VOTER PREFERENCES AND POLITICAL CHANGE: EVIDENCE FROM SHALE BOOMS*

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ABSTRACT

This paper studies how shifts in voter preferences from large wealth shocks affect political change. Support for conservatives rises after shale oil and gas booms and Republican candidates gain votes. Roll-call voting becomes more conservative after shale booms across many issues, including those unrelated to energy. These changes occur because Republicans win seats from Democrats, as opposed to Democratic incumbents voting more conservatively. Even among incumbent Democrats who do vote more conservatively, we find no increase in their re-election likelihood. The results suggest that incumbent politicians face challenges committing to move toward new voter preferences.

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1. INTRODUCTION

How do changes in electoral preferences affect political outcomes? Political theory contrasts two ways in which a democratic system might respond to shifts in voter preferences. At one extreme, electoral competition forces politicians to alter their voting behavior toward the new median voter's preferred outcomes (Downs, 1957; Calvert, 1985). This view implies *large* changes in voting of individual politicians but *small* changes in election outcomes. At the other extreme, politicians hold fast to their ideology, either because of principle or because their past votes make it hard to commit to supporting new policies (Alesina, 1988). This alternative implies *large* changes in election outcomes but *small* changes in the voting behavior of individual politicians, suggesting that political change occurs when voters replace politicians. Our results support this second view.

We design a series of tests to identify how changes in electoral preferences affect political outcomes. Identification is empirically challenging because any number of omitted variables could affect both preferences and outcomes. We meet this challenge by exploiting a large, exogenous and unexpected shock to voter interests from shale discoveries to trace out empirically how the political equilibrium responds. Shale booms stem from combining horizontal drilling with hydraulic fracturing ("fracking"), thus allowing energy companies to exploit previously uneconomic shale oil and gas reserves. Shale development began in 2003 with natural gas, and continued through the end of the decade with oil.

Shale booms resulted in large wealth windfalls for local residents.[2] However, the development of shale reserves has become a politically contentious issue, partly due to

[2]At the local level, Weber, Brown, Pender (2013) estimate that shale development results in $104,000 in wealth creation for the median farm. Similarly, Feyrer, Mansur, and Sacerdote (2015) estimate that one million dollars of new oil and gas production increases wages by $35,000 in a county. Large aggregate effects have also been

environmental concerns. Republicans, traditionally representing business interests, have supported fracking, while Democrats, traditionally representing environmental interests, have been more negative.[3] As a result, local residents in shale areas may have increased their support for Republicans. Beyond the divide on environmental grounds, wealth windfalls may have shifted preferences away from redistributive policies (Brunner, Ross, and Washington, 2011), another area of sharp partisan divide. Exit polling data illustrate the effect of shale on individual voter preferences. The share of self-reported Democratic Party members who vote for the Republican candidate nearly doubles in congressional districts with shale development, relative to other congressional districts. In contrast, there is little difference in Republicans voting for Democratic candidates – if anything, this share falls following shale development (Figure 1).

Our empirical analysis has two main components. First, we study election voting and outcomes. Focusing on the seven states with large shale booms, we find that in areas experiencing shale booms, the Republican vote share increases in U.S. House elections, U.S. Senate elections, U.S. presidential elections, and state gubernatorial elections. In all four types, party matters: voting patterns change *only* when the incumbent local office holder is a Democrat, meaning that voters support a switch from a Democrat to a Republican after booms. As a result, the probability of a change in incumbency increases following shale booms. When a congressional district moves from its pre-boom to post-boom years, the probability of a change in incumbency rises by 13 percentage points, a near doubling relative to the unconditional rate (16 percent). Even more striking, losses by Democrats increase by almost 23 percentage points, whereas shale booms have no effect on incumbents who are Republican. Relatedly, political

documented. For example, Gilje, Ready and Roussanov (2016) estimate a $2.5 trillion increase in U.S. equity market capitalization linked to oil shale.

3 For example, a 2012 Gallup survey shows that while 66% of Republicans support fracking, only 26% of Democrats do. Source: http://www.gallup.com/poll/182075/americans-split-support-fracking-oil-natural-gas.aspx.

competition increases as more candidates run for office, but only in areas with incumbent Democrats. On balance, political change associated with shale development represents among the most significant changes in the U.S. political system in recent times. Shale development is associated with 17 congressional seats changing control from Democrats to Republicans, accounting for nearly half of the Republican majority in Congress as of 2015.

We provide five tests to rule out reverse causality. That is, we consider, but reject, the possibility that shale development happens in an area *because* Republicans dominate locally, rather than vice versa. First, we show that there is no consistent difference in the Republican vote share in House districts between shale and non-shale areas before the onset of booms. Second, since shale areas *are* different based on population density (these areas are more rural), we report similar results for models that include only localities that ever experience shale booms (i.e., we report the 'treatment effect on the treated'). Third, we find no differences in trends in the voting behavior before the onset of shale booms, both graphically and by including pre-trend indicator variables (i.e., we pass 'parallel trends' tests). Fourth, we construct an instrumental variable (IV) alternative to our main specification that fixes the date of the onset of shale booms in all areas to 2003 and exploits cross-sectional variation in exposure to the booms based on the presence of geological shale formations.[4] The IV results are similar to OLS. This test alleviates concerns that contemporaneous political outcomes drive the timing of booms. Fifth, we report regression evidence from exit polls consistent with that of Figure 1: following shale booms, individual tastes shift toward the more conservative, Republican candidates, as voters who self-report as Democrats are more likely to vote Republican (but not vice versa). This shift rules out

[4] As we argue in Section 2, 2003 is the pivotal year in which hydraulic fracturing was combined with horizontal drilling to allow for the economically viable extraction of natural gas (Yergin 2011).

the idea that shale developments have no effect on voter preferences and occur in areas already dominated by Republicans.

In our second set of tests, we study the behavior of office holders using interest-group ratings, which depend on roll-call votes over issues of concern to each group. We consider three conservative groups and four liberal ones. Following shale booms, ratings for congressional office holders *increase* from the three conservative groups and *decrease* from the four liberal ones. Thus, changes in political attitudes stemming from one kind of shock (energy development) spill over into other arenas (civil rights, labor policies, tax policies).

We contrast variation in politicians' voting records at the extensive margin (between office holders) with variation at the intensive margin (within office holders). The comparison is striking in that almost all of the changes come at the extensive margin. For example, when we control for individual fixed effects in our regressions (rather than just geographical effects), there is almost no change in the voting patterns on either conservative or liberal issues. Thus, we find little evidence that office holders themselves alter their voting following shale booms. (It is worth emphasizing that this 'non-result' stems not from lack of statistical power but from big declines in coefficient estimates.)

To explore why voting patterns within office holder change so little, we interact exposure to shale booms with seniority, with party affiliation, or with the closeness of prior elections. Having staked out positions, senior politicians may be less able to signal credibly a change to voters than those with less well-defined voting records (Stratmann, 2000). We report evidence consistent with this idea. We also find that those incumbent Democrats who survive shale booms alter their voting behavior, but the converse is not true. Democrats who *do* change their voting toward conservative positions after shale booms do not increase their chance of staying in power. This helps rationalize why voting within office holder responds so little to shocks to electoral preferences. That is, politicians will not vote against their own ideology if voters will not reward such behavior.

Our results emphasize the importance of interest groups as a key driver of political outcomes. The interest-group approach emphasizes that long-run changes in political outcomes depend on the relative strength and bargaining power of underlying interest groups (e.g., Olsen, 1965; Stigler, 1971; Peltzman 1976, 1985, 1989; Irwin and Kroszner, 1998; Kroszner and Strahan, 1999). Consistent with this view, we find large increases in the strength of conservative and business interests after the shale booms and a big increase in support for Republicans (the traditional supporters of business interests), which leads to large changes in incumbency. Thus, changes in the economic interests of voters affect political outcomes because winners of elections change (the extensive margin).

We also show that ideology, or consistency of voting, dominates the behavior of individual politicians. Office holders are not affected much by changes in the views of their constituencies. At this level, our results are consistent with Poole and Rosenthal (1996), who emphasize the importance of ideology, arguing that U.S. Senators from the same state and party often end up on opposite sides of the same vote. This pattern emerges consistently throughout the history of the U.S. Senate, but it is hard to explain with interest-group factors, since such factors are common for Senators from the same state and party. Consistent with this view, Levitt (1996) shows that office-holder fixed effects explain more than 60% of variation in Senate roll-call votes. Nelson (2002) finds that ideology is even more important in explaining Senate votes on environmental issues. Lee, Moretti, and Butler (2004) find that an exogenous shift in the electoral strength due to incumbency does not affect voting records of politicians. Matsusaka (2015) shows that legislators vote according to ideology, even when in conflict with constituent preferences. Our results support and extend these findings: incumbent politicians' voting responds very little to shifts in voter interests *even when the stakes are at their highest* – when incumbent politicians risk losing power.

Our results also relate to a large literature which has sought to identify the drivers of political change (e. g., Kahn and Matsusaka, 1997; Levitt and Snyder, 1997; DellaVinga and Kaplan, 2007; Montalvo, 2011; Madestam, Shoag, Veuger, and Yanagizawa-Drott, 2013). We extend this literature by documenting that an exogenous economic shock stemming from a technological innovation significantly influences elections and political change. Perhaps more important, we show that political change caused by one particular issue (e.g. energy) can lead to large spillovers on unrelated issues (e.g. civil rights).

Finally, our paper contributes to the literature that studies how access to natural resources affects political outcomes (e.g., Barro, 1999; Ross, 1999; Guriev, Kolotilin, and Sonin, 2011; Tsui, 2011). Carreri and Dube (2016) show that in Colombia positive oil-price shocks lead to electoral gains by legislators affiliated with right-wing paramilitary groups and reduce electoral competition in oil-producing municipalities. In the context of Brazil, Caselli and Michaels (2011) and Monteiro and Ferraz (2012) show that oil booms lead to more patronage and government spending and create an incumbency advantage in local elections. In contrast, we show that shale booms in the U.S. *increase* political competition and *decrease* the incumbency advantage. Unlike in Brazil or Colombia, where governments largely control oil resources, the benefits of shale in the U.S. accrue directly to individual landowners. This mechanism diminishes politicians' ability to extract rents, thus enabling voters to initiate political change.

2. SHALE BOOMS AS A SHOCK TO VOTER PREFERENCES

The advent of shale development is one of the biggest changes in the U.S. economy in the last 20 years and was made possible by rapid technological breakthroughs in the 2000s. The existence of shale oil and gas resources has been known at least since the 1960s, when new gamma ray logging techniques facilitated technological advancements in geology that allowed for the delineation, depth, and thickness of shale to be identified. In 1977 the U.S. Energy Research and Development Administration confirmed that shale contained large amounts of gas and oil, but that new technology was needed to extract the hydrocarbons (Roen and Kepferle, 1993).

Reports and assessments from the 1970s through the 1990s suggest that shale boundaries and characteristics were well known; however, the appropriate technology had not yet been developed to properly extract oil and gas from shale until 2003. Technological breakthroughs began with natural gas, and then were adapted for oil. Mitchell Energy began drilling the Barnett Shale of northeast Texas in the early 1980s (Yergin, 2011). Mitchell encountered natural gas shale, which while holding vast reserves, is highly nonporous and thus difficult to extract. After 20 years of experimentation, in the early 2000s Mitchell found that hydraulic fracturing could break apart shale and free natural gas for collection at the surface. A turning point occurred in 2003, when Devon Energy acquired Mitchell Energy. Devon had expertise in horizontal drilling. Combining the two technological innovations — hydraulic fracturing and horizontal drilling ("fracking") — allowed for the large-scale extraction of shale natural gas for the first time. Signifying the turning point, Larry Nichols (CEO of Devon Energy) stated "By 2003, we were becoming very confident that this drilling truly worked" (Yergin, 2011). The new process spread quickly, making extraction of large reserves from shale economically profitable for the first time.

Shale development has resulted in rapid increases in both natural gas and oil production. According to the U.S. Energy Information Agency, shale gas production has increased from less than 4% of U.S. production in 2000 to 49% by 2015. Similarly, shale oil production has increased from 4% of U.S. production in 2000 to 48% by 2015. Figure 2 plots the number of shale wells drilled by election years. The effect of shale drilling clearly begins with the 2004 election cycle and grows over the subsequent cycles.

Shale development is capital intensive, with many wells being required to extract oil and gas reserves. For example, exploration and production companies may spend up to $128 million of capital on land, labor, and equipment to develop a single square mile of a shale formation. A significant portion of the capital investment on shale directly affects local communities, both by providing royalty payments to mineral owners and by stimulating job growth. Prior to initiating drilling, a firm must first negotiate with a mineral owner to lease the right to develop their land. These contracts typically have a large upfront bonus, paid whether or not the well is productive, plus a royalty contingent on the value of the oil or gas produced over time. Across the U.S., communities have experienced significant fast-paced mineral booms. For example, the New Orleans' *Times-Picayune* (2008) reports that in a matter of a single year bonus payments in the Haynesville Shale increased from a few hundred dollars an acre to $10,000 to $30,000 an acre (plus a 25% royalty). An individual with one square mile (640 acres) leased out at $30,000/acre would receive an upfront payment of $19.2 million, plus a monthly payment equal to 25% of the value of all the gas produced on his/her lease. The size and scale of these payments distinguish these events from other types of economic growth, as well as other types of natural resource extraction (e.g., Glaeser, Kerr, and Kerr, 2015). The media has dubbed those lucky enough to sign these lucrative contracts as "shalionaires."

