenue.

In 2003 the news was almost necessarily pre-occupied with national politics due to the start of a deeply divisive war. Politics in 2007 more closely approximated "normal" politics, and in particular, provides an interesting case of a member of Congress facing a non-partisan funding issue. In the classic model of the relationship between citizens, representatives, and the press, this is a situation in which we would expect to see the representative do all that they can to generate coverage of their ability to "bring home the bacon". If DeFazio could show his ability to provide jobs and financial security to his district then he may be over to shore up support with his base while attracting moderate voters from across-the-aisle. This would, all things equal, increase his chances of re-election

But this is not what we see. Only about half the time that the paper talked about the Federal funding issue was DeFazio included in the coverage. Put the other way, much of the time that citizens of Eugene read about this interaction between the Federal government and their counties, they did so in a way that emphasized it as part of a larger national struggle between political parties – not in a way that emphasized the ability of their representatives to deliver the funds in a non-partisan way. Indeed, even when Representative DeFazio had the opportunity to speak to his constituents directly he chose to emphasize divisive national politics, and not the local issue of funding.

6.1.3 Discussion

The federal funding issue would not end well for Eugene. President Bush would go on to veto the emergency spending bill, as he had always threatened to do. DeFazio and the rest of the Oregon delegation would try to secure funding again through a bill that would transfer untapped

Table 6.3: Articles on Rep. DeFazio 2007

Title	Author	Topic
Spending bill is best option for ending war	Commentary	Iraq War
A man of the house	Editorial	Election
Targeting Gordon Smith	Editorial	Elections
Bittersweet Bailout	Editorial	Federal Funding
It's not welfare	Editorial	Federal Funding
Time to shift course	Editorial	Federal Funding
Letter to the Editor (8)	Public	Federal Funding (1); Iraq (2) National Defense (1); Election (1); Gun Control (1)
Defazio won't take run at ousting GOP's Gordon Smith from Senate	Staff	Election
Longtime activists seeks Smith's U.S.Senate seat	Staff	Election
Defazio ponders U.S. Senate Run	Staff	Elections
Kucinich popular in Oregon	Staff	Elections/Iraq War
Change of heart over Iraq or change of stripes for Smith?	Staff	Elections/Iraq War
Congress supports timber aid for one year	Staff	Federal Funding
Congress tough sell on county payments	Staff	Federal Funding
County may scrub income tax	Staff	Federal Funding
Senate considers county aid	Staff	Federal Funding
Veto threat leaves county aid in limbo	Staff	Federal Funding

revenue from oil and gas leases into the Forestry subsidy program. This bill was killed, however, through the defection of Oregon Republican Representative Greg Walden. According to a June 2008 editorial in the *Register Guard*, "Walden's defection came in service of national Republican priorities that accord greater importance to oil and gas drilling than to a century-old commitment to counties". By November 2009, the *Register Guard* would be reporting on the dire financial state of county governments in Oregon.

In many ways this funding was a victim of national politics: both DeFazio and Walden made key decisions to prioritize party priorities over local politics. DeFazio continued to support the original spending bill even after his party leadership attached a poison-pill amendment ending the war in Iraq to bait a presidential veto. Walden chose to side with the national party and oil and gas interests over funding in a separate bill. According to classic theories of Congressional elections, these actions taken to prioritize national concerns would be detrimental to an incumbent's re-election. It is impossible to draw conclusions from just two cases, but it is telling that in 2008 – the next time voters had an opportunity to sanction these two representatives – Walden won with over 70% of the vote and DeFazio ran unopposed.

