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Resource Blessing? Oil, Risk, and Religious Communities as Social Insurance in the U.S. South*

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Abstract

Religious communities are important providers of social insurance. We document the development of religious communities in the face of economic volatility associated with *natural resource abundance*, using variation in major oilfield discoveries in the U.S. South between 1890 and 1990. We find that oil discoveries predict large and persistent increases in church membership. Effects are increasing with oil price volatility and larger for "oil-dependent" counties with small pre-oil populations and manufacturing sectors. Consistent with social insurance, larger religious communities limit spillovers from oil shocks across sectors, smoothing unemployment, while access to credit, private insurance, and public social insurance attenuate effects.

Keywords: Social insurance; resource abundance; religion; church membership; oil; risk
JEL Codes: N31, N32, H41, G52

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1 Introduction

In a world with economic uncertainty, individuals seek to insure themselves against negative shocks and rely substantially on the state for help. For instance, 67% of U.S. federal spending in 2016, or about $2.7 trillion, was devoted to social insurance and other assistance expenditures (Pew Research Center, 2017). Prior to the New Deal era, however, provision of social insurance was largely eschewed by the federal government (Fishback, 2020). Instead, early providers of social insurance were often *religious communities*.[1] In 1926, U.S. churches spent $150 million on supporting their members and local communities, compared to $23 and $37 million in social expenditures by state and local governments, respectively (Gruber and Hungerman, 2007). Churches continue to be important in settings lacking strong formal insurance mechanisms, in which they serve as networks for providing charity and aid (McCleary and Barro, 2006). A growing literature exists showing how environments characterized by risk, such as those with greater rainfall variability (Ager and Ciccone, 2018) or earthquake risk (Bentzen, 2019), tend to foster higher levels of religious participation and belief.

This paper documents the development of religious communities in the face of another source of considerable economic volatility: *natural resource abundance*.[2] In settings that rely on natural resources, managing such volatility is key to enjoying their economic benefits. Indeed, this as an important factor driving the "resource curse," in which resource dependence is linked to poor economic outcomes (van der Ploeg and Poelhekke, 2009; Venables, 2016).[3]

To study this relationship, we consider the setting of the U.S. South, where oil abundance has contributed to both increased wealth and economic risk. Beginning in the late 19th century, discoveries of large oilfields throughout Texas, Oklahoma, and Louisiana sparked the births of new urban areas, or "boomtowns," built around oil and marked by rapid economic growth (Michaels, 2011). With growth, there also emerged great risk, as a petroleum industry characterized by price volatility came to dominate the economies in these places over the long-run

[1] Even today, 75% of congregations have some form of financial support mechanism for the poor (Cnaan, Boddie, Handy, Yancey and Schneider, 2002), and 3 in 5 Catholics and 3 in 4 Baptists in the U.S. General Social Survey trust their congregation to help them in times of hardship (Glaeser and Sacerdote, 2008).

[2] The quantities of resources extracted and used tend to be highly persistent in the face of changes in price. Low price elasticities mean that even small shocks can generate large changes in price (Ross, 2012).

[3] This paper adopts a nomenclatural interchangeability of resource "dependence" and "abundance" from the literature, as is appropriate in our setting, although we explore variation in dependence later on.

(Brown and Yücel, 2004). In the absence of strong formal insurance mechanisms, this might in turn have given rise to increased religious participation throughout the oil South, where Christian church membership remains highly concentrated today.

To test this hypothesis, we focus on four questions. First, we examine whether oil abundance predicts increases in religious participation in the U.S. South over the short- and long-run. Second, we evaluate to what extent such increases stem from oil's economic volatility. Third, we examine whether religious communities emerged in the face of oil volatility as a form of social insurance, using variation in the availability of private and public insurance substitutes. Lastly, we explore the precise channels through which religious communities smooth consumption following oil price shocks. To answer these, we adopt a difference-in-differences (DD) design, using variation in the locations and timing of major oilfield discoveries and data on church membership at the county-level, spanning 1890 to 1990.[4] Following Michaels (2011), our dataset covers counties in Texas, Oklahoma, Louisiana, and surrounding states. Counties are considered to be oil-abundant if they lie above at least one oilfield with over 100 million barrels of oil pre-extraction. Church membership data spanning the oil discovery period are available via the Association of Religion Data Archives (ARDA) for 15 major Christian denominations and derived from 9 religious censuses, the first in 1890 and the last in 1990.[5]

First, our main results confirm that oil abundance gave rise to large increases in religious participation in the U.S. South. DD estimates show a 6.6 to 8.1 percentage point increase in membership among these major Christian churches relative to population following major oil discoveries, compared to a sample mean of about 33%, with effects growing over time in event-study specifications. Overall, these effects explain around 30% of the growth in membership that occurred among these groups in Southern oil counties from 1890 to 1990.[6]

We show the robustness of our results in a number of ways. First, we provide evidence

[4]Religious membership is a stricter definition of participation than adherence or belief, as it frequently entails some form of baptism or confirmation. While some religious censuses report adherence, all report membership.

[5]Some denominations, most notably several Black Baptist and Methodist groups, are excluded from our sample as they lack data for much of the oil discovery period. Despite these omissions, based on the 1926 data our measure of Christian membership still accounts for nearly 80% of a measure of membership that adds Black Baptist and Methodist groups. All church membership data are accessible at http://www.thearda.com.

[6]The unconditional sample mean rose from 21.5% in 1890 to 43.9% in 1990. Hence our lower-bound estimate of 6.6 percentage points accounts for $\frac{6.63}{43.9-21.5} \times 100 = 29.6\%$ of this increase. Using the upper bound estimate of 8.1 percentage points, we explain up to 36% of the increase in church memberships.

that the locations of major oilfield discoveries were as good as random, by showing that oil-abundant counties and nearby non-oil counties were similar along relevant dimensions prior to oil's discovery. We also rule out concerns related to the potential non-random *timing* of oil discoveries, which could generate anticipatory effects. We fail to estimate statistically significant pre-trends; we follow Goodman-Bacon (2018) in partialling out pre-treatment trends prior to estimation, yielding DD estimates that remain large and significant;[7] and we use propensity score matching to compare oil and non-oil counties with the same population growth trends, generating similar estimates. Results are robust to dropping individual years and states, using different treatment year definitions, and spatial correlation. Lastly, results are robust to controlling for changes in population growth and composition following oil discoveries, suggesting effects are not solely driven by migratory selection or agglomeration effects.

Second, we provide evidence for religious communities acting as social insurance. We show that oil volatility increases treatment effects using the moving standard deviation of real crude oil prices. A one sample standard deviation increase in twenty-five year oil price volatility coincides with treatment effects that are about 1 to 1.2 percentage points larger. Effects are also larger in "oil-dependent" counties, with small pre-discovery populations and manufacturing sectors, suggesting that they stem from higher-risk boomtowns that emerged solely around oil.

Third, we examine whether the existence of formal insurance mechanisms with more complete contracts crowds out increases in church memberships in response to oil discoveries (Hungerman, 2005; Chen, 2010). Effects are halved for counties with access to private insurance prior to treatment, while credit availability as measured by county-level access to savings and loans associations and bank tellers reduces effects almost entirely. We find similar effects for public social insurance, which became widespread in the 1930s and 1940s. We also examine whether demand for such substitutes also increases with oil abundance. Indeed, we find savings, time deposits, and the number of insurance agents and brokers per capita to all be increasing following major oil discoveries, even after controlling for urbanization.

Lastly, consider whether relative fluctuations in economic outcomes for oil-abundant counties are smaller in response to oil price shocks when a large religious community is present.

[7] As in Goodman-Bacon (2018), we adopt this approach over a unit-specific linear time trend control due to the increasing nature of treatment effects over time.

We examine a subsample of already-treated and never-treated counties and compare how local labor composition responds to oil price shocks when religious participation is above and below the sample median. We find that increases in relative unemployment in oil-abundant counties following a negative oil price shock are about 30% smaller when a large religious community is present. We find evidence that such communities reduce out-migration and limit the spread of such shocks across sectors, especially agriculture. Corresponding to this, we also find that oil discoveries are associated with increased competition among denominations, with larger increases in membership among non-mainline groups likely to be efficient providers of such services to members (Iannaccone, 1992).[8]

This paper provides important new insight into the economic roots of religious participation. To our knowledge, this is the first paper to connect religious intensity to natural resource abundance. Yet in doing so, it adds to a large literature on the economic role of religion and drivers of religious membership and identification (Iannaccone, 1998; Chen, 2010; Iyer, 2016). In particular, we follow several papers in showing how variability in the natural environment can foster religious participation and belief as sources of economic or psychological support (Ager, Hansen and Lonstrup, 2016; Ager and Ciccone, 2018; Bentzen, 2019). The results here similarly suggest that variation in natural resource availability may help explain different levels of religious participation across space. Empirically, this also further develops the historical narrative surrounding the roots of the unique evangelicalism that characterizes the U.S. South, led by Dochuk (2012, 2019), as well as on the origins of American culture and identity broadly speaking (Bazzi, Fiszbein and Gebresilasse, 2020; Fouka, Mazumder and Tabellini, 2019).

More specifically, we follow a recent literature studying the nature of religious communities as providers of *social insurance*.[9] Most similar is Ager et al. (2016), in which the emergence of religion likewise appears to have been rooted in mutual insurance, demanded in the aftermath of the Great Mississippi Flood of 1927. Consistent with our findings, they show that

[8]We examine the 3 most prominent denominations in our sample and find that oil discoveries predict increased membership for Southern Baptists and Catholics but not United Methodists. Southern Baptists saw the largest per capita increases in our sample, growing 437% in oil-abundant counties from 1906 to 1990 versus 244% in non-oil counties. To the extent that mainline denominations tend to be less efficient at providing services for members (Iannaccone, 1992), the absence of effects for Methodists is consistent with a social insurance explanation.

[9]This also relates to the literature on informal insurance mechanisms (see Townsend (1995), which include not only churches but agricultural guilds and relative networks (Richardson, 2005; Fafchamps and Lund, 2003).

affected counties lacking in formal mechanisms for managing risk turned to religion to smooth consumption, while increased access to credit crowded out religious participation. We provide some additional evidence in favor of religion as an important precursor of formal institutions for consumption-smoothing. We show that the availability of private insurance sizably reduced demand for religion in response to oil abundance. This also complements other existing work on “crowd out” from both government welfare and lending institutions (Hungerman, 2005; Gruber and Hungerman, 2007; Chen, 2010), for which we find evidence in favor as well. This may help explain declines in religious participation in developed regions of the world.

Our findings also represent an important contribution to the debate in economics on natural resources. Recent work by van der Ploeg and Poelhekke (2009), van der Ploeg (2011), Ross (2012), Cavalcanti, Mohaddes and Raissi (2014), Venables (2016) and others have emphasized the role of volatility in driving the “resource curse.” Yet less work has been done to study how resource-rich economies actually deal with volatility. We show that *religious communities* emerged in oil-abundant counties in the U.S. South as a form of social insurance, mitigating the impact of oil price shocks. Moreover, we find that demand for religion is greater in the absence of formal insurance and lending institutions. That churches mitigate the effects of shocks as a substitute for other, more formal mechanisms for smoothing consumption is consistent with existing evidence that resource-rich countries with poor financial institutions tend to be more volatile (van der Ploeg and Poelhekke, 2010), while shedding new light on how countries that *do* lack mature financial and formal insurance mechanisms may deal with resource volatility.

Lastly, our findings add to a large literature on urban growth and persistence. Why and to what extent “boomtowns” and other settlements persist over the long-run are questions of active inquiry among urban and development economists (Bleakley and Lin, 2012; Fafchamps, Koelle and Shilpi, 2016). This is especially the case for settlements established around natural factors, where the resource curse threatens to undermine long-run economic outcomes. U.S. oil settlements, on the other hand, have proven quite successful over the long-run, which may offer lessons for elsewhere (Michaels, 2011; Allcott and Keniston, 2018). In particular, our findings suggest that institutions for managing adverse economic shocks may be crucial for transforming mono-industrial boomtowns into high-income agglomerations.

2 Background

Religion as Social Insurance

Historians and social scientists have long noted the role of churches in providing various forms of social and economic support. In the United States, the Social Gospel movement coincided with an expansion of church activity during the 19th century into issues of social justice, such as poverty, inequality, and education (Cnaan et al., 2002). Prior to the advent of government welfare and social insurance programs in the 1930s,[10] religious communities had become a leading provider of financial assistance and other aid, such as food and clothing, as well as employment matching services, job and vocational training, and other social services (Gruber and Hungerman, 2007; Chen, 2010). In 1926, for example, churches provided a total of $150 million in charitable spending according to the U.S. Census of Religious Bodies. In comparison, social and charitable spending by state governments amounted to $23 million and $37 million by local governments in the same year (Gruber and Hungerman, 2007).

Even today, churches continue to play an active role in providing important support to their communities, particularly where formal mechanisms for dealing with economic uncertainty are lacking (Bartkowski and Regis, 2003; Hungerman, 2005; McCleary and Barro, 2006; Scheve and Stasavage, 2006). One U.S. study by Cnaan et al. (2002) finds that about 75% of congregations have some form of financial support mechanism for the poor, while Glaeser and Sacerdote (2008) note that 3 in 5 Catholics and 3 in 4 Baptists in U.S. General Social Survey trust their congregation to help them in times of hardship. The source of such support is generally the voluntary contributions of other members.[11] This is consistent with club models of religion and subsequent empirical work documenting how religious communities provide local public goods to their members, derived from the religious "investments" of members such as tithing and service-based contributions (Iannaccone, 1992, 1998). To the extent that major religious organizations span networks of individuals and communities with idiosyncratic risk and state realizations, churches thus entail an important source of mutual insurance and consumption

[10]The 1935 Social Security bill established federal unemployment insurance, while savings and loan associations became widespread after the 1932 Federal Home Loan Bank Act.

[11]For example, Wilson and Janoski (1995) find that 71% of conservative Protestants who attend church weekly engage in church-related volunteer work, relative to 38% that do not actively attend a congregation.

smoothing for religious participants (Berman, 2000; Chen, 2010; Ager and Ciccone, 2018).[12]

Oil Abundance as a Source of Risk

One source of risk against which religious communities might insure is generated by natural resource abundance. Natural resource quantities are generally inelastic in price in the short-run, leading to large fluctuations in world prices (van der Ploeg and Poelhekke, 2010; Ross, 2012). High volatility in the world prices of natural resources can in turn translate into considerable volatility in real income for the economies endowed with them, which may have ramifications for income *growth*, in the form of the so-called "resource curse." For instance, van der Ploeg and Poelhekke (2009) find that natural resource abundance is associated with positive growth after controlling for volatility, although they leave it relatively open as to how one might manage the risk associated with such volatility.[13]

This paper focuses on one of the most price volatile of all natural resources: oil. According to van der Ploeg and Poelhekke (2009), oil prices are more volatile than the prices of agricultural raw materials, food products, and ores and metals. By one estimate, world oil prices experience more volatility than 95% of all other products sold in the U.S. (Ross, 2012). By another, oil-rich countries experience over 100% greater volatility (e.g. in revenues) than non-resource-rich countries, compared with 50% for mineral-rich countries (Venables, 2016).

Petroleum has been a major industry in the U.S. since the discovery at Oil Creek in Pennsylvania in 1859, but America's "oil age" arguably began in Texas at the turn of the century with the strike at Spindletop. The oil boom that followed gave rise to hundreds of new settlements, or "boomtowns," throughout the Southern United States, especially in the states of Texas, Louisiana, and Oklahoma. The economies that emerged were highly oil-centric and remained heavily dependent on oil through the late 1980s (Brown and Yücel, 2004). Yet despite oil's booms and busts (see Figure 1), they oversaw considerable economic growth throughout the 20th century (Michaels, 2011).

[12]Consequently, less demand for religious services and lower levels of religious participation (i.e. crowding out) tend to be observed when formal mechanisms for providing economic support and smoothing consumption are strong (Gill and Lundsgaarde, 2004; Gruber and Hungerman, 2007; Ager et al., 2016).

[13]Their analysis does provide some insight regarding mechanisms that is relevant for this paper, in that resource abundant countries tend to experience greater income volatility when (i) they are otherwise less developed, (ii) financial systems are less developed, and (iii) they are more resource *dependent* (i.e. % GDP).

Oil and Religion in the U.S. South

Southern oil communities experienced oil's volatility not only via the market's booms and busts but also in the form of accidents such as fires and explosions. Though religion has featured prominently in the U.S. South since at least the Civil War period,[14] recent work by Dochuk (2012, 2019) documents how these challenges inspired an evangelical fervor and reliance on religion in the South's oil-patch boomtowns.[15] Weak state governments meant that oil activities went largely unregulated, and the church emerged as a key institution serving oil communities, with increasingly large congregations and oil wealth pouring into the church in turn.

Thereafter, petroleum and the Christian culture of the American South and Southwest "collaborated to construct a shared ideology and system of institutions" that persisted through the interwar era (Dochuk, 2012, p. 55). Today, they share a space in American political culture, with oil and evangelicals overlapping on the ideological right in the latter's opposition to climate change legislation and offshore drilling bans (Pew Research Center, 2015).

3 Theory

In this section, we develop a simple model to motivate our empirical analysis and illustrate how volatility in the return on one's endowment can lead to religious participation as a source of risk mitigation. In the model, as in the early oil South and in many undeveloped and developing settings today, there is a lack of strong formal insurance and lending institutions, for which religious communities may serve as a substitute. In the presence of uncertainty regarding the future return on one's endowment, this can generate incentives for workers to make religious investments, i.e. sacrifice some of their time and income to the church, which in turn may provide economic and other forms of support during hard times.

Endowment uncertainty in this setting is assumed to stem from a reliance on natural resources. Natural resource quantities are generally inelastic in price in the short-run, leading to large fluctuations in prices (van der Ploeg and Poelhekke, 2009; Ross, 2012). To the ex-

[14] Of course, there is also considerable spatial variation in religiosity within the South, with the epicenter of the "Bible Belt" moving westward over time (Brunn, Webster and Archer, 2011).

[15] "Evangelical" is used somewhat broadly here. Dochuk (2012) notes how such evangelicalism extended beyond conservative Protestants to Catholics and even more liberal groups.

tent that labor demand in resource-abundant communities is derived (directly and indirectly) from the market for such resources, relevant economic shocks can have a significant impact on real income in the short-run. If agents are risk averse, then such volatility may have important welfare implications for workers in those communities, upon which they will seek to improve intertemporally.