Shale development also stimulates local job creation and economic activity. Allcott and Keniston (2014) show that resource booms in the U.S. stimulate growth in manufacturing, while Feyrer, Mansur, and Sacerdote (2015) demonstrate that shale booms lead to a substantial increase in income and employment. Gilje (2014) and Plosser (2014) find that shale booms generate liquidity windfalls for local banks, and Gilje, Loutskina, and Strahan (2015) link expansion of credit from the booms to new lending and investment. As an example, Pennsylvania's Bradford County, in the heart of the Marcellus shale, has had 956 shale wells drilled in it. Personal income has risen 25% since the advent of the shale discovery, while business income has increased by 72%. This experience is not unique to Bradford County. The average shale county in Pennsylvania has experienced a 9% increase in personal income and a 24% increase in business income relative to non-shale counties. The intensity of shale development activity in Pennsylvania is similar to the other major shale formations. Hence, we focus on shale development in seven states: the Woodford (OK), Fayetteville (AR), Haynesville (LA + TX), Marcellus (PA + WV), Bakken (Oil ND), and Eagle Ford (TX) reserves. As of 2012, these areas comprised 97.4% of shale gas production and 95.5% of shale oil production.[5] Consistent with these states being the focus of shale development, 92.2% of all horizontal drilling took place in these states. [6]

Media attention also rose after shale booms. Figure 3 reports the number of articles that mention "shale" or "fracking" per paper over our sample period, using a key-word search in

[5] Figures on shale gas are derived from the U.S. Energy Information Agency: https://www.eia.gov/dnav/ng/ng_prod_shalegas_s1_a.htm. Figures on shale oil are based on increases in crude production from 2008 to 2012: https://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbblpd_a.htm. Figures on drilling are based on the Smith International Drilling dataset that we use in our study.

[6] After 2012, there are a number of other states that experienced shale discoveries due to further technological advancements in fracking technology, notably Colorado (oil production increase of 82% from 2012 to 2014), Wyoming (oil production increase of 52% from 2012 to 2014), and Ohio (gas production increase of 616% from 2012 to 2014). Additionally, we exclude Montana as our dataset does not allow us to distinguish shale wells from non-shale development in that state.

Lexis-Nexis among local newspapers with head offices in the seven states affected by shale booms. We separate these data into shale-affected and unaffected areas based on whether the location of the paper's head office ever experiences a shale boom. As expected, there is virtually no mention of shale prior to 2003 in either area. After 2003, however, we see sharp increases in media attention, but the difference between the shale vs. non-shale areas diverges. By 2012, there were more than five times as many articles per paper mentioning shale or fracking in the shale areas than in non-shale areas.

Shale development provides a powerful laboratory to test how politics responds to sharp shifts in voter preferences. Development started suddenly, following the fracking innovation that is exogenous to the underlying characteristics of counties. Since shale booms occurred suddenly and unexpectedly, we can draw a bright line between the pre-boom (1996-2002) and post-boom (2004-2012) election cycles. The sharpness of change increases the power of our empirical tests because we can absorb unobserved heterogeneity with geographical fixed effects yet preserve sufficient within-county variation to get empirical traction.

The booms also have large effects on political interests. The extraction of shale reserves has raised environmental concerns, an area of sharp partisan divide.[7] For example, Republicans have supported lifting the export ban on U.S. crude oil. The ban began in 1973 during the Arab oil embargo. Since shale oil increased U.S. light crude production so quickly, the export ban depressed U.S. crude prices relative to the rest of the world. Democrats only agreed to lift the ban after environmental measures and renewable-energy tax credits were included in the legislation (*Wall Street Journal*, 2015). Thus, voters willing to benefit from shale extraction may

[7] Cragg, Zhou, Gurney, and Kahn (2013), for instance, show that conservatives consistently vote against legislation to reduce greenhouse gas emissions. Relatedly, Cooper, Kim, and Urpelainen (2015) find that shale booms lead politicians to adopt less environmentally friendly policies.

increase their support for Republicans. Shale discoveries may also reduce support for redistributive policies (typically supported by Democrats). Landowners in shale-boom areas receive big inflows of wealth, tantamount to thousands of local residents 'winning the lottery,' which earlier studies have shown lead voters to increase support for conservative, low-tax policies (Doherty, Gerber, and Green, 2006; Powdthavee and Oswald, 2014).[8]

3. DATA AND RESEARCH METHODS

3.1 Data

We use data for the seven states that have experienced shale booms to date: Arkansas, Louisiana, North Dakota, Oklahoma, Pennsylvania, Texas, and West Virginia. Our data on political outcomes span the years from 1996 to 2012 and thus include the pre-boom (1996-2002) and post-boom (2004-2012) election cycles.

3.1.1 Voting Records

We compile data for voting shares at county and district levels from the Congressional Quarterly Press Library. Voting data are only available at district level for elections to the House, but are available by county for the other three types of elections. We collect the number of candidates in House elections from the official election records published by the Federal Election Commission. We exclude uncontested elections, since in such elections the winning vote share is constrained to 100%.[9] We also report somewhat more limited models from exit poll data available for the 2004, 2008 and 2012 election cycles compiled by the Roper Center for

[8] That shale booms result in more conservative and pro-business political attitudes (those typically supported by Republicans) is consistent with Brunner, Ross, and Washington (2011), who find that positive economic shocks in general reduce support for redistributive policies. It is also consistent with empirical evidence that income is a strong predictor of party affiliation (Pew Research Center, 2009) and that future income prospects are an important determinant of individual preferences for redistributive policies (e.g., Alesina and La Ferrara, 2005).
[9] We obtain similar results if we retain uncontested elections in the sample.

Public Opinion Research. These results are less well identified because we have no pre-boom data, but they allow us to draw inferences about individual behavior, whereas overall voting patterns reflect in part changes in the composition of voters.

In some models, we also control for the share of labor in the energy sector as well as a broader measure of economic outcomes (employment growth). These data are available for county-years from the U.S. Census Bureau's County Business Patterns. A congressional district may span several counties, and a county may be part of several congressional districts. To measure employment at district level, we divide county employment between all of the districts in which that county lies. For example, if a given county lies in two (three, four, …) congressional districts, each of those districts will receive ½ (⅓, ¼, …) of that county's employment in a given year.

In all our models, we control for aggregate time effects and unobserved geographical heterogeneity. In our models for Senate, gubernatorial and presidential elections, we remove geographical variation with county fixed effects (since votes are measured by county). In House elections, where measurement occurs by congressional district, absorbing geographical effects is somewhat more complicated because district boundaries change after redistricting.[10] To do so, we introduce county-level 'synthetic' fixed effects. As with standard fixed effects, we include a distinct variable for each county. These county effects 'turn on' whenever a given county is part of the congressional district in question. For example, if a given county is covered entirely by just one district, we would set that county's synthetic fixed effect to one in that district and to zero in all other districts, just like standard fixed effects. If, in contrast, a county is part of two

[10] During our sample period, nationwide redistricting took place after the Censuses in 2000 and 2010. Texas, additionally, redistricted in 2003 and then (by court order) in 2006.

(three, four, …) districts, each of these districts will have this county's fixed effect set to ½ (⅓, ¼, …).[11] This procedure allows us to treat unobserved geographical heterogeneity in a consistent manner despite shifting congressional district boundaries, which would not be possible if we instead used district-level fixed effects.

3.1.2 Roll-Call Votes and Interest Group Ratings

Interest group ratings (other than the ADA score) come from the Congressional Quarterly Press Library. We were provided the ADA scores directly from a representative of the Americans for Democratic Action.

To assess how individual members of Congress respond to shale booms, we focus first on an overall summary of their roll-call votes. The lobbying organization Americans for Democratic Action (ADA) has rated members of Congress along a liberal-to-conservative continuum since 1947.[12] The ADA determines a set of votes to cover a variety of issues, such as judicial, social, economic, and foreign policy.[13] For each of these votes, ADA then determines which side (yea or nay) reflects the liberal view, and constructs an ADA score for each congressional member representing the percentage of times the individual member votes for the liberal side. Thus, the score ranges from 0 to 100, with 100 being most liberal.[14]

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[11] This ensures that each county's fixed effect, when summed up across all districts that cover it, is equal to one.

[12] While ADA is a measure of voting that has been widely used in the literature, another measure of voting behavior of legislators is DW-NOMINATE scores (McCarty, Keith T. Poole, and Rosenthal, 1997). We obtain similar results when we use DW-NOMINATE scores instead of ADA scores.

[13] According to the Congressional Quarterly, the ADA chooses "Votes selected (to) display sharp liberal/conservative divisions un-blurred by extraneous matters. ADA therefore often chooses procedural votes, since votes on rules for debate, on procedures for amending legislation, or on amendments themselves may reveal basic attitudes obscured in a final vote of passage or defeat."

[14] ADA treats absences in the final voting analysis as votes against the liberal side. Hence, a failure to vote lowers a member's score.

Other interest group ratings also rely on roll-call voting data but focus on narrower causes. Thus, the specific interest group ratings allow us to assess whether shale booms potentially spill over into areas not directly affected by energy policies, such as civil rights or labor issues. On the conservative side, we use the ratings of three interest groups: the American Conservative Union (ACU), which reflects the broad interests of conservatives; the U.S. Chamber of Commerce (CCUS), which reflects business interests; and the National Taxpayers Union (NTU), which supports low taxes and small government. Each score varies from 0 to 100, with 100 representing the maximum support; hence, an *increase* in these scores reflects greater support for these three conservative causes. On the liberal side, we consider three additional groups: the American Civil Liberties Union (ACLU), which supports civil rights and individual liberties;[15] the Committee on the Political Education of the AFL-CIO (COPE), which reflects the interests of labor and labor unions; and the League of Conservation Voters (LCV), which reflects the interests of environmental protection. Each liberal score also varies from 0 to 100, with 100 representing the maximum support; hence, a *decrease* in these scores reflects greater support for conservative causes.

3.1.3 Shale Data

Information on shale development comes from Smith International Inc. These data provide details on the time (year), place (county), and type (horizontal or vertical) of all well drilling activity in the United States. We use horizontal wells drilled after the shale technological breakthrough as the key measure of shale development activity, because the majority of horizontal wells in the U.S. drilled after 2002 target shale or other unconventional

[15] Votes used in the computation of the ACLU score are drawn from both years of a given Congress. Therefore, the same rating score is provided for both years of each Congress. To address this issue, we alternatively dropped from the sample ACLU scores in odd (or even) years and obtained similar results.

formations (Gilje, 2014). Since not all shale resources are economically viable, we focus on the realized number of wells as the primary indicator of how good the geology is in an area, as well as how large of an economic impact shale has on an area (Gilje 2014). We allocate wells to congressional districts in the same manner in which we allocate county-level employment to congressional districts (described previously).

As the maps in Figure 4 show, each state contains a large number of counties that experienced shale booms as well as a large number of non-boom counties. As this figure also shows, there is a clear spatial correlation across shale counties. Moreover, Allcott and Keniston (2014) and Feyrer, Mansur, and Sacerdote (2015) report evidence of economic spillovers from shale to non-shale areas located nearby. In our empirical models, we use double-clustering by county/district to account for serial correlation across observations pertaining to the same county/district and by state-year to account for cross-sectional dependence across areas. In addition, we report our main model including *only* areas that eventually experience a shale boom, thus eliminating the possibility that results are affected by spillovers to adjacent areas that did not experience booms.

3.2 Empirical Models

3.2.1 Share of Votes to Republican

For elections to the U.S. Senate, the Governorship, and the Presidency, we estimate voting models of the following form:

$$Republican\text{-}Share_{i,t} = \alpha_t + \beta Log\ (1+Wells)_{i,t} + Economic\ Controls +$$

$$County\ Fixed\ Effects + \varepsilon_{i,t}\ , \qquad (1)$$

where *i* represents county and *t* represents each unique election cycle. *Republican-Share* equals the percentage of votes cast for the Republican candidate.[16] We use *Log (1+Wells)* to allow us to keep the zero observations during the pre-boom period and, at the same time, correct for the right skew in the raw number of wells.

We consistently include the α_t (time effects), which allow unconstrained aggregate changes in the strength of Republican support over time, such as those associated with a presidential candidate's so-called 'coat tails'. We also include county fixed effects, which account for time invariant differences in support for Republicans. Standard errors are double clustered at county level (to account for serial dependence) and also at state-year level (to account for cross-sectional dependence). In addition, we estimate our models with and without two economic control variables; these capture overall economic growth (using employment growth) as well as the importance of the energy sector (using the share of employment in the energy sector). In some models, we also introduce a *Republican-Incumbent* indicator, along with its interaction with *Log (1+Wells)*. This specification allows us to test whether changes in economic interests that follow shale booms affect the two major parties differently.[17] In the case

[16] We have also estimated similar models counting only votes for the two major parties. These results are very similar to those reported here.

[17] Defining incumbency needs some elaboration. We switch *Republican-Incumbent* to one in either of two cases: 1) the incumbent ran for re-election and was Republican; or, 2) the incumbent was Republican but chose not to run. The reason for the second condition is that the decision to run itself may be shaped by political realities that affect an incumbent's likelihood of winning. Special attention also needs to be paid to redistricting. After redistricting, districts sometimes have an incumbent and sometimes don't. Generally, each of the redistricted areas will have at least one of the incumbent Congress members residing in the district. In fact, districts are often gerrymandered to put vulnerable Congress members from the opposition party into unwinnable districts. Generally, Congress members that reside in a district are then assigned as incumbents to those districts (sometimes incumbents can choose in which district they will run). In three cases in our sample, two incumbents were assigned to the same district. If at least one of these assigned Congress members is Republican, we set *Republican-Incumbent* to 1. If a district has no incumbent assigned to it after redistricting (we have five of these cases), we set *Republican-Incumbent* to 0. Our results are robust to also dropping these observations.

of presidential elections, we use the party of the incumbent Governor, since this will provide some cross sectional variation in party strength across the seven states in our sample.[18]

For the U.S. House elections, the models are structured similarly but with two differences. First, we replace the county fixed effects with the synthetic county effects described above. Second, we double cluster at the congressional district level (since this is the level at which we measure votes) as well as the state-year level. In all cases we map *Log (1+Wells)* to the outcome based on the relevant geographical unit of analysis.

3.2.2 Exit Polling

One issue that equation (1) misses is the *source* of changes in voter preferences. Vote shares can change because individual voters' preferences shift (e.g., former Democrats become Republican voters), because the composition of voters shifts (e.g., Republican relative turnout rises), and because new (e.g. mostly Republican) voters enter the county or district. In fact, some shale boom areas experience strong in-migration and entrants may have preferences that differ from existing residents.