Table 6.4: Articles on President Bush, 2007

Title	Author	Topic
National parks budget mostly a shell game	Commentary	Federal Funding/Environment
Support stem cell research	Commentary	Stem cell
Spending bill is best option for ending war	Congressman	Iraq War
A serious setback	Editorial	Abortion
Caught in a lie	Editorial	Administration Malfeasance
Libby takes the fall	Editorial	Administration Malfeasance
More than mistakes	Editorial	Administration Malfeasance
Stop the stonewalling	Editorial	Administration Malfeasance
The missing e-mails	Editorial	Administration Malfeasance
Times out-Pace policy	Editorial	DADT
A separate reality	Editorial	Election/Iraq War
The breaching option	Editorial	Federal environmental policy
An insult to counties	Editorial	Federal Funding
Reason to cheer	Editorial	Federal Funding
Rolling boulders uphill	Editorial	Federal Funding
Fix immigration	Editorial	Immigration
A tale of two wars	Editorial	Iraq War
Iraq needs a deadline	Editorial	Iraq War
Iraq: Year Five	Editorial	Iraq War
Restore habeas rights	Editorial	Iraq War
Running out of options	Editorial	Iraq War
Support the troops	Editorial	Iraq War
An assault on civilization	Editorial	Mass Shooting
Plan B finally for sale	Editorial	Reproductive Health
Letter to the Editor (26)	Public	Iraq War(14); Taxes/Economy (1); Federal Funding (2); Administration Malfeasance Malfeasance (7); Climate Change (1); Religion(1)
Letter log	Public Editor	Administration Malfeasance
Letter log	Public Editor	Iraq War
Communities Briefly	Staff	Administration Malfeasance
Reading First audit faults UO officials	Staff	Education
Revised reading programs cause stir	Staff	Education
Change of heart over Iraq or change of stripes for Smith?	Staff	Election
Longtime activists seeks Smith's U.S. Senate Seat	Staff	Election
Congress supports timber aid for one year	Staff	Federal Funding
Congress tough sell on county payments	Staff	Federal Funding
County may scrub income tax	Staff	Federal Funding
County's income tax stuck in limbo	Staff	Federal Funding
Curry, Coos tailor levies to needs	Staff	Federal Funding
Income tax questions, answers	Staff	Federal Funding
Senate considers county aid	Staff	Federal Funding
Taxing dilemma	Staff	Federal Funding
Thousands sign petition to bring county tax to vote	Staff	Federal Funding
Timber payments plan gets in position	Staff	Federal Funding
Veto threat leaves county aid in limbo	Staff	Federal Funding
Taking Darfur to drivers	Staff	Foreign Policy/Local connection
Guard members to return to Iraq	Staff	Iraq War
Oregon legislators favor Iraq withdrawal	Staff	Iraq War

I undertook this close reading of one newspaper to better understand whether: (1) The coverage of DeFazio is of a nature that supports the incumbency advantage; (2) What coverage of the President in this small-town newspaper looks like, and whether that coverage is likely to increase the propensity of voters to act in a partisan fashion.

Part of the reason why DeFazio was able to win re-election despite prioritizing national politics over local politics may have been that, while the *Register Guard* certainly generated articles that would traditionally support his incumbency, in both 2003 and 2007 they also spent a great deal of time covering national partisan politics. We know from the results above that the expansion of broadband led to more coverage like this than what would have been expected in conditions where broadband stayed at constant levels. The coverage of the President in the *Register Guard* frequently discussed how national conflicts were filtering into the local community (through protests about the war, classroom arguments, or local participation in the war effort), and to an even greater extent, the editorial board gave a great number of column-inches to national politics in a way wholly separate from the local issues of Eugene. Further, in 2007, when Representative DeFazio was covered he was often done so in the context of national politics in a way he was not in 2003.

It is significant that a great deal of the coverage mentioning the President came in the form of editorials. While much of the literature on coverage frames itself around straight-news, editorials may be even more important in driving public opinion about politics. In his study of how newspapers cover members of Congress, Arnold (2013: 183) finds that:

> Well reasoned editorials help citizens think about the of standards that are important in evaluating candidates for Congress, encouraging them to consider aspects of representatives' behavior that are not featured in campaign advertisements. Editors can contribute to informed decision making by highlighting relevant facts, suggesting criteria for judgment, and weighing the advantages and disadvantages of competing candidates.

This intuition, that editorial content is particularly important in shaping public opinion, has been also been empirically tested. A team of authors in two elections ran a targeted survey in

counties where they also collected newspaper data. In the two time periods, the content of editorials (and interestingly, not straight news or television content) altered voters support for the President (Beck et al. 2002; Dalton et al. 1998). Kahn and Kenney (2002) find similar results, with editorial endorsements influencing vote choice, but also find that an important secondary effect is that editorial content bleeds over into how the newspapers report straight news.

