Economic Geography and Corporate Political Activity: Evidence from Fracking and State Campaign Finance

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Abstract

Business entry into communities may stimulate local economies, but its negative externalities—including environmental degradation—can generate backlash. To understand how firms use campaign contributions to preempt opposition to their expansion, we study the fracking boom as a natural experiment that transformed the geography of drilling activities across the U.S. Through panel analysis and an instrumental variable design, we show that state legislative districts where drilling expanded due to the fracking boom saw a surge in oil and gas drilling-related campaign contributions. While this effect was primarily driven by in-district drilling firms, out-of-district, same-state firms also contributed to the overall rise in money. Finally, the influx of contributions into fracking districts disproportionately benefited Republican candidates in historically Democratic districts, even relative to the industry’s high baseline support for Republicans. These findings illuminate the roles of business geography in corporate political strategy, energy and environmental policymaking, and democratic representation.

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1 Introduction

Business entry or expansion in a community can be a celebratory event marked by ribbon-cutting ceremonies and effusive local news coverage about job creation and economic growth. Such a positive conceptualization of the presence of industry activities has shaped existing research on how economic geography shapes corporate political activities in the United States (e.g., Hall and Wayman 1990; Bombardini and Trebbi 2011; Raiha 2018). However, business activities need not be universally celebrated. For instance, the fracking boom in the United States has been stimulated local economies in communities where horizontal drilling expanded (Feyrer et al., 2017), but it has also led to environmental, health, and social degradation to many of these communities (Vidic et al. 2013). As a result, fracking was at once embraced with open arms in some communities while fiercely opposed in others (Jerolmack and Walker 2018; Vasi et al. 2015).

How do businesses use political activities to pre-empt potential opposition by local communities and mitigate any resulting regulatory uncertainty? We explore this question in the context of the fracking boom in the United States. During the mid-200s, technological innovation in unconventional drilling quickly turned several previously inaccessible oil and gas deposits in the United States into highly productive ones (U.S. Energy Information Administration 2011b, 2016), thereby providing a rare natural experiment that rapidly and substantially transformed the geographic distribution of this industry. Since fracking policies are predominantly determined at the state level (Davis 2017), we examine the impact of such exogenous changes in drilling activities by state legislative districts on patterns of oil and gas campaign contributions in such districts.
Using both fixed-effects panel regressions and an instrumental variable design, we first demonstrate that in districts where drilling activities grew exogenously due to their shale geology, there was a subsequent influx in campaign contributions from horizontal-drilling related firms. These effects are economically meaningful: relative to the benchmark value of $1,780 in total drilling-related campaign contributions in the average state legislative district, a one-standard-deviation increase in horizontal drilling would increase such contributions by 117% to 317%. We provide further support for this causal interpretation by demonstrating that shale geology is unrelated to observable local trends in favorability towards drilling development or political leanings, and that we do not observe comparable effects on campaign contributions from energy firms that were peripheral to horizontal drilling.

Why might drilling firms want to increase their campaign contributions in fracking districts? One existing explanation is that representatives may favor the interests of local firms owing to their constituency connection, which under certain conditions may increase the marginal effectiveness of campaign contributions for gaining legislative access to such representatives or persuading them to adopt pro-firm policies (Bombardini and Trebbi 2011). However, we emphasize an alternative (and non-exclusive) explanation: the total impact of business development upon local communities—both benefits and costs—can lead local representatives to prioritize setting the legislative agenda for such policies (Stratmann 1992). Moreover, if representatives perceive that the costs outweigh the benefits, their agenda-setting efforts may threaten business interests and usher in regulatory changes that impact an industry’s operations throughout a legislature’s jurisdiction.

Under this alternative perspective, drilling firms may seek to use campaign contributions to mitigate regulatory uncertainty originating from fracking districts, and that such incentives
may hold for local firms as well as out-of-district firms within the same state. Indeed, we find that while drilling firms that operated within a state legislative district exhibited the greatest proportional increase in their campaign contributions to said district following the fracking boom, out-of-district drilling firms within the same state also significantly contributed to the overall influx of campaign money into fracking districts. Such findings also raises normative questions about the potential crowding-out effect of out-of-district corporate money for the representation of constituent interests in local communities (Canes-Wrone and Miller n.d.; Wright 1989).

Beyond the amount and sources of corporate money channeled into districts with industry presence, it is important to understand how such money is split among candidates in these districts. These allocation choices can reveal the underlying motivations of firms—such as pursuing a legislative strategy of persuading local incumbents to pursue firm-friendly policies (e.g., Snyder, 1991; Groseclose & Snyder, 1996; Grossman & Helpman, 2001) or an electoral strategy of aiding firm-friendly partisan candidates against opponents (e.g., Austen-Smith, 1987; Baron, 1994; Fox & Rothenberg, 2011)—and shed light on the potential impact of their campaign contributions for democratic representation in local communities.

In the context of the fracking boom in the United States, we conjecture that the marginal dollars flowing into fracking districts may be particularly targeted at helping to tip elections in favor of allied Republican candidates. To the industry, both the polarizing nature of fracking policies and the asset immobility of horizontal drilling raise the stakes of ensuring securing favorable legislative representation in fracking districts (Cooper, Kim, and Urpelainen 2018; Sances and You 2019; Hacker et al. 2021). The relative ease of financing campaigns in state legislative districts and incumbency advantages in these positions makes an electoral strategy
even more cost-effective (Fournaies and Hall 2014a; Mulvihill 2018). Indeed, we show that even relative to the oil and gas industry’s high baseline propensity to support the Republican party (Gimpel, Lee, and Parrott 2014), fracking-induced influx in campaign contributions from drilling firms disproportionately benefited Republican candidates in fracking districts that historically represented by Democrats. We also demonstrate that this may have partly accounted for Republican candidates’ electoral success in fracking districts. Given the highly polarized nature of state legislatures (e.g., Grumbach, 2018; McCarty et al., 2016; Shor & McCarty, 2011), electorally motivated concentration of campaign contributions in fracking-intensive areas may have distorted democratic representation not only with respect to fracking policies, but also to a host of other economic and social policies that are sorted by partisanship.

The remainder of this paper is organized as follows. Section 2 provides institutional background on the science and politics of the fracking boom, reviews existing research on the link between business geography and corporate political activities, and outlines our hypotheses under the theoretical framework that firms use campaign contributions to mitigate regulatory uncertainty generated by representatives of districts with significant industry presence. Section 3 describes our data sources and key measurement choices. Section 4 presents our empirical design that leverages the fracking boom as a natural experiment on the changing geography of drilling activities across state legislative districts, and shows an overall increase in drilling money into fracking-intensive districts. Section 5 demonstrates that this overall influx of money originates from in-district drilling firms as well as out-of-district firms that operate within the same state. Section 6 shows that these marginal dollars disproportionately benefited Republican candidates in fracking districts historically controlled by Democrats, and may have contributed to
Republican seat gains in fracking districts. Section 7 discusses the implications of these findings for business and politics and suggests avenues of future research.

2 Background, Context, and Theory

In this section, we begin by describing the context of the fracking boom, why the fracking boom constitutes a natural experiment on the locations of drilling activities, the economic, environmental, and social impact of fracking, the dominance of state governments in fracking regulations and the polarized nature of fracking policies. We then discuss theories and review the literature on the relationship between economic geography and corporate political activity.

2.1 The Science and the Politics of the Fracking Boom

Rapid development of shale resources began around 2006, after a long period of experimentation (U.S. Energy Information Administration 2011a, 2011b, 2016).¹ The technology for shale development combines horizontal drilling with high-volume hydraulic fracturing, or “fracking,” which together effectively release oil and gas trapped in shale rocks many thousands of feet below the surface; the combined process is referred to as “unconventional” drilling (NY State Department of Environmental Conservation 2015). Since this technological breakthrough happened over a relatively short time span, and the spatial distribution of shale is a result of natural forces, the fracking boom rapidly transformed the locations of drilling activities across the United States in ways beyond the control of oil and gas firms as well as policymakers.

Communities that experienced the fracking boom saw major changes, with mixed impacts on social welfare. On the one hand, the fracking boom is estimated to have created up to

¹ Natural gas production from unconventional drilling in the Barnett Shale in North-Central Texas began its ascent somewhat earlier than 2006.
640,000 new jobs nationwide both within and beyond the mining sector (e.g., Allcott & Keniston, 2018; Fetzer, 2014; Feyrer et al., 2017). Other economic benefits to local residents include bonus and royalty payments, generally higher property values, and greater local government revenue (e.g., Muehlenbachs et al., 2015; Newell & Raimi, 2015; Davis, 2017; Feyrer et al., 2017; Newell & Raimi, 2018). On the other hand, the fracking boom has generated considerable negative externalities for affected communities. Most of the fracking-related environmental and health risks are highly local to the areas immediately surrounding drilling sites, such as groundwater contamination (e.g., Davis, 2017; Muehlenbachs et al., 2015; Olmstead et al., 2013), methane leakage and other forms of local air pollution (Davis 2017), accidental explosions and spills (Stine and Cohon 2016), and heightened earthquake risks (Ellsworth 2013). Additionally, fracking activities have reportedly exacerbated social issues such as higher high school drop-out rates among male teenagers (Cascio and Narayan 2015) and rising alcoholism and drug trafficking (Healy 2016).

States are the primary policymaking body for domestic onshore oil and gas development, although their policy choices interact with those of local governments (Davis 2017). State policies cover a wide variety of issues related to development, and there is substantial variation across states in how and to what extent these issues are regulated (Richardson et al. 2013). One class of state policies govern specific practices in the fracking process, often to address health and safety concerns, such as setback restrictions from buildings and water sources, pre-drilling water well testing and liability rules for drinking water contamination, and fracturing fluid disclosure (e.g. disclosure using FracFocus). Other regulations pertain to a wide range of complex issues, including local and state government revenue (e.g., severance taxes and impact fees) and the balance of competing property rights (e.g., whether private landowners and/or local
municipalities get to decide where drilling takes place). There are cases where state and local governments are at odds with each other on fracking policies, and in many cases state courts have upheld state preemption of local ordinances; one notable exception is Pennsylvania’s Act 13, where the courts have overturned (in 2013 and 2016 rulings) several parts of the law that were intended to prevent local governments from zoning out oil and gas development (Rabe & Borick, 2013; Mallinson, 2014; Fisk, 2016; Fisk et al., 2017; StateImpact Pennsylvania, 2020). Given how central state legislation is for fracking regulations, as well as the relatively low costs of state electoral campaigns (Mulvihill 2018), oil and gas firms may have a particularly strong incentive to influence state legislators with strategic campaign contributions. Indeed, donations to state legislative candidates appear to have affected votes on amendments to important hydrofracking-related bills (Bishop and Dudley 2017; Mallinson 2014).