To understand individual-level voting decisions, we exploit exit polling data available at the individual level for the last three presidential election cycles (2004, 2008, and 2012). Since all of these years reflect post-shale boom periods, we are no longer able to control for geographical heterogeneity with fixed effects. However, the exit polls ask voters to self-report their normal party affiliation – Republican, Democrat, Independent or Other – so we can control for an individual's normal voting behavior, which will account for the fact that some areas are persistently more or less conservative than others. Thus, we can test whether individuals become

[18] In any given year, there is no cross-sectional variation in the identity of the incumbent President.

more likely to vote Republican, relative to their self-reported typical behavior, with shale booms. Specifically, we estimate the following:

$$Voted\ Republican_{j,t} = \alpha_t + \beta Log\ (1{+}Wells)_{i,t} + Economic\ Controls\ +$$

$$Voter\text{-}Party\ Affiliation\ Fixed\ Effects + \varepsilon_{j,t}\ , \qquad (2a)$$

where j varies across individuals, i varies across districts, and t varies with time. These data, it should be noted, are not panel, as each election cycle reflects a fresh set of respondents.

As an alternative to control for party affiliation on the right-hand side of (2a), we estimate a second model that incorporates this information into the dependent variable. We code *More Conservative* to reflect a voter's tendency to move toward the more-conservative direction. Specifically:

$More\ Conservative_{j,t}$ = 1 if $voter_{j,t}$ votes Republican and reports Democrat affiliation;
$More\ Conservative_{j,t}$ = 0 if $voter_{j,t}$ votes Republican and reports Republican affiliation;
$More\ Conservative_{j,t}$ = 0 if $voter_{j,t}$ votes Democrat and reports Democrat affiliation;
$More\ Conservative_{j,t}$ = -1 if $voter_{j,t}$ votes Democrat and reports Republican affiliation.

After dropping respondents who self-report as Independent or Other (and those who do not vote for one of the two major parties), we estimate the following model:

$$More\ Conservative_{j,t} = \alpha_t + \beta Log\ (1{+}Wells)_{i,t} + Economic\ Controls + \varepsilon_{j,t} \qquad (2b)$$

3.2.3 Probability of Change in Incumbency

To assess whether shale booms affect election winners, we model the probability of a change in incumbency for U.S. House elections with a linear probability model, as follows: [19]

$$\textit{Indicator-for-Incumbency-Change}_{i,t} = \alpha_t + \beta \textit{Log}\ (1{+}\textit{Wells})_{i,t} + \textit{Economic Controls}$$

$$+ \textit{Synthetic-County Fixed Effects} + \varepsilon_{i,t} \qquad (3)$$

We focus only on House elections in estimating (3) because the other offices change too infrequently.[20] As above, we also augment this model with *Republican-Incumbent* and its interaction with *Log (1+Wells)*.

3.2.4 Roll-Call Votes and Interest Group Rating

As noted, we use the ADA score and scores from interest groups to assess individual voting behavior of House members. These models have the following structure:

$$\textit{Score}_{i,t} = \alpha_t + \beta \textit{Log}\ (1{+}\textit{Wells})_{\mathrm{i,t}} + \textit{Economic Controls} + \textit{Synthetic County Fixed Effects}$$

$$+ \textit{Individual Fixed Effect} + \varepsilon_{i,t} \qquad (4)$$

In these models we continue to control consistently for both time effects as well as geographical effects to remove time-invariant heterogeneity in local interests. But with these data we can also assess how the results depend on the inclusion or exclusion of individual fixed effects. Including these effects removes all variation at the extensive margin (i.e., variation stemming from changes

[19] We estimate equation (3) with a linear probability model due to the high number of fixed effects (see Greene, 2004).

[20] Note that, unlike vote shares, the outcome of presidential elections varies only at the national level and is therefore entirely absorbed by time fixed effects, thus making equation (3) inestimable for presidential elections. We have estimated equation (3) for Senate and gubernatorial elections. However, these models have very little power since the outcomes for election transitions in these elections are determined at the state level and therefore do not vary by district or county.

in election winners) because all of the variation that remains reflects within-individual changes in outcomes. Thus, by comparing results with and without individual fixed effects, we can assess the degree to which politicians themselves change their behavior when local interests shift. We also test whether the effects of *Log (1+Wells)* depends on the seniority of a given member of Congress or on the closeness of the previous election.

4. RESULTS

4.1 Summary Statistics

Table 1 reports summary statistics for county-level election variables (Panel A), district-level election variables (Panel B), politician-level interest group rating variables (Panel C), and voter-level respondent variables from exit poll data (Panel D). In Panel E, we compare observable characteristics of areas the experienced booms ('treated' areas) with those that did not ('control') in 2002, the last year before the onset of fracking.

The table reports total shale wells and *Log (1 + Wells)*, our main explanatory variable of interest. We also report the distribution of each of these both with and without the zero observations, since we intentionally include data before 2003 to generate meaningful within-county (within-district) variation. During our sample, shale drilling occurs in about 24% of the county-year observations (1,165/4,866). In the booming county-years, the average number of wells drilled is 59.7 (7 at the median). The data are heavily skewed in levels, however, even without the zero observations. In contrast, the log transformation alleviates this problem, with mean and median values close to each other. In assessing statistical significance, a useful benchmark is to consider the effect on political outcomes when we move *Log (1+ Wells)* from no drilling (its pre-boom value) to its post-boom mean (i.e. when drilling is non-zero), a change of

2.5 at county level (Panel A). The average share of votes to Republicans exceeds 50% in all election types. This comes as no surprise as the states that we study are so-called 'red states', in which Republicans win the majority of votes in all election types (and they also hold the majority of seats).

In our models of vote shares and incumbency for U.S. House elections, we analyze data at district rather than county level (Panel B). Since these are larger geographical areas, the share of non-zero shale districts rises to more than 40% (200/498). At this larger level of geographical aggregation, a move from zero to the post-boom average of *Log (1+Wells)* equals 3.7. Panel B of Table 1 also shows that the probability of a change in incumbency is quite low, at just 16% of the House elections in our sample.

Panel C provides further support that these seven states are 'red'. The average scores from the liberal interest groups are all below 50: 35.7 for ACLU, 34.1 for LCV, and 46.7 for COPE. Conversely, these scores are high for the conservative interest groups: 58.1 for ACU, 72.3 for CCUS. [21] The one exception is the NTU, where the average is below 50. The ADA score, which attempts to cover all issues, averages 38.5; thus, the majority of roll-call votes represent the conservative side of the issues. These scores, however, have quite wide distributions, with standard deviations of 25 to 40 points. Much of this variation is explained by fixed effects, however, because some areas are consistently more conservative than others. To assess economic significance of shale booms on voting patterns, we thus use the variation that remains after removing time and geographical effects, which reduces these by about half (to 15 to 20 points).

[21] Not all scores are available for all members of Congress in all years, which explains slight variations in the sample sizes.

Panel D provides summary statistics on individual level respondent variables from exit poll data. The observations span presidential elections from 2004 to 2012. Exit polls for elections prior to 2004 do not have the congressional district information that we need for our tests; therefore, we do not have a pre-boom period for the data. Additionally, the data are not structured as a panel, as different respondents are polled in different elections. There is also significant variation on which congressional districts are polled in an election. For example, in 2004 Pennsylvania's 12th district was heavily polled, while in 2008 and 2012 it was not. Therefore, for much of our analysis we will rely on using district level control variables, and also whether a respondent is deviating from the party they typically associate with (e.g., vote Republican but view themselves as Democrat).

If shale areas had consistently higher dominance of Republican support in the pre-period, one might worry that shale developments happen *because* of political support. Panel E helps rule out this possible reverse causality.[22] There is no consistent tendency for shale-boom areas to have Republican dominance in the pre-boom period. For House and Senate elections, there is no difference in the vote shares between shale and non-shale areas. For presidential elections, the Republican share is significantly higher in shale areas, but the opposite is true for gubernatorial elections. These comparisons are important for drawing a causal link from shale booms to political outcomes.[23]

[22] We compare shale and non-shale areas in 2002, the year immediately preceding the earliest shale breakthroughs. Not all elections were held in all counties in 2002; in such cases we use the latest available election before 2002.
[23] Shale areas do look different based on population. In robustness tests, we offer a test based only on treated areas, which helps alleviate the concern that treated v. control observations may differ across unobservables.

4.2 Voting and Shale Booms

Table 2 reports estimates of equation (1). We estimate the model for legislative elections to the U.S. House and Senate (Panel A), and executive branch elections for Governor and President (Panel B). Each panel reports four specifications: 1) a simple model that includes just *Log (1+Wells)* plus fixed effects; 2) a model that adds economic controls (column 2); we then augment each of these two specifications with the *Republican-Incumbent* indicator and its interaction with *Log (1+Wells)*. In the models for the Presidency, we use the party of the sitting Governor to define *Republican-Incumbent* to capture variation in both time-series and cross-state dimensions.

In all elections, support for Republican candidates rises after shale booms. The increase is not affected much by inclusion or exclusion of economic control variables. For House elections, we can assess magnitudes by multiplying the coefficient by 3.7, the change in *Log(1+Wells)* from 0 (pre-boom) to its mean level for post-boom district-years. From column (1), this change equals 3.2 percent of the total votes (=0.865*3.7). This change is very large relative to the variation in the *Republican Share* after removing the time and geographical fixed effects (about 7 percentage points for House elections). Even more striking: all of the increase comes when Democrats hold the seat. Specifically, the sum of *Log (1+Wells)* and its interaction with *Republican-Incumbent* (1.222 – 1.289) is not statistically significantly different from zero. In contrast, the economic magnitude in cases of Democrat incumbency rises to 4.5 percentage points (=1.222*3.7). We observe even larger effects in the Senate elections.

In Panel B, we see very similar patterns for elections to Governor or President. Specifically, support for Republicans increases with shale booms, but only when the incumbent in power is Democrat. As in Panel A, economic magnitudes are large. For example, when the incumbent is Democrat, the advent of a shale boom increases votes for Republicans by 3.9 percentage points in gubernatorial elections (=1.574*2.5, where 2.5 equals the change from zero to the post-boom mean of *Log (1+Wells)* for counties that had shale booms). The change is very large relative to the variation in *Republican-Share* after removing time and geographical effects (6.9 percentage points for gubernatorial elections). We see similar effects of shale booms on elections to the President.

4.2.1 Ruling Out Reverse Causality

We argue that shale booms cause changes in *local* voting preferences, leading to big wins for Republicans. However, one might object that the reverse could explain some of our results: if local control by Republicans increases support for pro-energy policies, this might stimulate investments in shale and lead to energy booms.

We offer several pieces of evidence to rule out reverse causality. First, shale booms *precede* shifts in local political outcomes. Figure 5 uses data for each of the four election types to show graphically that pre-boom trends are parallel. We plot the coefficients on a sequence of 'event time' indicator variables for elections with Democrat incumbents, as these areas are where the effect is concentrated. The number of coefficients plotted differs by election type, because some elections (House and Senate) occur more often than others (Governor and President). We include time and geographical fixed effects as well the other control variables used in our main regressions. As an example, the specification for presidential elections follows:

$$Republican\text{-}Share_{i,t} = \alpha_t + \beta_1 D^{-2} + \beta_2 D^{-1} + \beta_3 D^{0} + \beta_4 D^{1} + \beta_5 D^{2+}$$

$$+ \beta_6 D^{-2} *RepInc + \beta_7 D^{-1} *RepInc + \beta_8 D^{0} *RepInc + \beta_9 D^{1} *RepInc + \beta_{10} D^{2+} *RepInc +$$

$\beta_{11} RepInc + Economic\ Controls + County\ Fixed\ Effects_i + \varepsilon_{i,t}$.

Figure 5 (the bottom right panel) plots coefficients β_1, β_2, β_3, β_4, and β_5 (with 95% confidence intervals). To be clear, D^0 is set to one in the year that a given county's shale boom begins, based on having drilled the county's first shale well. Shale discoveries occur at different times, so the event time indicators are set to one in different years in different counties. For example, a county that experiences a boom in 2012 will have $D^0 = 1$ in 2012 and zero all other years; $D^{-1} = 1$ in 2008 (for presidential elections) and zero in all other years; and $D^{-2} = 1$ in 2004 (for presidential elections) and zero in all other years. Therefore, the coefficients measure *Republican Share* relative to the omitted categories (event time minus three and earlier). The graph shows no significant difference (or trend), comparing shale and non-shale districts in years just prior to booms. Thus, support for Republicans increases after shale booms, not before.

Second, Panel A of Table 3 offers similar evidence to that of Figure 5 using the regression set-up of equation (1). Now, we add indicators set to one in the two election cycles leading up to the first shale well development. The indicators are set to zero for all other observations. As noted before, shale discoveries occur at different points in time, so the pre-boom indicators are set to one in different years depending on the exact timing of a shale discovery. We find that these indicators are never significant. Moreover, we find that adding these has almost no impact on the point estimate for *Log (1 + Wells)* and its interaction with *Republican-Incumbent*. Overall, these results provide no evidence of reverse causality: that is, shale booms lead to increased support for Republicans, but the reverse does not hold.

Third, we re-estimate our model using only areas that eventually experience shale booms (Table 3, Panel B). This alternative helps alleviate two concerns. First, the non-shale areas appear to be different on one observable – they tend to be larger and more urban (Table 1, Panel E). Second, spillovers to areas near shale booms may themselves be affected (Allcott and Keniston, 2014; Feyrer, Mansur, and Sacerdote, 2015). The results suggest that the main message holds, although the results for gubernatorial elections are not statistically significant (while signs remain the same).

Fourth, policies governing shale and fracking are set at the *state* rather than the local level.[24] Thus, local political factors are unlikely to drive shale developments. In some cases, communities have attempted to ban fracking (e.g., over earthquake concerns). In Oklahoma the State Legislature responded by passing legislation clarifying the role of the state in regulating oil and gas activities and preventing cities and counties from banning drilling activities (*Oklahoma Senate Bill 809*). In fact, in every instance where fracking has been banned locally, and the ban has been challenged, the state has asserted its authority to determine where and when fracking takes place in courts or with state legislation (overturning bans in Denton, TX; Longmont, CO; St. Tammany, LA; Mora County, NM; Broadview Heights, OH; Morgantown, WV; Grant Township, PA – fracking water disposal wells). Judicial rulings have concluded that state governments determine where and when fracking may take place. Below is a quote from a Federal judge in Pennsylvania:

[24] Each state in our sample has a state regulatory body that issues drilling permits and regulates oil and gas activities. These are the Oklahoma Corporation Commission (OK), Texas Railroad Commission (TX), Arkansas Oil and Gas Commission (AR), North Dakota Industrial Commission (ND), Louisiana Department of Natural Resources (LA), Pennsylvania Department of Environmental Protection (PA), West Virginia Department of Environmental Protection (WV).