Given that editorials are theoretically and empirically important in shaping public opinion, the fact that newspapers like the Eugene *Register Guard* use their editorial discretion to highlight presidential politics is important in determining what voters are thinking about when headed to the ballot box. We know that split-ticket voting happens when voters have idiosyncratic non-partisan information in mind when going to vote. When newspapers spend more time highlighting national politics at the expense of local politics on the editorial pages, it is likely to cause voters to think of politics in a partisan frame instead.

Letters to the editor also made up a good deal of the content. Treating this as "coverage" that may affect voters is complicated because it is written *by* voters.[2] There is a complicated causal relationship here, and it is plausible that broadband nationalizes voters through other means, and the relationship between broadband and increased coverage of the president occurs because a more nationalized voting base writes an increasing amount of letters to newspapers mentioning the President.

On the one hand, newspaper content of *all* types is a function of both editorial discretion and viewer demand: the same critique of reverse causality can be made about straight-news coverage or editorials. On the other hand, it has long been thought that the content of letters to the editor reflect editorial discretion for more than public opinion. When researchers have compared what letters are published versus the stock of letters sent to newspapers they have found that the editorial process led to significant bias (Renfro 1979).[3] Other studies have looked at coverage of the same issue across newspapers, and found a significant amount of variation which speaks to editorial

[2]Note, however, that letters are included in other analyses of member content (Arnold 2013), and as such leaving them out would have reduced comparability to other work.

[3]To my knowledge this study has never been repeated, likely due to the need for full participation from a newspaper.

discretion. In his work on letters to the editor on the Equal Rights Amendment, Hill (1981) interviewed many editors to understand their decision making criteria. While many of them cited strict decision rules, the metrics they used for decisions – like "balance" and "readability" – were vague enough to introduce a great deal of idiosyncratic bias. For Richardson and Franklin (2004: 459): "Editors select letters not simply according to their newsworthiness but to reflect the identity of the newspaper, to meet the perceived preferences of readers, as well as the more prosaic requirements of availability of space and editorial imperatives concerning balance". Given this accumulated research, the high proportion of letters to the editor printed about the President should be seen as further evidence of an editorial imperative to increase national coverage.

Together, commentary like editorials, columns, and letters may be the most impactful changing feature of news coverage of politics. As we saw above, this coverage is influential in changing attitudes. It is *also* cheaper to produce and thought to be more popular (Hamilton 2004). Newspapers turning to more opinion-based news coverage about national politics in response to an economic threat would echo larger changes in the media ecosystem during this period, away from straight-news and towards opinion coverage. While more work would need to be done beyond the Eugene *Register Guard* to confirm this intuition, it would seem that the positive relationship between broadband and coverage of the President is a function of newspapers shifting column inches from their straight-news section to more opinions and commentary.

6.2 Validation of Broadband Measure

To further validate the use of the number of broadband providers in an area as a proxy for access to high-speed internet, I merge the FCC data on the number of broadband providers used in the main analysis to individual level data from the Current Population Study Internet Supplement for the 2001, 2003, and 2007 years [4]. These data have two main benefits. First, they include a respondent's county, which allows a closer mapping of number of providers the respondent is exposed to. Second, the number of people interviewed is large: nearly 100,000 individuals across

[4]Data collected from the Integrated Public Use Microdata Series: Version 6.0 (Flood et al. 2015)

these three years.

I relate the logged number of broadband providers in each individual's county to a variable indicating whether that person has a home broadband subscription (1) or has dial-up or no internet (0). As with the specifications above, I control for county fixed effects, year fixed effects, and controls for population and income. Once again, this strategy rules out confounders based on stable characteristics of counties and confounders correlated with the time trend.

The results are presented in table 6.5. A 100% increase in the number of broadband providers in an individual's county is associated with an 11% increase in the probability that individual has a home broadband subscription. The standard error on this coefficient is of a size that I reject the null hypothesis of no relationship between broadband providers and home broadband subscriptions.

Table 6.5: Effect of Broadband Providers on Home Broadband Subscription

	P(Home Broadband)
$ln(Providers_{ict})$	0.11^*
	(0.03)
$ln(Population_{ict}$	-0.28^*
	(0.13)
$ln(Med.Income_{ict})$	0.003
	(0.003)
County F.E.	Yes
Year F.E.	Yes
N	99928
R-squared	0.34
Residual Std. Error	19.95 (df = 99594)

$^*p < .05$; Cluster-Robust Standard Errors. Weighted using CPS `wtsupp` variable.