These policy debates occur against a backdrop of intense polarization on this policy domain (Cooper, Kim, and Urpelainen 2018; Fedaseyeu, Gilje, and Strahan 2018), which mirror the party division of public opinions on the issue (Pew 2017). This partisan divide motivates our conjecture that oil and gas interests would want to concentrate their campaign contributions more heavily on Republican candidates in state legislative districts where horizontal drilling expanded due to the fracking boom.

2.2 How Business Presence Shapes Corporate Money in Politics

2.2.1 Business Presence as Interest Alignment: Existing Theory and Evidence

How might oil and gas firms adapt their campaign contribution strategies in fracking-intensive areas? Existing research that has examined the interaction between business locations and corporate political activities often argues that legislators are more likely to cater to the interests of in-district firms owing to their constituency connection (Hall and Wayman 1990; Bombardini and Trebbi 2011; Raiha 2018). This notion accords with empirical evidence
demonstrating that firm values fluctuate according to changes in the legislative power or electoral fortunes of incumbents in districts where firms have a local presence (Artes, Richter, and Timmons 2019; Faccio and Parsley 2009; Roberts 1990). However, this conceptual framework also generates ambiguous predictions for corporate campaign contributions. On the one hand, legislators may pursue in-district firms’ policy objectives even in the absence of campaign contributions as rewards, since employees and other stakeholders of such firms can be pivotal voter blocs (Bombardini and Trebbi 2011). On the other hand, when either money or constituency ties alone is insufficient for gaining legislative access, a firm’s physical presence in given district might make its campaign contributions marginally more effective at opening doors for its lobbyists to local representatives (e.g., Biersack et al., 1994; Box-Steffensmeier et al., 2005; Levine, 2008; Sabato, 1985; Wright, 1989).

Existing empirical evidence generally mirrors these conflicting predictions. Corporate PACs across sectors contribute more money to politicians in districts where they have geographic ties (Sabato 1985; Box-Steffensmeier, Radcliffe, and Bartels 2005; Biersack, Herrnson, and Wilcox 1994; Bombardini and Trebbi 2011; Huneeus and Kim 2018; Gimpel, Lee, and Parrott 2014). Similarly, corporate PAC managers believe that their organizations’ campaign contributions are effective in districts where they have a significant local presence (Sabato 1985; Wright 1989; Biersack, Herrnson, and Wilcox 1994; Box-Steffensmeier, Radcliffe, and Bartels 2005; Bombardini and Trebbi 2011; Huneeus and Kim 2018). However, amounts of corporate campaign contributions do not monotonically increase in firms’ business presence in a district, and may instead exhibit an inverse-U relationship (Wright 1989; Stratmann 1992; Bombardini and Trebbi 2011). Furthermore, these observational studies fall short of establishing a causal link between industry geography and patterns of corporate campaign
contributions, since the regulatory favorability and political uncertainty of local communities simultaneously shape where businesses operate (e.g., Henisz & Delios, 2001; Jensen, 2003; Holburn & Zelner, 2010; Raiha, 2018) and which candidates receive corporate campaign contributions (e.g., Austen-Smith, 1987; Baron, 1994; Fox & Rothenberg, 2011; Grossman & Helpman, 2001; Snyder, 1991).

Beyond the lack of a consensus on how business presence affects the overall amount of campaign contributions from an industry, existing research that views business presence as a source of policy bias due to constituency ties with legislators also makes two key assumptions that are seldom tested in data. First, under this theoretical framework, since any given firm has no constituency links to districts where other firms in the industry (but not itself) operate, the locations of these other firms should have no first-order effect on its own allocation of campaign contributions. Second, it is often presumed that business geography can potentially shape the amount of money given to local incumbents by a firm, but not how it allocates campaign contributions across candidates of different partisanship or incumbency status. In other words, firm or industry locations do not change the underlying motivation of corporate campaign contributions, which is predominantly to buy access to existing incumbents rather than to affect election outcomes (Grier and Munger 1986a; Snyder 1991).

2.2.2 Business Presence as Legislative Agenda: Hypotheses
While firm locations can align local representatives with firm interests through their constituency connection, we think this theoretical framework need not provide a comprehensive assessment of how business geography shapes corporate money in politics. A somewhat less explored alternative perspective—one that does not preclude the former—is that firm or industry presence raises the salience of firm-relevant policies to local candidates, incentivizing them to
take leadership in setting the legislative agenda on such policies in manners that may or may not reflect business interests (Stratmann 1992). The fracking boom in the United States provides ample examples. KC Becker, of the 13th district of the Colorado House of Representatives, was a primary sponsor of SB19-181 (2019), which enabled local authorities to ban fracking activities on health and environmental grounds despite a recent defeat of an anti-fracking ballot measure in the state. In an interview, Becker stated that her bill gave the commissioners of Boulder County (a part of Becker’s district) the power to protect her constituents from the health and safety threats posed by fracking activities. In another instance, Aaron D. Kaufer, representative of the 120th district of the Pennsylvania House of Representatives, sponsored House Bill 732 (2020), which established a local resource manufacturing tax credit to attract fracking activities. Kaufer touted that his legislative accomplishment would “[bring] good-paying jobs and cutting-edge technologies to Northeast Pennsylvania [where Kaufer’s district is].”

These examples illustrate that business presence in a district can lead local candidates to prioritize related policy domains. Although individual legislators seldom get to monopolize legislative outcomes, they can still influence the agenda-setting process via a number of channels, such as proposing bills and amendments (Gamm and Kousser 2010), lobbying their colleagues in state legislatures (e.g. Awad, 2020) and influencing policymakers in other branches of government (Gordon and Hafer 2005; Ritchie and You 2019). Moreover, the contrast between KC Becker and Aaron D. Kaufer shows that business presence is not necessarily an unalloyed good for firm’s political interests in a district. Instead, depending on whether local

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2 https://leg.colorado.gov/bills/sb19-181
4 https://www.timescall.com/2020/01/07/boulder-county-residents-call-on-commissioners-to-approve-fracking-ban/
5 https://www.legis.state.pa.us/cfdocs/billinfo/bill_history.cfm?syear=2019&sind=0&body=H&type=B&bn=732
representatives appreciate the net impact of business activities in their districts—shaped by both their partisanship or ideology as well as the totality of constituent opinions—the agenda-setting activities pursued by these representatives may promote or undermine firm interests.

Insofar as business geography shapes the legislative agenda pursued by local representatives, firms may seek to use campaign contributions to mitigate the resulting regulatory uncertainty. This alternative theoretical framework thus leads to three sets of predictions. First, firms may increase their campaign giving in districts where they or their industry operate to secure favorable representation in these districts. In the context of the fracking boom in the United States, drilling firms may find it worthwhile to concentrate donations in fracking districts due to local representatives’ vested interest in shaping the agenda of state-level fracking policies. Second, this incentive to inject additional campaign cash into a district with significant business presence is not limited to in-strict firms, but also extends to out-of-district firms within the same industry that share a common legislature. In the case of fracking, any regulatory uncertainty that originates from one fracking-intensive district can have statewide repercussions for all drilling firms. Third, in districts with significant industry presence, firms may be more inclined to pursue an electoral strategy of using campaign funds to tip elections in favor of allied partisan candidates (Austen-Smith 1987; Baron 1994; Fox and Rothenberg 2011) rather than a legislative strategy of using campaign contributions to buy policy favors from incumbents (Fourirmaires and Hall 2014b; Grier and Munger 1986b). This is particularly plausible in our context since an electoral strategy can be more cost-effective for drilling firms in their attempt to secure favorable representation in fracking-intensive areas, owing to partisan polarization over fracking policies (Cooper, Kim, and Urpelainen 2018; Sances and You 2019), asset immobility of horizontal drilling (Hacker et al. 2021), the relative ease of
financing campaigns in state legislative districts (Mulvihill 2018), and incumbency advantages for state legislators (Fouirnaies and Hall 2014a).

3 Data

Our study combines data on campaign contributions in state elections and electoral outcomes with data on oil and gas drilling and shale geology. Specifically, using geography and timing, we combined National Institute on Money In State Politics (NIMSP; 2018) political information with data on wells drilled from DrillingInfo (Enverus 2018) and shale plays from the EIA (U.S. Energy Information Administration 2017a). To link these datasets together, we used the boundaries of the state legislative districts collected by the U.S. Census and standardized by the Minnesota Population center for 2009 and 2016 (Minnesota Population Center 2018; U.S Census Bureau 2019). We discuss our data construction in this section. First, we explain how we linked these data sources, then we explain how we addressed decennial state legislative redistricting; and finally, we present summary statistics.

3.1 Data Sources and Linking

Our data on political donations to state legislators is from the National Institute of Money In State Politics (NIMSP; 2018), which collects and standardizes these data from state governments. NIMSP also categorizes donations by industry and by whether the donation is from an individual or organization. We summarized this data to the district-election cycle level, calculating donations for several recipient-industry-type combinations. NIMSP data also contains electoral outcomes, which we use to calculate whether a Republican candidate won in each district-election combination. We focus on lower chambers in state legislatures, and our analysis includes nearly 4,000 districts across the nation.
Data on oil and gas development is from DrillingInfo (Enverus 2018), which collects and standardizes data on oil and gas drilling, including individual drilling events and their surface locations (latitude and longitude). These data report whether a well is a horizontal or vertical, and we restrict to horizontal wells (also called “unconventional” wells) since these are the wells primarily associated with the recent shale development (we include the relatively few wells coded as “directional” with horizontal wells). The date that drilling first begins on a well is referred to as its “spud date” in industry parlance and is also included. We use these dates to calculate cumulative wells drilled in each state legislative district and cycle.