"There is no state authority expressly granting a municipal government or its people the authority to regulate the depositing of waste from oil and gas wells or to invalidate permits granted by the state or federal government. Any provision enacted without underlying legislative authority is invalid and unenforceable."

- Magistrate Judge Susan Baxter

While state control predominates, some areas did delay shale investments, and in some cases the bans have not yet been challenged. Hence, we offer one more test to remove this last potential source of endogeneity. We do so by building an instrument for *Log (1 + Wells)* that depends on shale development across all areas multiplied by each locality's access to booms from to its exogenous geological endowment of shale.[25] Specifically:

$$Instrument\ for\ Log(1+Wells_{i,t}) =$$

$$Log(1 + Total\ Wells_t * (Local\ Shale\ Geology\ Sq.\ Miles_i\ /\ Total\ Shale\ Geology\ Sq.\ Miles))$$

The instrument gets its time-series variation from the total number of shale wells drilled across all seven states ($Total\ Wells_t$), and its cross-sectional variation from the geological presence of shale in an area ($Local\ Shale\ Geology\ Sq.\ Miles_i\ /\ Total\ Shale\ Geology\ Sq.\ Miles$).[26] Both dimensions are exogenous from the perspective of local decision makers. The value of the instrument is set to zero in all years for areas that have no shale (i.e., counties in which $Local\ Shale\ Geology\ Sq.\ Miles_i = 0$), and it equals zero for all counties in years before 2003. The

[25] We have also verified that our results are robust to excluding from the sample all counties that have ever instituted fracking bans.

[26] We collect information on shale formation geology from the U.S. Energy Information Agency (see https://www.eia.gov/maps/layer_info-m.cfm). As noted previously, the boundaries of shale formations have been delineated in the 1970s and 1990s, prior to shale booms.

within-area estimator remains identified because we have both time series and cross sectional variation.

Panel C of Table 3 reports the results of IV estimation for each election type. Here again we find very consistent support for the idea that the advent of shale increased support for Republican candidates, and that this increase occurred only in cases where the incumbent candidate was Democrat (i.e. the sum of the coefficients on *Log (1 + Wells)* and *Republican-Incumbent * Log (1 + Wells)* is close to 0). Sign patterns remain the same, and coefficient magnitudes are close to OLS across all election types except Governor (where they are larger, but also with much larger standard errors). Some coefficients lose significance, but this is not too surprising given the increase in standard errors.[27]

4.2.2 Exit Polls

Table 4 reports estimates of Equations (2a) and (2b) using individual level exit poll responses. These data are available for the 2004, 2008 and 2012 election cycles with consistent questions regarding both votes for the Presidency as well as for the local House election. Thus, we report estimates for each dependent variable (*Voted Republican* and *More Conservative*) for the two election types, and we estimate each of these with and without the economic controls (eight specifications).

The results provide very robust evidence that individual voters gravitate toward more conservative, Republican candidates in areas with shale booms. The magnitude remains large, and is quite consistent with what we see in the overall vote shares. For example, increasing

[27] In the Internet Appendix, we report the first-stage regressions and show that our instruments pass the tests for weak instruments. We also report subsequent models using the IV, which have been left out of the main paper in the interest of brevity.

Log(1+Wells) by one standard deviation (=2.46 in this sample) raises a voter's probability of choosing the Republican running for Congress by about 3.7 percentage points (=0.015 * 2.46, based on column 2) and 4.4 percentage points for the Presidency (=0.018 * 2.46, based on column 4). Since the regressions control for the voter's normal behavior with party affiliation indicators, these effects reflect a change in behavior relative to voters' self-reported political preferences. The last four columns of Table 4 suggest that most of the variation in voting stems from Democrat-affiliated voters switching toward the Republican choice. These results are similar to the indicator models in terms of statistical significance, but the magnitudes are smaller because we code *More Conservative* as -1 when Republican voters choose a Democrat candidate.

<u>4.3 Incumbency, Political Competition, and Shale Booms</u>

Table 5 (panels A and B) reports estimates of the probability of a change in incumbency (equation 3). As in Table 2, we report four specifications: with and without economic control variables, and with and without the *Republican Incumbent* and *Republican Incumbent * Log (1 + Wells)*. We report these models only for House elections because, as noted previously, there is not sufficient variation for the other, less frequent, elections.

The results suggest that the shift in voting patterns translates into a large change in incumbency, and that the effect is driven by changes *from* a Democrat incumbent *to* a Republican election winner. In the simple model (column 1), the coefficient on *Log (1 + Wells)* suggests that the overall probability of a change increases by 13 percentage points (=0.035*3.7). This almost doubles the unconditional transition probability of 16 percentage points (recall Table 1). Moreover, as with the voting data, the effect is dominated by transitions from Democrats to

Republicans (columns 3 & 4). When a Democrat holds the incumbency, the probability of transition rises by 23 percentage points (=0.061*3.7).[28]

In Panel B, we de-construct the dependent variable into four mutually exclusive outcomes for election transitions: (1) from Republican to Republican (columns 1 & 2); (2) from Republican to Democrat (columns 3 & 4); (3) from Democrat to Republican (columns 5 & 6); and, (4) from Democrat to Democrat (columns 7 & 8). In columns 1-4, we include only elections in which the incumbent is Republican (N=267), and in columns 5-8 we include only Democrat incumbent elections (N=231). Consistent with Panel A, we only find an increase in switches from Democrat to Republican. In fact, the point estimate signs negatively in transitions from Republican to Democrat (although magnitudes are small).

Losses by incumbents suggest greater political competition following shale booms. One potential mechanism is that shale booms give rise to new challengers who can better represent the interests of the new median voter. Consistent with this idea, Panel C of Table 5 documents an increase in the number of individuals running for House elections after shale booms. As with the results for vote shares and incumbency, elections in which the incumbent is a Democrat drive the increase.

4.4 Roll-Call Voting and Shale Booms

Tables 6A and 6B report estimates of changes in voting records by individual House members. We report models for the ADA score (Table 6A), which captures overall voting behavior on a conservative (most conservative ADA = 0) to liberal scale (most liberal ADA = 100). We then report similar models for three liberal and three conservative interest groups

[28] For robustness, we also estimated equation (3) after dropping all transitions in which the incumbent attempted a run for higher office (Senate, Governorship, or Presidency) and obtained similar results.

(Table 6B). These latter results allow us to assess whether shifts in preferences stemming from one kind of shock – shale booms – spill over into other policy decisions.

Table 6A reports eight specifications for the ADA score. The first two (with and without economic variables) control only for fixed time and geographical heterogeneity. Thus, these models leave variation coming from the extensive margin (transitions) in the model. The last six specifications take out variation at the extensive margin by adding individual fixed effects. In these models, we also introduce the seniority of each House member, along with its interaction with *Log (1+Wells).* Adding this variable allows us to test whether a House member's reputation – based on the number of years spent voting on various issues – constrains his or her ability to adjust to changing voter preferences. We model seniority either with a linear specification or by taking the log of the number of terms in Congress.

We find, consistent with the election results, very strong evidence that shale booms reduce support for liberal causes and increase support for conservative ones. As a summary, the ADA score falls by about 14 points (= -3.799 *3.7) when a district moves from pre-boom to the average value of *Log (1+Wells)* in the post-boom years. This change is meaningful relative to the overall variation in ADA (standard deviation = 38 points), but a better benchmark is to compare this 14-point change with the amount of variation in ADA scores after removing the time and geographical fixed effects (root mean square error = 19 points).

From Table 6B, we find that support for liberal causes falls, even those that would seem to have little to do with energy policies, such as civil rights. For example, the ACLU score drops by 15 points (= -3.997 * 3.7), a very large drop relative to its root mean square error of 17 points. Conversely, support for conservative causes increases consistently.

Once we control for individual fixed effects, *all* of the coefficients on *Log (1 + Wells)* fall, and most fall very substantially. For example, the effect of shale booms on the ADA score changes from -3.799 to -0.599 (compare column 1 with column 3 in Table 6A). Notice that the coefficient with individual effects is measured quite precisely – the standard error equals 0.430. So, lack of power is *not* the reason for the decline in statistical significance. In columns (5)-(8) of Table 6A, we test whether seniority affects politicians' responses to shale booms. We find that less senior politicians are more prone to change their views in the advent of shale booms than more senior politicians, consistent with the idea that it is difficult to credibly commit to new policy after having staked out positions in the past.

4.4.1 Do Marginal Candidates Change Their Voting?

We have shown that election outcomes change dramatically following shale booms toward Republican (and conservative) candidates, leading to large election losses among Democrats. Within individual, however, we find much less of an effect of shale booms on voting records. These results together suggest that most politicians hold fast to their ideology and, as a result, many lose power. But some Democrats do not lose power. Do these survivors change their voting behavior? Panel A of Table 7 addresses this question by conditioning the sample on political party and re-estimating the within-individual models for the ADA voting score. This analysis shows some evidence that surviving Democrats do alter their voting records toward more conservative positions.

To avoid the survivorship bias in Panel A, Panel B of Table 7 considers the ADA scores for marginal candidates *without* conditioning on the party. Instead, we introduce an interaction of *Log (1 + Wells)* with measures of the closeness of the previous election. If the past election were close, we would expect a greater response within individual politicians to changes in voter preferences elicited by shale booms. Following Lee, Moretti, and Butler (2004), we define close elections as those in which the winner received strictly less than 52% of the vote. To investigate how politicians' behavior changes in the vicinity of the 52% threshold, we additionally build an indicator variable for elections in which the winner received between 52% and 54% of the vote. In both cases, we find that closeness does not significantly interact with *Log (1 + Wells).* Overall, there is not robust evidence that politicians change their voting behavior in response to shale booms, even when those politicians risk losing power.

4.4.2 Do Vote Changes Matter?

We have shown that Democrats lose to Republicans in large numbers following shale booms. More conservative voting patterns across a wide range of issues also come with shale, but this more conservative voting happens from electoral transitions. Within office holders, votes change little on average. This may occur: 1) because ideology inhibits a politician's willingness to change; or, 2) because vote changes have little effect on the likelihood of maintaining power (so the incentive to change is weak).

To separate these two explanations, we ask: do Democrats who move toward conservative positions get rewarded by voters? We therefore revisit the incumbency regressions from Table 5, introducing variables that capture changes in individual incumbent office holder's voting patterns between the first and second year of each incumbent's House term. If voting more conservatively helps Democrats keep power, then this variable ought to help explain transition probabilities from Democrat to Republican after shale booms. Thus, we re-estimate the incumbency model from equation (3) above, as follows:

$$Indicator\text{-}for\text{-}Incumbency\text{-}Change_{i,t} = \alpha_t + \beta^1 Log\ (1{+}Wells)_{i,t} + \beta^2 \Delta Vote_{i,t} + \beta^3 (\Delta Vote){*}Log\ (1{+}Wells)_{i,t} + Economic\ Controls + Synthetic\text{-}County\ Fixed\ Effects + \varepsilon_{i,t}\,.$$

We code $\Delta Vote_{i,t}$ in four different ways: 1) the change in the ADA score for the incumbent; 2) an indicator equal to 1 for the 10% of office holders who reduce their ADA scores most; 3) the change in the League of Conservation Voters (LCV) score for the incumbent; or, 4) an indicator equal to 1 for the 10% of office holders who reduce their LCV scores most. The indicator variable specifications identify those Democrat incumbents who move their voting positions most aggressively toward the more-conservative direction.[29] We estimate voting records based on the ADA score because it captures a bundle of issues, and we estimate voting changes based on the LCV score, which focuses on those issues most relevant to an energy boom – issues regarding protection of the environment.

Table 8 reports these estimates, along with baseline models that replicate the results from Table 5, Panel B (columns 5 & 6). (The sample is slightly smaller because the ADA and LCV scores are not available in all years for all office holders.) These regressions reveal no evidence that voting adjustments help maintain power. Those Democrat incumbents who move most toward the conservative direction do *not* fare better following shale booms. These 'non-results' emphasize the weak incentive for politicians to change, and helps rationalize why voting within office holders responds so little to shocks to electoral preferences. Politicians have little reason to vote against their own beliefs when such costly (to them) behavior is not being rewarded by voters.

[29] Alternatively, we defined large changes in ADA and LCV scores as cases in which a representative's score fell by more than 10 points and obtained similar results.

5. CONCLUSIONS

We explore the mechanisms by which the political system responds to large changes in local interests. In 2003, Mitchell Energy demonstrated the economic utility of hydraulic fracturing to extract gas and oil from shale reserves. This new technology spurred an unexpected economic boom that brought large wealth windfalls to local landowners. Consistent with past research, we find that this positive wealth shock led voters to increase their support for conservative, Republican candidates. We show that almost all of the adjustments to these exogenous changes in taste occur at the extensive margin, as Democrats lose seats to Republicans. As a result, voting records of representatives elected from boom districts become sharply more conservative on a variety of issues. A shock to political preferences from one arena (energy development) spills over into other arenas (civil rights, labor policies, tax policies).

Despite these seismic changes in political outcomes, we find almost no evidence that individual politicians alter their voting positions to cater to shifting local interests. This lock-in may happen because past votes constrain a politician's ability to commit to new policies in the future. We find some evidence for this mechanism, as even those Democrats who do shift their voting toward more conservative positions after shale booms are not rewarded by voters.