To show this, we adopt a two-period model with uncertainty in future endowment returns. In the first period, a risk-averse representative agent is endowed with some initial income y_0, which she can use for consumption c_0 or for religious investments r_1. In making such investments today, the agent provides the church with resources (e.g. money, manpower) needed for it to help her and others should hard economic times strike tomorrow.[16] Then, in the second period, the agent receives for consumption some additional income $y_1(s)$, the value of which depends on the state of the economy s, as well as support from the church *if and only if* that income is relatively low, the value of which depends on the agent's first period investment.

We define the agent's lifetime utility maximization problem as

$$\max_{c_0, c_1(s), r_1} u(c_0) + \beta \mathbb{E}[u(c_1(s))],$$

where $u(\cdot)$ is twice continuously differentiable with $u'(c_t) > 0$ and $u''(c_t) < 0$, and $\beta > 0$ is an intertemporal discount factor. Consumption in the initial period ($t = 0$) depends on initial income as well as the size of religious investments made: $c_0 \leq y_0 - r_1$. Consumption in period $t = 1$ depends on the state of the economy, with church support supplementing the agent's endowment in "bad" states, i.e. when $y_1(s)$ is relatively low:

$$c_1(s) \leq y_1(s) + \mathbb{1}\{s \in bad\} \times Ar_1,$$

where $A > 1$ is a multiplier parameter, representing the supplemental effects of religious investments from across different markets with the same religious institutions but idiosyncratic state realizations.[17]

[16] In an extended model with more time periods, such sacrifices would occur in an ongoing manner, not just in the period prior, while shocks would be modeled as idiosyncratic across several communities or markets.

[17] For example, if shocks were independently and identically distributed across a large number of identical regions, with half in bad states, and all religious investments went to providing church support, then $A = 2$.

Maximization yields:

$$u'(c_0^*) = \beta APr[s \in bad]\mathbb{E}[u'(c_1^*(s)|s \in bad], \tag{1}$$

with budget constraints binding in equilibrium due to the strictly increasing nature of utility. In order to see how consumption and in turn religious investments respond to endowment volatility, one must place some restrictions on the distribution from which $y_1(s)$ is drawn. We now evaluate the problem using a normal probability distribution with quadratic utility functions.[18]

Let $y_1 = \theta + \varepsilon$, where θ is some measure of long-run real income and $\varepsilon \sim N(0, \sigma^2)$ is a normally-distributed random variable, scaled by $\sigma > 0$. Similar to before, the church provides support if and only if real income is below average in $t = 1$, i.e. $\varepsilon \leq 0$. We then adopt a quadratic utility function, which is a common choice in settings such as this, as it satisfies risk aversion while enabling one to pass the expectations operator through $u'(\cdot)$ to evaluate $\mathbb{E}[\varepsilon|\varepsilon \leq 0]$. Letting $u(c_t) = c_t - \frac{\alpha}{2}c_t^2$, equation (1) becomes

$$1 - \alpha(y_0 - r_1^*) = \frac{\beta}{2}A(1 - \alpha(\theta + \mathbb{E}[\varepsilon|\varepsilon \leq 0] + Ar_1^*)). \tag{2}$$

Evaluating the expectation yields equilibrium religious investments of r_1^*, which are positive if and only if shocks are sufficiently large relative to real income, θ. That is, there exists some threshold value of $\sigma \equiv \tilde{\sigma}$, only above which religious investments are made in equilibrium. This is because the agent only receives church support in return for her investments during below-average income periods, such that there must be a lot at stake, relatively speaking, for her to invest. Then, conditional upon $\sigma > \tilde{\sigma}$, the size of religious investments is always increasing in σ. Altogether, these results can be summarized with the following proposition:

Proposition 1. *There exists an equilibrium in which agents forgo some consumption in favor of religious investments if and only if:*

(i) The relative impact of negative economic shocks on real income is sufficiently large: $r_1^* > 0$ *if and only if* $\sigma > \tilde{\sigma}$*, with* $\frac{\partial \tilde{\sigma}}{\partial \theta} > 0$*; where*

[18]The same insights can be yielded using general utility functions by assuming a binary probability distribution. For that analysis, please see the Theory Appendix.

(ii) *The size of religious investments is further increasing in endowment volatility:* $\frac{\partial r_1^*}{\partial \sigma} > 0$ *when* $r_1^* > 0$.

In other words, if typical shocks to the return on one's natural resource endowment are economically salient, then an agent will engage in religious participation, with greater volatility in the return on one's endowment increasing religious investments thereafter. Given this, we expect to find that counties with greater dependence on oil will experience increased religious participation, with such demand further increasing with greater oil price volatility.

4 Data and Empirical Strategy

We now describe the county-level dataset compiled for this paper. Our dataset combines information on county-specific oil discoveries with population and religious censuses. We discuss each in turn before describing how this data is used to estimate the effect of oil abundance on religious participation in the U.S. South.

Our main sample is based on the data collected by Michaels (2011), which cover all counties with major oil discoveries in Texas, Oklahoma, Louisiana, and surrounding states, including any county within 200 miles of an oil-abundant county in those three states (see Figure 2).[19] This generates a large number of control counties while limiting the geographic heterogeneity of the sample. Oilfields with 100 million barrels of oil or more are defined as a major discovery. The main treatment variable is an indicator for when at least one major oilfield is discovered in a county. The first county to discover a major oilfield in this sample did so in 1893, while the most recent discovery was made in 1982. Figure 3 shows the evolution of the outcome and treatment over time.

Data on the location of major U.S. oilfields come from the Oil and Gas Journal Data Book (2000), which lists the universe of oilfields in the United States, their locations by state, and their overall discovery years. We link major oilfields with data for all county-oilfields from the Oil and Gas Field Code Master List (U.S. Department of Energy, 2004), which lists all oil and gas fields in the United States, their counties, and each field's discovery year by county.

[19] We adopt the same sample as Michaels (2011), although our replication moves 9 counties in Texas from oil-abundant to non-abundant, as only natural gas portions of major oilfields are present in those counties, leaving 162 oil-abundant and 613 non-abundant, of which 255 are oil-adjacent.

We combine the oil discovery data with information on religious participation obtained from the Association of Religion Data Archives (ARDA). This includes data from nine religious censuses, beginning in 1890 and ending in 1990, for an average of 12.5 years between censuses. These correspond to the red lines in Figure 3. All religious censuses measure participation using counts of church "membership," which may entail baptism or confirmation, while only some also report a less restrictive count of "adherents." We therefore adopt the former. As far as possible, we harmonize church membership and denominations across years for major Christian groups. Many smaller denominations, as well as predominately-Black Baptist and Methodist groups, are excluded as their memberships were not reported for much of the oil-discovery period. We then aggregate membership data across groups to construct our measure of religious participation. County boundaries are harmonized to boundaries from the nearest religious census year, following the procedure in Hornbeck (2010), in order to consistently match them with census data and to avoid issues of the merging or splitting of counties over time. More detailed information on the construction of oil and religious variables can be found in the Data Appendix.

Other data come from the U.S. Census of Population and Housing and the Census of Agriculture, compiled by Haines (2010) and Haines, Fishback and Rhode (2018), respectively, as well as manufacturing data from Matheis (2016). We also use information from the individual full-count Census provided by Ruggles, Flood, Goeken, Grover, Meyer, Pacas and Sobek (2018). These include data on county population and median family income, data on sector composition, wages, and output, and data on savings and loan associations, bank deposits, and the number of insurers and tellers. Once combined with religious data, county boundaries are harmonized again to 2000 boundaries to create a unified panel. Detailed information on this data can be found in the Data Appendix. Lastly, data on public social insurance, including unemployment insurance and workers compensation at the state level for 1940 through 1990, are merged from Fishback (2020).

4.1 Estimation

We estimate the effect of oil abundance on church membership using the following generalized difference-in-differences (DD) framework with two-way fixed effects:

$$\mathrm{y}_{ct} = \mu_c + \theta_t + \beta \cdot \mathrm{D}(t \geq E_c) + \varepsilon_{ct}, \tag{3}$$

where y_{ct} is the share of church members in the population of county c in year t, E_c is a county's first major oil discovery event, μ_c are county fixed effects, and θ_t are year fixed effects. The coefficient of interest is β, which captures average differences in religious participation between oil-abundant and non-oil counties relative to such differences prior to a major oil discovery.

Several conditions must be satisfied for β to be interpreted as the causal effect. First, the locations of major oil discoveries should be exogenous to relevant factors. That is, there must not be time-varying confounding factors that correlate both with the discovery of oil and a county's religious participation. Second, one must not detect changes in the outcome across treated oil and non-oil control counties in the absence of treatment (i.e. pre-trends). Third, given the heterogeneity in treatment timing, treatment effects must be constant over time or β will be biased (Goodman-Bacon, 2018). We discuss these concerns now.

Plausible Exogeneity of Oil Discoveries

One identification concern is potential selection into treatment. We thus examine whether observable county characteristics can predict major oil discoveries. Due to heterogeneous treatment timing, control counties lack a natural pre-oil counterfactual period. To deal with this, we define local *clusters* of counties around each treated county that discovers oil in period t.[20] We then regress an indicator for being an oil-abundant county on the observable characteristics of all counties in a given cluster in period $t-1$. Given that all counties in the vicinity of the treated county potentially had the opportunity to also discover the same major oilfield, we can test whether certain characteristics predict such discoveries locally, indicating non-random treatment assignment.[21] Figure A1 plots the coefficients from these balance tests,

[20] These local clusters are built by first computing the distance of each control county to all oil counties. Control counties that have the same oil county as their closest treatment county are then grouped together.

[21] The pre-oil discovery characteristics we consider are the share of Christian population, Black, French, Italian, and German population, the log population size, the share of employment in manufacturing and agriculture, the

using a variety of specifications to isolate potential local differences. We find no statistically significant differences in observable pre-oil characteristics between non-oil and eventual oil-abundant counties, corroborating the identifying assumption that major oilfield discoveries are as good as randomly assigned in space.

This finding is consistent with the historical narrative. Early methods of oil discovery were unreliable as they relied on first discovering surface saps or random drilling. For example, the strike at Spindletop that began the Texas oil boom came when Patillo Higgins, a Sunday school teacher in Beaumont, noticed clouds of gaseous liquid in spring water on a class field trip (Dochuk, 2012). Much of the speculation that followed took place in Southeast Texas, yet the largest Southern oilfields were yet to be found. It was not until 1930, for instance, that Columbus Joiner discovered the 134,000 acre, five-county East Texas Oilfield northeast of Henderson.[22] Because none had yet sought oil in that region, tracts of land were subsequently sold at little cost to incoming prospectors (Olien and Olien, 2000). Technologies to detect oil continued to be rather unreliable in later years. In 1950, only 20% of performed onshore oil explorations were successful (Gorelick, 2009). Even in 1978, the exploratory success rate was only at 27.5% (Forbes and Zampelli, 2002).[23] This suggests that wealthier counties, for instance, were not more likely to discover oil, corroborating the balance tests.

Estimating Dynamic Treatment Effects

To estimate changes in treatment effects over time, including possible pre-trends, we utilize an event-study framework in addition to the standard DD. This event-study framework entails the following:

$$\mathrm{y}_{ct} = \mu_c + \theta_t + \sum_{l=\underline{l}}^{-2} \gamma_l \cdot \mathrm{D}(t - E_c = l)_{ct} + \sum_{l=0}^{\bar{l}} \gamma_l \cdot \mathrm{D}(t - E_c = l)_{ct} + \varepsilon_{ct}, \tag{4}$$

number of manufacturing firms, farms, and area dedicated to agriculture, the share of agricultural land used for cotton, the total area size, as well as latitude and longitude. Except for latitude and longitude, all variables are standardized to have mean zero and variance one to measure effects on a comparable scale.

[22] While we cluster standard errors at the county level in main specifications, we also consider specifications that cluster standard errors at higher levels of aggregation or allow for spatial correlation to account for the tendency of oil endowments and other relevant characteristics to span beyond the county level.

[23] In a later sensitivity exercise we show that no particular year is changing our estimates, hence changes in oil discovery technologies are unlikely to drive our results (see Figure A4).

Under this approach, treatment effects are expressed over an *effect window* $l \in [\underline{l}, \overline{l}]$, which we set to be $[-3, +3]$, and are estimated relative to the omitted period before the observed event (i.e., $l = -1$). For $l < -1$, γ_l estimates pre-trends and for $l \geq 0$, γ_l estimates the dynamic treatment effects of the event. The effect window length was chosen to create a mostly balanced panel. Counties with observations outside of the effect window are binned into -4 and $+4$ groups. These dummies are used in estimation only to identify dynamic treatment effects, with such observations serving as controls (Schmidheiny and Siegloch, 2019). As such, the estimates γ_{-4} and γ_4 are themselves not of interest and not reported.

5 Main Results

To study the connection between oil abundance and religious participation in the U.S. South, we exploit variation in the timing and locations of major oil discoveries in Texas, Oklahoma, Louisiana, and surrounding states between 1890 and 1990. Following a major oil discovery, a county is considered to be "oil abundant" and as such treated.

We begin by estimating the difference-in-differences (DD) framework as defined by equation (3). In our preferred specification, we exclude 255 counties directly adjacent to oil-abundant counties to avoid biases arising from spillover effects.[24] This minimizes the probability that the control group is itself partially treated, which would bias estimated effects towards zero, while nonetheless retaining the comparability of treated and control counties on observable characteristics due to geographic proximity.

Estimates using this "donut" subsample can be found in column (1) of Table 1, which shows a 6.6 percentage points (pp) increase in church membership relative to population associated with oil abundance among the 15 major Christian churches sampled – about 20% above the mean. Note that the sample mean indicates average membership among the denominations sampled, which typically requires baptism or confirmation and thus may exclude children and recent converts. Secondary specifications corroborate these findings. Estimates from the full sample reduce estimates, as expected, to about 4.8 pp.

[24] Table A6 in the Appendix shows that excluding adjacent control counties is sufficient to remove most spillover effects, as compared to excluding counties within 50, 100, and 150 km of the nearest oil county, while *not* excluding counties in the proximity reduces our treatment effect as predicted.

One concern is that many Southern towns emerged around oil and were thus made up of residents who purposefully selected into them post-oil discovery. As such, oil county residents may have simply been religious prior to moving, rather than having turned to religion *ex post* in response to oil. We thus consider the importance of migratory selection along both extensive and intensive margins, by controlling for population inflows and composition, respectively. Estimated effects increase to 8.1 pp when we control for log population size in column (3); including covariates for the share of Black, French, Italian, and German population in column (4) sees estimates increase only slightly, to 6.7 pp; and including both in column (5) sees estimates increase to just over 8 pp. We also estimate a specification in column (6) that includes these alongside controls for the share of employment in agriculture and manufacturing and the share of land in agriculture used for cotton production, which produces an estimate of 7.3 pp. Altogether, these are consistent with the notion that such channels actually work *against* increased religious participation. For instance, oil tends to increase urbanization and decrease Black populations, whereas increased urbanization and smaller Black populations are associated with decreased religious participation. That being said, we do caution that these controls could potentially be outcomes of the oil treatment themselves and therefore our preferred specification is the one reported in column (1). We further probe for the robustness of our results with respect to issues of population growth in the next subsection when we discuss dynamic treatment effects, using a series of matching exercises.

Finally, Table 1 also reports the δ statistic by Oster (2019) to test for the sensitivity of our results with respect to selection on unobservables. The test uses the coefficient and R^2 movements from the controlled and uncontrolled estimates to develop a bounding exercise. The δ statistic then reports how much more influence the unobservables, relative to the observables, should need to have in the relationship between oil and religion in order to explain away our oil abundance effect if those observables could be included in the regression. The value of δ in column (1) implies that the unobservables would need to be 1.7 times more important than the observable controls in order to potentially explain away our treatment effect.[25] A value of $\delta \geq 1$ is typically considered a robust result.

[25]In columns (1) and (2) the observable controls are essentially the county and sample year fixed effects.

Robustness: Event-study Estimates

One concern when using DD estimation is that changes in the outcome occur across treated oil and non-oil control counties prior to the treatment switching on. Moreover, recent work by Goodman-Bacon (2018) shows that heterogeneous treatment timing in settings such as this tends to produce biased DD estimates when treatment effects evolve over time, to the extent that comparisons between different timing groups (i.e. early versus late treated) are used to identity effects. Given these concerns, we also estimate the effects of oil abundance on religious participation using an event-study framework, as defined in equation (4), which interacts the treatment indicator with event time dummies for census periods leading up to and following the treatment year. This approach will allow us to estimate possible pre-trends as well as evaluate changes in the treatment effect over time.

We present event-study estimates graphically, in Figure 4, with the specifications used to produce plots (a) and (b) being analogous to the first two estimated in Table 1, respectively. Two things immediately stand out. First, post-treatment effects appear quite small at first, likely due in part to heterogeneity in the amount of time since treatment in period 0, and then continue increasing over time. As we later show, the increasing nature of effects likely stems from higher levels of oil price volatility in the later years of the sample. Second, though not statistically significant, we detect subtle signs of pre-trends. Given the exogeneity of oilfields in space, as discussed above, this is likely driven by timing – that is, it likely reflects anticipatory effects, with oil discoveries inspiring searches for probable others nearby and some effects in turn appearing prior to any discovery having been made. We focus on this latter problem first.

One common strategy for dealing with such pre-treatment "effects" is to control for county-specific linear time trends. However, this is likely to dilute estimates of dynamic treatment effects in the presence of increasing effects over time. Goodman-Bacon (2018) proposes an alternative strategy, in which pre-treatment trends are estimated directly and then subtracted from the outcome for all periods. Adjusting for pre-trends accordingly in our main specification decreases estimates somewhat to 4.9 (.9) pp, which remains highly significant. The associated event-study plot can be seen in part (c) of Figure 4.

A second approach involves modifying the estimation strategy to better compare treated counties with control counties This involves matching on pre-treatment trends in log population or log population density, via propensity score matching as well as the inclusion of matched-pair fixed effects. These exercises tend to flatten pre-trends whilst generating moderate decreases in DD estimates relative to our main specification. One such example can seen in part (d) of Figure 4, which matches on pre-treatment growth trends in log population density. This particular example yields a smaller DD estimate, of 4.0 (1.3) pp. All DD estimates from pre-treatment matching exercises can be found in Table A1. We also perform the same matching exercises with matching based on full sample population trajectories, which yield similar estimates. These can be found in Table A2. Overall, this is reassuring that pre-trends are not a threat to our identification, while again reaffirming that the treatment effect is not driven merely by differential population growth trends between oil and non-oil counties.