In addition, we use data on the boundaries of shale plays to construct instruments for the presence of drilling activities in state legislative districts, since the recent boom in unconventional drilling requires shale as one of its inputs. Our measure of “shale contact” is the percent of the legislative district’s land area on shale. We obtained shale boundaries from the Energy Information Administration (EIA) (U.S. Energy Information Administration 2017a). To perform these geographic calculations, we used the boundaries of the state legislative districts collected by the U.S. Census and standardized by the Minnesota Population Center for 2009 (which we consider as “pre-redistricting”) and 2016 (which we consider as “post-redistricting”) (Minnesota Population Center 2018; US Census Bureau 2019). In the next subsection, we discuss how we handle the decennial redistricting event.

To finish our data construction, we linked the NIMSP data to the U.S. Census boundaries on state and district names. We were unable to link New Hampshire and Vermont, and we excluded Nebraska due to its atypical chamber structure. This left us with 47 states for analysis.

Our main analysis focuses on how campaign finance donations from political action committees (PACs) sponsored by oil and gas firms or associations respond to unconventional oil
and gas development. Based on available state campaign finance reports, NIMSP codes donations to state legislators by donor type, industry categories, and specific businesses. Throughout, we restrict to donor types that are coded by NIMSP as “non-individual,” meaning these donations are from firms, PACs, or other organizations. Note that while at the federal level, firms cannot contribute directly to candidate campaigns (and must use PACs or other employee-based donation strategies to contribute), firms are allowed to contribute directly to state legislature candidate campaigns in many state-years covered by our sample (D. R. Barber 2017). These direct contributions are included in the donations we study. Our focus is broadly on the oil and gas industry category; however, that industry contains several specific businesses which we a priori believed unlikely to have donation strategy driven by the geography of domestic oil and gas drilling. Table 1 displays our definitions of drilling-relevant and drilling-irrelevant specific businesses within the oil and gas general industry. For simplicity, we have referred to the specific businesses that we include in our main analyses, as displayed in column (2) of the table, as “drilling-related.”

We also examine the effects of drilling on donations, splitting donations between those from businesses and associations that are operating wells in the district versus those that are not operating any wells in the district. For this purpose, we link well operator names in Enverus data to contributor names in the donations data based on a string distance approach, followed by manual cross-checking. We ultimately build 58 links between operators and contributors. All of these linked operators have horizontal wells at some point in our panel, though some of these operators do not have that many horizontal wells, e.g., only 42 operate at least 10 horizontal wells in our sample. While many of the linkages are straightforward, some are complicated, which makes the final linkage a many-to-many match, i.e., many contributors link to many
operators and we have to aggregate the data to produce unique identifiers. For instance, sometimes operators have multiple associated PAC names, which is perhaps not surprising given the multiple states and long time period represented in the donations data. For example, since EQT changed its name in 2009, “EQT Corp,” “Equitable Resources Inc” and “Equitable Resources Inc State” all link to the operator “EQT Production,” which is standardized in the Enverus data. Acquisitions and subsidiaries also complicate these links. Two notable acquisitions occur in our sample: the acquisition of XTO Energy by ExxonMobil and the acquisition of Atlas Energy by Chevron, both in 2010. We therefore merged these firms and donors each into single units starting in the 2010 election cycle. As a third example, Aera Energy LLC is a Californian exploration and production company and one of its largest oil and natural gas producers, and is jointly owned by Shell Oil Company and ExxonMobil; in this case, we linked Aera to ExxonMobil even though Shell Oil is the majority (52%) owner, since Shell Oil does not appear to substantially participate in our donations data (while there are a few donations that may be Shell-related, they are meager compared with those linked to ExxonMobil). In our final linked dataset, the largest linked operators by maximum wells operated include merged ExxonMobil/XTO Energy, merged Chevron/Atlas Energy, California Resources, Noble Energy, Anadarko, Chesapeake, and Devon Energy.\footnote{Anadarko Petroleum was acquired by Occidental Petroleum in 2019, and Noble Energy was acquired by Chevon in 2020. Both acquisitions occur after our sample, which ends in the 2016 election cycle.}

For our regression analysis, our unit of analysis is the state legislative district election cycle, sometimes additionally split by party of the recipient (Democrat or Republican). We restrict to elections from 2002 through 2016. The careful reader will note that a redistricting event occurred within this time period, thus making it difficult to analyze our constructed dataset.
as a simple panel of districts. We next turn to describing the strategies we take to analyze the data in light of redistricting.

3.2 Addressing Redistricting

Ideally, given recent trends in shale development, we would conduct our analyses over our full data period, 2002 through 2016. However, in the middle of this period, state lower chambers were redistricted. The problem of panel analysis on electoral districts that overlap with redistricting events is a common challenge for research on the political implications of shale development as well as studies on other topics in political science. Scholars have addressed this challenge in different ways. For example, previous research on the federal electoral effects of shale development by Cooper et al. (2018) restricted the sample to the election years 2004 through 2010. By contrast, Larsen et al. (2019), who study the precinct-level effects of the housing market on voting behavior, take a sample-maximizing approach to address redistricting: they standardize voting to the precinct boundaries of one election year. This is our preferred approach.

To elaborate, first, we take each state legislative district in 2009 and link it to the legislative district in 2016 (in the same state) that has the most land area in common, and use these links to form panel units which we call “geographic legislative districts.” With our panel dimension $j$ thus defined, we have three natural strategies we may take to analyze the data. Our first strategy simply uses the geographic district identifier $j$ as the panel unit and includes fixed-effects at the level $j$. This, however, means some cross-sectional variation remains identifying the model, which may be a source of bias. Our second strategy is our preferred approach, similar to Larsen et al. (2019), which we call “base-year standardization:” we use pre-period (2009) boundaries to calculate independent variables assuming the boundaries of the district did not
change. Through this approach, we ensure that variation over time in drilling and shale coverage for a geographic legislative district is not driven by the boundary changes due to redistricting, although the outcome variables we study will remain partly driven by boundary changes, which will lead our estimates to be noisier relative to the counterfactual of unchanging boundaries. Our third strategy, which we call the “district-times-decade fixed-effects” approach, includes (geographic) district identifier times redistricting period effects. This eliminates the redistricting concern, but at the price of larger standard errors. In our baseline analysis, we present results from all three strategies to compare. Qualitatively, our findings are similar across approaches. We therefore chose to use the base-year standardization strategy for the remainder of the analysis.

3.3 Summary Statistics and Pennsylvania as an Illustration

Table 2 displays summary statistics for our analysis, including campaign contributions from oil and gas interests, electoral outcomes, and drilling activities across state legislative district-cycles. Note that cycles are coded using the year of the election, so that in odd-year election states, the cycles will be coded as e.g. 2003, 2005, and so forth; for states that have elections every four years, the cycles may be 2004, 2008, and so forth.

Since both oil and gas donations and oil and gas drilling are heavily right-skewed variables, with many districts taking on zero values, for our regression analysis we transform these variables using the log(\(x + 1\)) transformation. Table 2, Panel B, shows that horizontal wells drilled since 2000 for the average district-cycle grew from about 2.7 in the early period to about 44.3 in the latter period; this is an increase of about 2.5 units in the log (\(x + 1\)) transformation (i.e., \(\log(38.7 + 1) - \log(2.2 + 1)\) is approximately 2.5).
While our empirical analysis and data is national (47 states are included), we illustrate our data and conjecture with the state of Pennsylvania. Pennsylvania is among the most heavily-fracked states, and its natural gas production skyrocketed over our sample period so that today, it is the second largest natural gas producing state (U.S. Energy Information Administration 2017b). Moreover, Pennsylvania is a swing state, the Pennsylvanian state government has vacillated between Republican and Democratic control, and several unique state policies have been enacted by the state government with respect to fracking (StateImpact Pennsylvania 2020; Ballotpedia 2022a, 2022b). For these reasons, it makes an especially interesting example. The right column of Figure 1 shows substantial expansion in the set of state legislative districts in Pennsylvania with horizontal wells between 2002, before the fracking boom, and 2010, near the peak of the fracking boom. In addition, the left column of Figure 1 displays changes in the set of state legislative districts in Pennsylvania that received campaign contributions from drilling-related businesses during the election cycle. Comparing the left and right column, one can easily discern that districts where drilling-related donations expanded during the fracking boom (mostly in northeastern Pennsylvania) correspond quite closely with the expansion of horizontal drilling in the state.

Turning to the partisanship of these donations, the right column of Figure 2 again shows the vast spatial expansion in the set of state legislative districts in Pennsylvania with horizontal drilling. The left column of Figure 2 displays, for districts in Pennsylvania that received campaign contributions from drilling-related businesses during each given election cycle, whether the recipient(s) of such contributions were Democratic, Republican, or both. Comparing the columns suggests that in northeastern Pennsylvania where horizontal drilling expanded due
to the fracking boom, the coincident new campaign contributions from drilling-related businesses favored Republicans.

4 Overall Rise in Drilling Donations into Fracking Districts

Our first set of analyses relates state-level political activity, as measured by drilling-related political donations to state legislative candidates, to drilling activity, using a panel design and instrumental variable empirical strategy. As discussed in Sections 1 and 2, one of our objectives is to understand whether firms’ geographic ties to districts lead them to channel more money into elections in these districts. To this end, we estimate the causal effect of the presence of horizontal drilling activities in state legislative districts on the total amount of state-level campaign contributions given to these districts from drilling-related interests.

4.1 Empirical Strategy

To test our hypothesis, we begin with a panel dataset, identified by district $j$ and election cycle $t$. Note that aggregate on districts, not candidates: our first goal is to study whether more funds are allocated to districts with drilling, not to whom the funds go. Let $C_{jt}$ be a measure of total political contributions to all candidates running in district $j$ during election cycle $t$ by a particular set of interest groups (such as drilling-related firms), and $W_{jt}$ be a measure of the cumulative horizontal wells drilled in the district up through cycle $t$. Letting $s$ denote the state of the district, we begin with the following specification:

$$C_{jt} = \beta W_{jt} + \lambda_j + \lambda_{st} + u_{jt} \quad (1)$$

Here, $\lambda_j$ and $\lambda_{st}$ are, respectively, district and state-cycle fixed-effects; $u_{jt}$ contains all unobserved, district-and-time-varying variables that affect interest group contributions in state elections. Given that both $C_{jt}$ and $W_{jt}$ are right-skewed and with many zeroes, we take $C_{jt}$ to be the log$(x + 1)$ transformation of total political donations from PACs associated with some
selection of business types or industry group, such as drilling-related firms; and we take $W_{Kt}$ to be the same transformation of total cumulative horizontal wells drilled in the district (see Section 3 for discussion).