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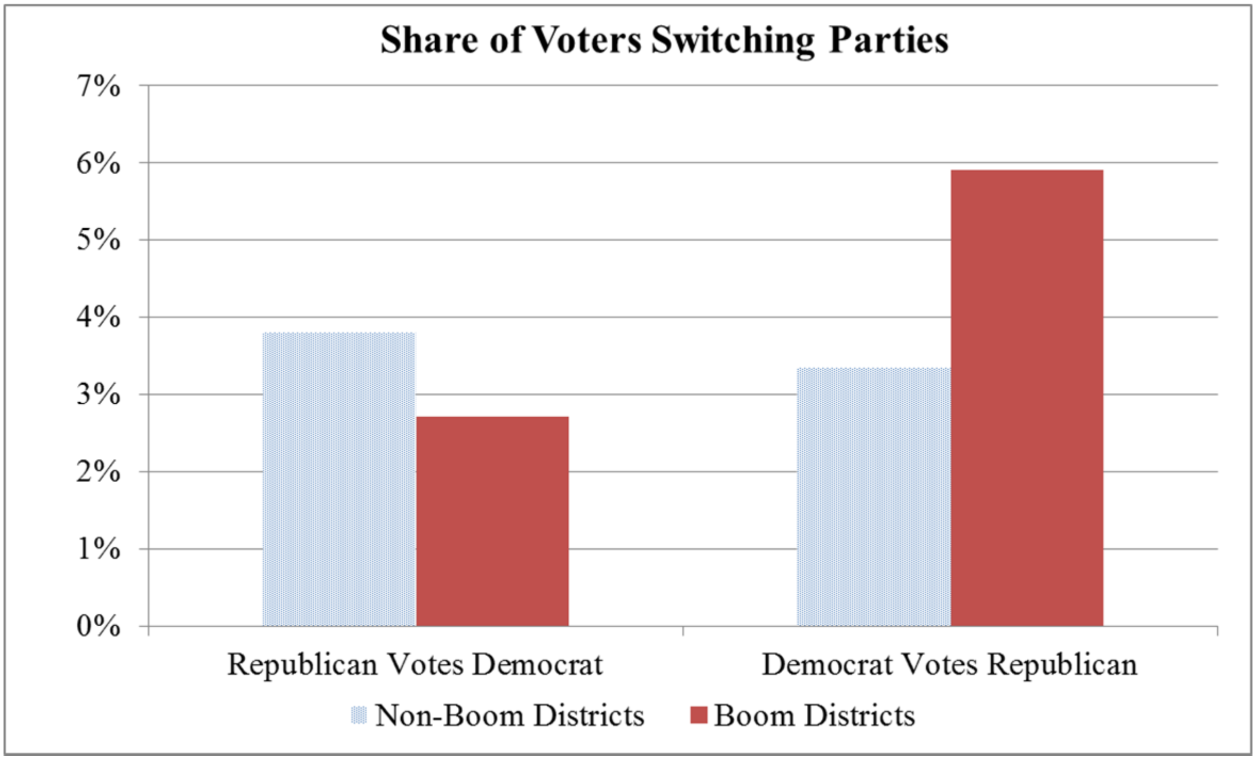

Figure 1: Booms and Exit Poll Respondents (House Districts)

This figure plots the percentage of overall respondents that self-identify as a particular party, but vote for the opposite party. The figure compares the percentage of switchers in boom districts (districts with some shale activity) vs. non-boom districts. The figure is based on exit poll data from the 2004, 2008, and 2012 elections.

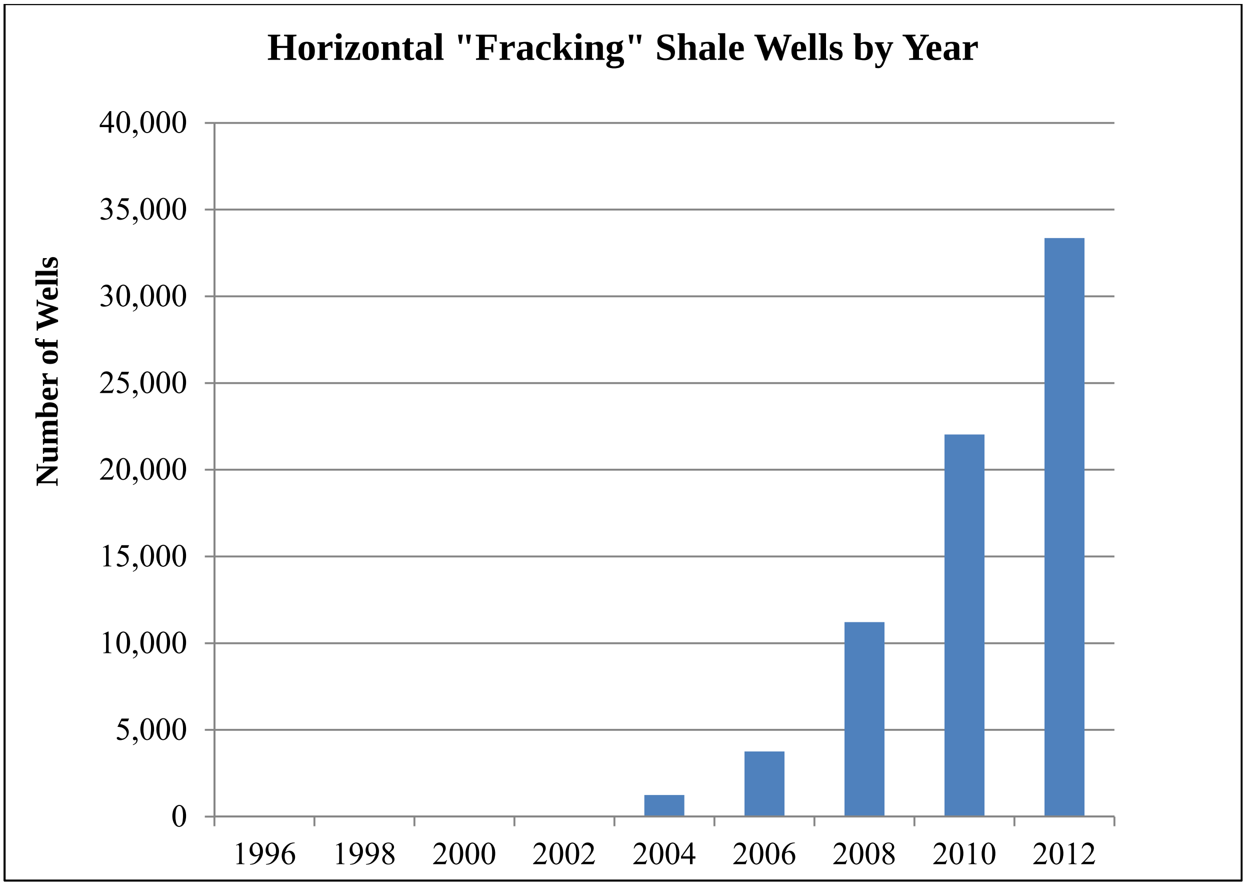

Figure 2: **Shale Development over time**
This figure plots the number of shale wells in existence over different election cycles.

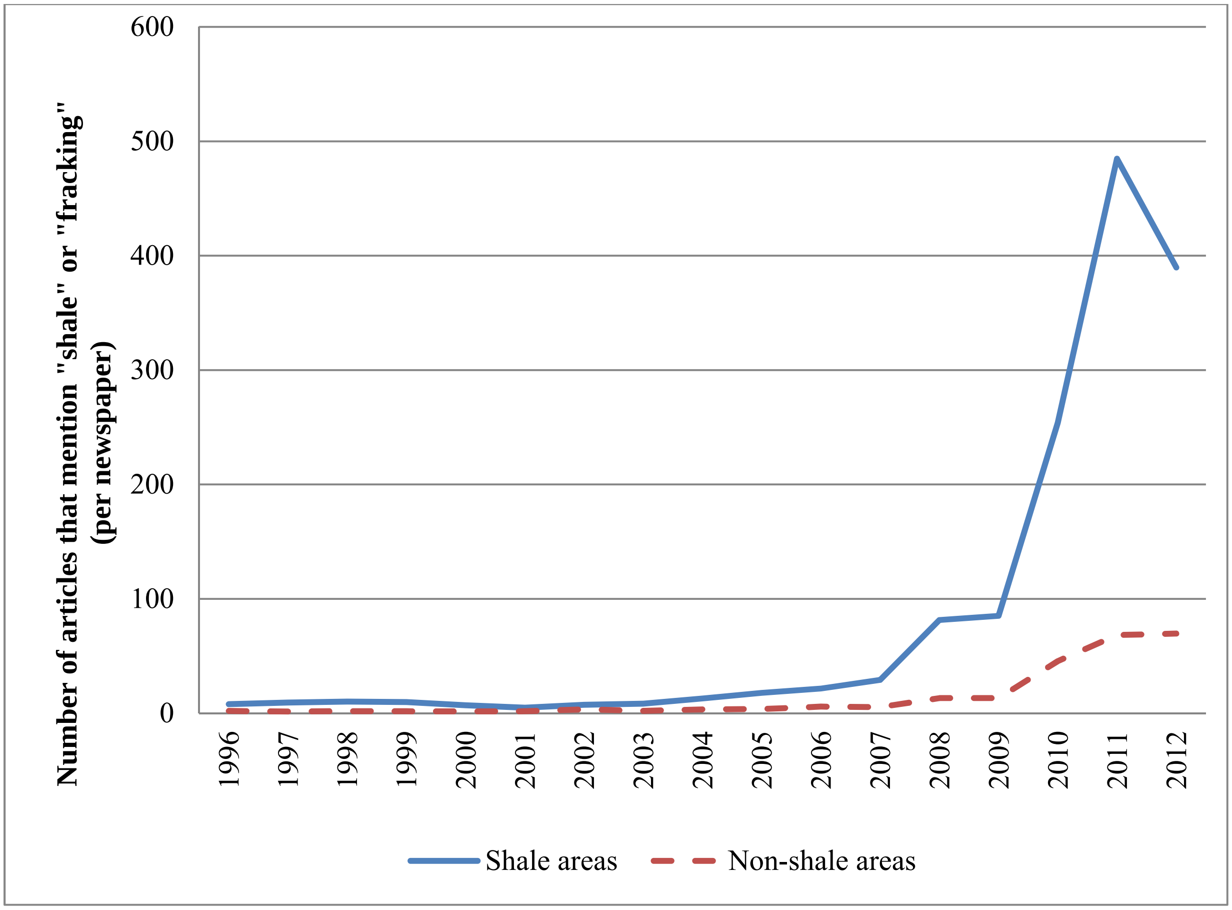

Figure 3: Media Attention to Shale

This figure plots the average number of new articles per paper/year that mention 'shale' or 'fracking' from 1996 to 2012 based on the set of local newspapers indexed by Lexis-Nexis and headquartered in one of the seven states with shale booms. We divide the sample into 'shale' and 'non-shale' areas based on whether or not the county of the paper's head office ever has shale investments. The following newspapers are located in shale areas: The Charleston Gazette-Mail (Charleston, WV), Pittsburgh Post-Gazette (Pittsburgh, PA), Pittsburgh Tribune Review (Pittsburgh, PA), The Daily Oklahoman (Oklahoma City, OK), The Journal Record (Oklahoma City, OK), Journal Record Legislative Report (Oklahoma City, OK). The following newspapers are located in non-shale areas: The Austin American-Statesman (Austin, TX), The Bismarck Tribune (Bismarck, ND), CityBusiness North Shore Report (New Orleans, LA), El Paso Times (El Paso, Texas), The Evening Sun (Hanover, PA), The Journal of Jefferson Parish (Gretna, LA), The Lebanon Daily News (Lebanon, PA), The Morning Call (Allentown, PA), New Orleans CityBusiness (New Orleans, LA), The Philadelphia Daily News (Philadelphia, PA), The Philadelphia Inquirer (Philadelphia, PA), Public Opinion (Chambersburg, PA), San Antonio Express-News (San Antonio, TX), Tulsa World (Tulsa, OK), The York Dispatch (York, PA).

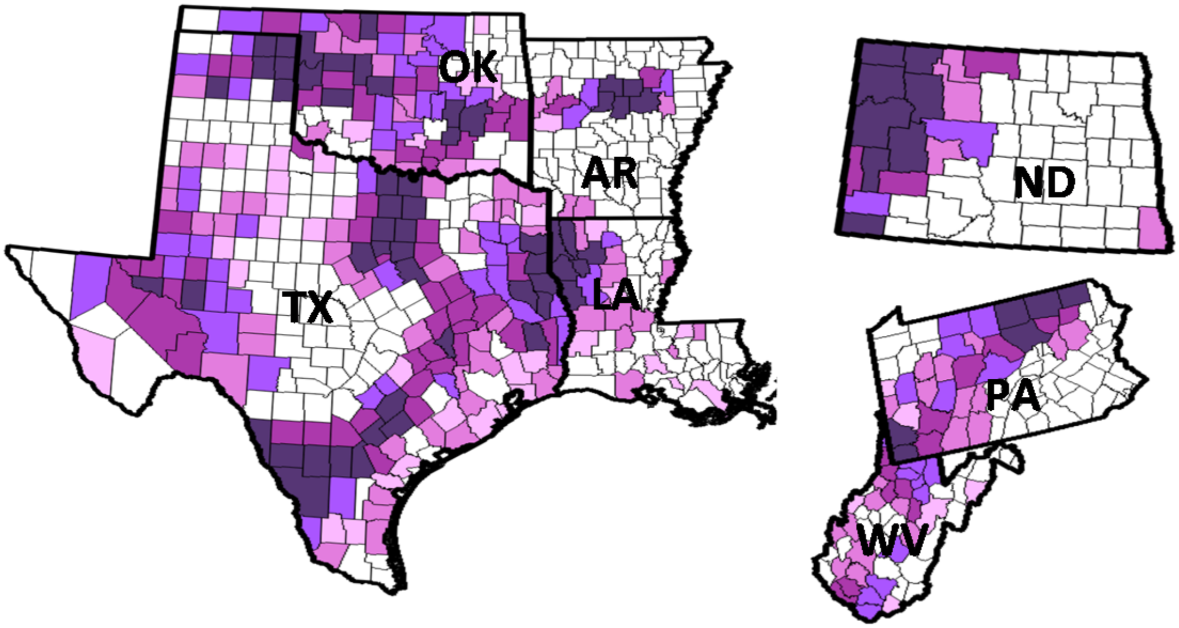

Figure 4: Map of Shale Development

This figure plots a heatmap of shale development at the county level. Counties shaded darker colors are counties that experienced more shale development over the 2003 to 2012 time period.