The other concern regarding dynamic treatment effects it that they are increasing over time. Following Goodman-Bacon (2018), this raises the possibility that DD estimates are biased somewhat toward zero. This is more likely to be the case if estimation relies highly on time variation, for instance comparisons between different timing groups. Fortunately, our sample contains a large number of never-treated counties, with the Bacon decomposition showing almost 90% of variation used in estimating equation (3) as coming from comparisons between treated and never-treated units, and DD estimates using *only* this variation to be 7.75 pp.

The relative unimportance of time-variation in this setting is corroborated by robustness exercises showing DD estimates to be largely unchanged when alternative treatment years are used, changing treatment timing. Besides our preferred treatment year definition, which defines the treatment as "switching on" the year a county discovers its first major oilfield, we construct four alternative measures. The first defines as the treatment year the year *any oil at all* was discovered in an oil-abundant county. The second considers an oil-abundant county to be treated the year it *or an adjacent oil-abundant county* discovered a major oilfield, whichever came first. The third considers an oil-abundant county to be treated the first year any of its major oilfields were discovered *in any county*, even if not in that county. The fourth considers an oil-abundant county to be treated the first year any county in the set of oil-abundant counties with which it is *contiguous* discovered a major oilfield. Despite these increasingly conservative definitions of treatment year, Table A3 shows estimates to be highly stable, varying by no more than half of a percentage point.

Robustness: Spatial Correlation and Spillovers

A secondary identification issue concerns *spatial interdependencies* across counties. We consider such factors now. One such issue involves spatial correlation in the disturbance ε_{ct}, which is likely to span beyond individual counties c. We adopt several approaches to account for these. First, we adopt Conley standard errors, which assume that unobservables may be correlated across contemporaneous counties up to distances of 25, 50, 100 and 150 km. In general, this generates smaller standard errors than specifications that cluster standard errors, as shown in Table A4. Second, we estimate effects using standard errors clustered at trans-county levels of aggregation, at which the treatment is likely to have occurred in practice. We adopt two approaches: (i) clustering at the oilfield level, where a county is assigned to whichever of its major oilfields was discovered first in any county, and (ii) clustering by the set of contiguous oil-abundant counties of which a county is a part, even if they share no common oilfields, as treatment in practice may span even beyond the major oilfield level. These standard errors are slightly larger but estimates remain highly significant, as shown in Table A5.

Another issue is that effects from oil discoveries are not necessarily confined to oil-abundant counties but may have positive spillovers for neighboring counties, biasing estimates. Indeed, Table 1 considers both "donut" and full sample specifications, where including counties adjacent to oil-abundant counties decreases treatment effects by nearly a fifth. To further examine the importance of spillover effects, we consider several additional donut exercises, excluding counties within 50, 100, and 150 km of a treated county. Increasingly extreme measures to limit spillovers increase estimates, as expected, with the most restrictive approach producing a DD estimate of 7.5 (1.0), as shown in Table A6.

Robustness: Sample changes, outcome definitions, and income and education

There are three additional robustness exercises of note, which we discuss here. The first considers heterogeneity of effects across time and space. One concern, for instance, is that effects are driven entirely by Texas, which makes up almost a third of the sample and contains more than half of the treated counties. To probe for the sensitivity of our results to particular states or sample years, we re-estimate equation (3) and exclude each state and year at a time and observe how the oil abundance effect changes from our baseline result. Figure A4 plots the coefficients from this exercise. The omitted state or year is reported on the left scale and the coefficients represent the estimated effect of oil abundance on the share of Christian membership under a given sample restriction. The baseline result is represented by the vertical red line. In none of the cases does excluding any given state or year significantly change the estimated coefficient relative to the baseline result.

The second exercise has to do with the construction of the outcome variable. Because our measure of religious participation requires the same set of Christian denominations across all years, certain groups are inevitably excluded, such as various Pentecostal churches, Black Methodist churches such as the African Methodist Episcopal Church, and Black Baptist churches, namely the National Baptist Convention. This latter group in particular did not participate in the last four religious censuses in our sample.

Unfortunately, it is not enough to simply exclude National Baptists, as the 1906 Religious Census reports National Baptists *in combination* with the non-Black Northern and/or Southern Baptists for each county. To remedy this, our preferred outcome variable sums Northern, Southern, and National Baptists in 1916 and uses the county-level ratio of non-Black to Black Baptists in that year to impute non-Black Baptist counts for 1906. As the actual ratio may differ over time, however, we also consider several alternative approaches. The first simply drops 1906; the second uses the same ratio but from 1890, which lacks some counties for Oklahoma; and the third excludes Baptists entirely. Effect sizes are remarkably stable and statistically significant across all specifications, as shown in Table A7.

Lastly, a substantial body of literature has studied the relationship between education, income, and religion.[26] One potential issue is that the places in which oil is discovered may entail or subsequently develop different education or income levels, which could explain their relative

[26]The relationship between education and religiosity has been studied prominently by Marx (1844). For a more modern treatise, see for instance Glaeser and Sacerdote (2008), Becker, Nagler and Woessmann (2017), among others. The relationship between income and religion has been studied by Bettendorf and Dijkgraaf (2010), Becker and Woessmann (2013), or Herzer and Strulik (2017), among others. Since it is beyond the scope of this paper to summarize all the relevant literature, we also refer to reader to the overviews by Iannaccone (1998) and McCleary and Barro (2006).

increases in religious participation. Though we can only test for this with data from the 1936 Religious Census onward, after which the population Census included detailed education and income information, we nonetheless examine these relationships in Appendix Table A8. Here, we run the specification in equation (3) controlling for the percentage of adults with high school degree in column (1), median family income in column (2), and both measures in column (3). While the oil abundance coefficient reduces in magnitude, it remains economically and statistically significant. At the same time, we find a negative and significant relationship between educational attainment and religious participation, but no evidence of a direct relationship for income, the latter being consistent with Becker and Woessmann (2013) in the Prussian context.

One concern is that income and education are potentially outcomes of oil discoveries themselves, thus making these variables 'bad controls'. To test for this, we regress them on the oil discovery treatment in columns (4) and (5), respectively. We find a negative and significant relationship between oil discoveries and the share of adults with a high school degree, and a positive and significant relationship for income.

6 Religion as Social Insurance

Having established in the previous section that major oil discoveries gave rise to increases in religious participation in the oil-rich U.S. South, we now examine whether religious communities emerged specifically as a form of *social insurance*. We begin by first examining simply whether treatment effects are rooted in the *risk* associated with oil abundance. We then examine whether demand for religious communities stems from their provision of actual economic support, particularly in lieu of private and public forms of social insurance.

6.1 Oil Risk Drives Religious Participation

Proposition 1 predicts that, conditional upon oil price shocks being economically salient, oil price volatility will foster greater religious participation in-oil abundant counties. For the oil communities of the U.S. South, many of which emerged around oil's discovery, the conditional part of this prediction has historically been true, with downturns in the oil market being linked to economic distress.[27] Given this, one would expect increased *volatility* in real oil prices over time to increase the size of treatment effects. We explore this hypothesis now.

Oil Price Volatility and Treatment Effects

To measure oil volatility, we use the standard deviation of logged and unlogged real crude oil prices (in 2018 USD) over the previous five, ten, and twenty-five years. A greater standard deviation implies higher levels of volatility over that time period. Because crude oil prices are determined by the world market, their fluctuations are largely exogenous to the conditions in any individual oil county. We therefore interact this measure of volatility with the treatment indicator in equation (3) to capture the interaction effects of oil volatility on religious participation in oil-abundant counties relative to non-oil counties.

Table 2 shows these interaction effects using the preferred "donut" specification with two-way fixed effects and no other controls. Estimates reveal that a one standard deviation increase in oil price volatility coincides with treatment effects that are up to 1.2 percentage points larger, consistent with our theory in Section 3, with larger and more precise interaction effects coming from longer-run measures of volatility.

Figure 1 illustrates the temporal sources of variation in oil price volatility in our sample, which is moderate in the early decades of the sample, low in the middle years, and high from 1970. To the extent that oil price volatility is an important driver of the treatment effect, this explains why dynamic treatment effects are increasing over time in the event-study, as later event years are more likely to correspond to the 1971, 1980 or 1990 religious censuses.

Of course, crude oil prices are not the only source of risk faced by oil communities. Others are more local and date back to the often sparsely-populated places in which oil was discovered.

Oil Dependence and Treatment Effects

When the Texas oil boom began at the turn of the 20th century, much of Texas was sparsely populated and neither Oklahoma nor New Mexico were U.S. states. And though many major agglomerations sprung up around oil boomtowns (Michaels, 2011), many oil communities in the western parts of the sample remained highly oil-dependent throughout the 20th century –

[27] Brown and Yücel (2004) show this in the context of 20th century Texas, while our own examination of county-level panel data shows important effects of oil price shocks on relative unemployment, median family income, and various mining, manufacturing, and agricultural outcomes in oil-abundant counties, as shown in Table A9.

and arguably would have remained sparsely populated in the absence of oil's riches.

To the extent that oil is the sole source of wealth and urbanization in many parts of the U.S. South and Southwest, the local economic risk entailed by oil abundance may be amplified even more. This in turn may have contributed to the treatment effects observed above, driving even greater reliance on religious communities for economic support during oil downturns.

To capture heterogeneous effects from "oil dependence," we develop four additional time-invariant variables with which to interact the treatment dummy. The first two capture the *extent of urbanization* at the start of the Oil Age. One of these is a continuous variable, measuring log population density in 1900. Another is a dummy from Michaels (2011), capturing whether a county contained part of an urban agglomeration with a population of at least 25,000 in 1890. To the extent that a county had high levels of urbanization prior to discovering oil, it is less likely that its economic activity thereafter has been dependent on oil's bounty.

The second set of variables capture a county's *manufacturing presence* prior to oil's discovery. The first of these is again continuous, measuring log manufacturing employment per capita in 1900. The final variable is a dummy indicating above-sample median manufacturing output in 1900. Having a larger manufacturing presence implies lower aggregate risk: not only does it mean a place has historically had an economic presence independent of oil, but manufacturing serves as a key substitute sector for mining labor during oil downturns.[28]

Consistent with oil dependence posing local economic risk, treatment effects are significantly larger in "oil-dependent" counties with small pre-discovery populations and manufacturing sectors. Estimates produced from these four interaction terms, as shown in Table 3, reveal that treatment effects are driven entirely by counties without an urban presence prior to oil's discovery and reduced significantly by the pre-oil presence of manufacturing – with a one standard deviation increase from the sample mean in log population density in 1900 reducing treatment effects to zero and a one standard deviation increase from the sample mean in manufacturing employment in 1900 reducing treatment effects by nearly 90% – suggesting effects are being driven largely by higher-risk boomtowns that emerged solely around oil.

[28]Whereas a decrease in crude oil prices tends to decrease per capita mining wages, mining output, and agricultural employment in oil-abundant counties relative to non-oil counties, the same decrease tends to *increase* manufacturing employment and slightly decrease per capita manufacturing wages, consistent with a shift to the right in the manufacturing labor supply curve. For these estimates, see Table A9 in the Appendix.

6.2 Crowd Out

It is not enough to show that religious participation increases in response to the risk associated with oil abundance, as such may just as likely be rooted in psychological forms of support as economic ones. Indeed, evidence for "religious coping" has been documented in recent work by Bentzen (2019). Though we do not rule out religious coping as a possible channel, we now turn to the evidence that religious communities indeed provide economically-meaningful forms of social insurance demanded in response to oil risk.

To show this, we first examine key substitutes in the provision of insurance. If religious participation emerges in oil counties in response to increased demand for social insurance, one would expect a greater supply of private and public substitutes for smoothing consumption, i.e. with more complete contracts, to *crowd out* relative increases in religious participation in oil counties (Hungerman, 2005; Chen, 2010). Our results suggest both were important. We begin by examining private substitutes, in the forms of private insurance and banking.

Private Insurance and Banking

Do oil counties with greater access to credit and private insurance prior to their major oil discoveries exhibit smaller increases in religious participation? To answer this, we use data on credit availability, as measured by the number of savings and loan associations and bank tellers in each county, as well as on private insurance, as measured by the number of insurance agents and brokers in each county. As many counties report having zero of these, we simply generate a dummy variable for each, indicating whether a county had any prior to treatment.

Due to limitations in how far back data on credit availability and private insurance go, we drop some treated counties in our preferred specifications to reduce "bad control" concerns. In particular, savings and loan associations became prominent throughout the U.S. following the Federal Home Loan Bank Act of 1932, and county-level reporting on them first corresponds with our religious census dataset in 1950. County-level data on bank tellers and insurance agents, meanwhile, are available for the full set of sample counties starting in 1910. We thus feature specifications that drop counties treated prior to 1950 when examining heterogeneous effects from savings and loan availability and pre-1910 for bank tellers and private insurance.

Estimates for these are featured in Table 4 and are consistent with the notion that greater pre-treatment access to credit and private insurance *crowd out* increases in religious participation following oil discoveries. In particular, having a savings and loan association or access to bank tellers reduces effects almost entirely in specifications that drop previously treated observations, as shown in columns (1b) and (2b), respectively. Similarly, effects are more than halved for counties with access to private insurance, as shown in column (3b). Effects are robust to including all observations, as shown in the remaining columns. This suggests religious communities are indeed engaged in the provision of social insurance, particularly in the absence of private substitutes.

Given the attenuation of effects from the supply of private substitutes, one would expect *demand* for them to also increase with oil abundance, all else fixed. To measure demand for private banking as used for smoothing consumption, we use two continuous measures of savings as outcomes: log savings capital in savings and loan associations per capita and log time deposits per capita. To measure demand for private insurance, we use the logged number of insurance agents and brokers per capita.

These results are again consistent with the notion of religious communities and private banking or insurance as substitutes. Table 5 shows oil abundance increases demand for savings capital and time deposits by nearly 10%, while it increases the number of insurance agents and brokers per capita by nearly 50%. That being said, as many counties lack banks, savings and loan associations, or insurance agencies, results for these are somewhat sensitive to including zero-valued counties, with statistical significance for log savings capital appearing only in their absence. Altogether, however, these results are consistent with increased risk and demand for insurance mechanisms in oil-abundant economies.

One concern is that the results in Tables 4 and 5 do not reflect demand for these private substitutes but rather are corollaries of urbanization. For instance, a place with no insurance agents is likely to be rural and therefore more religious, while oil abundance is likely to increase population size and in turn the probability that an insurance branch locates in that county. We replicate Table 4 but control for pre-treatment log population density in 1950 and 1910 to probe for robustness, for columns (1a-b) and (2a-3b) respectively. As these are time-invariant, we interact them with year fixed effects. The results are reported in the Appendix in Table A10. Interaction effects for savings and loan associations and bank tellers are reduced by about 30 percent and effects for insurance agents are reduced by half, while neither main nor interaction effects lose statistical significance. Hence, although initial population size seems to matter for the relationship between private substitutes for consumption smoothing and religious participation, it does not explain away our main finding.

Appendix Table A11 performs a similar exercise for the regressions in Table 5, albeit controlling for time-varying log population density to see if increased urbanization over time post-oil discovery captures the relevant variation driving increases in outcomes in Table 5. The only effect that loses statistical significance is for the log number of insurance agents and brokers per capita when zero-valued counties are included. In general, increases in log population density and urbanization during the sample period do not explain away our findings.

Oil and Religion in the Public Social Insurance Era

We also study interaction effects for public social insurance, which became widespread in the U.S. in the 1930s and '40s but continued to vary by state thereafter, with Southern states generally providing less (Fishback, 2020). To do this, we interact our oil abundance indicator with time-varying measures of state-level maximum weekly unemployment insurance and workers compensation benefits from Fishback (2020). These measures are each adjusted to reflect relative value, using the ratio of benefits to either (i) the national poverty line weekly income equivalent for a 4 person family, (ii) average weekly earnings plus benefits for manufacturing workers in the state, or (iii) state weekly per capita income.

As shown in Table 6, we find that the introduction of public social insurance benefits comparable to national poverty line income standards reduces effects by nearly two thirds. When it is available at levels comparable to even higher standards, such as average state incomes or manufacturing earnings, positive effects of oil on religious participation disappear entirely, although availability to this extent is seldom the case in our sample.

6.3 Do Religious Communities Smooth Economic Volatility?

Now that we have shown that religious communities exhibit substitutability with other insurance mechanisms in oil-abundant settings, we consider whether relative fluctuations in economic outcomes for oil counties are indeed smaller in response to oil price shocks when a large religious community is present. To do this, we compare how local labor composition in oil-abundant counties responds to oil price shocks when religious participation is above versus below the sample median, using our measure of Christian membership in 1936 and a subsample of already-treated and never-treated counties spanning each decade from 1940 to 1990.[29]

Consistent with the historical evidence outlined in Section 2, that churches have historically been involved in providing economic aid and services such as employment matching and job training to their members, we find that increases in relative unemployment in oil-abundant counties following a negative oil price shock are significantly smaller when a large religious community is present. In particular, Table 7 shows that whereas a large, negative oil price shock of $30 2018 USD – about a sample standard deviation – increases the unemployment rate in an oil-abundant county relative to non-oil county by about 1 pp among below-median Christian counties, the same shock increases the relative unemployment by only about 0.7 pp among above-median Christian counties, with the difference between these coefficients being highly statistically significant.

To what extent is this rooted in reduced consumption volatility, as proposed in our theory in Section 3? The remainder of Table 7 suggests that religious communities indeed achieve this by reducing the spread of demand shocks beyond the oil sector. Following a negative oil price shock, oil-abundant counties tend to see out-migration and local agriculture suffers, while manufacturing becomes relatively more important for local labor demand. In oil-abundant counties with relatively large religious communities, however, migratory patterns remain flat relative to non-oil counties, and relative fluctuations in agricultural and manufacturing employment are both reduced by about two thirds. This is consistent with the notion that material aid as well

[29] This year is chosen because most outcomes are reported in the U.S. Census County Data Books beginning in 1940. We therefore exclude counties treated after 1936, which as such may see increases in Christian participation later in the panel thus biasing estimates. Results are nonetheless robust to not dropping these counties, as shown in Table A12, with the exception of population density effects, which lose some in significance.

as provision of labor market matching services by religious communities may smooth the local effects of income shocks in oil counties – not just for oil workers but for their neighbors.