Causal identification in this panel fixed-effects model rests on there being no third factors simultaneously related to trends in contributions from drilling-related firms and trends in district-specific oil and gas drilling. In this context, one salient confounding factor is the extent to which a state legislative district is politically favorable towards oil and gas development (Republican control, rural constituency, etc.), which could simultaneously affect the rate of expansion of drilling activities in the local area, and attract oil and gas campaign contributions into the district due to candidate characteristics (rather than business presence) in this district. If this is true, we may see a spurious relationship between drilling trends and donation trends even if the location of business activities has no bearing on the spatial allocation of oil and gas campaign contributions.

As a result, we also exploit an exogenous source of variation in drilling activities, as provided by the shale boom, across communities. To this end, we run additional models where we instrument for oil and gas development using shale geography, specifically, the percent of the district’s land area that is on shale times an indicator for 2007 or after. This shale-times-time

\[13\] Whether the rate of expansion of drilling activities in areas that are politically favorable towards such development is higher or lower is unclear. On the one hand, this rate of increase might be slower if these districts started with higher levels of drilling activities before the shale boom (since the rate will be larger if the district begins at a smaller baseline level). On the other hand, political favorability of an area can facilitate on-shale districts to economically exploit the shale boom more so than on-shale districts where local representatives are skeptical of oil and gas development.
instrument is analogous to that used in previous work (Feyrer, Mansur, and Sacerdote 2017; Weber 2012).\footnote{In preliminary analysis (not shown) we also attempted to construct instruments in the spirit of Feyrer, Mansur, & Sacerdote (2017), by splitting our instrument into several instruments based on which particular shale play was underneath the district. While more powerful, these instruments failed the placebo tests which we discuss later, which made us skeptical that they can address confounding. We thus chose to use our simpler, though less statistically powerful, instrument.} Formally, our two-stage least squares (2SLS) model is as follows,

\[
W_{jt} = \gamma \text{PctShale}_j \times (t \geq 2007) + \eta_j + \eta_{st} + \epsilon_{jt} \\
C_{jt} = \beta \hat{W}_{jt} + \lambda_j + \lambda_{st} + \upsilon_{jt} \tag{2}
\]

In the first-stage, our measure of drilling \(W_{jt}\) is regressed on a shift-share instrument, \(\text{PctShale}_j \times (t \geq 2007)\), which is the percent of the district on shale times cycle being 2007 or later. This first-stage regression contains all of the controls (specifically, fixed-effects) from the second-stage regression. The second-stage regression relates drilling-related contributions to the predicted values of drilling \(\hat{W}_{jt}\). The parameter \(\beta\) in the second-stage of this model is our instrumental variable estimate for the effect of drilling on drilling-related donations.

For the exclusion restriction to hold for this instrumental variable, it must affect the outcome variable only through changing the independent variable of interest after controlling for the relevant fixed effects in the second stage. One way the exclusion restriction may not hold is if the instrument, i.e., the percent of the district on shale times cycle being 2007 or later, is correlated with confounders that could result in differential counterfactual trends in campaign contributions from oil and gas interests to districts with a faster versus slower growth in the number of horizontal wells drilled. As discussed earlier, a likely confounder is local political favorability to the oil and gas industry. We want to ensure that favorability does not appear related to our treatment, or at the very least our instrument, prior to the shale boom. Favorability
to oil and gas development could be related to our treatment after the boom, since the boom may influence local politics; we will discuss this possibility later.

To provide evidence on this question, we use regressions relating whether a Republican won office in a given district-election cycle, during the cycles 2006 and prior, to the average propensity for drilling to take place in the district (averaged over all election cycles), or to the share of the district on shale (following the base-year standardization approach, we measure the share on shale for each geographic district using the share on shale for its pre-2010 boundaries). In notation, the regression we fit is

$$ R_{jt} = \beta_s + \beta_1 \bar{X}_j + u_{jt} $$  (3)

where $R_{jt}$ is an indicator for a republican winning district $j$ in cycle $t$, $\beta_s$ is a fixed effect for each state $s$, and $\bar{X}_j$ is the mean of the variable of interest, either mean drilling or mean share on shale, for district $j$. Ideally, $\beta_1 = 0$, so that our treatment is unrelated to the pre-period chance of Republican representation, which we believe is a reasonable proxy for the local propensity of the community to be pro-drilling prior to the shale boom.

Even if the average Republican victory rate were unrelated to our treatment variable, it is possible that trends in this variable may nevertheless be related. Because our identification strategy relies on parallel trends, we would like to find our treated districts to be no more likely to trend toward being represented by a Republican legislator than our control districts. To test this hypothesis, we again restrict to election cycles between 2001 and 2006, and run placebo regressions of the form

$$ R_{jt} = \beta_s + \beta_1 \bar{X}_j + \beta_2 t + \beta_3 \bar{X}_j \times t + u_{jt} $$  (4)
If we find evidence in favor of $\beta_3 = 0$, this suggests that there is no pre-trend heterogeneity by our variable of interest, $\bar{X}_j$.

A second way in which the exclusion restriction assumption may fail is if the percentage of a district’s land that is on shale has a direct effect on the inflow of campaign contributions from oil and gas businesses, regardless of whether the presence of shale led to (or could potentially lead to) an expansion in drilling activities. To address this concern, we conduct a different set of placebo tests below for election cycles prior to 2007 (i.e., before the start of the shale boom):

$$C_{jt} = \rho_s + \rho_1 \bar{X}_j + u_{jt} \quad (5)$$

$$C_{jt} = \rho_s + \rho_1 \bar{X}_j + \rho_2 t + \rho_3 \bar{X}_j \times t + \epsilon_{jt} \quad (6)$$

Where again, $\bar{X}_j$ is either mean drilling or share on shale. If we fail to reject that $\rho_1 = 0$ in equation 5 when $\bar{X}_j$ represents share on shale, it would suggest that shale geology was not related to the level of campaign contributions from drilling-related businesses on average prior to the shale boom. More importantly (since, again, our identification strategy relies on parallel trends), if we fail to reject $\rho_3 = 0$ in equation 6 when $\bar{X}_j$ represents share on shale, we would interpret this as evidence that shale geology did not affect the change in amounts of campaign contributions from oil and gas businesses independently of the subsequent shale boom and expansion in horizontal drilling.

In Section 2, we presented a potential theory to explain the geographic coincidence of business economic and political activities: legislators in districts with business activities are more likely to engage in unilateral actions that are important for what business-effecting policies are adopted. The theory suggests that when drilling occurs in district $j$, interest groups not directly
present in district $j$ but nevertheless interested in statewide policies may donate to candidates in district $j$. To test this, we use a specification like Equation 1 except with dependent variable the log($x + 1$) transformed amount of campaign donations from a particular in- or out-of-district related group, where “in-district” is defined by having horizontal wells drilled in some year since 2000 in the district (the independent variable is the same as in Equation 1).

4.2 Results

We begin by presenting estimates of the effects of horizontal drilling within a district on total political donations to candidates running in that district from drilling-related firms (what we mean by “drilling-related” was described in Section 3 and Table 1). Table 3 displays the results from regressions, following Equations 1 and 2, that speak to this question. We consistently find statistically significant positive effects of drilling on donations from drilling-related firms. Thus the expansion of horizontal drilling in communities leads on average to increased giving to candidates running in these communities. Comparing the estimates, throughout we find that district fixed-effects estimates are smaller than instrumental variable estimates. The two approaches to addressing redistricting (columns 3 through 6) are qualitatively consistent. While all estimates are statistically significant at conventional significance levels, standard errors are much larger in instrumental variable specifications, and especially so in column (6).

We propose the base-year standardization approach, columns (3) and (4), as our preferred specification. We make three arguments in favor of this approach. First, the more rigorous district-by-decade fixed effects approach indicates slightly larger point estimates (compare columns 5 and 6 with columns 3 and 4), suggesting that base-year standardization may be, if anything, conservative. Second, the base-year standardization approach follows the spirit of Larsen et al. (2019), who also standardize boundaries to a single year in their study. Finally,
while it may be tempting to use district-by-decade fixed effects, since all approaches yield similar results and this specific approach addresses bias most convincingly, column (6) has a much larger standard error than column (4), for a natural reason: our instrumental variable does not vary during the 2010s, thus by splitting the panel in two via district-by-decade effects the instrument is by construction constant over time in one fourth of our data. In contrast, base-year standardization is not affected by this issue.

We obtain sizeable estimates of the effect of drilling presence in state legislative districts on the amount of oil and gas contributions going into these districts. For the average district where any fracking occurred in our sample, the number of horizontal wells increased from roughly 20.7 to 325 before versus after the fracking boom. Using the estimate in column (3), and starting from a benchmark of $1,780 in the average amount of donations from drilling-related firms to these districts prior to the fracking boom, the average increase in drilling would lead to about $2,075 in additional donations from these firms, representing about a 117% increase. If we used the larger instrumental variable estimates for this counterfactual, we would obtain a larger increase; using column (4) estimates, the increase would be about $5,646, or about 317% relative to the benchmark.

Having established positive effects of drilling on campaign donations from drilling-related firms, we now examine the extent to which drilling moved total donations in broader industry groups containing these firms. Table 4 displays regression results speaking to this question. Following our earlier discussion, we restrict to the base-year standardization approach in this table. Thus, columns (1) and (2) repeat columns (3) and (4) from Table 3. Then, columns (3) and (4) expand to all donations from non-individuals in the oil and gas industry; all the specific businesses for this industry in the NIMSP data were listed in Table 1. Point estimates are
smaller but not appreciably different from columns (1) and (2), meaning that our specific categorization, which was based on an *a priori* understanding of the industry, turned out not to be important for our main results. In columns (5) and (6), we expand the scope to the much broader “Energy and Natural Resources” sector, which in addition to all oil and gas related interest groups includes electric utilities, mining, railroads, waste management, and many other industries. Estimated effects are smaller and not statistically significant for this sector, consistent with the oil and gas industry being far more influenced by drilling than other industries in this sector.