6.3 Metro Areas and Newspaper for Content Analysis

Metro Area	Major Newspaper
Bangor, ME	Bangor Daily News
Boston-Worcester-Lawrence, MA-NH-ME-CT (C)	Boston Globe
Burlington, VT	Burlington Free Press
Charleston, WV	Charleston Gazette (WV)
Charleston-North Charleston, SC	Charleston Post and Courier (SC)
Dayton-Springfield, OH	Dayton Daily News
Detroit-Ann Arbor-Flint, MI (C)	Detroit Free Press
Dubuque, IA	Dubuque Telegraph - Herald
Eugene-Springfield, OR	Eugene Register-Guard
Fort Collins-Loveland, CO	Fort Collins Coloradoan
Hattiesburg, MS	Hattiesburg American
Honolulu, HI	Honolulu Advertiser
Iowa City, IA	Iowa City Press Citizen
Lancaster, PA	Lancaster New Era
Las Vegas, NV-AZ	Las Vegas Review-Journal
Lincoln, NE	Lincoln Journal Star
Madison, WI	Wisconsin State Journal (Madison)
Milwaukee-Racine, WI (C)	Milwaukee Journal Sentinel
Monroe, LA	Monroe News-Star
Montgomery, AL	Montgomery Advertiser
Orlando, FL	Orlando Sentinel
Pensacola, FL	Pensacola News Journal
Phoenix-Mesa, AZ	Arizona Republic (Phoenix)
Reno, NV	Reno Gazette
St. Cloud, MN	St. Cloud Times
St. Louis, MO-IL	St. Louis Dispatch
Tallahassee, FL	Tallahassee Democrat
Topeka, KS	Topeka Capital Journal
West Palm Beach-Boca Raton, FL	Palm Beach Post
Yakima, WA	Yakima Herald

6.4 Content Results with Count Dependent Variables

To increase comparability across newspapers the main analysis focused on political coverage as a percentage of total coverage. The following shows that not taking that step – instead using raw count as a dependent variable – produces the same results. A 100% change in broadband providers leads to an increase of 252 articles covering politics, with the majority of that increase (237 articles) coming from an increase of coverage of the President.

Table 6.6: Effect of Communication Environment on Newspaper Content

	Politics Articles	**Member Articles**	**President Articles**	**President:Member Articles**
$ln(Providers_{pt})$	252.68**	14.28	237.92**	1.95*
	(109.16)	(27.26)	(105.38)	(1.03)
$ln(Population_{pt})$	−416.25	30.42	−446.99	−3.28*
	(344.73)	(79.10)	(295.08)	(1.95)
$ln(Median.Income_{pt})$	1027.45	126.59	920.48	−0.14
	(1123.68)	(339.81)	(935.89)	(10.05)
Paper F.E.	Yes	Yes	Yes	
Time F.E.	Yes	Yes	Yes	
N	498	498	501	498
R-squared	0.81	0.72	0.81	0.74
Residual Std. Error	196.81 (df = 449)	43.50 (df = 449)	181.78 (df = 452)	2.31 (df = 449)

*p $<$ .10 **p $<$ .05; Cluster-Robust Standard Errors

6.5 Traditional Interaction for Population Moderating Effect of Broadband on Circulation

The following supplements the split-sample test of population size and broadband's effect on circulation by interacting the broadband with population in one model. This results in substantively identical conclusions. The effect of broadband when population is low is negative. (The coefficient on $ln(Providers)$ indicates the effect of broadband when city population is 1, so should not be read too closely). The positive and significant coefficient on the interaction term indicates that as population increases, the effect of broadband on newspaper circulation attenuates towards zero.