6.4 Evidence from Denominational Responses

Further evidence that effects are driven by increased demand for social insurance can be found by looking at different denominational responses to oil discoveries, including (i) increased competition among denominations and (ii) greater increases in participation among denominations that are more likely to efficiently provide social insurance. First, column (1) of Table A13 shows that oil abundance decreases the concentration of different Christian denominations in our sample of denominations by about 3.8%. This suggests churches became more competitive in these places. This makes sense: a positive demand shock for the goods and services provided by religious communities, such as social insurance, may trigger new entrants into the market for religion and spur all denominations, including pre-existing ones, to increase their level of effort, increasing religious participation across multiple denominations (Iyer, 2016).

Which denominations are driving this? We examine the three most prominent groups in our sample of the U.S. South: Roman Catholics, Southern Baptists, and United Methodists. We find sizable and significant membership increases following major oil discoveries for only the first two. This is consistent with club models of religion, as described in Section 2, in which joining a religious community entails access to certain goods and services (e.g. social insurance) in return for the costs entailed by membership. More liberal denominations with fewer such membership costs (e.g. less sacrifice), including mainline Protestants such as Methodists, tend to entail greater free-riding with respect to such goods, at the expense of their provision to members (Iannaccone, 1992). Along the same lines, among mainline Protestants, provision of social support and volunteering tends to be more community- than congregation-focused, relative to evangelical groups (Wilson and Janoski, 1995). A demand shock for social insurance would therefore not necessary generate an increase in membership among Methodists, relative to Southern Baptists. Meanwhile, Catholics are comparatively moderate, having become more liberal following the Vatican II reforms in the early 1960s (Iannaccone, 1994).

Among Catholics and Southern Baptists, there are nonetheless some key differences. Early on, Catholics tended to focus their aid spending more on urban areas. In urban areas, about

4% of expenditures in 1936 went to local relief and charity versus about 2.1% in rural areas (U.S. Census Bureau, 1936). Meanwhile, Southern Baptists invested more in rural areas, with 3.2% of expenditures going to local relief and charity in such places versus 1.9% in urban areas. These comparative advantages reflect their membership: in the same census, only 19.4% of Catholics were rural versus 62.1% of Southern Baptists. The heatmaps in Figure 5 similarly illustrate a spatial differentiation of Catholics and Southern Baptists early in the event window. After WWII, Southern Baptists became increasingly prominent throughout the South, as shown in subsequent heatmaps in Figures A5 and A6. Indeed, most of the increase in overall membership observed in our data stems from their growth.[30] Of this growth, a large amount occurred in oil counties: Southern Baptist membership grew 437% in oil-abundant counties between 1906 and 1990, compared to 244% in (non-adjacent) non-oil counties.[31] The heatmaps also show the relative stagnation of the Methodists, whose historically conservative Southern groups joined the more liberal Methodist Episcopals in 1939.[32] Future research should focus more on denominational differences, including their changes over time.

7 Conclusion

In the U.S. today, social insurance and public assistance make up the lion's share of federal spending. Yet before the advent of such programs during the New Deal era, individuals had to find other means to insure themselves against negative states of the world. Of these, churches were a key provider of social support (Gruber and Hungerman, 2007). Such continues to be the case in settings lacking strong formal insurance mechanisms, for which churches may serve as networks for providing charity and aid (McCleary and Barro, 2006).

In this paper, we document the development of local religious communities as a form of social insurance in the face of natural resource abundance and its associated volatility, using the case of the oil-rich U.S. South. Using county level data from 1890 to 1990 on major oil

[30]Southern Baptists grew from 4.8% of sample population in 1906 to 20% in 1990. In comparison, Catholics grew from 6.8% to 13.5%, while United Methodists grew from 5.7% to 7.4%.

[31]For comparison, sample Catholic participation grew 143% in oil counties versus 60% in non-oil counties over the same period, while United Methodists grew just 29% in oil counties and 24% in non-oil counties.

[32]The 1936 data is notable for being prior to the merger of 1939. While the share of spending on local relief and charity remained somewhat high for the South church, at around 3.5% in both urban and rural areas, such spending by the Methodist Episcopals with whom it soon merged was much lower, at about 2%.

discoveries and church participation in Texas, Oklahoma, Louisiana, and their neighboring states, we document a strong and persistent relationship between oil discoveries and religious participation. Difference-in-differences regressions show that Christian church membership increases by 6-8 percentage points following a major oil discovery. This effect continues to grow over time, even after the advent of the welfare state, with the volatile later years of our sample feeding into increased demand for church support.

Part of this persistence post-1940 is rooted in a mechanism of "crowd out." Southern states often lack strong state social insurance programs, even today, and we find that such places continue to exhibit strong effects. We find similar evidence of crowd out from private institutions, such as private insurance and banks. Yet another part of it likely boils down to path dependence, with religiosity becoming a core part of Southern identity in the U.S. Indeed, our findings explain 30% of the overall increase in Christian church memberships from 1890 to 1990 in our sample of Southern oil counties. We rule out alternative explanations relating to increased population size or composition following oil discoveries. We also show that pre-discovery characteristics cannot predict which counties find oil, in line with the historic narrative. Even in the later parts of our sample, only a quarter or so of explorations were successful (see Gorelick, 2009), indicating substantial uncertainty in the discovery process. Finally, we show that larger religious communities mitigate relative volatility in oil-abundant counties, smoothing fluctuations in employment dynamics both across sectors and counties, in the form of smaller increases in unemployment and out-migration in low oil price periods.

These are no small findings. Beyond illustrating alternative means for coping with economic uncertainty in the absence of strong formal insurance mechanisms, this paper constitutes an important contribution to the literature on the economic role of religion and the environmental drivers of religious participation Ager et al. (2016); Ager and Ciccone (2018); Bentzen (2019). In particular, it provides new insight into the economic roots of the unique religiosity of the U.S. South, and the importance of its abundant natural resources in shaping it. Given the importance of natural resources for economies around the globe, as well as the vast heterogeneity in religious engagement across space, future work should examine the extent to which this connection is innate – extending beyond our setting, to other periods and places in history.

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Tables

Table 1: Oil Abundance and Religious Participation

	Outcome: Membership in major Christian churches (% population)					
	(1)	(2)	(3)	(4)	(5)	(6)
Oil abundance	6.627***	4.801***	8.126***	6.679***	8.055***	7.282***
	(0.921)	(0.892)	(1.023)	(0.908)	(1.011)	(0.953)
Sample	Donut	Full	Donut	Donut	Donut	Donut
Log pop. control	No	No	Yes	No	Yes	Yes
Compositional controls	No	No	No	Yes	Yes	Yes
Other controls	No	No	No	No	No	Yes
Observations	4574	6808	4574	4574	4574	4563
Counties	520	774	520	520	520	520
Adj. R^2	0.761	0.750	0.765	0.764	0.767	0.772
Outcome mean	32.88	33.43	32.88	32.88	32.88	32.87
Oster's δ	1.703	1.544	2.157	1.727	2.107	1.753

Note: Estimates are from difference-in-differences regressions of membership in 15 mainstream Christian denominations (% population) in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, covering the nine church and religious censuses held between 1890 and 1990. Counties that are adjacent to counties which eventually discover oil are excluded in the *donut* sample to limit spillover effects that might dilute the treatment, while the full sample includes those neighboring counties. All regressions include county and sample year fixed effects. Column (3) includes the county log population control. Column (4) includes compositional population controls, including the percent Black, percent French, percent Italian, and percent German population. Column (5) includes all five population controls. Column (6) includes population controls as well as the share of land in agriculture used for cotton production, the share of agricultural and manufacturing employment. The bottom row of the table reports the δ statistic by Oster (2019) which indicates how much selection on unobservables than on observables would have to play a role in order to explain away the oil abundance effect. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 2: Heterogeneous Effects: Oil Price Volatility

	Outcome: Membership in major Christian churches (% population)					
	(1)	(2)	(3)	(4)	(5)	(6)
Oil abundance	5.499***	5.182***	5.015***	5.674***	5.578***	4.618***
	(0.884)	(0.885)	(0.890)	(1.031)	(0.920)	(0.946)
Oil $\times$ 5 yr log price s.d.	0.130***					
	(0.044)					
Oil $\times$ 10 yr log price s.d.		0.106***				
		(0.032)				
Oil $\times$ 25 yr log price s.d.			0.119***			
			(0.035)			
Oil $\times$ 5 yr price s.d.				4.966		
				(3.781)		
Oil $\times$ 10 yr price s.d.					3.066**	
					(1.445)	
Oil $\times$ 25 yr price s.d.						4.949***
						(1.592)
Observations	4574	4574	4574	4574	4574	4574
Counties	520	520	520	520	520	520
Adj. R^2	0.761	0.761	0.761	0.761	0.761	0.761
Outcome mean	32.88	32.88	32.88	32.88	32.88	32.88
Interaction sample st. dev.	6.716	10.247	10.202	.085	.205	.212

Note: Estimates are from difference-in-differences regressions of membership in 15 mainstream Christian denominations (% population) in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, covering the nine church and religious censuses held between 1890 and 1990. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. All regressions include county and sample year fixed effects. The additional regressors include interactions of the oil abundance indicator with the standard deviation of world per barrel real (2018 USD) oil prices (columns [1-3]) and of the log world oil price (columns [4-6]) over 5, 10, and 25 years as measures of income risk associated with oil. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Heterogeneous Effects: "Boomtowns" and Oil Dependence

	Outcome: Membership in major Christian churches (% pop.)			
	(1)	(2)	(3)	(4)
Oil abundance	5.168***	7.782***	5.408***	10.487***
	(0.844)	(0.986)	(0.884)	(1.360)
Oil × Log pop density, 1900	-5.582***			
	(0.685)			
Oil × Urban in 1890		-8.104***		
		(1.755)		
Oil × Log mfg employment, 1900			-8.241***	
			(1.421)	
Oil × Above-median mfg output, 1900				-8.747***
				(1.583)
Observations	4566	4574	4226	4226
Counties	519	520	479	479
Adj. R^2	0.767	0.762	0.775	0.775
Outcome mean	32.87	32.88	32.27	32.27

Note: Estimates are from difference-in-differences regressions of membership in 15 mainstream Christian denominations (% population) in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, covering the nine church and religious censuses held between 1890 and 1990. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. All regressions include county and sample year fixed effects. We interact the oil abundance indicator with county characteristics in 1890 and 1900, which for most counties is before major oil discoveries were made. These include mean-normalized log population density in 1900; an indicator for having (part of) a city with a population of 25,000 or more in 1890; mean-normalized log manufacturing employment in 1900; and an indicator for above median manufacturing output in 1900. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Oil and Religion with Private Substitutes for Consumption Smoothing

	Outcome: Membership in major Christian churches (% population)					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
Oil abundance	9.342***	10.067***	7.614***	7.781***	13.354***	13.442***
	(1.259)	(2.952)	(1.003)	(1.018)	(1.697)	(1.744)
Oil × Any savings & loans banks, 1950	-5.625***	-9.814**				
	(1.581)	(4.337)				
Oil × Any bank tellers, 1910			-6.330***	-6.508***		
			(2.037)	(2.161)		
Oil × Any insurance agents, 1910					-8.997***	-8.830***
					(1.859)	(1.905)
Observations	4574	3390	4529	4426	4529	4426
Counties	520	382	513	501	513	501
Adj. R^2	0.762	0.761	0.763	0.761	0.765	0.763
Outcome mean	32.88	31.83	32.73	32.71	32.73	32.71
Drops counties treated $\leq$ 1950?	No	Yes				
Drops counties treated $\leq$ 1910?			No	Yes	No	Yes

Note: Estimates are from difference-in-differences regressions of membership in 15 mainstream Christian denominations (% population) in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, covering the nine church and religious censuses held between 1890 and 1990. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. All regressions include county and sample year fixed effects. We interact the oil abundance indicator with indicators for alternative insurance possibilities such as banks and private insurance companies. Those include dummies for whether a county had any savings and loan associations in 1950, or whether there were any bank teller or insurance agents in the county in 1910. The latter two variables come from the full count Census of 1910, while data on savings and loan associations were not available in the U.S. Census County Data Books until the mid-19th century. To minimize bad control concerns, secondary specifications in all columns (b) exclude counties treated prior to the year of the interaction term. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Oil and Demand for Private Substitutes for Consumption Smoothing

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
	Log savings per capita		Log time deposits per capita		Log insurance agents per capita	
Oil abundance	0.501	0.674***	1.091***	0.623***	0.017***	0.019***
	(0.397)	(0.235)	(0.307)	(0.223)	(0.004)	(0.005)
Observations	4160	2405	4680	4394	2080	1721
Counties	520	435	520	515	520	483
Adj. R^2	0.743	0.903	0.849	0.912	0.673	0.674
Outcome mean	4.576	7.866	6.671	7.103	0.047	0.056
Outcome >0	No	Yes	No	Yes	No	Yes

Note: Estimates are from difference-in-differences regressions of county-level measures for insurance and banking in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. All regressions include county and sample year fixed effects. Outcomes include log savings per capita, log time deposits in banks per capita, and the log number of insurance agents per capita. Savings capital data are available for all counties for eight years between 1947 and 1982; time deposits data are available for all counties for nine years between 1940 and 1980; and decadal insurance agent data are available from the full count Censuses for all counties from 1910 to 1940. Columns (b) restrict the sample to those counties that had strictly positive outcome values to account for significant truncation at zero for the variables. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Oil and Religion in the Age of State Social Insurance, 1936-90

	Outcome: Membership in major Christian churches (% population)					
	(1)	(2)	(3)	(4)	(5)	(6)
Oil abundance	10.551***	10.412***	11.614***	12.166***	10.298***	11.548***
	(2.591)	(2.115)	(2.408)	(2.465)	(2.132)	(2.327)
Oil × State max weekly UI	-7.055**	-21.319***	-13.130***			
	(2.971)	(4.229)	(3.413)			
State max weekly UI	0.521	-6.325**	-0.722			
	(2.055)	(2.718)	(2.561)			
Oil × State max weekly WC				-8.261***	-17.486***	-11.212***
				(1.877)	(3.100)	(2.333)
State max weekly WC				-8.109***	-7.091***	-6.212***
				(1.948)	(2.582)	(2.371)
Observations	2600	2600	2600	2544	2544	2544
Counties	520	520	520	520	520	520
Adj. R^2	0.791	0.795	0.792	0.791	0.791	0.790
Outcome mean	39.58	39.58	39.58	40.09	40.09	40.09
Adj for poverty line	Yes			Yes		
Adj for per capita income		Yes			Yes	
Adj for mfg income			Yes			Yes

Note: Estimates are from difference-in-differences regressions of membership in 15 mainstream Christian denominations (% population) in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, during the post-New Deal period when states had developed social insurance systems. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. All regressions include county and sample year fixed effects. The additional regressors are interactions of the oil abundance indicator with measures of state-level maximum weekly unemployment insurance and workers compensation benefits from Fishback (2020), beginning in 1940 through 1990, each of which is adjusted to reflect relative value, by (i) national poverty line weekly income equivalent for a 4 person family, (ii) average weekly earnings plus benefits for manufacturing workers in the state, and (iii) state weekly per capita income, respectively. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

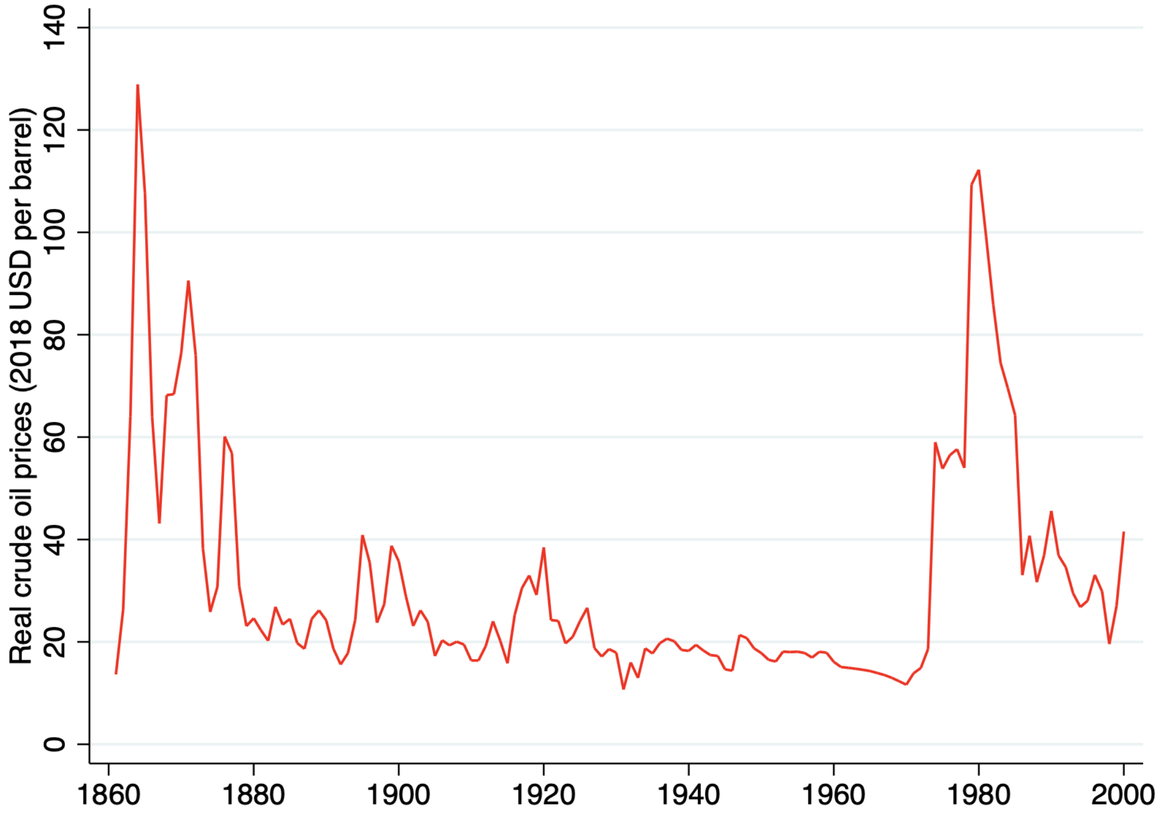
Table 7: Religion, Oil Shocks, and Local Labor Composition, 1940-90