As discussed previously, one salient concern for causal inference is that both trends in donations and drilling activities in a given legislative district may be confounded by the extent to which the district is politically favorable to oil and gas development. Table 5 presents placebo estimates speaking to this concern, following regression Equations 3 and 4. Throughout this table, the dependent variable is an indicator for whether a Republican won the district-election cycle; data is restricted to elections between 2001 and 2006, i.e., prior to the shale boom. Estimates in columns (1) and (3) suggest that the total amount of drilling that takes place in a district from 2001 through 2016 is not correlated on average with Republican control in the district in each election cycle the pre-shale boom period, but more drilling does correspond to an increasing rate of Republican control in said district over time even before the start of the shale boom (see coefficient on the interaction in column 3). By contrast, the percent of a legislative district that is on shale is not significantly correlated with either the level (column 2) nor trends (column 4) in how often a district has been held by a Republican incumbent, prior to 2006. This finding lends additional credibility to our instrumental variable strategy, by alleviating concerns
of confounding effects due to differential trends in local political support for oil and gas development in districts where drilling activities did or did not expand over time.

Another concern for causal inference, specifically in our application of the instrumental variable design, is that the percent of a district’s land that is on shale could independently affect the inflow of campaign contributions from drilling-related businesses, even if the presence of shale did not lead to a (potential) expansion of drilling activities. Table 6 presents placebo estimates speaking to this concern, following regression equations 5 and 6. Throughout this table, the dependent variable is the (transformed) total amount of campaign contributions from drilling-related businesses; data is restricted to elections between 2001 and 2006, i.e., prior to the shale boom. The first two columns in Table 6 show that both the presence of drilling and the percent that a district is on shale predicts levels of drilling-related campaign contributions prior to the shale boom. However, the next two columns of the same table show that neither factor—and in particular, our instrumental variable share on shale—correlates with pre-trends in drilling-related campaign contributions before the shale boom started. In particular, given the generalized difference-in-differences empirical design that we adopt, column 4 of Table 6 provides evidence against another ex ante plausible threat to the exclusion restriction of the instrumental variable design, i.e., shale geology cannot have a direct effect on the inflow of drilling-related campaign contributions that bypasses the channel of (potential or actual) expansion in horizontal drilling.

5 In-District vs. Out-of-District Sources of Fracking-Induced Influx of Campaign Contributions

As previously discussed in Section 2, different theories may account for why firm presence could lead to an increase in campaign contributions in a district. If firm presence works primarily as a form of constituency connection to local incumbents, we should expect any
increase in campaign contributions to come from in-district firms who can boast about such connections. However, under the alternative (and non-exclusive) view that firm presence incentivizes local candidates to prioritize firm-related regulatory policies to local candidates in agenda-setting activities—without necessarily persuading them to take firm-friendly positions—in-district firms as well as out-of-district firms that operate in the same industry and the same state may be motivated to use campaign contributions as a tool to ensure favorable representation in these key districts. As a result, one should expect at least some of the overall increase in campaign contributions to originate from same-state, out-of-district firms as well. This is precisely what we find.

Table 7 displays estimated effects on in-district versus out-of-district money. These are regression models following Equation 1, but replacing the dependent variable with the transformed amount of campaign donations from a particular in- or out-of-district interest group. In this analysis, an “in-district firm” is defined by being a firm that has horizontal wells drilled in the district in some year since 2000 by the election cycle under consideration. Reviewing the panel fixed-effects regression results (Panel A), we find that both in-district and out-of-district firm campaign contributions increase when there is drilling in a legislative district. The out-of-district increase persists if we include oil and gas associations (column 4) or all drilling-related interests not matched to any horizontal well operators (column 5), and the effect is not meaningfully larger if we restrict to out-of-district operators that nevertheless operate in the state of focus (column 2). When we use the instrumental variable (Panel B) we find qualitatively distinct results, though not an inconsistent story. Specifically, we find positive effects on in-district money (column 1, Panel B), and out-of-district money conditional on the firm having wells in the state (column 2, Panel B). These results can be rationalized by considering that firms
that have wells in the state are likely to have interests in state policy, and would thus be expected to contribute to important legislators in that state. Our theory (Section 2.2) suggests that drilling in a district will increase the importance of the relative legislator in that district, and thus the results in column (2) Panel B are consistent with our theory. Columns (3) through (5) of Panel B suggest that adding not-directly-interested out-of-district special interests to the analysis leads to a dilution of the effect, and hence smaller magnitude coefficients that are not statistically significant.

6 Electoral Motivations for Marginal Money in Fracking Districts

In Section 2.2 we theorize that firms’ geographic ties to a district may lead them to pivot to an electoral strategy in corporate campaign contributions in said district. To test this hypothesis, we examine heterogeneity in the amounts of fracking-induced campaign contributions to state legislative districts from drilling interests with respect to candidates’ partisan affiliation as well as districts’ partisan leanings.

To be clear, firms and other special interests may employ a variety of campaign contribution strategies at the same time (e.g., Stratmann, 1992; Grossman & Helpman, 2001; Bonica, 2013; Schnakenberg & Turner, Forthcoming), and our goal is not to claim that oil and gas firms never pursue a legislative strategy in campaign giving to further their policy objectives. Rather, through our heterogeneity tests discussed in this section, we aim to show that the oil and gas firms behaved as if they became relatively more inclined to use campaign contributions to tip elections in favor of allied Republican candidates in districts that experienced the fracking boom, relative to districts that did not.
6.1 Empirical Design

As discussed in Section 2.2, a key observable distinction between a legislative vs. electoral strategy in campaign giving is that the former implies that interest group money would target incumbent legislators (whose partisan affiliation is of secondary concern), whereas the latter implies that interest group money would target allied candidates (whose incumbency is of secondary concern). At the same time, given the polarized state of fracking policies, the oil and gas industry finds its natural allies in the Republican party. (Gimpel, Lee, and Parrott 2014; Cooper, Kim, and Urpelainen 2018; Sances and You 2019). Consequently, insofar as the presence of fracking activities in a state legislative district incentivizes drilling firms to pursue an electoral strategy in campaign giving there, these firms should be more likely to concentrate their campaign contributions on the Republican candidates in said district (i.e., relative to the baseline in districts without fracking activities).

To empirically verify this hypothesis, we first estimate heterogeneity in the treatment effects presented in Section 4 with respect to candidates’ partisan affiliations. We reshape the data so that observations are identified by party of the recipient \( p \), district \( j \), and election cycle \( t \). The new outcome variable, \( C_{pjt} \), is now the log \((x + 1)\) of the total political contributions from drilling-related interests to candidates of party \( p \) running in district \( j \) in cycle \( t \). We run regressions of the form,

\[
C_{pjt} = \beta_D 1(p = D)W_{jt} + \beta_R 1(p = R)W_{jt} + \lambda_{pj} + \lambda_{st} + u_{pjt} \quad (7)
\]

where \( 1(x) \) is an indicator function taking on the value 1 if \( x \) is true, and 0 otherwise; and \( W_{jt} \) is our drilling intensity measure, as defined previously. This equation generalizes the specification in equation 1 to allow heterogeneity by the party of the recipient.
The parameters of interest are $\beta_D$ and $\beta_R$; these are the effects of oil and gas development on contributions to Democratic candidates and Republican candidates, respectively. If $\beta_R > \beta_D$, it would suggest that the relative increase in contributions when a district experienced fracking development was greater on average for Republican candidates than for Democratic candidates. In that case, oil and gas firms would appear to have a particularly strong interest to support allied Republican candidates in such a district.

However, $\beta_R > \beta_D$ alone need not prove that the presence of fracking activities in a district leads oil and gas firms to pivot to an electoral strategy in campaign giving there. This is because the fracking boom may have independently generated an electoral swing in favor of the Republican party (Cooper, Kim, and Urpelainen 2018; Sances and You 2019). As a result, it is possible for oil and gas firms to concentrate their campaign giving on Republican candidates in fracking-intensive districts not because of these candidates’ partisan leanings, but due to their (newly acquired) incumbency statuses. This means that even if we find $\beta_R > \beta_D$, we cannot rule out the possibility that oil and gas campaign contributions in districts where fracking activities take place are primarily driven by legislative rather than electoral motivations.

To further examine the conjecture of electorally motivated campaign contributions, we conduct an additional heterogeneity test based on prior work on the effectiveness of campaign spending on electoral outcomes. The best available empirical evidence, including findings from a field experiment, suggests that the marginal returns to campaign spending on vote shares or probabilities of electoral victory tend to be higher for challengers than incumbents (Jacobson 1978; Gerber 2004). Consequently, we might expect that within Republican candidates in fracking-intensive state legislative districts, fracking-induced increases in oil and gas campaign contributions could be even higher for those who were non-incumbents rather than incumbents.
Since incumbency statuses of partisan candidates are post-treatment in the context of the fracking boom (Cooper, Kim, and Urpelainen 2018; Sances and You 2019), we proxy for the incumbency status of candidates in each district with said district’s historical (i.e., pre-fracking boom) partisan leanings, i.e., the share of elections won by a Republican for all cycles from 2001 through 2006. This measure of districts’ pre-fracking partisan leanings, when interacted with candidates’ partisan affiliation, is a proxy for candidates’ incumbency statuses. For example, contributions given to a Republican candidate in a historically Democratic district are more likely to be contributions made to a Republican challenger than a Republican incumbent. We may then specify our second heterogeneity test:

\[
C_{pjt} = \beta_{DD}(1 - \bar{R}_j)1(p = D)W_{jt} + \beta_{RD}\bar{R}_j1(p = D)W_{jt} \\
+ \beta_{DR}(1 - \bar{R}_j)1(p = R)W_{jt} + \beta_{RR}\bar{R}_j1(p = R)W_{jt} \\
+ \lambda_{pj} + \lambda_{st} + u_{pjt}
\]  

In this regression, \( \bar{R}_j \) denotes the (time-invariant) percent of elections between 2001 and 2006 (i.e., prior to the shale boom) in which a Republican candidate won. Our measure of party-district-election specific contributions from drilling-related firms, \( C_{pjt} \), is regressed on four quantities, plus the same fixed-effects as in equation 7. The four quantities correspond to four parameters of interest, which we interpret as follows: \( \beta_{DD} \) is the effect of oil and gas development in historically Democratic-leaning districts (first \( D \) in the subscript) on donations to Democratic candidates (second \( D \) in the subscript); \( \beta_{RD} \) is the effect of oil and gas development in historically Republican-leaning districts on donations to Democratic candidates; \( \beta_{DR} \) is the effect of drilling in historically Democratic districts on donations to Republicans; and finally, \( \beta_{RR} \) is the effect of drilling in historically Republican districts on donations to Republicans. Based on our theoretical discussion, if oil and gas firms are indeed more inclined to pursue an
electoral strategy in campaign giving in districts where they conduct horizontal drilling activities, we would expect $\beta_{DR} > \beta_{RR}$. In words, this would mean that within fracking-intensive districts, Republican candidates received even more campaign contributions from the oil and gas industry if their districts were historically Democratic-leaning (rather than Republican-leaning).