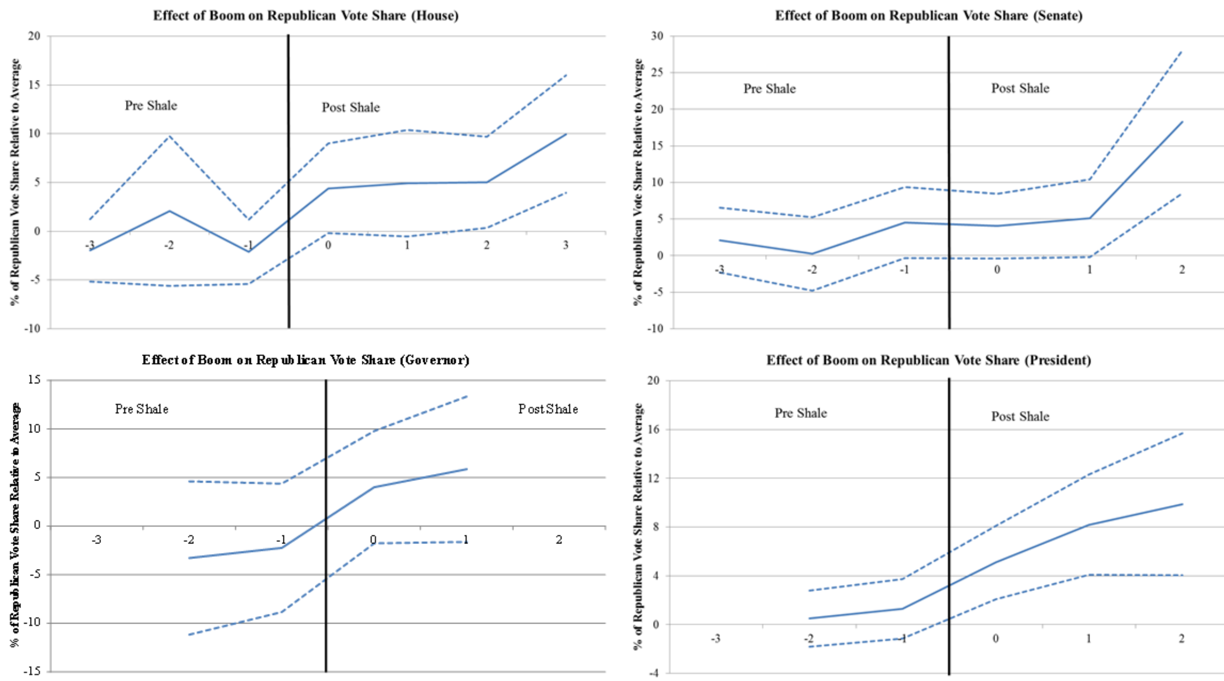

Figure 5: Effect of Boom on Republican Vote Share

This figure plots the relative percentage of votes received by Republican candidates over time, based on when shale development first occurs in a district (House election) or county (non-House elections). The figures plot districts and counties when there is a Republican incumbent. Time 0 is the first election cycle that any shale development occurs in a given geography. We plot the coefficients on a sequence of 'event time' indicator variables (along with standard error bands), after controlling for time and geographical fixed effects. The solid line represents the point estimates of Republican vote share relative to the initial period, while the dotted lines represent the 95% confidence interval. The number of coefficients plotted differs by election type, because some election types (House and Senate) occur more often than others (Governor and President).

Table 1: Summary Statistics

This table reports summary statistics. In panels A-C, data are at county or congressional district level from Arkansas, Louisiana, North Dakota, Oklahoma, Pennsylvania, Texas, and West Virginia and span the years from 1996 to 2012. Exit poll data in Panel D are from the same states but are only available for the 2004, 2008 and 2012 election cycles.

	N	Mean	25th Pctl.	Median	75th Pctl.	Std. Dev.
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: County-level election variables						
Total shale wells	4,866	14.3	0.0	0.0	0.0	101.6
Total shale wells – non-zero obs. only	1,165	59.7	2.0	7.0	32.0	201.1
Log (1 + Wells)	4,866	0.6	0.0	0.0	0.0	1.3
Log (1 + Wells) – non-zero obs. only	1,165	2.5	1.1	2.1	3.5	1.6
Percentage of energy employment	4,866	3.2	0.0	0.2	3.0	6.6
Employment growth	4,866	1.9	-1.8	1.4	4.9	10.5
Republican percentage of vote (Governor)	2,194	53.6	41.5	54.6	66.8	16.2
Republican percentage of vote (Senate)	3,185	55.6	44.4	57.7	68.4	16.5
Republican percentage of vote (President)	2,704	59.7	49.9	61.2	70.6	14.6
Panel B: District-level election variables						
Total shale wells	498	120.8	0.0	0.0	13.0	435.9
Total shale wells – non-zero observations only	200	300.7	4.5	45.8	224.8	648.3
Log (1 + Wells)	498	1.5	0.0	0.0	2.6	2.3
Log (1 + Wells) – non-zero observations only	200	3.7	1.7	3.8	5.4	2.2
Percentage of energy employment	498	1.1	0.2	0.6	1.5	1.5
Employment growth	498	1.5	0.1	1.7	3.1	2.5
Republican percentage of vote (House)	498	51.1	39.0	55.0	64.0	16.7
Change in incumbency indicator	498	0.16	0.00	0.00	0.00	0.37
Number of candidates running	498	4.42	3.00	4.00	5.00	2.68
Panel C: Ratings of voting record (politician level)						
ADA (Americans for Democratic Action)	1,201	38.5	5.0	20.0	80.0	37.6
ACLU (American Civil Liberties Union)	1,207	35.7	7.0	22.0	64.0	32.4
LCV (League of Conservation Voters)	1,207	34.1	6.0	20.0	64.0	33.2
COPE (Committee on Political Education of the AFL-CIO)	1,207	46.7	8.0	33.0	91.0	40.7
ACU (American Conservative Union)	1,205	58.1	20.0	72.0	92.0	36.7
CCUS (Chamber of Commerce of the U.S.)	1,208	72.3	50.0	80.0	94.0	25.1
NTU (National Taxpayers Union)	1,202	45.7	19.0	52.0	67.0	26.5
Seniority (number of terms in Congress)	1,214	5.3	2.0	4.0	8.0	3.9
Log (Seniority)	1,214	1.7	1.1	1.6	2.2	0.6
Last election was very close (<52%) indicator	1,214	0.07	0.00	0.00	0.00	0.25
Last election was somewhat close (52%-54%) indicator	1,214	0.05	0.00	0.00	0.00	0.21
Panel D: Exit poll data (voter level)						
Log (1 + Wells)	5,723	2.3	0.0	1.3	4.8	2.5
Log (1 + Wells) – non-zero observations only	3,588	3.7	1.6	4.0	5.5	2.2
Percentage of energy employment	5,723	1.3	0.1	0.4	1.5	2.0
Employment growth	5,723	1.8	0.7	1.7	2.6	1.7
Voted for Republican (House) 0 or 1	5,553	0.47	0.0	0.0	1.0	0.50
Voted for Republican (President) 0 or 1	5,688	0.50	0.0	1.0	1.0	0.50
More Conservative (House) -1, 0, or 1	4,093	0.02	0.0	0.0	0.0	0.28
More Conservative (President) -1, 0, or 1	4,208	0.03	0.0	0.0	0.0	0.33

Panel E: Comparing shale and non-shale areas in 2002 (before shale)	N (non-shale)	Mean (non-shale)	N (shale)	Mean (shale)	Non-shale minus shale	t-stat
Republican percentage of vote (House)	13	56.0	49	58.3	-2.3	-0.3
Republican percentage of vote (Senate)	217	53.6	305	53.9	-0.3	-0.3
Republican percentage of vote (Governor)	217	57.3	305	55.0	2.3	1.8
Republican percentage of vote (President)	217	58.3	305	60.4	-2.1	-2.0
Population	217	116472.9	305	65270.2	51202.8	2.4
Population growth	217	0.5	305	0.3	0.2	1.3
Percentage of energy employment	217	1.2	305	4.4	-3.2	-5.5
Employment growth	217	-1.2	305	1.6	-2.8	-1.7

Table 2: Republican Vote Share and Shale Booms

This table reports panel regressions of the share of votes to Republican candidates on our measure of shale booms = Log (1+Wells). Our data are at county or congressional district level from Arkansas, Louisiana, North Dakota, Oklahoma, Pennsylvania, Texas, and West Virginia and span the years from 1996 to 2012. We include fixed time and geographic effects in all models; the models for House elections contain 'synthetic' county-level effects (see text for a full explanation). Standard errors are clustered at the county (district) and state-year level.

Panel A: Legislative Elections	U.S. House Elections (District level)				U.S. Senate Elections (County level)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log (1 + Wells)	0.865**	0.713**	1.222***	1.143***	1.023***	0.918***	1.995***	1.886***
	(0.342)	(0.357)	(0.427)	(0.425)	(0.346)	(0.324)	(0.721)	(0.686)
Share of Employment in Energy	-	1.236	-	0.958	-	0.108**	-	0.112**
	-	(0.949)	-	(0.858)	-	(0.048)	-	(0.047)
Employment Growth	-	-0.165	-	-0.178	-	0.019	-	0.016
	-	(0.156)	-	(0.219)	-	(0.018)	-	(0.016)
Incumbent is Republican	-	-	17.765***	17.786***	-	-	5.102*	5.106*
(House in cols. 1-4, Senate in 5-8)	-	-	(3.552)	(3.538)	-	-	(2.957)	(2.943)
Republican * Log (1 + Wells)	-	-	-1.289***	-1.377***	-	-	-1.367	-1.360
	-	-	(0.492)	(0.506)	-	-	(0.901)	(0.878)
Observations	498	498	498	498	3,185	3,185	3,185	3,185
Adjusted R-squared	0.706	0.706	0.794	0.793	0.816	0.817	0.823	0.823
Geographic & year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE clustered by district/county and state-year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Panel B: Executive Branch Elections	Gubernatorial Elections (County level)				Presidential Elections (County level)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log (1 + Wells)	0.615	0.603	1.574*	1.558*	0.397*	0.352	1.912***	1.888***
	(0.467)	(0.473)	(0.881)	(0.879)	(0.223)	(0.222)	(0.466)	(0.470)
Share of Employment in Energy	-	0.047	-	0.054	-	0.070	-	0.085*
	-	(0.050)	-	(0.050)	-	(0.054)	-	(0.051)
Employment Growth	-	-0.025	-	-0.024	-	-0.013	-	-0.012
	-	(0.029)	-	(0.025)	-	(0.015)	-	(0.015)
Incumbent Governor is Republican	-	-	0.673	0.634	-	-	-0.788	-0.780
	-	-	(5.080)	(5.060)	-	-	(1.383)	(1.379)
Republican * Log (1 + Wells)	-	-	-1.448	-1.447	-	-	-1.741***	-1.782***
	-	-	(1.102)	(1.099)	-	-	(0.486)	(0.486)
Observations	2,194	2,194	2,194	2,194	2,704	2,704	2,704	2,704
Adjusted R-squared	0.752	0.752	0.754	0.754	0.887	0.887	0.892	0.892
Geographic & year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE clustered by county and state-year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Table 3: Republican Vote Share and Shale Booms – Ruling out reverse causality

This table reports panel regressions of the share of votes to Republican candidates on our measure of shale booms = Log (1+Wells). Our data are at county or congressional district level from Arkansas, Louisiana, North Dakota, Oklahoma, Pennsylvania, Texas, and West Virginia and span the years from 1996 to 2012. We include fixed time and geographic effects in all models; the models for House elections contain 'synthetic' county-level effects (see text for a full explanation). Panel A controls for an indicator equal to 1 for the two election cycles just before the onset of shale booms; Panel B includes only areas that ever experience shale booms ('treatment effect on the treated'); Panel C reports an IV regression using an instrument for shale booms equal to Log (1+Total wells * (Square miles of shale in a county (district) / Total square miles of shale)). Standard errors are clustered at the county (district) and state-year level.

Panel A: Controlling for Pre-Boom Effects	House	Senate	Governor	President
	(1)	(2)	(3)	(4)
Log (1 + Wells)	1.096**	1.783**	1.270	1.917***
	(0.466)	(0.720)	(0.807)	(0.512)
Share of Employment in Energy	0.972	0.116***	0.057	0.084*
	(0.868)	(0.045)	(0.050)	(0.051)
Employment Growth	-0.179	0.017	-0.023	-0.012
	(0.217)	(0.016)	(0.025)	(0.015)
Incumbent is Republican	17.820***	5.065*	0.425	-0.763
	(3.538)	(2.943)	(5.067)	(1.401)
Republican * Log (1 + Wells)	-1.380***	-1.365	-1.419	-1.791***
	(0.507)	(0.879)	(1.097)	(0.494)
Pre-Boom Election Cycles (Two Prior Cycles)	-0.464	-0.587	-1.206	0.109
	(1.737)	(1.082)	(1.306)	(0.460)
Observations	498	3,185	2,194	2,704
Adjusted R-squared	0.793	0.823	0.754	0.892
Geographic & year FE	Yes	Yes	Yes	Yes
SE clustered by district/county and state-year	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Panel B: Retaining only shale areas in the sample	House	Senate	Governor	President
	(1)	(2)	(3)	(4)
Log (1 + Wells)	1.414**	1.713**	0.322	1.825***
	(0.609)	(0.785)	(1.286)	(0.347)
Share of Employment in Energy	1.587	6.459*	0.077	0.044
	(0.986)	(3.414)	(0.047)	(0.043)
Employment Growth	-0.310	-1.644*	-0.014	-0.002
	(0.277)	(0.945)	(0.022)	(0.018)
Incumbent is Republican	15.867***	0.089**	-2.906	1.017
	(3.804)	(0.045)	(4.410)	(1.021)
Republican * Log (1 + Wells)	-1.189**	0.027	-0.436	-2.228***
	(0.477)	(0.021)	(1.333)	(0.379)
Observations	374	1,876	1,286	1,578
Adjusted R-squared	0.801	0.846	0.771	0.914
Geographic & year FE	Yes	Yes	Yes	Yes
SE clustered by county/district and state-year	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Panel C: Instrumental Variables Estimate	House	Senate	Governor	President
	(1)	(2)	(3)	(4)
Log (1 + Wells)	1.920***	2.520*	5.256**	1.293
	(0.743)	(1.443)	(2.229)	(1.691)
Share of Employment in Energy	0.674	0.137**	-0.039	0.118**
	(0.966)	(0.054)	(0.073)	(0.059)
Employment Growth	-0.166	0.015	-0.030	0.000
	(0.223)	(0.016)	(0.030)	(0.019)
Incumbent is Republican	18.212***	5.923*	1.019	-0.504
	(3.770)	(3.257)	(5.752)	(1.503)
Republican * Log (1 + Wells)	-1.838**	-2.838	-3.370	-1.874
	(0.867)	(1.955)	(2.394)	(1.439)
Observations	498	3,185	2,194	2,704
Adjusted R-squared	0.792	0.820	0.731	0.890
Geographic & year FE	Yes	Yes	Yes	Yes
SE clustered by county/district and state-year	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Exit Poll Responses and Shale Booms

This table reports regressions of and indicator equal to 1 for voters who tell pollsters they have voted Republican (columns 1-4), and a variable measuring whether a voter reports choosing the more conservative candidate relative to the individual's self-reported party. Exit poll data are available for the 2004, 2008 and 2012 elections for the US House and the Presidency. Standard errors are clustered at the district and state-year level.