	(1) % Unemployed	(2) Log pop density	(3) % Mining workers	(4) % Agricultural workers	(5) % Mfg workers
Oil × Oil price increase	-0.035***	0.002***	-0.008	0.123***	-0.030***
	(0.003)	(0.001)	(0.006)	(0.014)	(0.008)
Oil × Oil price increase					
× Above-median Christian, 1936	0.011***	-0.002**	0.007	-0.073***	0.020*
	(0.004)	(0.001)	(0.009)	(0.019)	(0.012)
Observations	2718	2718	2714	2716	2718
Counties	453	453	453	453	453
Adj. R^2	0.556	0.946	0.821	0.810	0.759
Outcome mean	5.351	2.317	2.698	21.93	12.97
Drops counties treated $\geq$ 1936?	Yes	Yes	Yes	Yes	Yes

Note: Estimates are from regressions of county-level economic outcomes in county c in year t on an "oil" indicator which equals one if and only if a county lies above an oilfield holding 100 million barrels of oil or more. This oil dummy is interacted with a time-varying measure of world per barrel crude oil prices (in 2018 USD). This is in term interacted with a time-invariant indicator of whether a county was above the sample median in Christian membership in 1936. This year is chosen because most outcomes are reported in the U.S. Census County Data Books beginning in 1940. We therefore exclude counties treated after 1936, which as such may see increases in Christian participation later in the panel thus biasing estimates. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, and is decadal from 1940 to 1990. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. All regressions include county and sample year fixed effects. Outcomes include log population density, shares of labor force in mining, agriculture, and manufacturing, and the unemployment rate. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

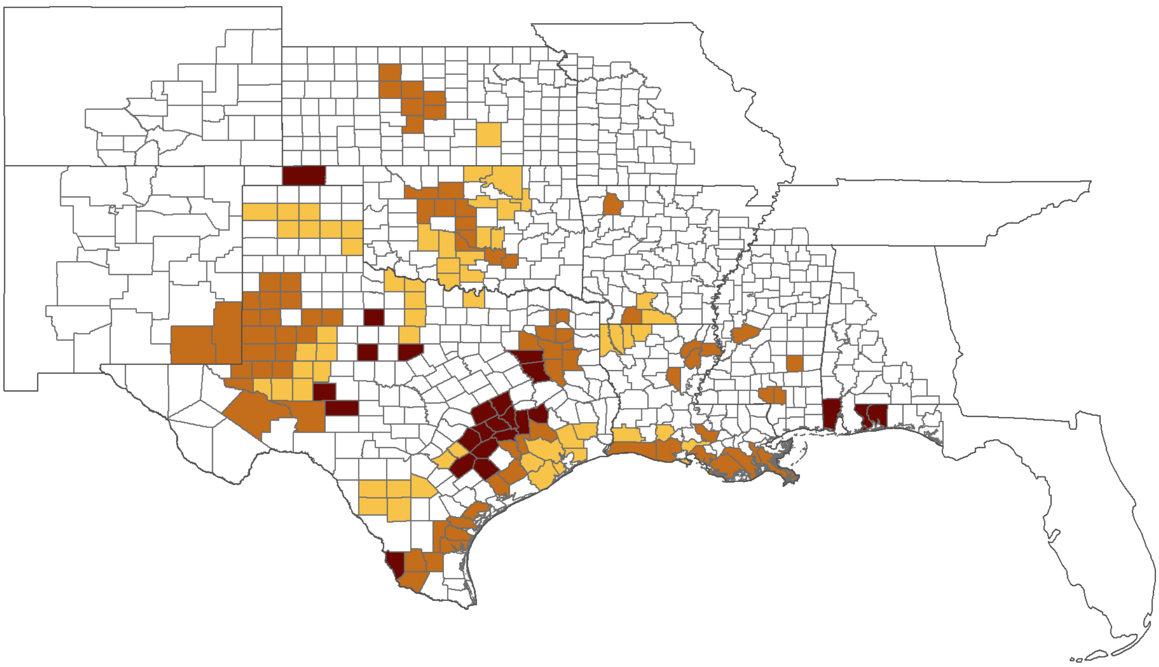
Figures

Figure 1: Real Crude Oil Prices, 1861 to 2000



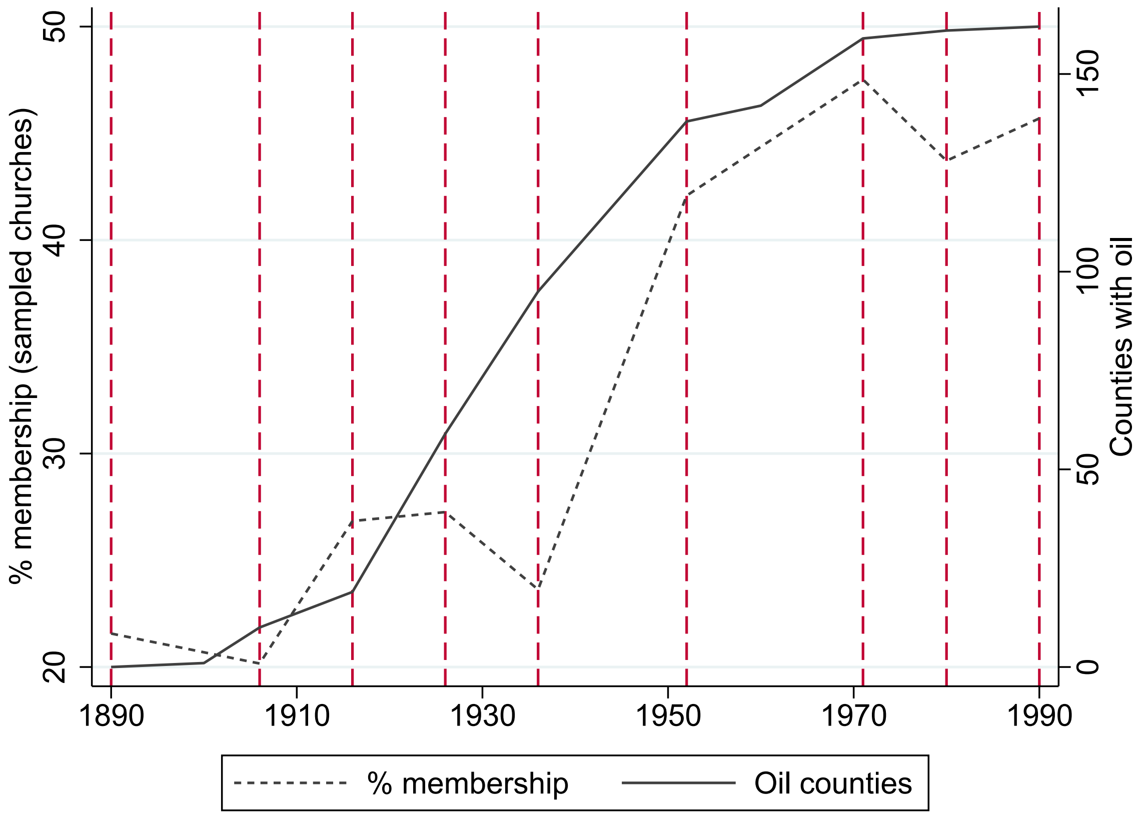
Note: Prices are expressed in 2018 USD per barrel. Prices from 1861 to 1944 are U.S. average spot prices, 1945 to 1983 are Arabian Light prices, and 1984 to 2010 are Brent dated prices. Oil price data was compiled by BP and collected from Quandl at https://www.quandl.com/data/BP/CRUDE_OIL_PRICES (date retrieved: July 27, 2020).

Figure 2: Map of All Oil-Abundant Counties in the Sample



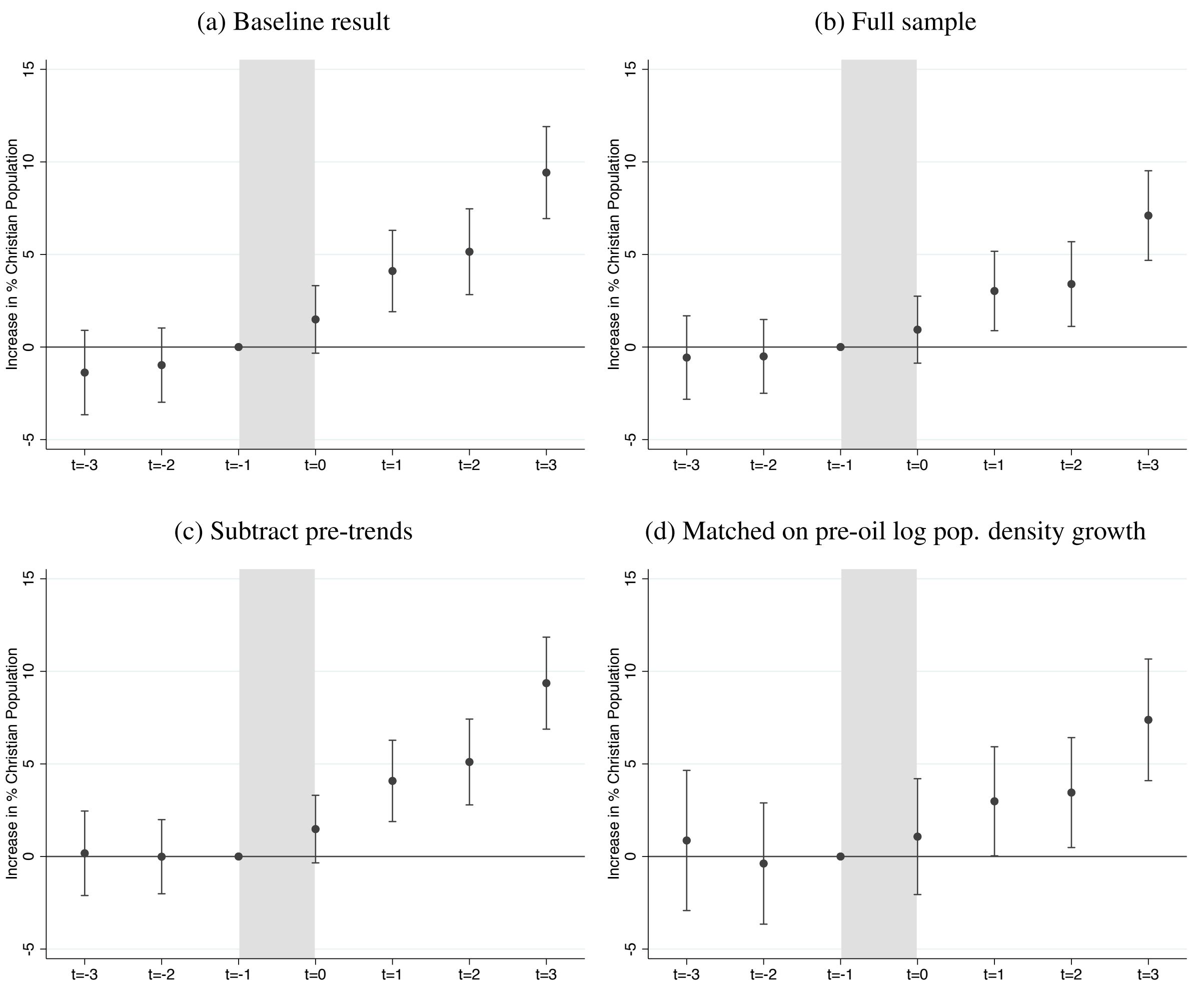
Note: Major oilfield with $\geq$ 100 million barrels discovered in each county between 1893 and 1925 (light orange), 1926 and 1950 (medium orange), and 1951 and 1982 (dark orange). White indicates no major oilfields were discovered. Counties included in the sample are outlined. These are limited to all counties within 200 km of oil-abundant counties in Louisiana, Oklahoma and Texas as in Michaels (2011) to limit the geographic heterogeneity of the sample.

Figure 3: Oil Discoveries and Membership in the Major Christian Churches, 1890 to 1990



Note: The solid line indicates the number of treated counties with treatment "switched on" at a given point in time, as determined by the year of a county's first major ($\geq$ 100 million barrels) oilfield discovery (right vertical axis). The first county in the sample to discover a major oilfield was Hardin County, TX, in 1893. The last county in the sample to have had its first major discovery was Taylor County, TX, in 1982. The dashed lined plots the evolution of memberships in the sampled Christian churches as a percent of total population (left vertical axis). Membership generally entails baptism or confirmation and is a stricter definition of religious participation than adherence. Note that the 1936 religious census had underreporting among some Baptist and Methodist groups (Ager et al., 2016). Results are not sensitive to dropping 1936, as shown in Figure A4. Also note the sharp rise in membership between 1936 and 1952, which reflects the growth of evangelical Protestantism in the South and is consistent with a dramatic rise in church attendance after WWII (Pew Research Center, 2018). Red dashed lines indicate the years of the religious censuses in the sample, the first being compiled in 1890 and the last in 1990.

Figure 4: Oil and Religion Event Study Plots



(a) Baseline result

(b) Full sample

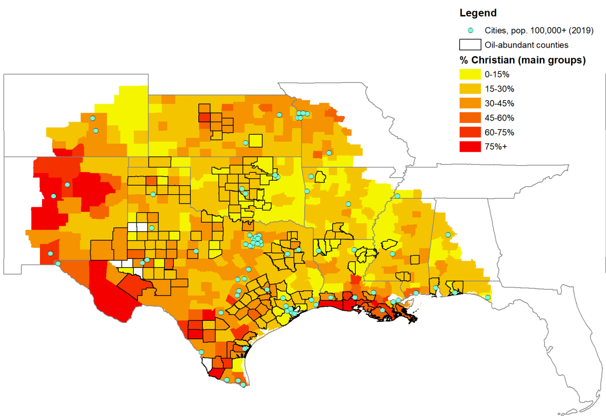
(c) Subtract pre-trends

(d) Matched on pre-oil log pop. density growth

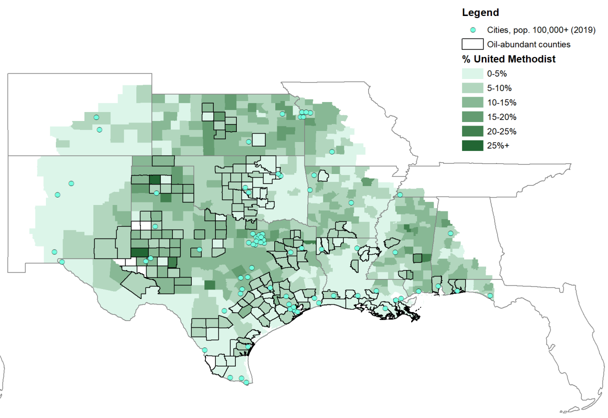
Note: Coefficient plots from event-study difference-in-differences analyses that regress membership in 15 mainstream Christian denominations (% population) in a county on both year and county fixed effects as well as an indicator for a major oil discovery in the county interacted with event time fixed effects. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. Event time is defined as the three periods before and after the occurrence of the first major oil discovery. The omitted baseline period is $t = -1$, which is the last pre-treatment period. The gray shaded area indicates the time frame within which oil is discovered between $t = -1$ and $t = 0$. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, covering the nine church and religious censuses held between 1890 and 1990. Except in the full sample, we exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. Standard errors are clustered at the county level and error bars represent 95% confidence intervals.

Figure 5: Spatial Distribution of Denominations in 1916

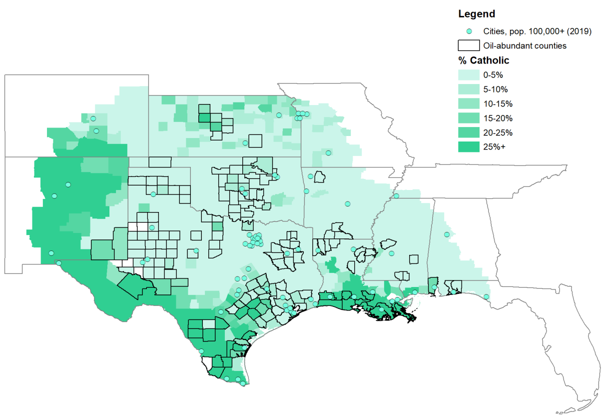
(a) All sample Christian churches (% population)



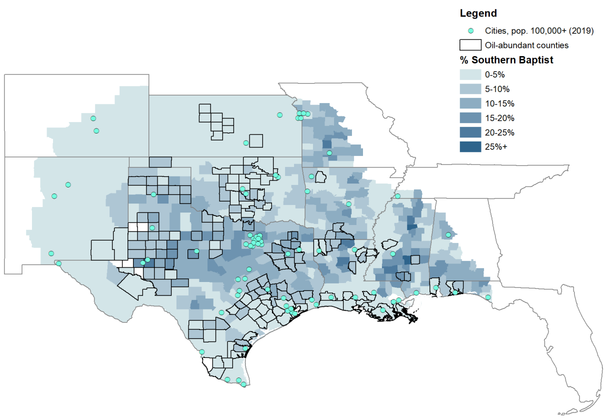
(b) United Methodist (% population)



(c) Roman Catholic (% population)



(d) Southern Baptist (% population)



Note: Maps show the spatial distribution of different Christian denominations as a share of the total population in our sample counties, as reported in the 1916 United States Census of Religious Bodies. Oil-abundant counties are outlined in black, while urban areas (cities with population >100,000 in 2019) are dotted in light blue. Note the sudden decline in Southern Baptists at the Kansas border, which generally marks the edge of the Bible Belt. City population and longitude-latitude data from SimpleMaps.com at https://simplemaps.com/data/us-cities (date retrieved: August 20, 2020).