Table 6.7: Effect of Broadband Rollout on Newspaper Circulation

	Newspaper Circulation per 10000 Residents
2000	-127.06^{**}
	(23.55)
2004	-187.49^{**}
	(57.31)
ln(Providers)	-255.71^{**}
	(128.68)
ln(Population)	-628.16^{**}
	(163.34)
ln(Median Income)	252.94
	(173.36)
Number of Dailies	495.05^{**}
	(127.86)
ln(Providers)*ln(Population)	18.97^{**}
	(9.29)
City F.E.	Yes
N	3637
R-squared	0.99
Residual Std. Error	196.51 (df = 2386)

$^{*}p < .10$ $^{**}p < .05$; Cluster-Robust Standard Errors

6.6 Validity of Content Analysis

An important test of validity of the content measures is if the electoral competitiveness of districts drives coverage. All things being equal, cities that intersect with Congressional districts which have more competitive elections should produce greater coverage of their members of Congress relative to the President.

To determine this, I first determined the electoral competitiveness of the districts which overlapped with each city. I calculated the average competitiveness of each election in each district across the 2000-2008 elections. I then took a weighted average of these results for each city, weighing by the percentage of the city which lived in the districts which overlapped it. I then split the sample by determining which cities were above and below the median level of marginality (19.19).

Table 6.8 displays a regression of this dummy variable for marginality on each the dependent variables with year fixed-effects (there is no need for paper fixed effects here as marginality does not vary within-paper). This effectively produces a difference in means test for marginal and non-marginal districts.

The expected results are found. While marginal districts do not cover politics more overall, they cover members of Congress significantly more, and the President significantly less. This makes it clear that newspapers are responding to their environments and changing their coverage to fit.

Table 6.8: Effect of Communication Environment on Newspaper Content

	Politics Articles %	**Member Articles %**	**President Articles %**	**President:Member Articles**
Marginal Districts	-0.08	0.19^{**}	-0.26^{**}	-2.25^{**}
	(0.12)	(0.04)	(0.11)	(0.37)
Constant	2.17^{**}	0.73^{**}	1.43^{**}	3.48^{**}
	(0.27)	(0.10)	(0.25)	(0.82)
Time F.E.	Yes	Yes	Yes	Yes
N	498	498	501	498
R-squared	0.13	0.07	0.16	0.13
Residual Std. Error	1.35 (df = 480)	0.49 (df = 480)	1.23 (df = 483)	4.08 (df = 480)

$^{*}p < .10$ $^{**}p < .05$; Cluster-Robust Standard Errors

6.7 Lagged Measure of Broadband

In this section I replicate the content analyses in the paper using a lagged measure of broadband. In the main analyses the level of broadband for a newspaper is measured at the start of the half year for which content is gathered. In this section I apply the level of broadband from one year before the content is gathered (i.e. broadband from December 2000 is applied to content from December to June 2001). It may be that the effect of broadband is only fully realized on a longer time scale, in which case the magnitude of the effects here will be larger than those found in the panel analyses above. Alternatively, if the lagged variable produces null results, it suggests that broadband causes a quick impact on legislative behavior that later dissipates.

The results are presented in Table 6.9. Compared to the main results, the results are certainly weaker. The effect on political articles drops from 0.75 to 0.48; for member articles from 0.04 to -0.01; for president articles from 0.7 to 0.5; and for the ratio of president to member articles from 1.95 to 1.40.

These results are in the same direction and substantively similar to those found with the contemporaneous broadband. Therefore, there is a longer term effect of broadband present, though this effect does weaken over time.

Table 6.9: Effect of Lagged Communication Environment on Newspaper Content

	Politics Articles	**Member Articles**	**President Articles**	**President:Member Articles**
$ln(LaggedProviders_{pt})$	0.48	−0.01	0.50*	1.40
	(0.33)	(0.14)	(0.30)	(1.06)
$ln(Population_{pt})$	0.78	1.09	−0.29	−4.24
	(1.91)	(0.71)	(1.36)	(2.60)
$ln(Median.Income_{pt})$	0.28	−0.80	0.98	4.38
	(4.75)	(1.70)	(3.91)	(12.94)
Paper F.E.	Yes	Yes	Yes	Yes
Time F.E.	Yes	Yes	Yes	Yes
N	401	401	403	401
R-squared	0.71	0.65	0.76	0.60
Residual Std. Error	0.78 (df = 357)	0.31 (df = 357)	0.63 (df = 359)	2.13 (df = 357)

*p $<$ .10 **p $<$ .05; Cluster-Robust Standard Errors