Dependent Variable:	Indicator = 1 if Voted Republican				+1 for More Conservative, 0 no change, -1 Less Conservative			
	House Elections		Presidential Elections		House Elections		Presidential Elections	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log (1 + Wells)	0.017***	0.015***	0.026***	0.018***	0.009***	0.008***	0.017***	0.010***
	(0.003)	(0.004)	(0.005)	(0.005)	(0.002)	(0.002)	(0.005)	(0.004)
Employment Growth	-	0.000	-	-0.003	-	-0.001	-	-0.002
	-	(0.005)	-	(0.003)	-	(0.003)	-	(0.003)
Share of Employment in Energy	-	0.005	-	0.021***	-	0.003	-	0.018***
	-	(0.005)	-	(0.005)	-	(0.003)	-	(0.002)
Republican party affiliation	0.815***	0.815***	0.766***	0.765***	-	-	-	-
	(0.019)	(0.018)	(0.027)	(0.026)	-	-	-	-
Independent party affiliation	0.356***	0.357***	0.364***	0.366***	-	-	-	-
	(0.029)	(0.028)	(0.030)	(0.030)	-	-	-	-
Other party affiliation	0.344***	0.345***	0.361***	0.363***	-	-	-	-
	(0.047)	(0.046)	(0.046)	(0.044)	-	-	-	-
Observations	5,375	5,375	5,483	5,483	4,093	4,093	4,208	4,208
Adjusted R-squared	0.536	0.536	0.488	0.493	0.006	0.006	0.015	0.024
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE clustered by district and state-year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Incumbency, Political Competition, and Shale Booms, U.S. House Elections

This table reports panel regressions of the probability of a change in incumbency and the number of candidates running for U.S. House elections on our measure of shale booms = Log (1+Wells). Our data are at congressional district level from Arkansas, Louisiana, North Dakota, Oklahoma, Pennsylvania, Texas, and West Virginia and span the years from 1996 to 2012. We include fixed time and geographic effects in all models. Standard errors are clustered at the district and state-year level. We estimate linear probability models.

Panel A: Dependent Variable = 1 if Incumbency Changes

	(1)	(2)	(3)	(4)
Log (1 + Wells)	0.035*	0.038**	0.061***	0.061***
	(0.019)	(0.019)	(0.020)	(0.021)
Share of Employment in Energy	-	-0.024	-	0.003
	-	(0.051)	-	(0.051)
Employment Growth	-	0.011	-	0.010
	-	(0.012)	-	(0.012)
Incumbent is Republican	-	-	-0.094	-0.095
	-	-	(0.101)	(0.101)
Republican * Log (1 + Wells)	-	-	-0.050	-0.050*
	-	-	(0.032)	(0.030)
Observations	498	498	498	498
Adjusted R-squared	0.016	0.013	0.036	0.032
Synthetic county & year FE	Yes	Yes	Yes	Yes
SE clustered by district and state-year	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Panel B: Incumbency Changes, by Party	Republican to Republican		Republican to Democrat		Democrat to Republican		Democrat to Democrat	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log (1 + Wells)	-0.011	-0.013	-0.011	-0.007	0.053**	0.055***	0.002	0.003
	(0.029)	(0.029)	(0.018)	(0.018)	(0.021)	(0.020)	(0.007)	(0.008)
Share of Employment in Energy	-	0.018	-	-0.034	-	-0.019	-	-0.025
	-	(0.036)	-	(0.025)	-	(0.072)	-	(0.072)
Employment Growth	-	0.002	-	0.005	-	0.009	-	-0.002
	-	(0.012)	-	(0.005)	-	(0.011)	-	(0.019)
Observations	267	267	267	267	231	231	231	231
Adjusted R-squared	0.023	0.010	0.280	0.274	0.601	0.597	0.018	0.004
Incumbent is Republican	Yes	Yes	Yes	Yes	No	No	No	No
Synthetic county & year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE clustered by district and state-year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Panel C: Dependent Variable = Number of Candidates Running

	(1)	(2)	(3)	(4)
Log (1 + Wells)	0.549**	0.560**	0.901***	0.884***
	(0.248)	(0.273)	(0.291)	(0.297)
Share of Employment in Energy	-	-0.093	-	0.240
	-	(0.296)	-	(0.256)
Employment Growth	-	0.011	-	0.006
	-	(0.068)	-	(0.067)
Incumbent is Republican	-	-	0.066	0.069
	-	-	(0.593)	(0.590)
Republican * Log (1 + Wells)	-	-	-0.732***	-0.752***
	-	-	(0.227)	(0.229)
Observations	498	498	498	498
Adjusted R-squared	0.208	0.204	0.258	0.254
Synthetic county & year FE	Yes	Yes	Yes	Yes
SE clustered by district and state-year	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Table 6A: ADA Roll-Call Voting Score and Shale Booms, U.S. House Members

This table reports panel regressions of the ADA (Americans for Democratic Action) scores based on roll-call votes of U.S. House members on our measure of shale booms = Log (1+Wells). The scores range from 0 to 100, with 100 meaning most liberal. Data are measured at the individual Congress member level from Arkansas, Louisiana, North Dakota, Oklahoma, Pennsylvania, Texas, and West Virginia, spanning the years from 1996 to 2012. We include fixed time and geographic effects in all models. Standard errors are clustered at the district and state-year level.

	Without Congress Member Fixed Effects		------With Congress Member Fixed Effects------					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log (1 + Wells)	-3.799***	-3.522***	-0.599	-0.560	-2.338***	-2.435***	-5.083***	-5.522***
	(0.623)	(0.673)	(0.430)	(0.414)	(0.816)	(0.801)	(1.816)	(1.846)
Share of Employment in Energy	-	-1.884	-	-0.349	-	-0.922	-	-1.065
	-	(1.707)	-	(0.752)	-	(0.718)	-	(0.683)
Employment Growth	-	0.095	-	0.179	-	0.199	-	0.211
	-	(0.138)	-	(0.169)	-	(0.167)	-	(0.167)
Seniority	-	-	-	-	0.327	0.322	-	-
	-	-	-	-	(0.494)	(0.513)	-	-
Seniority * Log (1 + Wells)	-	-	-	-	0.222**	0.247**	-	-
	-	-	-	-	(0.110)	(0.104)	-	-
Log of Seniority	-	-	-	-	-	-	-0.228	-0.226
	-	-	-	-	-	-	(3.149)	(3.162)
Log of Seniority * Log (1 + Wells)	-	-	-	-	-	-	2.096**	2.354***
	-	-	-	-	-	-	(0.901)	(0.912)
Observations	1,201	1,201	1,201	1,201	1,201	1,201	1,201	1,201
Adjusted R-squared	0.733	0.732	0.950	0.950	0.950	0.950	0.950	0.950
Synthetic county & year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE clustered by district and state-year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Table 6B: Interest Group Ratings and Shale Booms, U.S. House Members

This table reports panel regressions of the scores of six special interest groups, based on roll-call votes of U.S. House members on our measure of shale booms = Log (1+Wells). The scores range from 0 to 100, with 100 meaning most liberal for the ACLU (American Civil Liberties Union), the LCV (League of Conservation Voters) and the COPE (Committee on the Political Education of the AFL-CIO), and 100 meaning most conservative for the ACU (American Conservative Union), CCUS (US Chamber of Commerce) and NTU (National Taxpayers Union). Data are from Arkansas, Louisiana, North Dakota, Oklahoma, Pennsylvania, Texas, and West Virginia measured at the individual Congress member level, spanning the years from 1996 to 2012. We include fixed time and geographic effects in all models. Standard errors are clustered at the district and state-year level.

	Liberal Interest Groups			Conservative Interest Groups		
Panel A: Without Congress Member Fixed Effects	ACLU	LCV	COPE	ACU	CCUS	NTU
	(1)	(2)	(3)	(4)	(5)	(6)
Log (1 + Wells)	-3.997***	-2.935***	-3.345***	2.565***	2.141***	3.136***
	(0.730)	(0.831)	(0.767)	(0.729)	(0.531)	(0.820)
Share of Employment in Energy	-0.804	-0.941	-0.344	2.039	-0.375	2.785*
	(1.344)	(1.555)	(2.061)	(2.056)	(1.184)	(1.475)
Employment Growth	0.030	0.482**	-0.128	-0.212	-0.297***	-0.223
	(0.134)	(0.239)	(0.139)	(0.198)	(0.079)	(0.196)
Observations	1,207	1,207	1,207	1,205	1,208	1,202
Adjusted R-squared	0.718	0.703	0.744	0.719	0.678	0.707
Synthetic county & year FE	Yes	Yes	Yes	Yes	Yes	Yes
SE clustered by district and state-year	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

	Liberal Interest Groups			Conservative Interest Groups		
Panel B: With Congress Member Fixed Effects	ACLU	LCV	COPE	ACU	CCUS	NTU
	(1)	(2)	(3)	(4)	(5)	(6)
Log (1 + Wells)	-1.771*	-0.562	-0.403	-0.348	1.483**	0.114
	(0.984)	(0.882)	(0.671)	(0.501)	(0.628)	(0.684)
Share of Employment in Energy	0.601	-0.273	0.654	0.241	-0.162	1.371
	(0.687)	(0.913)	(0.713)	(1.081)	(0.802)	(0.846)
Employment Growth	-0.006	0.562***	-0.078	-0.258	-0.346**	-0.246*
	(0.108)	(0.201)	(0.168)	(0.171)	(0.169)	(0.130)
Observations	1,207	1,207	1,207	1,205	1,208	1,202
Adjusted R-squared	0.936	0.883	0.953	0.941	0.859	0.921
Synthetic county & year FE	Yes	Yes	Yes	Yes	Yes	Yes
SE clustered by district and state-year	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Table 7: ADA Voting Record and Shale Booms, U.S. House Members: Do Marginal Candidates Adjust their Voting?

This table reports panel regressions of the ADA (Americans for Democratic Action) score based on roll-call votes of U.S. House member on our measure of shale booms = Log (1+Wells). The scores range from 0 to 100, with 100 meaning most liberal. Data are measured at the individual Congress member level from Arkansas, Louisiana, North Dakota, Oklahoma, Pennsylvania, Texas, and West Virginia, spanning the years from 1996 to 2012. We include time, geographic and Congress member fixed effects in all models. Standard errors are clustered at the district and state-year level.

Panel A: Republicans v. Democrats	Republicans		Democrats	
	(1)	(2)	(3)	(4)
Log (1 + Wells)	0.340	0.384	-1.174**	-1.089**
	(1.058)	(1.010)	(0.467)	(0.454)
Share of Employment in Energy	-	-0.215	-	-1.369
	-	(0.654)	-	(1.020)
Employment Growth	-	0.033	-	0.162
	-	(0.174)	-	(0.207)
Observations	659	659	542	542
Adjusted R-squared	0.618	0.616	0.785	0.785
Synthetic county & year FE	Yes	Yes	Yes	Yes
SE clustered by district and state-year	Yes	Yes	Yes	Yes
Congress member FE	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Panel B: Add Close Last Election Interactions				
	(1)	(2)	(3)	(4)
Log (1 + Wells)	-0.580	-0.551	-0.523	-0.499
	(0.423)	(0.408)	(0.418)	(0.401)
Share of Employment in Energy	-	-0.251	-	-0.218
	-	(0.769)	-	(0.777)
Employment Growth	-	0.169	-	0.164
	-	(0.173)	-	(0.174)
Last Election Was Very Close (<52%)	6.105*	6.054*	6.226*	6.179*
	(3.385)	(3.395)	(3.453)	(3.464)
Very Close Election * Log (1 + Wells)	-0.622	-0.631	-0.802	-0.803
	(1.147)	(1.165)	(1.214)	(1.227)
Last Election Was Somewhat Close (52%-54%)	-	-	0.309	0.325
	-	-	(2.163)	(2.152)
Somewhat Close Election * Log (1 + Wells)	-	-	-0.685	-0.660
	-	-	(0.545)	(0.552)
Observations	1,201	1,201	1,201	1,201
Adjusted R-squared	0.950	0.950	0.950	0.950
Synthetic county & year FE	Yes	Yes	Yes	Yes
SE clustered by district and state-year	Yes	Yes	Yes	Yes
Congress member FE	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Table 8: Probability of a Change in Incumbency From Democrat to Republican, U.S. House Elections

This table reports panel regressions of the probability of a change in incumbency for U.S. House elections on our measure of shale booms = Log (1+Wells), along with interactions reflecting changes in incumbent voting patterns prior to each election. Our data are at congressional district level from Arkansas, Louisiana, North Dakota, Oklahoma, Pennsylvania, Texas, and West Virginia and span the years from 1996 to 2012. Large ADA decrease equals 1 if a representative's change in ADA is among the 10% most negative changes in ADA scores in the sample; Large LCV decrease is defined similarly. The sample is restricted to elections with Democrat incumbents. We include fixed time and geographic effects in all models. Standard errors are clustered at the district and state-year level. We estimate linear probability models.