Appendix

Appendix Tables

Table A1: Oil Abundance and Religious Participation Robustness to Pre-Oil Population Trends

	Outcome: Membership in major Christian churches (% population)					
	Panel a: Sample matched on pre-oil log population growth					
	(1)	(2)	(3)	(4)	(5)	(6)
Oil abundance	5.718***	5.718***	2.776*	2.770*	6.069***	6.054***
	(1.374)	(1.374)	(1.506)	(1.508)	(1.542)	(1.546)
Observations	1811	1811	1811	1811	1811	1811
Counties	194	194	194	194	194	194
Adj. R^2	0.764	0.764	0.528	0.528	0.595	0.595
Outcome mean	36.54	36.54	36.54	36.54	36.54	36.54
County FE	yes	yes				
Pair FE			yes	yes	yes	yes
Propensity score control		yes		yes		yes
Geographic region control					yes	yes
	Panel b: Sample matched on pre-oil log population density growth					
	(1)	(2)	(3)	(4)	(5)	(6)
Oil abundance	4.077***	4.077***	4.011***	3.728***	3.341**	3.142**
	(1.380)	(1.380)	(1.316)	(1.306)	(1.366)	(1.370)
Observations	1964	1964	1964	1964	1964	1964
Counties	201	201	201	201	201	201
Adj. R^2	0.761	0.761	0.565	0.566	0.595	0.599
Outcome mean	35.34	35.34	35.34	35.34	35.34	35.34
County FE	yes	yes				
Pair FE			yes	yes	yes	yes
Propensity score control		yes		yes		yes
Geographic region control					yes	yes

Note: Estimates are from difference-in-differences regressions of membership in 15 mainstream Christian denominations (% population) in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, covering the nine church and religious censuses held between 1890 and 1990. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. Oil counties were matched to non-oil counties via propensity score matching using the log population growth (panel a) and log population density growth (panel b) in the pre-oil discovery years. All regressions include sample year fixed effects. We control for county fixed effects in columns (1) and (2), and for matched pair fixed effects in columns (3) and (4). Columns (2) and (4) also condition on the propensity score that was estimated by the matching algorithm. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A2: Oil Abundance and Religious Participation Robustness to Population Trends

	Outcome: Membership in major Christian churches (% population)					
	Panel a: Sample matched on log population growth					
	(1)	(2)	(3)	(4)	(5)	(6)
Oil abundance	5.307***	5.307***	2.598*	2.598*	3.870**	3.875**
	(1.226)	(1.226)	(1.514)	(1.513)	(1.525)	(1.536)
Observations	1695	1695	1695	1695	1695	1695
Counties	189	189	189	189	189	189
Adj. R^2	0.749	0.749	0.507	0.507	0.540	0.540
Outcome mean	36.11	36.11	36.11	36.11	36.11	36.11
County FE	yes	yes				
Pair FE			yes	yes	yes	yes
Propensity score control		yes		yes		yes
Geographic region control					yes	yes
	Panel b: Sample matched on log population density growth					
	(1)	(2)	(3)	(4)	(5)	(6)
Oil abundance	4.474***	4.474***	4.935***	5.140***	4.985***	5.206***
	(1.206)	(1.206)	(1.410)	(1.391)	(1.456)	(1.438)
Observations	1650	1650	1650	1650	1650	1650
Counties	184	184	184	184	184	184
Adj. R^2	0.752	0.752	0.553	0.559	0.569	0.572
Outcome mean	34.92	34.92	34.92	34.92	34.92	34.92
County FE	yes	yes				
Pair FE			yes	yes	yes	yes
Propensity score control		yes		yes		yes
Geographic region control					yes	yes

Note: Estimates are from difference-in-differences regressions of membership in 15 mainstream Christian denominations (% population) in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, covering the nine church and religious censuses held between 1890 and 1990. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. Oil counties were matched to non-oil counties via propensity score matching using the log population growth (panel a) and log population density growth (panel b) over all years in the sample. All regressions include sample year fixed effects. We control for county fixed effects in columns (1) and (2), and for matched pair fixed effects in columns (3) and (4). Columns (2) and (4) also condition on the propensity score that was estimated by the matching algorithm. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A3: Oil Abundance and Religious Participation Robustness to Treatment Year

	Outcome: Membership in major Christian churches (% population)			
	(1)	(2)	(3)	(4)
Oil abundance	6.658^{***}	6.202^{***}	6.511^{***}	7.147^{***}
	(0.886)	(0.916)	(0.921)	(1.123)
Observations	4574	4574	4574	4574
Counties	520	520	520	520
Adj. R^2	0.760	0.759	0.760	0.759
Outcome mean	32.88	32.88	32.88	32.88
Treatment defined by	Earliest oil	Adjacent county	Oldest oilfield	Earliest, contig group

Note: Estimates are from difference-in-differences regressions of membership in 15 mainstream Christian denominations (% population) in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, covering the nine church and religious censuses held between 1890 and 1990. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. All regressions include county and sample year fixed effects. Regressions vary the year in which treatment turns on. Column (1) considers an oil-abundant county to be treated the year *any* oil was discovered there, even if not from a major oilfield. Column (2) considers an oil-abundant county to be treated the year it *or* an adjacent oil-abundant county discovered a major oilfield, whichever happened first. Column (3) considers an oil-abundant county to be treated the first year any of its major oilfields were discovered anywhere, even if not in that county. Column (4) considers an oil-abundant county to be treated the first year any county in the set of oil-abundant counties with which it is contiguous discovered a major oilfield. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A4: Oil Abundance and Religious Participation Robustness to Spatial Autocorrelation

	Outcome: Membership in major Christian churches (% population)			
	(1)	(2)	(3)	(4)
Oil abundance	6.627^{***}	6.627^{***}	6.627^{***}	6.627^{***}
	(0.622)	(0.632)	(0.746)	(0.831)
Observations	4574	4574	4574	4574
Counties	520	520	520	520
Adj. R^2	0.139	0.139	0.139	0.139
Outcome mean	32.88	32.88	32.88	32.88
Distance cutoff	25km	50km	100km	150km

Note: Estimates are from difference-in-differences regressions of membership in 15 mainstream Christian denominations (% population) in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, covering the nine church and religious censuses held between 1890 and 1990. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. All regressions include county and sample year fixed effects. Conley standard errors that adjust inference for spatial autocorrelation in parentheses with the distance cutoff being reported in kilometers in the bottom table row. Distance cutoffs are 25, 50, 100, and 150 kilometers (approximately 15.5, 31, 62, and 93 miles). Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A5: Oil Abundance and Religious Participation Robustness to Alternative Clustering

	Outcome: Membership in major Christian churches (% population)		
	(1)	(2)	(3)
Oil abundance	6.627***	6.627***	6.627***
	(0.921)	(1.057)	(1.583)
Observations	4574	4574	4574
Counties	520	453	382
Adj. R^2	0.761	0.761	0.761
Outcome mean	32.88	32.88	32.88
S.E. clustered by	County	Oilfield	Contiguous oil counties

Note: Estimates are from difference-in-differences regressions of membership in 15 mainstream Christian denominations (% population) in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, covering the nine church and religious censuses held between 1890 and 1990. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. All regressions include county and sample year fixed effects. Regressions consider alternative ways in which to cluster standard errors. Column (1) clusters standard errors at the county level, at which the treatment is defined. Column (2) clusters standard errors at the major oilfield level, where a county is assigned whichever of its major oilfields was discovered first in any county, as treatment is likely to have occurred in practice on that basis. Column (3) clusters standards errors by the set of contiguous oil-abundant counties in which it exists, even if they share no common major oilfield, as treatment in practice may span beyond the major oilfield level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A6: Oil Abundance and Religious Participation Robustness to Spillover Effects

	Outcome: Membership in major Christian churches (% population)				
	(1)	(2)	(3)	(4)	(5)
Oil abundance	4.801***	6.627***	6.623***	6.966***	7.536***
	(0.892)	(0.921)	(0.922)	(0.956)	(1.039)
Observations	6808	4574	4565	3672	2778
Counties	774	520	519	418	317
Adj. R^2	0.750	0.761	0.761	0.757	0.751
Outcome mean	33.43	32.88	32.89	33.74	35.06
Excl. control counties	None	Adjacent	<50km	<100km	<150km

Note: Estimates are from difference-in-differences regressions of membership in 15 mainstream Christian denominations (% population) in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, covering the nine church and religious censuses held between 1890 and 1990. All regressions include county and sample year fixed effects. Regressions utilize different "donut" approaches to remove spillover effects. Column (1) excludes no counties. Column (2) excludes control counties that are adjacent to an oil county. The remaining columns exclude control counties within a certain distance threshold of 50, 100, and 150 kilometers (approximately 31, 62, and 93 miles) to the nearest oil county to test for sensitivity with respect to potential spillover effects. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A7: Oil Abundance and Religious Participation Alternative Imputation Procedures

	Outcome: Membership in major Christian churches (% population)			
	(1)	(2)	(3)	(4)
Oil abundance	5.894***	6.495***	6.627***	3.930***
	(0.928)	(0.922)	(0.921)	(0.882)
Observations	4085	4497	4574	4574
Counties	520	520	520	520
Adj. R^2	0.761	0.761	0.761	0.784
Outcome mean	34.37	33.24	32.88	22.12
Procedure	Excludes 1906	Imputed from 1890	Imputed from 1906	Excludes Baptists

Note: Estimates are from difference-in-differences regressions of membership in 15 mainstream Christian denominations (% population) in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, covering the nine church and religious censuses held between 1890 and 1990. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. All regressions include county and sample year fixed effects. Regressions reflect different approaches to dealing with the aggregation of Northern, Southern, and National Baptists in the 1906 Religious Census. Column (1) simply excludes the 1906 Religious Census from the sample. Column (2) uses the ratio of Northern+Southern to National Baptists from the 1890 Religious Census to impute values for 1906. Column (3) uses the ratio from the 1916 Religious Census to impute values for 1906. Column (4) simply excludes both Baptists groups from the sample. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A8: Oil Abundance, Education, and Incomes (1936-1990)

	% Membership in major Christian churches			% Adults with high school degree	Median family income
	(1)	(2)	(3)	(4)	(5)
Oil abundance	4.451***	3.425*	3.094*	-1.272**	2324.042***
	(1.691)	(1.785)	(1.743)	(0.586)	(863.679)
% adults with high school degree	-0.352***		-0.236***		
	(0.057)		(0.066)		
Median family income		-0.000*	-0.000		
		(0.000)	(0.000)		
Observations	2600	2417	2417	3120	2941
Counties	520	520	520	520	520
Adj. R^2	0.812	0.824	0.826	0.959	0.945
Outcome mean	39.58	40.17	40.17	40.23	36601.8

Note: Estimates are from difference-in-differences regressions of membership in 15 mainstream Christian denominations (% population) in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, covering the nine church and religious censuses held between 1890 and 1990. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. All regressions include county and sample year fixed effects. Regressions also control for log population to capture factors associated with urbanization and market size that might drive relevant variation in education or income level independent of the channels of interest (e.g. there may be no schools in very rural areas, higher nominal incomes in urban areas). Education is the percentage of adults (aged 25 plus) with a high school degree. Median family income is in 2018 dollars. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A9: Negative Oil Shocks Hurt Oil-abundant Counties

	(1) % Mining workers	(2) Log mean mining wage	(3) Log mining per worker output	(4) % Agricultural workers
Oil abundance	2.968***	1.018***	1.267***	-3.993**
	(0.414)	(0.165)	(0.409)	(1.755)
Oil × Oil price increase	0.005	0.062***	0.062**	0.062***
	(0.004)	(0.010)	(0.025)	(0.008)
N	3116	928	926	3118
Counties	520	271	270	520
Adj. R^2	0.816	0.793	0.841	0.807
Outcome mean	3.005	10.66	12.59	22.13

	(1) % Mfg workers	(2) Log mean mfg wage	(3) % Unemployed	(4) Median family income
Oil abundance	-2.615***	0.058**	-0.079	2945.032***
	(0.780)	(0.028)	(0.273)	(847.142)
Oil × Oil price increase	-0.019***	0.001**	-0.028***	62.602***
	(0.005)	(0.000)	(0.002)	(18.110)
N	3519	4211	3640	2941
Counties	520	471	520	520
Adj. R^2	0.727	0.848	0.551	0.924
Outcome mean	11.63	10.14	4.869	36601.8

Note: Estimates are from difference-in-differences regressions of membership in 15 mainstream Christian denominations (% population) in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. This indicator is interacted with a time-varying measure of world per barrel crude oil prices (in 2018 USD), which is normalized around the annual 1861 to 2000 mean. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, and covers various years from 1930 to 1990. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. All regressions include county and sample year fixed effects. Outcomes include the shares of labor force in mining, agriculture, and manufacturing, log per worker annual mining output, log per worker annual mining wages, log per worker annual manufacturing wages, the unemployment rate, and median family annual income. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A10: Oil and Religion with Private Substitutes Robustness to Population Density

	Outcome: Membership in major Christian churches (% population)					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
Oil abundance	8.396***	8.585***	6.288***	6.464***	10.014***	9.991***
	(1.273)	(2.755)	(1.002)	(1.015)	(1.876)	(1.930)
Oil × Any						
savings & loans banks, 1950	-3.674**	-7.102*				
	(1.602)	(4.089)				
Oil × Any						
bank tellers, 1910			-4.096**	-4.141**		
			(1.836)	(1.947)		
Oil × Any						
insurance agents, 1910					-5.706***	-5.395***
					(1.927)	(1.979)
Observations	4574	3390	4529	4426	4529	4426
Counties	520	382	513	501	513	501
Adj. R^2	0.768	0.767	0.773	0.771	0.774	0.772
Outcome mean	32.88	31.83	32.73	32.71	32.73	32.71
Drops counties treated ≤ 1950?	No	Yes				
Drops counties treated ≤ 1910?			No	Yes	No	Yes

Note: Estimates are from difference-in-differences regressions of membership in 15 mainstream Christian denominations (% population) in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, covering the nine church and religious censuses held between 1890 and 1990. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. All regressions include county and sample year fixed effects. We interact the oil abundance indicator with indicators for alternative insurance possibilities such as banks and private insurance companies. Those include dummies for whether a county had any savings and loan associations in 1950, or whether there were any bank teller or insurance agents in the county in 1910. The latter two variables come from the full count Census of 1910, while data on savings and loan associations were not available in the U.S. Census County Data Books until the mid-19th century. To minimize bad control concerns, secondary specifications in all columns (b) exclude counties treated prior to the year of the interaction term. We also control for the log population density of each county in 1950 or 1910, interacted with sample year fixed effects. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A11: Oil and Private Substitutes Robustness to Population Density

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
	Log savings per capita		Log time deposits per capita		Log insurance agents per capita	
Oil abundance	0.454	0.680***	1.105***	0.648***	0.006	0.010**
	(0.423)	(0.232)	(0.307)	(0.216)	(0.004)	(0.004)
Observations	4160	2405	4680	4394	2080	1721
Counties	520	435	520	515	520	483
Adj. R^2	0.745	0.903	0.850	0.915	0.692	0.691
Outcome mean	4.576	7.866	6.671	7.103	0.047	0.056
Outcome >0	No	Yes	No	Yes	No	Yes

Note: Estimates are from difference-in-differences regressions of county-level measures for insurance and banking in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. All regressions include county and sample year fixed effects. Outcomes include log savings per capita, log time deposits in banks per capita, and the log number of insurance agents per capita. Savings capital data are available for all counties for eight years between 1947 and 1982; time deposits data are available for all counties for nine years between 1940 and 1980; and decadal insurance agent data are available from the full count Censuses for all counties from 1910 to 1940. Columns (b) restrict the sample to those counties that had strictly positive outcome values to account for significant truncation at zero for the variables. All regressions include each county's log population density. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A12: Religion, Oil Shocks, and Local Labor Composition Robustness to Sample

	(1) % Unemployed	(2) Log pop density	(3) % Mining workers	(4) % Agricultural workers	(5) % Mfg workers
Oil × Oil price increase	-0.033***	0.001***	0.001	0.099***	-0.030***
	(0.003)	(0.000)	(0.005)	(0.012)	(0.007)
Oil × Oil price increase					
× Above-median Christian, 1936	0.013***	-0.001	0.007	-0.074***	0.025**
	(0.004)	(0.001)	(0.007)	(0.016)	(0.010)
Observations	3120	3120	3116	3118	3120
Counties	520	520	520	520	520
Adj. R^2	0.554	0.944	0.817	0.811	0.759
Outcome mean	5.310	2.307	3.005	22.13	12.47
Drops counties treated $\geq$ 1936?	No	No	No	No	No

Note: Estimates are from regressions of county-level economic outcomes in county c in year t on an "oil" indicator which equals one if and only if a county lies above an oilfield holding 100 million barrels of oil or more. This oil dummy is interacted with a time-varying measure of world per barrel crude oil prices (in 2018 USD). This is in term interacted with a time-invariant indicator of whether a county was above the sample median in Christian membership in 1936. This year is chosen because most outcomes are reported in the U.S. Census County Data Books beginning in 1940. Nevertheless, in this version we do not exclude counties treated after 1936, which as such may see increases in Christian participation later in the panel thus biasing estimates. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, and is decadal from 1940 to 1990. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. All regressions include county and sample year fixed effects. Outcomes include log population density, shares of labor force in mining, agriculture, and manufacturing, and the unemployment rate. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

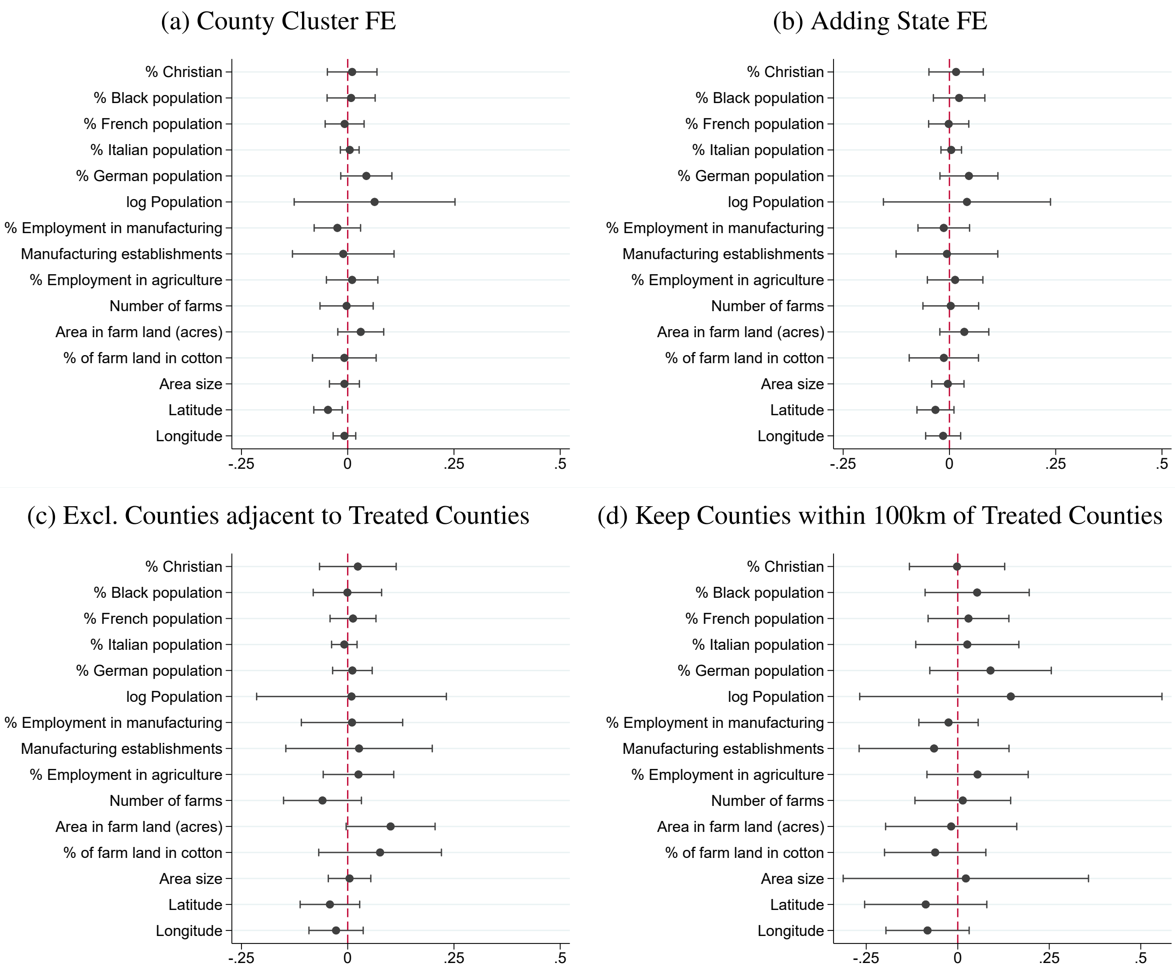
Table A13: Oil Abundance and Religious Participation Alternative Imputation Procedures