In both specifications, we also run instrumental variable versions of the regressions. To do so, we construct instruments by replacing $W_{jt}$ with our instrument, $\text{PctShale}_j \times (t \geq 2007)$, throughout equations 5 and 6. This means that, for example, we instrument for $(1 - \bar{R}_j)1(p = D)W_{jt}$ using $(1 - \bar{R}_j)1(p = D)\text{PctShale}_j \times (t \geq 2007)$ in equation 7. This approach exactly identifies two-stage least squares version of equations 7 and 8, which we compare to the simpler district fixed-effects specifications.

6.2 Results

Table 8 displays the results of estimating regression equations 7 and 8. Following our earlier discussion, throughout we use the base-year standardization approach to handle the redistricting issue. Columns (1) and (2) are district fixed-effects regressions, while columns (3) and (4) use the plug-in instrumental variables for identification. Throughout, the dependent variable is the $\log(x + 1)$ of contributions from drilling-related interests, at the party-district-cycle level.

The table presents an interesting story. Drilling leads to increased contributions to Republicans, but not Democrats (columns 1 and 3). Campaign contributions from the oil and gas industry are thus particularly partisan in fracking-intensive districts. Moreover, columns 2 and 4 show that, within districts that experienced the fracking boom, the Republican advantage in campaign fundraising from drilling-related special interests were even more pronounced if these
districts historically leaned Democratic (in other words, districts where Republican candidates were more likely to be non-incumbents than incumbents). Thus, our findings are consistent with the notion that the presence of fracking activities in state legislative districts led oil and gas firms to pivot to an electoral strategy in campaign giving there. These results are similar regardless of whether we use our instrumental variables strategy.

In light of the evidence above, it is interesting to ask whether and to what extent districts that expanded horizontal drilling over our sample period indeed switched to Republican control. Our analysis here is similar to that of Cooper et al. (2018), who study whether federal congressional elections tended to swing Republican over time in places that are on shale, relative to places off shale.

To this end, Table 9 estimates regression models based on equation 1, except taking as dependent variable an indicator for a Republican candidate winning the district instead of a measure of total contributions from drilling interests. The table reads the same as Table 3. We generally find evidence that Republicans indeed win more victories as drilling increases, but the magnitude and statistical significance varies by specification. As before, columns (5) and (6) provide the noisiest estimates. Our preferred base-year standardization approach, columns (3) and (4), suggest fairly large effects. Recall from Table 2 that the independent variable rose on average about 2.52 from pre-shale boom to post, a shift that would increase the chance a Republican won the district by about 7.8 percentage points (based on our column 3 estimate), a politically significant effect.

Note that this result by itself does not prove that drilling-related contributions alone tipped state elections in favor of Republicans in districts that experienced the shale boom. Nonetheless, our results suggest that an influx of electorally motivated oil and gas campaign
contributions into fracking-intensive state legislative districts could be one of the mechanisms through which the fracking boom facilitated Republican victories in state elections. This is particularly plausible since the presence of fracking did not uniformly shift constituent sentiments in favor of the industry given its mixed socioeconomic impact on local communities (Sances and You 2019).

Insofar as the marginal dollars pouring into fracking districts were motivated by electoral rather than legislative considerations, the impact of drilling money on democratic representation in these districts could extend well beyond energy policymaking. By tipping elections in favor of allied Republican candidates, the oil and gas industry may not only ensure that local representatives are aligned with its regulatory interests, but also transform legislative activities pursued by these representatives on a host of other economic and social issues that, like fracking, are polarized along party lines in state legislatures (e.g., Grumbach, 2018; McCarty et al., 2016; Shor & McCarty, 2011). The impact of any electoral turnovers in fracking districts aided by drilling money could potentially affect the lives of many different local constituencies.

Another implication of firms’ pivot to an electoral strategy in campaign giving in districts with significant industry presence is that, in anticipation of such corporate political strategy, lawmakers may have an incentive to distort economic policymaking so as to protect their own electoral prospects. While the notion that politicians may design policies (e.g., legislation on public sector unions) to mobilize allies or demobilize rivals is not new (e.g., Hertel-Fernandez, 2018), our findings suggest that policies pertaining to business development may be yet another tool available for lawmakers to potentially skew economic activities for their electoral gains. There is some suggestive evidence in the context of the shale boom: Democratic Governor Andrew Cuomo of New York issued a statewide ban in 2014 on hydrofracking.
activities in spite of the state’s rich deposits of shale as well as popular support for drilling activities in on-shale communities in southern New York (Kaplan 2014). Had hydrofracking been allowed to expand in the state, the subsequent influx of oil and gas campaign contributions might have helped expand Republican seat shares in the New York State Legislature.\textsuperscript{15}

7 Conclusion

Business entry or expansion in local communities is not universally celebrated. While some may laud its positive economic impact, others may raise concerns over environmental damage or other forms of externalities. How do firms use political activities, such as campaign contributions, to preempt opposition from local communities and mitigate regulatory risks, and what are the consequences for democratic representation in communities where firms are located? To these ends, we examine the fracking boom, a technological breakthrough that transformed the geography of drilling activities across the United States, and study its subsequent impact on the strategic allocation of oil and gas campaign contributions in state elections. This natural experiment helps us isolate exogenous shifts in business geography on whether and how it changes donation patterns, overcoming inference challenges faced by many previous studies.

Using both panel fixed-effects analysis and an instrumental variable design, we find that drilling-related firms significantly increased political contributions to candidates in state legislative districts where horizontal drilling activities expanded as a result of the shale boom. This represents one of the first sets of causal evidence that firms’ geographic ties to districts may cause them to channel more money into elections in these districts. Such evidence suggests that strategic corporate campaign contributions might entrench business influence, which many argue

\textsuperscript{15} Note that the New York State Senate was usually controlled by Republicans in the half century prior to the 2018 elections.
is already disproportionate in American politics (e.g., Barber, 2016; Bartels, 2017), in areas where firms maintain a local presence.

We also examine the origins of such fracking-induced influx of campaign cash. While drilling firms that operated in a district that experienced the fracking boom saw the greatest proportional increase in their campaign contributions into said district, out-of-district drilling firms that operate within the same state also accounted for the overall rise in money. In contrast, out-of-state firms were not at all responsive. Such empirical evidence is consistent with the notion that representatives in fracking districts take leadership in setting their states’ legislative agenda on fracking regulations. The fact that a sizeable share of the overall influx of fracking-induced campaign contributions originated from out-of-district firms also raises normative questions about out-of-district interests potentially crowding out the representation of local constituents (Canes-Wrone and Miller n.d.; Wright 1989).

Furthermore, departing from existing research that focuses exclusively on how firms’ geographic ties influence amounts of corporate campaign contributions, we also examine how business presence in a district affects the allocation of such contributions across candidates. We show that the fracking-induced influx of campaign contributions from the oil and gas industry overwhelmingly benefited Republican candidates, especially those in fracking-intensive districts that historically leaned Democratic. Consistent with the notion that oil and gas firms may have used campaign contributions to tip elections in favor of allied Republican candidates in districts that experienced the fracking boom, we also find that such districts indeed became more likely to elect Republicans after the fracking boom, therefore pointing to strategic oil and gas campaign contributions as one of the potential mechanisms accounting for such electoral turnovers. Our insight that firms’ geographic ties to a district may lead them to pivot to an electoral strategy in
campaign giving contributes to the literature on corporate political activities as well as the broader impact of corporate influence in society. Regarding the former, we highlight the geography of business activities as an important source of within-firm variation in corporate campaign contribution strategies (i.e., a legislative vs. electoral strategy). Regarding the latter, we show that corporate influence, via the money in elections channel, may usher in wide-ranging changes in political representation in communities that host firm activities.

To examine the external validity of our theoretical insights beyond the context of the oil and gas industry and the fracking boom, future work could benefit from identifying plausibly exogenous shifts in the geographic distribution of business activities in other industries. First, to further test whether the strategic importance of firms’ geographic ties derives from their impact upon local communities, future research could investigate whether firms’ local presence become less important for explaining variations in corporate campaign contributions across districts in industries whose positive or negative externalities (e.g., employment and other economic growth, environmental and social effects) are spatially diffused rather than locally concentrated as is in the case of fracking. Second, to further investigate whether time horizons affect firms’ tendencies to pursue an electoral strategy in campaign giving in districts where they are located (i.e., viewing these campaign contributions as long-term political investments), future work could look into other industries where the locations of business activities are more flexible and not as geographically constrained as in the case of fracking. Third, research that follows our work could identify industries whose salient policy domains are less polarized than those for the oil and gas industry (Egan and Mullin 2017; Pew 2017), so as to test whether firms’ tendencies to attempt to electorally capture districts where they have geographic ties weaken in the policy stakes of electoral representation (Eatough and Barber n.d.). Last but not least, given the
diversity in corporate political strategies (e.g. Bonica, 2013; Gimpel et al., 2014; Li, 2018), and
the notable conservatism of the oil and gas industry (Bonica 2013, 2014; Gimpel, Lee, and
Parrott 2014), future work that exploits similar natural experiments in business locations in other
economic sectors may help us assess the generalizability of our findings beyond energy politics.