	(1)	(2)	(3)	(4)	(5)	(6)
Log (1 + Wells)	0.057***	0.062***	0.062***	0.059***	0.061***	0.056***
	(0.022)	(0.022)	(0.022)	(0.021)	(0.020)	(0.021)
Share Energy Employment	-	-0.059	-0.059	-0.056	-0.067	-0.037
	-	(0.068)	(0.066)	(0.072)	(0.071)	(0.073)
Employment Growth	-	0.018	0.016	0.018*	0.018	0.018*
	-	(0.011)	(0.011)	(0.010)	(0.011)	(0.010)
Change in ADA score	-	-	0.276	-	-	-
	-	-	(0.242)	-	-	-
Change in ADA x Log (1 + Wells)	-	-	-0.024	-	-	-
	-	-	(0.067)	-	-	-
Large ADA decrease	-	-	-	-0.033	-	-
	-	-	-	(0.074)	-	-
Large ADA decrease x Log (1 + Wells)	-	-	-	0.018	-	-
	-	-	-	(0.026)	-	-
Change in LCV score	-	-	-	-	-0.042	-
	-	-	-	-	(0.220)	-
Change in LCV x Log (1 + Wells)	-	-	-	-	0.018	-
	-	-	-	-	(0.046)	-
Large LCV score decrease	-	-	-	-	-	0.019
	-	-	-	-	-	(0.066)
Large LCV decrease x Log (1 + Wells)	-	-	-	-	-	0.029
	-	-	-	-	-	(0.030)
Observations	217	217	217	217	217	217
Adjusted R-squared	0.602	0.603	0.601	0.598	0.597	0.604
Synthetic county & year FE	Yes	Yes	Yes	Yes	Yes	Yes
SE clustered by district and state-year	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

APPENDIX A: INSTRUMENTAL VARIABLES ESTIMATION

We build an instrument for *Log (1 + Wells)*, which varies across counties (districts) and over time, by disaggregating the total amount of drilling activity across all shale areas in a given year (*Total Wells*$_t$) based on the geological exposure of a given county (district) to shale *(Local Shale Geology Sq. Miles*$_i$ */ Total Shale Geology Sq. Miles)*. The instrument gets its time-series variation from the total number of shale wells drilled across all seven states (*Total Wells*$_t$), and its cross-sectional variation from the geological presence of shale in an area *(Local Shale Geology Sq. Miles*$_i$ */ Total Shale Geology Sq. Miles)*. The value of the instrument is set to zero in all years for areas that have no shale (i.e., areas in which *Local Shale Geology Sq. Miles*$_i$ =0), and it equals zero for all areas in years before 2003. As our main specification has two potentially endogenous variables, *Log (1 + Wells)* and *Republican*Log (1+Wells),* we instrument for *Republican*Log (1+Wells)* with *Republican* Log(1 + Total Wells*$_t$ ** (Local Shale Geology Sq. Miles*$_i$ */ Total Shale Geology Sq. Miles))*. Each state contains a large number of counties that experienced shale booms as well as a large number of non-boom counties. Thus, the overall amount of drilling activity is exogenous with respect to political conditions *in any given area*. Geology is also exogenous to political changes. Thus, both dimensions of the instrument are exogenous from the perspective of local decision makers. The within-area estimator remains identified because we have both time series and cross sectional variation.

To assess the strength of the instruments, we follow the diagnostic approach developed in Stock and Yogo (2005). We report *F*-tests of the instruments' joint significance in the first stage and as well as the values of the Cragg-Donald and Kleibergen-Paap Wald statistics along with Stock and Yogo (2005) critical values. The null hypothesis is that the actual size of the *t*-test that the point estimates on the endogenous variables equal zero at the 5 percent significance level is greater than 10 percent (the value of the test statistic higher than the critical value indicates that the instruments are strong). Stock and Yogo (2005) computed critical values of the Cragg-Donald statistic under the assumption of i.i.d. errors. Critical values have not been tabulated for the Kleibergen-Paap statistic. We follow others in the literature and apply the critical values tabulated for the Cragg-Donald statistic to the Kleibergen-Paap results (e.g., Baum, Schaffer, and Stillman, 2007; Bazzi and Clemens, 2013).

Table A1 reports the first stage of the IV estimation for election regressions. Both instruments have significant predictive power with respect to the potentially endogenous variables, and all first-stage F statistics are above 70. Other weak-instruments tests, reported below second-stage estimates in Table A2, also show strong instrumentation. The Cragg-Donald statistic always exceeds its critical value, while the Kleibergen-Paap statistic exceeds its critical value in all models except for changes in incumbency regressions when the incumbent is Republican. Importantly, this statistic exceeds its critical value in regressions that model switches from Democrats to Republicans, which is the main mechanism through which changes in voter preferences due to fracking translate into political change.

Table A2 further reports second-stage results of the IV estimation, separately for election regressions, for changes in incumbency regressions, and for interest group ratings regressions. In this last set of specifications, we separately report regressions with and without Congress member fixed effects (consistent with the results reported in the paper, all point estimates decrease substantially after the inclusion of Congress member fixed effects, and almost all of them lose statistical significance). Overall, the IV results are in line with the OLS estimates reported in the paper, suggesting that the endogenous timing of shale drilling is unlikely to be a first-order concern in our analysis.

Table A1: First stage of instrumental variables estimation

This table reports the first stage of instrumental variables estimation. We instrument *Log (1+Wells)* by *Log (1 + Total Wells*$_t$ ** (Local Shale Geology Sq. Miles*$_i$ */ Total Shale Geology Sq. Miles))* and *Republican*Log (1+Wells)* by *Republican*Log (1+Wells)* by *Republican*Log (1 + Total Wells*$_t$ ** (Local Shale Geology Sq. Miles*$_i$ */ Total Shale Geology Sq. Miles)),* where *Total Wells*$_t$ is the sum of all shale wells in a given year, *Local Shale Geology Sq. Miles*$_i$ is the square mileage of shale formations in a given county (district), and *Total Shale Geology Sq. Miles* is the total square mileage of shale formations. The instrument is set to zero for all areas that never experience a boom. Our data are at county or congressional district level from Arkansas, Louisiana, North Dakota, Oklahoma, Pennsylvania, Texas, and West Virginia and span the years from 1996 to 2012. We include fixed time and geographic effects in all models. Standard errors are clustered by county (district) and state-year.

Panel A: Dependent variable is Log (1+Wells)	House	Senate	Governor	President
	(1)	(2)	(3)	(4)
Instrument for Log (1 + Wells)	0.770***	0.341***	0.319***	0.261***
	(0.105)	(0.070)	(0.064)	(0.069)
Instrument for Republican * Log (1 + Wells)	-0.067	0.110	0.195**	0.194***
	(0.086)	(0.070)	(0.080)	(0.065)
Share of Employment in Energy	0.399**	0.037***	0.032***	0.036***
	(0.172)	(0.009)	(0.009)	(0.008)
Employment Growth	0.042	0.006**	0.003	0.015***
	(0.028)	(0.003)	(0.002)	(0.004)
Incumbent is Republican	0.125	-0.140	0.162	-0.048
	(0.149)	(0.197)	(0.162)	(0.118)
F-test of the instruments' joint significance (p-value)	74.22 (0.00)	96.80 (0.00)	127.99 (0.00)	156.19 (0.00)
Observations	498	3,185	2,194	2,704
Adjusted R-squared	0.893	0.592	0.569	0.608
Geographic & year FE	Yes	Yes	Yes	Yes
SE clustered by county/district and state-year	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

*Panel B: Dependent variable is Republican*Log (1+Wells)*	House	Senate	Governor	President
	(1)	(2)	(3)	(4)
Instrument for Log (1 + Wells)	-0.047	-0.086**	-0.035**	-0.050**
	(0.058)	(0.038)	(0.016)	(0.024)
Instrument for Republican * Log (1 + Wells)	0.712***	0.526***	0.611***	0.512***
	(0.079)	(0.047)	(0.044)	(0.036)
Share of Employment in Energy	0.315**	0.024***	0.021***	0.032***
	(0.160)	(0.007)	(0.007)	(0.008)
Employment Growth	0.013	0.003	0.003	0.013***
	(0.020)	(0.002)	(0.002)	(0.004)
Incumbent is Republican	0.034	-0.267*	0.192**	0.065
	(0.163)	(0.154)	(0.094)	(0.125)
F-test of the instruments' joint significance (p-value)	83.46 (0.00)	130.11 (0.00)	200.66 (0.00)	199.94 (0.00)
Observations	498	3,185	2,194	2,704
Adjusted R-squared	0.897	0.613	0.667	0.628
Geographic & year FE	Yes	Yes	Yes	Yes
SE clustered by county/district and state-year	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Table A2: Second stage of instrumental variables estimation

This table reports the second stage of instrumental variables estimation. We instrument *Log (1+Wells)* by *Log (1 + Total Wells$_t$ * (Local Shale Geology Sq. Miles$_i$ / Total Shale Geology Sq. Miles))* and *Republican*Log (1+Wells)* by *Republican*Log (1+Wells)* by *Republican*Log (1 + Total Wells$_t$ * (Local Shale Geology Sq. Miles$_i$ / Total Shale Geology Sq. Miles)),* where *Total Wells$_t$* is the sum of all shale wells in a given year, *Local Shale Geology Sq. Miles$_i$* is the square mileage of shale formations in a given county (district), and *Total Shale Geology Sq. Miles* is the total square mileage of shale formations. The instrument is set to zero for all areas that never experience a boom. Our data are at county or congressional district level from Arkansas, Louisiana, North Dakota, Oklahoma, Pennsylvania, Texas, and West Virginia and span the years from 1996 to 2012. Panel A reports IV estimates for regressions of the share of votes to Republican candidates on shale booms. Panel B reports IV estimates for linear probability models of a change in incumbency on shale booms. Panel C and Panel D report IV estimates for regressions of interest group ratings on shale booms, with and without Congress member fixed effects, respectively. Below each regression we report the values of the Cragg-Donald and Kleibergen-Paap Wald statistics as well as Stock and Yogo (2005) critical values. We include fixed time and geographic effects in all models. Standard errors are clustered by county (district) and state-year.

Panel A: Election results	House	Senate	Governor	President
	(1)	(2)	(3)	(4)
Log (1 + Wells)	1.920***	2.520*	5.256**	1.293
	(0.743)	(1.443)	(2.229)	(1.691)
Share of Employment in Energy	0.674	0.137**	-0.039	0.118**
	(0.966)	(0.054)	(0.073)	(0.059)
Employment Growth	-0.166	0.015	-0.030	0.000
	(0.223)	(0.016)	(0.030)	(0.019)
Incumbent is Republican	18.212***	5.923*	1.019	-0.504
	(3.770)	(3.257)	(5.752)	(1.503)
Republican * Log (1 + Wells)	-1.838**	-2.838	-3.370	-1.874
	(0.867)	(1.955)	(2.394)	(1.439)
Cragg-Donald Wald statistic	116.1	223.5	115.9	149.7
Kleibergen-Paap Wald statistic	21.41	36.39	13.99	13.25
Stock-Yogo (2005) critical value for 10% maximal IV size	7.03	7.03	7.03	7.03
Observations	498	3,185	2,194	2,704
Adjusted R-squared	0.792	0.820	0.731	0.890
Geographic & year FE	Yes	Yes	Yes	Yes
SE clustered by county/district and state-year	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Panel B: Changes in incumbency	Republican to Republican	Republican to Democrat	Democrat to Republican	Democrat to Democrat
	(1)	(2)	(3)	(4)
Log (1 + Wells)	0.006	-0.075	0.051***	0.021
	(0.085)	(0.081)	(0.014)	(0.013)
Share of Employment in Energy	0.009	-0.001	-0.016	-0.040
	(0.059)	(0.054)	(0.072)	(0.079)
Employment Growth	0.002	0.006	0.009	-0.002
	(0.012)	(0.005)	(0.011)	(0.020)
Cragg-Donald Wald statistic	27.91	27.91	218.8	218.8
Kleibergen-Paap Wald statistic	3.819	3.819	70.38	70.38
Stock-Yogo (2005) critical value for 10% maximal IV size	16.38	16.38	16.38	16.38
Observations	267	267	231	231
Adjusted R-squared	0.007	0.223	0.597	-0.002
Incumbent is Republican	Yes	Yes	No	No
Geographic & year FE	Yes	Yes	Yes	Yes
SE clustered by district and state-year	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1

Panel C: Interest group ratings (without congress member fixed effects)	Liberal Interest Groups				Conservative Interest Groups		
	ADA	ACLU	LCV	COPE	ACU	CCUS	NTU
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log (1 + Wells)	-2.328***	-3.764***	-1.153	-2.536***	2.032**	2.367***	4.057***
	(0.672)	(0.837)	(1.015)	(0.578)	(0.894)	(0.718)	(1.187)
Share of Employment in Energy	-3.015*	-1.018	-2.583	-1.090	2.530	-0.583	1.933
	(1.683)	(1.424)	(1.678)	(1.884)	(2.059)	(0.909)	(1.773)
Employment Growth	0.108	0.033	0.506**	-0.118	-0.219	-0.294***	-0.211
	(0.150)	(0.141)	(0.257)	(0.148)	(0.208)	(0.082)	(0.191)
Cragg-Donald Wald statistic	680.3	674.6	674.6	674.6	672.7	676.5	672.3
Kleibergen-Paap Wald statistic	115.1	113.9	113.9	113.9	113.5	114.3	113.6
Stock-Yogo (2005) critical value for 10% maximal IV size	16.38	16.38	16.38	16.38	16.38	16.38	16.38
Observations	1,201	1,207	1,207	1,207	1,205	1,208	1,202
Adjusted R-squared	0.731	0.718	0.701	0.744	0.719	0.678	0.705
Geographic & year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE clustered by district and state-year	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Congress member FE	No	No	No	No	No	No	No

*** p<0.01, ** p<0.05, * p<0.1

Panel D: Interest group ratings (with congress member fixed effects)	Liberal Interest Groups				Conservative Interest Groups		
	ADA	ACLU	LCV	COPE	ACU	CCUS	NTU
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log (1 + Wells)	0.158	-0.343	0.114	0.039	-0.350	1.815**	0.795
	(0.559)	(0.853)	(0.948)	(0.606)	(0.622)	(0.881)	(0.932)
Share of Employment in Energy	-0.606	0.107	-0.508	0.500	0.242	-0.277	1.137
	(0.811)	(0.713)	(0.889)	(0.755)	(1.099)	(0.731)	(0.916)
Employment Growth	0.184	0.005	0.567***	-0.075	-0.258	-0.343**	-0.241*
	(0.167)	(0.113)	(0.204)	(0.165)	(0.170)	(0.170)	(0.131)
Cragg-Donald Wald statistic	855.2	854	854	854	847.6	855	849.6
Kleibergen-Paap Wald statistic	36.65	36.37	36.37	36.37	35.47	36.39	35.53
Stock-Yogo (2005) critical value for 10% maximal IV size	16.38	16.38	16.38	16.38	16.38	16.38	16.38
Observations	1,201	1,207	1,207	1,207	1,205	1,208	1,202
Adjusted R-squared	0.949	0.935	0.883	0.953	0.941	0.859	0.921
Geographic & year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE clustered by district and state-year	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Congress member FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*** p<0.01, ** p<0.05, * p<0.1