	Herfindahl index	% Southern Baptist	% Roman Catholic	% United Methodist
	(1)	(2)	(3)	(4)
Oil abundance	-0.038***	2.884***	4.199***	-0.423
	(0.009)	(0.671)	(0.821)	(0.292)
Observations	4574	4574	4598	4598
Counties	520	520	520	520
Adj. R^2	0.717	0.766	0.821	0.613
Outcome mean	0.558	10.40	9.930	7.546

Note: Estimates are from difference-in-differences regressions of measurements of membership in Christian denominations (% population) in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. In column (1), all denominations as well as the remainder are used to construct a county-level Herfindahl index of denominational concentration. Columns (2-4) measure county-level membership of Southern Baptists, Roman Catholic, and United Methodist denominations (% population), respectively. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, covering the nine church and religious censuses held between 1890 and 1990. We exclude counties that are adjacent to oil counties to limit spillover effects that might dilute the treatment. All regressions include county and sample year fixed effects. Standard errors are clustered at the county level. Significance levels are denoted by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix Figures

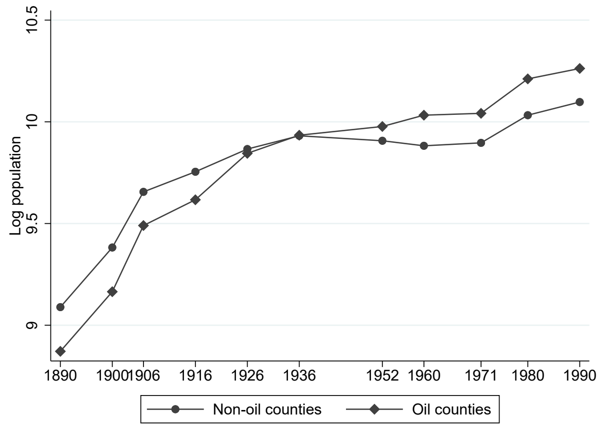
Figure A1: Balancing Test of the Oil Treatment on Pre-Discovery Observables



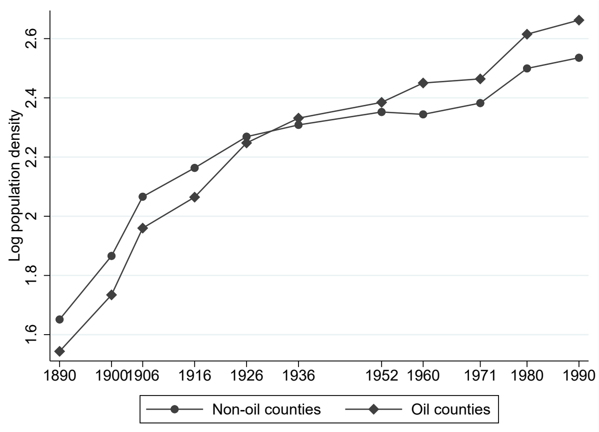
Note: Regressions of the oil treatment indicator on observable pre-oil discovery characteristics in the year prior to discovery. Due to the different timing of oil discoveries, we first define *clusters* of control counties and their nearest treated county. In each cluster, we consider all counties in the year before oil is discovered in the treated county of this cluster and regress the oil treatment indicator on observable county characteristics to test whether there are pre-determined variables that can predict discoveries. Since all counties are in the vicinity of an eventually treated county, they arguably had similar chances of discovering oil. All variables except latitude and longitude are standardized to have mean zero and variance one for comparability. The coefficients of these regressions with their 95% confidence intervals are plotted in each sub-graph which subsequently add different fixed effects, in (a and b), or exclude counties depending on proximity to the oil county, in (c and d). Major oilfields hold 100 million barrels of oil or more, which is also the definition of the oil treatment variable. Standard errors are clustered at the county level and the red dashed line marks zero.

Figure A2: Matched Sample on Pre-Oil Population Growth

(a) Unconditional Log Population Growth

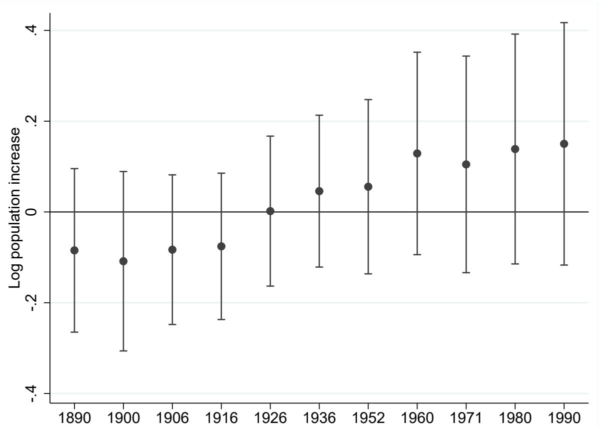


(b) Unconditional Log Population Density Growth



(c) Conditional Log Population Growth

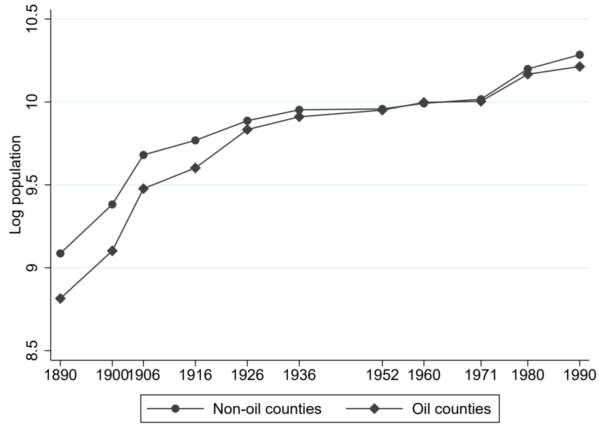
(d) Conditional Log Population Density Growth



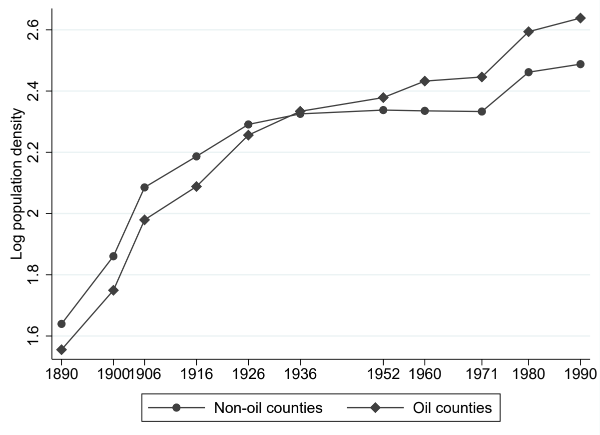
Note: Log population and log population density growth in oil and non-oil counties after matching on each variable for the years prior to the discovery of oil in the oil counties. Figures (a) and (b) show the unconditional evolution in the two groups for the matched sample over time. Figures (c) and (d) show the conditional evolution of these variables by regressing them on county and year fixed effects as well as the interaction of an indicator for whether a county ever had oil with the year fixed effects. The coefficients from this interaction are plotted in the two figures together with the 95% confidence interval which is represented by the error bars. Standard errors are clustered at the county level.

Figure A3: Matched Sample on Population Growth Over the Full Sample

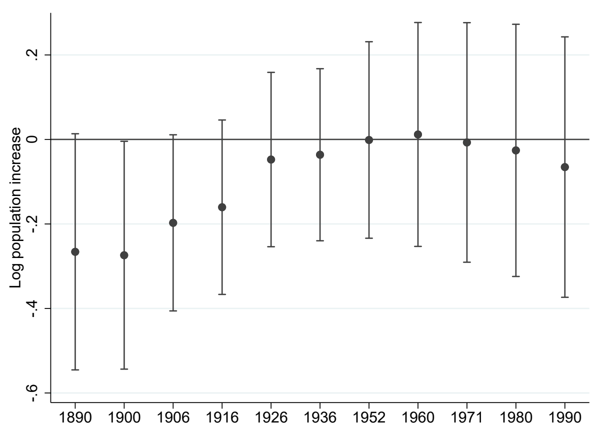
(a) Unconditional Log Population Growth



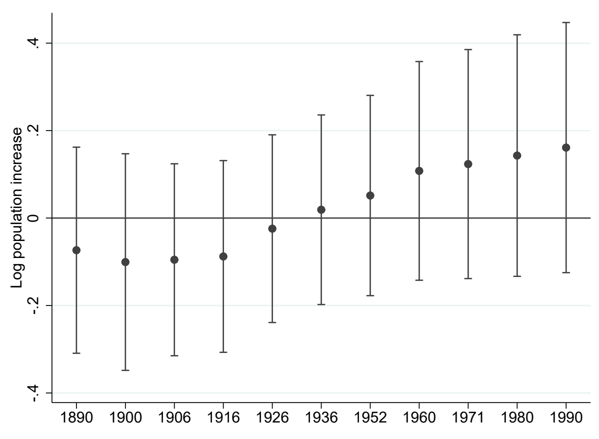
(b) Unconditional Log Population Density Growth



(c) Conditional Log Population Growth

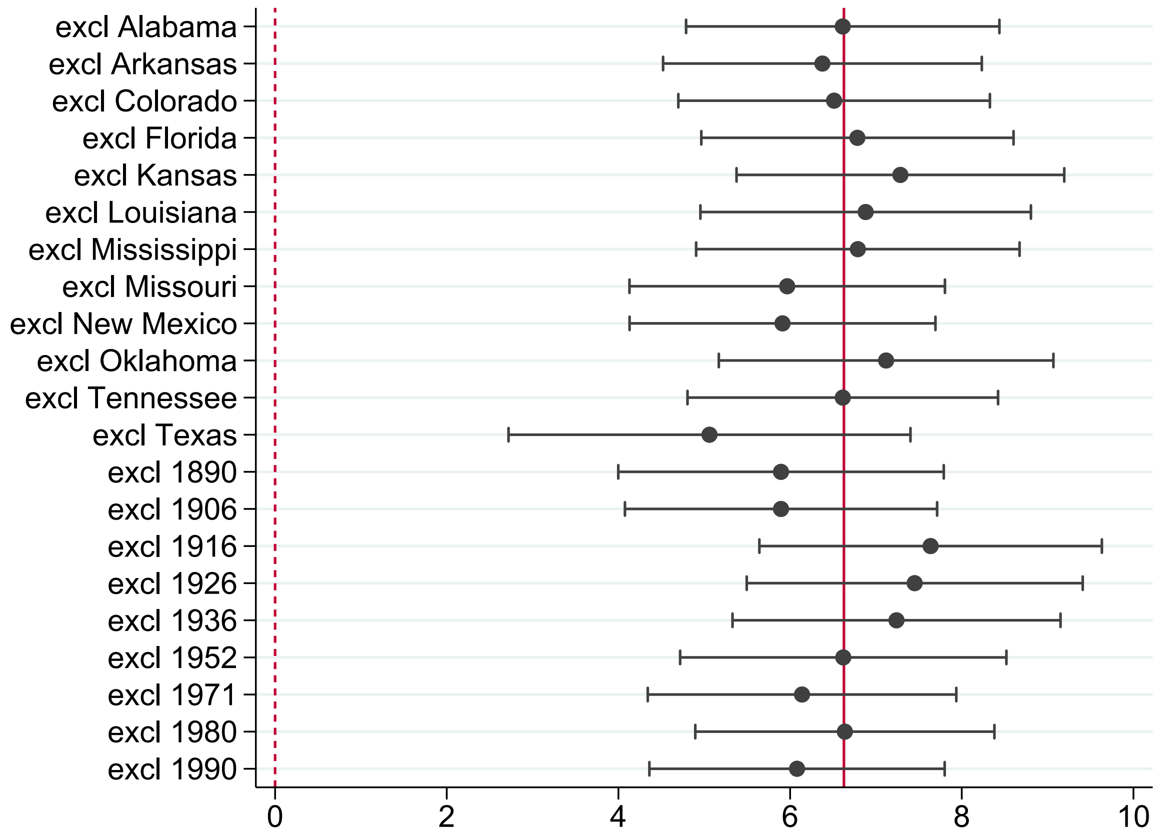


(d) Conditional Log Population Density Growth



Note: Log population and log population density growth in oil and non-oil counties after matching on each variable over the entire sample period. Figures (a) and (b) show the unconditional evolution in the two groups for the matched sample over time. Figures (c) and (d) show the conditional evolution of these variables by regressing them on county and year fixed effects as well as the interaction of an indicator for whether a county ever had oil with the year fixed effects. The coefficients from this interaction are plotted in the two figures together with the 95% confidence interval which is represented by the error bars. Standard errors are clustered at the county level.

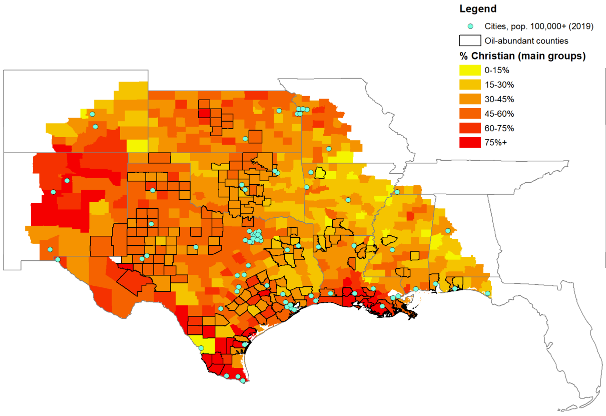
Figure A4: Sensitivity of Oil Abundance and Religious Participation to Sample Changes



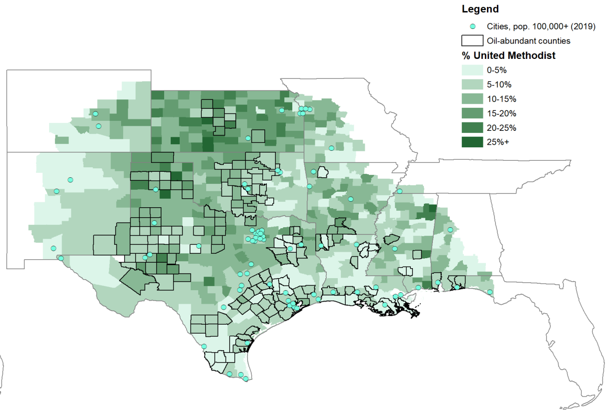
Note: Estimates are from difference-in-differences regressions of membership in 15 mainstream Christian denominations (% population) in county c in year t on an indicator called "oil abundance," which equals one for a county in years following a major oil discovery and is zero otherwise. Major oil discoveries are defined as oilfields holding 100 million barrels of oil or more. The sample consists of counties in Louisiana, Oklahoma, and Texas as well as surrounding counties in Alabama, Arkansas, Colorado, Florida, Kansas, Mississippi, Missouri, New Mexico, and Tennessee, covering the nine church and religious censuses held between 1890 and 1990. Each coefficient represents the oil abundance effect on membership among 15 mainstream Christian denominations, while excluding a certain state or sample year at a time. We exclude control counties that are adjacent to oil counties to avoid issues from spillover effects. The solid red line is the baseline effect, the dashed red line marks zero to show the distance of a specific coefficient from being a null effect. Standard errors are clustered at the county level and error bars show 95% confidence intervals.