In addition to extending our analysis to other industries, future work could also build
upon this paper by investigating other forms of corporate political activities. In the context of the
shale boom, we focus on state-level campaign contributions due to several advantages. These
advantages aside, there is no reason a priori to expect that the geography of business activities
only affects the spatial allocation of corporate campaign contributions. In particular, since our
findings suggest that campaign contributions help firms to secure favorable electoral (and hence
lasting) representation in districts where firms have geographic ties, future work may particularly
benefit from investigating other tools at firms’ disposal—e.g., corporate philanthropy (Bertrand
et al. 2018, 2020) and economic influence activities (Raiha 2018)—that are of electoral value to
political candidates. Such extensions would allow us to gauge the extent to which firms’
geographic ties shape corporate political strategy across avenues of influence, thereby providing
a more comprehensive assessment of how business influence may dominate democratic
representation in districts where firms have a local presence.

References

Allcott, Hunt, and Daniel Keniston. 2018. “Dutch Disease or Agglomeration? The Local
Economic Effects of Natural Resource Booms in Modern America.” The Review of


Barber, Michael J. 2016. “Representing the Preferences of Donors, Partisans, and Voters in the US Senate.” *Public Opinion Quarterly* 80(S1): 225–49.


NY State Department of Environmental Conservation. 2015. “FINAL SUPPLEMENTAL GENERIC ENVIRONMENTAL IMPACT STATEMENT ON THE OIL, GAS AND SOLUTION MINING REGULATORY PROGRAM.”


Tables and Figures

**Table 1:** Drilling-related specific businesses within the Oil & Gas general industry.

<table>
<thead>
<tr>
<th>Specific Business</th>
<th>2010 Total Amount ($)</th>
<th>Drilling-Related (Our Definition)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major (multinational) oil &amp; gas producers</td>
<td>1,566,184</td>
<td>Yes</td>
</tr>
<tr>
<td>Oil &amp; gas</td>
<td>1,465,721</td>
<td>Yes</td>
</tr>
<tr>
<td>Natural gas transmission &amp; distribution</td>
<td>878,215</td>
<td>Yes</td>
</tr>
<tr>
<td>Independent oil &amp; gas producers</td>
<td>298,800</td>
<td>Yes</td>
</tr>
<tr>
<td>Oilfield service, equipment &amp; exploration</td>
<td>67,525</td>
<td>Yes</td>
</tr>
<tr>
<td>Petroleum refining &amp; marketing</td>
<td>908,971</td>
<td>No</td>
</tr>
<tr>
<td>Gasoline service stations</td>
<td>569,741</td>
<td>No</td>
</tr>
<tr>
<td>LPG/Liquid propane dealers &amp; producers</td>
<td>56,645</td>
<td>No</td>
</tr>
<tr>
<td>Fuel oil dealers</td>
<td>20,050</td>
<td>No</td>
</tr>
</tbody>
</table>

**Notes:** Table lists all *specific businesses* (NIMSP terminology) within the Oil & Gas *general industry* from the NIMSP data. The Oil & Gas industry is part of the Energy & Natural Resources *broad sector* (not shown). Column (1) reports the sum total amount donated to lower chamber state legislators from each specific business in 2010 according to NIMSP; column (2) reports whether we include the specific business in analysis of effects on “drilling-related” campaign donations. While we erred on the side of inclusion, we *ex ante* judged that some specific businesses would be less likely to have donation strategies driven by domestic onshore drilling.
Table 2: Summary statistics on politics and drilling.


<table>
<thead>
<tr>
<th>Statistic</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistic</td>
<td>All</td>
<td>2002-2005</td>
<td>2013-2016</td>
<td>Non-drilling</td>
<td>Drilling</td>
</tr>
<tr>
<td>Mean Total Donations ($)</td>
<td>142,663</td>
<td>112,507</td>
<td>167,899</td>
<td>132,848</td>
<td>202,046</td>
</tr>
<tr>
<td>Mean Drilling-Related Donations ($)</td>
<td>1,010</td>
<td>605</td>
<td>1,368</td>
<td>674</td>
<td>3,042</td>
</tr>
<tr>
<td>... To Republicans ($)</td>
<td>690</td>
<td>350</td>
<td>1,000</td>
<td>438</td>
<td>2,214</td>
</tr>
<tr>
<td>... To Democrats ($)</td>
<td>317</td>
<td>255</td>
<td>365</td>
<td>234</td>
<td>823</td>
</tr>
<tr>
<td>... Where a Republican is Incumbent ($)</td>
<td>563</td>
<td>258</td>
<td>877</td>
<td>363</td>
<td>1,774</td>
</tr>
<tr>
<td>... Where a Democrat is Incumbent ($)</td>
<td>309</td>
<td>220</td>
<td>364</td>
<td>229</td>
<td>793</td>
</tr>
<tr>
<td>Mean Oil &amp; Gas Donations ($)</td>
<td>1,374</td>
<td>905</td>
<td>1,797</td>
<td>993</td>
<td>3,682</td>
</tr>
<tr>
<td>Mean Energy Industry Donations ($)</td>
<td>4,680</td>
<td>3,124</td>
<td>6,187</td>
<td>3,902</td>
<td>9,388</td>
</tr>
<tr>
<td>% Republican Won</td>
<td>51.4</td>
<td>49.4</td>
<td>57.9</td>
<td>50.1</td>
<td>59.4</td>
</tr>
</tbody>
</table>

Panel B: Wells & Shale

<table>
<thead>
<tr>
<th>Statistic</th>
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<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Horizontal Wells Drilled Since 2000</td>
<td>20.2</td>
<td>2.7</td>
<td>44.3</td>
<td>0.0</td>
<td>142.1</td>
</tr>
<tr>
<td>Mean % Land on Shale</td>
<td>12.4</td>
<td>12.2</td>
<td>12.7</td>
<td>7.2</td>
<td>43.7</td>
</tr>
<tr>
<td>% Any Land on Shale</td>
<td>18.5</td>
<td>18.2</td>
<td>19.0</td>
<td>10.8</td>
<td>65.2</td>
</tr>
</tbody>
</table>

Panel C: Sample Sizes

<table>
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<tr>
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<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Districts</td>
<td>3971</td>
<td>3959</td>
<td>3813</td>
<td>3437</td>
<td>622</td>
</tr>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
<td>------</td>
<td>-------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Number of District-Elections</td>
<td>29489</td>
<td>7465</td>
<td>7240</td>
<td>25306</td>
<td>4183</td>
</tr>
</tbody>
</table>

**Notes:** In all calculations, district-elections (election cycles) are weighted equally. Non-drilling means zero horizontal wells by the last cycle of the district in our data, usually 2016.
Figure 1: Spatial Changes in Horizontal Wells vs. Total Amounts of Campaign Contributions from Drilling-Related Firms in Pennsylvania, 2002 versus 2010 election cycle. The left column contrasts the set of state legislative districts in Pennsylvania that received any campaign contributions from drilling-related firms in the 2002 vs. 2010 election cycles. The right column shows the expansion in state legislative districts in Pennsylvania with any horizontal wells drilled (cumulative since 2000) between 2002, before the fracking boom, and 2010, at the height of the fracking boom.
Figure 2: Spatial Changes in Horizontal Wells vs. Partisan Allocation of Campaign Contributions from Drilling-Related Firms in Pennsylvania, 2002 versus 2010 Election Cycles. The left column displays the partisan affiliation(s) of the recipient(s) of campaign contributions from drilling-related interests in state legislative districts in Pennsylvania in the 2002 vs. 2010 election cycles. Note that legislative districts that received no contributions from drilling-related interests in the election cycle are in solid gray, as are the few (and geographically small) districts where drilling-related interests donated to candidates from both parties. The right column shows the expansion in state legislative districts in Pennsylvania with any horizontal wells between 2002, before the fracking boom, and 2010, at the height of the fracking boom.
Table 3: Effects of drilling on political donations from drilling-related businesses.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>District FEs</td>
<td>(1) with IV</td>
<td>Base-year Standardization</td>
<td>(3) with IV</td>
<td>District-by-Decade FE</td>
<td>(5) with IV</td>
</tr>
<tr>
<td>log(Wells Drilled Since 2000 + 1)</td>
<td>0.254*** (0.046)</td>
<td>0.552*** (0.174)</td>
<td>0.285*** (0.051)</td>
<td>0.527*** (0.174)</td>
<td>0.314*** (0.069)</td>
<td>0.669** (0.283)</td>
</tr>
<tr>
<td>Number of Clusters (Districts)</td>
<td>3,971</td>
<td>3,971</td>
<td>3,971</td>
<td>3,970</td>
<td>3,970</td>
<td>3,970</td>
</tr>
<tr>
<td>First-stage F (for IVs)</td>
<td>129.35</td>
<td>121.00</td>
<td>89.14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample Size (District-Cycles)</td>
<td>29,489</td>
<td>29,489</td>
<td>29,489</td>
<td>29,487</td>
<td>29,321</td>
<td>29,321</td>
</tr>
</tbody>
</table>

Notes: Standard errors clustered on legislative district in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01. See Table 1 and the text for discussion of our definition of “drilling-related business.” The dependent variable is total donations from these businesses to all candidates running in the given district, transformed using log(x + 1). Columns vary over specification. Three difference-in-differences specifications to control for district-specific effects given shifting borders are shown in odd columns (see the text for details). The difference-in-differences regressions correspond to equation 1 in the text. Even columns repeat these specifications using our shale-based instrument for identification and correspond to equation 2 in the text.
Table 4: Effects of drilling on political donations from drilling-related businesses, and larger industry supersets.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Drilling-Related</td>
<td>Oil &amp; Gas</td>
<td>Energy Broad</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Specific Businesses</td>
<td>General Industry</td>
<td>Sector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1) with IV</td>
<td>(3) with IV</td>
<td>(5) with IV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>log(Wells Drilled Since</td>
<td>0.285***</td>
<td>0.527***</td>
<td>0.264***</td>
<td>0.435**</td>
<td>0.056*</td>
<td>0.132</td>
</tr>
<tr>
<td>2000 + 1)</td>
<td>(0.051)</td>
<td>(0.174)</td>
<td>(0.050)</td>
<td>(0.170)</td>
<td>(0.032)</td>
<td>(0.125)</td>
</tr>
<tr>
<td>Number of Clusters</td>
<td>3,971</td>
<td>3,970</td>
<td>3,971</td>
<td>3,970</td>
<td>3,971</td>
<td>3,970</td>
</tr>
<tr>
<td>(Districts)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-stage F (for IVs)</td>
<td>121.00</td>
<td>121.00</td>
<td>121.00</td>
<td>121.00</td>
<td>121.00</td>
<td>121.00</td>
</tr>
<tr>
<td>Sample Size (District-</td>
<td>29,489</td>
<td>29,487</td>
<td>29,489</td>
<td>29,487</td>
<td>29,489</td>
<td>29,487</td>
</tr>
<tr>
<td>Cycles)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Standard errors clustered on legislative district in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01. Columns (1) and (2) repeat columns (3) and (4) from Table 3. The remaining columns repeat the analysis with broader industry supersets; throughout, the “base-year standardization” specification is used. See notes to Table 3.
Table 5: Placebo effects of drilling and shale on pre-period Republican representation.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Levels, Wells</td>
<td>Levels, Shale</td>
<td>Pre-trends, Wells</td>
<td>Pre-trends, Shale</td>
</tr>
<tr>
<td>Mean log(Wells Drilled + 1), 2001 through 2016</td>
<td>0.015 (0.009)</td>
<td>-6.695** (2.671)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share of District on Shale</td>
<td>-0.018 (0.032)</td>
<td>13.395 (10.184)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year trend</td>
<td></td>
<td>-0.010**** (0.002)</td>
<td>-0.008*** (0.002)</td>
<td></td>
</tr>
<tr>
<td>Year times Mean log(Wells Drilled + 1)</td>
<td>0.003** (0.001)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year times Mean % District on Shale</td>
<td></td>
<td>-0.007 (0.005)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Clusters (Districts)</td>
<td>3,964</td>
<td>3,964</td>
<td>3,964</td>
<td>3,964</td>
</tr>
<tr>
<td>Sample Size (District-Cycles)</td>
<td>11,075</td>
<td>11,075</td>
<td>11,075</td>
<td>11,075</td>
</tr>
</tbody>
</table>

Notes: Standard errors clustered on legislative district in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01. Throughout, the dependent variable is an indicator for whether a Republican won the district-election cycle. Data is restricted to elections in the interval 2001 through 2006, i.e. prior to the fracking boom. Columns (1) and (2) relate Republican victory to average wells drilled throughout our sample or percent of the district on shale, respectively. These columns correspond to regression equation 3 in the text. Columns (3) and (4) examine whether time trends in Republican victory vary depending on average wells drilled or share on shale, respectively. These columns correspond to regression equation 4 in the text.
Table 6: Placebo effects of shale on pre-period campaign contributions.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Levels, Wells</td>
<td>Levels, Shale</td>
<td>Pre-trends, Wells</td>
<td>Pre-trends, Shale</td>
</tr>
<tr>
<td>Mean log(Wells Drilled + 1), 2001 through 2016</td>
<td>0.174*** (0.042)</td>
<td>-31.680 (24.263)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share of District on Shale</td>
<td>0.467*** (0.146)</td>
<td></td>
<td>98.585 (101.690)</td>
<td></td>
</tr>
<tr>
<td>Year trend</td>
<td>-0.019 (0.014)</td>
<td>-0.008 (0.014)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year times Mean log(Wells Drilled + 1)</td>
<td>0.016 (0.012)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year times Mean % District on Shale</td>
<td></td>
<td>-0.049 (0.051)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of Clusters (Districts)</td>
<td>3,964</td>
<td>3,964</td>
<td>3,964</td>
<td>3,964</td>
</tr>
<tr>
<td>Sample Size (District-Cycles)</td>
<td>11,075</td>
<td>11,075</td>
<td>11,075</td>
<td>11,075</td>
</tr>
</tbody>
</table>

Notes: Standard errors clustered on legislative district in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01. Throughout, the dependent variable is total donations from drilling-related businesses to all candidates running in the given district, transformed using log(x + 1). Data is restricted to elections in the interval 2001 through 2006, i.e. prior to the fracking boom. Columns (1) and (2) relate amount of campaign contributions received from drilling-related businesses to average wells drilled throughout our sample or percent of the district on shale, respectively. These columns correspond to regression equation 5 in the text. Columns (3) and (4) examine whether in these campaign contributions vary depending on average wells drilled or share on shale, respectively. These columns correspond to regression equation 6 in the text.
Table 7: Effects of unconventional drilling on political donations from firms, split by firm presence.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>In-District Only</strong></td>
<td><strong>Out of District</strong></td>
<td><strong>All Out of District</strong></td>
<td><strong>(3) Adding Associations</strong></td>
<td><strong>(4) Adding All Unmatched</strong></td>
</tr>
<tr>
<td>log(Wells Drilled Since 2000 + 1)</td>
<td>0.539*** (0.047)</td>
<td>0.150*** (0.056)</td>
<td>0.132** (0.056)</td>
<td>0.155*** (0.056)</td>
<td>0.178*** (0.047)</td>
</tr>
<tr>
<td><strong>Panel A: Panel Fixed-Effects Regression</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>log(Wells Drilled Since 2000 + 1)</td>
<td>0.581*** (0.081)</td>
<td>0.487*** (0.156)</td>
<td>-0.031 (0.180)</td>
<td>-0.068 (0.177)</td>
<td>0.268 (0.171)</td>
</tr>
<tr>
<td><strong>Panel B: Adding Instrumental Variable</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>First-stage F</strong></td>
<td>114</td>
<td>114</td>
<td>114</td>
<td>114</td>
<td>114</td>
</tr>
<tr>
<td><strong>Number of Clusters (Districts)</strong></td>
<td>3,600</td>
<td>3,600</td>
<td>3,600</td>
<td>3,600</td>
<td>3,600</td>
</tr>
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<td><strong>Sample Size (District-Cycles)</strong></td>
<td>28015</td>
<td>28015</td>
<td>28015</td>
<td>28015</td>
<td>28015</td>
</tr>
</tbody>
</table>

Notes: Standard errors clustered on legislative district in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01. The dependent variable varies by column: in column (1), it is the log(x + 1) transformed campaign contributions of firms with wells operating within the legislative district (meaning that the firm has any horizontal wells in the district during the given cycle); in column (2) the dependent variable consists of transformed contributions of firms with horizontal wells operating somewhere in the same state, but not in the given district (during the election cycle); and column (3) takes the dependent variable to be contributions from all out-of-district operators (not necessarily operating in the same state). Column (4) adds oil and gas associations (which are never matched to wells, since they are not themselves operators, and are therefore always in a sense “out of district”), and column (5) adds all firms that are not matched to well operators (treating them all as “out of district”). Panel A reports results from panel fixed-effects models, while Panel B additionally employs the shale-geography-based instrumental variable.
Table 8: Heterogeneity analysis.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base-year Stand.</td>
<td>Base-year Stand.</td>
<td>(1) with IV</td>
<td>(2) with IV</td>
</tr>
<tr>
<td>Contributions to Democrats</td>
<td>-0.142***</td>
<td>0.033</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.050)</td>
<td>(0.116)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contributions to Republicans</td>
<td>0.441***</td>
<td>0.538***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.053)</td>
<td>(0.127)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrib. to Dem. in Historically-Dem. Districts</td>
<td>-0.219**</td>
<td>-0.079</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.092)</td>
<td>(0.201)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrib. to Dem. in Historically-Rep. Districts</td>
<td>-0.070*</td>
<td>0.141</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.040)</td>
<td>(0.094)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrib. to Rep. in Historically-Dem. Districts</td>
<td>0.596***</td>
<td></td>
<td>0.821***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.081)</td>
<td></td>
<td>(0.166)</td>
<td></td>
</tr>
<tr>
<td>Contrib. to Rep. in Historically-Rep. Districts</td>
<td>0.296***</td>
<td></td>
<td>0.295*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.071)</td>
<td></td>
<td>(0.163)</td>
<td></td>
</tr>
<tr>
<td>Number of Clusters (Districts)</td>
<td>3,971</td>
<td>3,964</td>
<td>3,970</td>
<td>3,964</td>
</tr>
<tr>
<td>First-stage F (for IVs)</td>
<td>61</td>
<td></td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Sample Size (District-Party-Cycles)</td>
<td>58,978</td>
<td>58,936</td>
<td>58,974</td>
<td>58,936</td>
</tr>
</tbody>
</table>

Notes: Standard errors clustered on legislative district in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01. Table displays results from regression equation 7 in columns (1) and (3), and equation 8 in columns (2) and (4). All specifications use base-year standardization; columns (1) and (2) are difference-in-differences, while columns (3) and (4) use plug-in shale geology instruments.
**Table 9**: Do districts flip? Effects of drilling on Republican victories.

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2) with IV</th>
<th>(3) with IV</th>
<th>(4) with IV</th>
<th>(5) with IV</th>
<th>(6) with IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>District FEs</td>
<td>(1)</td>
<td>(3)</td>
<td>(5)</td>
<td>(5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>log(Wells Drilled Since 2000 + 1)</td>
<td>0.020*** (0.006)</td>
<td>0.039* (0.022)</td>
<td>0.030*** (0.007)</td>
<td>0.043* (0.022)</td>
<td>0.016** (0.008)</td>
<td>0.030 (0.030)</td>
</tr>
<tr>
<td>Number of Clusters (Districts)</td>
<td>3,971</td>
<td>3,971</td>
<td>3,970</td>
<td>3,970</td>
<td>3,970</td>
<td>3,970</td>
</tr>
<tr>
<td>First-stage F (for IVs)</td>
<td>129</td>
<td>121</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample Size (District-Cycles)</td>
<td>29,489</td>
<td>29,489</td>
<td>29,489</td>
<td>29,487</td>
<td>29,321</td>
<td>29,321</td>
</tr>
</tbody>
</table>

**Notes**: Standard errors clustered on legislative district in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01. Throughout, the dependent variable is an indicator for whether a Republican won the district-election cycle. Otherwise the table is identical to Table 3.