Figure A5: Spatial Distribution of Denominations in 1952

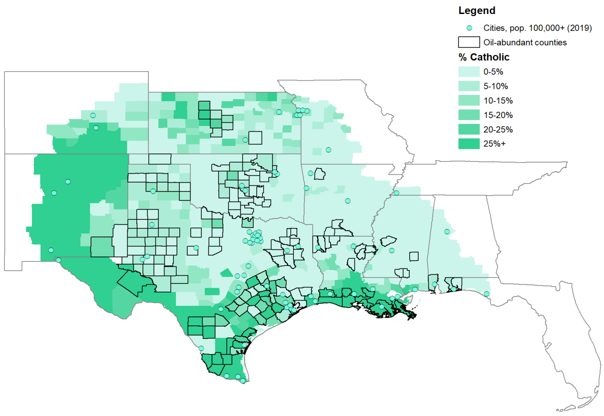
(a) All sample Christian churches (% population)



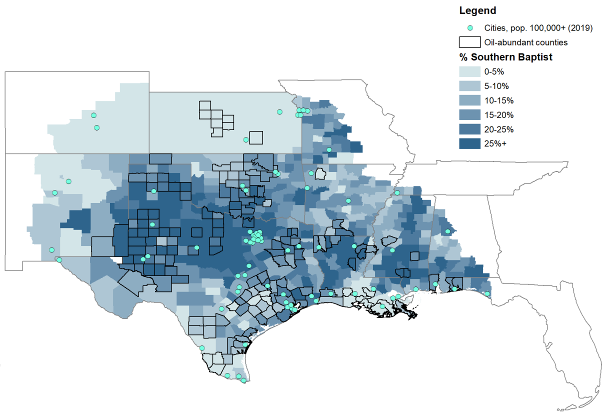
(b) United Methodist (% population)



(c) Roman Catholic (% population)



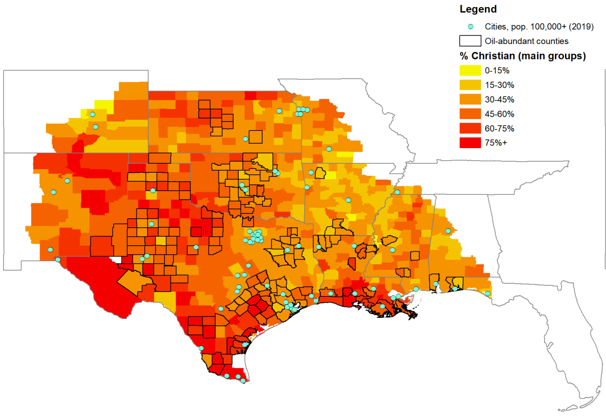
(d) Southern Baptist (% population)



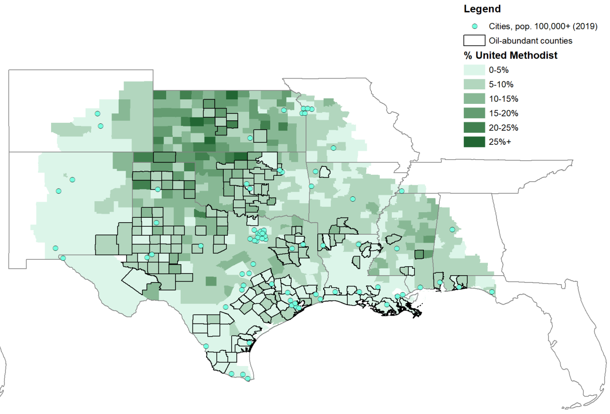
Note: Maps show the spatial distribution of different Christian denominations as a share of the total population in our sample counties, as reported in the 1952 religious census. Oil-abundant counties are outlined in black, while urban areas (cities with population >100,000 in 2019) are dotted in light blue. Note the sudden decline in Southern Baptists at the Kansas border, which generally marks the edge of the Bible Belt. City population and longitude-latitude data from SimpleMaps.com at https://simplemaps.com/data/us-cities (date retrieved: August 20, 2020).

Figure A6: Spatial Distribution of Denominations in 1990

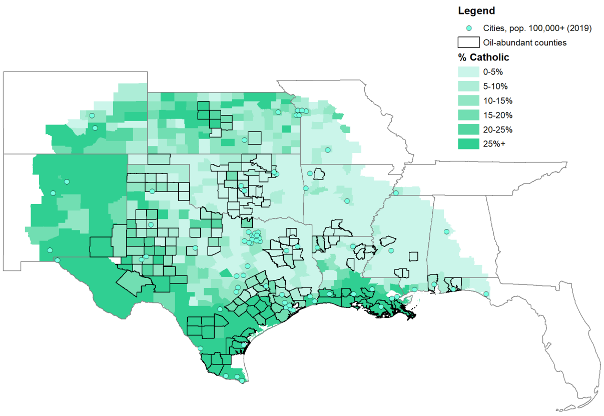
(a) All sample Christian churches (% population)



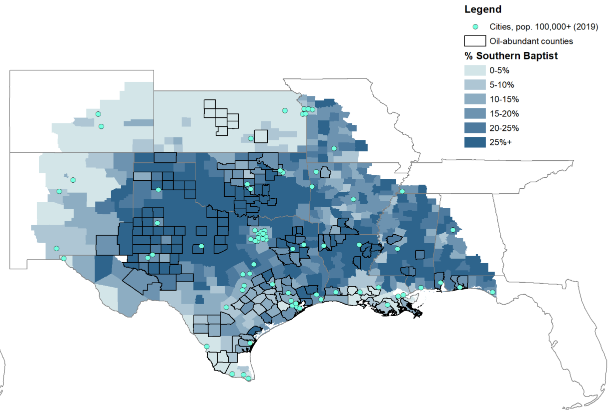
(b) United Methodist (% population)



(c) Roman Catholic (% population)



(d) Southern Baptist (% population)



Note: Maps show the spatial distribution of different Christian denominations as a share of the total population in our sample counties, as reported in the 1990 religious census. Oil-abundant counties are outlined in black, while urban areas (cities with population >100,000 in 2019) are dotted in light blue. Note the sudden decline in Southern Baptists at the Kansas border, which generally marks the edge of the Bible Belt. City population and longitude-latitude data from SimpleMaps.com at https://simplemaps.com/data/us-cities (date retrieved: August 20, 2020).

Theory Appendix

Proof of Proposition 1

Proof. The Lagrangian is:

$$L = u(c_0)+\lambda_1[y_0-r_1-c_0]+\beta Pr[\varepsilon \leq 0](\mathbb{E}[u(c_1)|\varepsilon \leq 0]+\lambda_2[\mathbb{E}[y_1|\varepsilon \leq 0]+Ar_1-c_1(\varepsilon \leq 0)]) \\ +\beta Pr[\varepsilon > 0](\mathbb{E}[u(c_1)|\varepsilon > 0]+\lambda_3[\mathbb{E}[y_1|\varepsilon > 0]-c_1(\varepsilon > 0)]). \quad (5)$$

Since utility is strictly increasing, this yields four first order conditions:

$$r_1^* : -\lambda_1^* + \lambda_2^* \beta Pr[\varepsilon \leq 0]A = 0, \quad (6)$$

$$c_0^* : u'(c_1^*) - \lambda_1^* = 0, \quad (7)$$

$$c_1^*(\varepsilon \leq 0)]) : \beta Pr[\varepsilon \leq 0]\mathbb{E}[u'(c_1^*)|\varepsilon \leq 0] - \lambda_2^* \beta Pr[\varepsilon \leq 0] = 0, \quad (8)$$

$$c_1^*(\varepsilon < 0)]) : \beta Pr[\varepsilon > 0]\mathbb{E}[u'(c_1^*)|\varepsilon > 0] - \lambda_3^* \beta Pr[\varepsilon > 0] = 0, \quad (9)$$

Combining (7) and (8) using (6) and using the fact that $u'(c_t) = 1 - \alpha c_t$ under quadratic utility yields:

$$1 - \alpha c_0^* = \beta A Pr[\varepsilon \leq 0](1 - \alpha \mathbb{E}[c_1^*|\varepsilon \leq 0]).$$

Then, using the fact that $Pr[\varepsilon \leq 0] = \frac{1}{2}$ if $\varepsilon \sim N(0, \sigma^2)$, $c_0^* = y_0 - r_1^*$, and $\mathbb{E}[c_1^*|\varepsilon \leq 0] = \theta + \mathbb{E}[\varepsilon|\varepsilon \leq 0] + Ar_1^*$, it is easy to see that this is equivalent to equation (2).

From here, solving for r_1^* requires that one evaluate $\mathbb{E}[\varepsilon|\varepsilon \leq 0]$. $\mathbb{E}[\varepsilon|\varepsilon \leq 0] = \sigma\mathbb{E}[\frac{\varepsilon}{\sigma}|\frac{\varepsilon}{\sigma} \leq \frac{0}{\sigma}]$, where $\frac{\varepsilon}{\sigma} \sim N(0, 1)$ is standard normal with a density function of $\phi(\epsilon)$ and a cumulative distribution function of $\Phi(\epsilon)$. Hence, this conditional expectation can be evaluated as follows:

$$\mathbb{E}[\varepsilon|\varepsilon \leq 0] = \sigma\mathbb{E}[\frac{\varepsilon}{\sigma}|\frac{\varepsilon}{\sigma} \leq 0] = \sigma\frac{\int_{-\infty}^{0} \epsilon\phi(\epsilon)d\epsilon}{Pr[\frac{\varepsilon}{\sigma} \leq 0]}.$$

For the standard normal distribution, $\phi'(\epsilon) = -\phi(\epsilon)\epsilon$, so we can rewrite this as

$$\mathbb{E}[\varepsilon|\varepsilon \leq 0] = -2\sigma \int_{-\infty}^{0} \phi'(\epsilon)d\epsilon = -2\sigma\phi(0) = -2\sigma(2\pi)^{-\frac{1}{2}},$$

which upon plugging into (2) simplifies to

$$r_1^* = \frac{\alpha[2y_0 - \beta A(\theta - 2\sigma(2\pi)^{-\frac{1}{2}})] - 2 + \beta A}{\alpha(2 + \beta A^2)}.$$

It is straightforward to show from here that is strictly increasingly in σ but strictly positive for only some values of σ, namely:

$$r_1^* > 0 \Leftrightarrow \sigma > \frac{2(1 - \alpha y_0) - \beta A(1 - \alpha\theta)}{2\alpha\beta A(2\pi)^{-\frac{1}{2}}} \equiv \tilde{\sigma},$$

which by inspection is increasing in θ. □

Alternative Model: General Utility With Binary Income States

Let $y_1(s) \in \{y_1(b), y_1(g)\}$ be bad and good state endowment incomes, respectively, where $y_1(g) = y_1(b) + \eta > y_1(b) > 0$ and where η represents the income differential between good and bad states. As before, the church provides support if and only if $s = b$.

In this setting, the Euler equation becomes

$$u'(y_0 - r_1^*) = \beta A Pr[s = b]u'(y_1(b) + Ar_1^*).$$

Setting $y_1(b) = y_1(g) - \eta$ and defining $Pr[s = b] = p(b)$, we can derive comparative statics for r_1^* by implicitly differentiating this equation with respect to η, which yields:

$$\frac{\partial r_1^*}{\partial \eta} = \frac{\beta A p(b)u''(y_1(g) - \eta + Ar_1^*)}{u''(y_0 - r_1^*) + \beta A^2 p(b)u''(y_1(g) - \eta + Ar_1^*)} > 0.$$

As η indicates both the relative impact of negative shocks on real income as well as overall income dispersion, this comparative static is more or less synonymous with Proposition 1 without restricting the utility function, albeit at the cost of using a much simpler distribution of income states.

Data Appendix

Religious Data

The data on religious bodies and church memberships were obtained from the Association of Religion Data Archives (ARDA).[33] This includes data from Statistics of Churches in the United States 1890, the U.S. Census of Religious Bodies for 1906, 1916, 1926 and 1936, Churches and Church Memberships in the United States 1952, 1971, 1980, and 1990. As far as possible,[34] we harmonized church memberships and denominations across years. For the final sample, this includes membership information by county for the Roman Catholics Church, Latter Day Saints, several mainline Protestant groups (United Methodist Church, Evangelical Lutheran Church in America, American (Northern) Baptist Church, Episcopal Church, Presbyterian Church, United Church of Christ, Disciples of Christ, Reformed Church of America), and several evangelical Protestant groups (Southern Baptist Church, Wisconsin Evangelical Lutheran Synod, Lutheran Church–Missouri Synod, Christ Reformed Church, and Seventh Day Adventists), which we aggregate to construct a measure of (mainstream, predominantly-white) Christian participation in sample counties. Other groups, including various Pentecostal churches, Black Methodist churches, and Black Baptist churches, are not included due to missing data for several religious censuses. County boundaries for religious census years are also harmonized to boundaries from the nearest census year, following the procedure in Hornbeck (2010). Between-census county boundaries were determined using the Atlas of Historical County Boundaries.[35] Once combined with census data as described below, these are then harmonized again to 2000 boundaries using the same approach to create a unified panel. Census-year county boundaries are Tiger/Line boundaries provided by the U.S. Census Bureau.

Some additional measures are taken to construct the full sample:

- For 1906, major Baptist groups are combined and counts must be imputed from their 1890 or 1916 relative membership counts. This is the subject of Table A7.

- Through 1916, Wisconsin and Missouri Lutheran members are counted as part of the Evangelical Lutheran Synodical Conference of North America, which at times included some other minor groups. We treat these groups as jointly synonymous.

[33] These can be accessed online at http://www.thearda.com/Archive/ChCounty.asp.

[34] A frequent issue with the church census and religious data is that several churches and denominations merge, split, or change name over time.

[35] See https://publications.newberry.org/ahcbp/ (last accessed on Dec. 1, 2019).

- Some groups were notably undercounted in 1936, namely Southern Baptists and Southern Methodists (Ager et al., 2016). Results are not sensitive to dropping 1936, as shown in Figure A4.

- From 1971 forward, Catholics are only reported by number of adherents, not members, the former being a superset of the latter. We thus adopt this measure in place of membership for this denomination for these years.

- Measurement error causes a small number of county-years' Christian membership to exceed 100% of the population upon aggregation. These counties are censored at 100%. To account for this, we create a dummy variable, given a value of 1 for these counties, for which we control in all specifications. Results are not sensitive to instead dropping these county-years.

Oil Data

Data for major U.S. oilfields come from the Oil and Gas Journal Data Book (2000), which lists the universe of oilfields in the United States with 100 million barrels (bbl) of oil or more, both on land and offshore, their locations by state, and their *overall* discovery years. We link on-land major oilfields with data for all county-oilfields from the Oil and Gas Field Code Master List (U.S. Department of Energy, 2004). This lists all oil and gas fields in the United States, their county(s), each county-field's discovery year, and its composition (for example, oil, natural gas, both, etc.). Only county-fields with oil are kept. Then, as treatment is at the county level, we compile a list of all major oilfields for treated counties in the sample, along with their county-specific discovery year, and then assign to that county the earliest of those years as its treatment year.

Data for crude oil prices are based on U.S. average spot prices for 1861 to 1944, Arabian Light prices as posted at Ras Tanura in Saudi Arabia for 1945 to 1983, and Brent dated prices after 1983. Oil price data was compiled by BP and collected from Quandl.[36]

County Level Data

The two main data sources we use to construct economic information at the county level for our estimation sample are the U.S. Census of Population and Housing digitized by Haines

[36]These data can be accessed from https://www.quandl.com/data/BP/CRUDE_OIL_PRICES, from where we retrieved our data on July 27, 2020.

(2010) and the Census of Agriculture which was collected by Haines et al. (2018). From the population Census we harmonized variables over time. The variables we harmonized from the Census include the total population, number of urban population in cities of at least 25,000 people, county area, the percent of Black, native-born, and foreign-born from various countries of origin, and the number of firms, employment, wages, and output in manufacturing. From the Census of Agriculture we harmonized the number of farms, farm values, acres of land in farms, output, and the value of machinery and implements. Nominal values were deflated to 2018 U.S. dollars using the CPI provided by the Minneapolis Fed.[37] A few county-level variables were taken from secondary sources. Additional decadal data on sector employment for 1960-90 from Michaels (2011), as well as an indicator he constructed for whether a county had a least some of its population in an urban area of 25,000+ in 1890, were also merged into our dataset, as were manufacturing data for 1910. To create consistent county boundaries over time, we follow the approach by Hornbeck (2010). The year to which these boundaries were harmonized is 2000.

Information on the number of bank tellers (305), insurance agents (450), actuaries (83), clergy (9), religious workers (78), and social workers (79) per county was obtained from the 1910, 1920, 1930, and 1940 full count Census files provided by Ruggles et al. (2018). Numbers in parentheses indicate the occupation code contained in the `occ1950` variable, which uses the 1950 U.S. Census Bureau occupational definitions to classify workers into these occupational groups. In each Census year, we kept individuals who were between 15 and 75 years of age, active in the labor force, and who did not report to currently attend school.

Stata-level data for unemployment insurance and workers compensation benefits from 1940 through 1990 are also merged with county-level data. These measures are derived in Fishback (2020) and downloaded from that paper's data archives.

Generating Matched Samples Based on Population Growth and Migration

This section describes the matching procedure based on the full population growth trajectory of oil and non-oil counties, as well as for the pre-oil discovery population trajectories that are used in Appendix Tables A1 and A2, and Appendix Figures A2 and A2. One potential concern we sought to address by controlling for the log population size in columns (3) and (4) of table 1 is that oil counties may have been substantially different from the comparison counties in terms of their local development. For instance, new oil discoveries were typically made in sparsely

[37]The CPI series is available online and can be accessed at https://www.minneapolisfed.org/about-us/monetary-policy/inflation-calculator/consumer-price-index-1800-.

populated areas. This might have had several implications not only for local development but also for the incentives of religious organizations to establish footholds in such areas.

To further address this potential issue, we attempt to make oil and non-oil counties more comparable by matching them on their population growth over time. We employ two different strategies. First, we match counties based on their log population growth and log population density growth in the years before the oil discovery using propensity score matching. For each oil county we determine the year in which oil is found and then match potential comparison counties on our population measures for those pre-oil discovery years. The idea is to limit the possibility that post-oil outcomes are driven by differences in pre-oil population growth which would imply a violation of the parallel trends assumption in our difference-in-differences setting. Second, we also match oil and non-oil counties on the three population measures over the entire sample period. While population growth might be a direct result of oil discoveries, this strategy allows us to verify that post-oil discovery increases in religion are not merely a result of population increases in the respective counties. Since we are then comparing counties that have the same population growth over all time periods, any changes in religion cannot be driven by differential population growth across oil and non-oil counties.

We show the unconditional and conditional evolution of the population and log population size across oil and non-oil counties from both matching exercises in Figures A2 and A3, respectively. The conditional plots were generated by regressing the corresponding population measure on year fixed effects as well as their interaction with an indicator for oil counties. The latter takes the value of one if oil is discovered at any point in the county over the sample period and is zero otherwise. As it turns out, the difference between matching on population variables in pre-oil discovery years compared to matching along the whole population growth trajectory over the entire sample makes little difference. This implies that population growth is relatively stable and is not strongly affected by oil discoveries themselves. While oil counties tend to start out with both lower log population and log population density in the earlier years and growing over time, the matched sample from our propensity score matching exercise is good enough such that those differences are relatively small and never significant.

We then use the matched samples to re-estimate equation (3). The results are reported in Table A1 using the sample matched on pre-oil discovery population outcomes, and in Table A2 using the matched sample on population outcomes along the entire sample period. When we condition on matched pair fixed effects, we also estimate effects controlling for geographic region dummies,[38] as not all matched oil and non-oil counties are in comparable geographic areas. This is ordinarily taken into account by county fixed effects. Because we are interested in the effect of population growth on our estimates, we partial out such geographic differences. Both tables show a positive and significant effect of oil abundance on Christian membership (% population) with effect sizes that are generally in the range of our main results in Table 1. We can therefore conclude that the treatment effect is not driven merely by differential effects of population growth between oil and non-oil counties.

[38] We define five geographic regions in our sample at the state-level: (i) Great Plains (Oklahoma and Kansas), (ii) Ozarks (Arkansas and Missouri), (iii) Deep South (Louisiana, Mississippi, Southwest Alabama and the Florida panhandle), (iv) the Southwest (New Mexico and Colorado), and (v) Texas.