Oil Shocks & Suicide*

Chandler Hubbard[†‡] Alexander James[*] Makenzi Scott[*]

October 12, 2025

Abstract

We estimate the effect of positive and negative oil shocks on suicide. Using restricted-use, U.S. state-level mortality data, we find that economic losses increase suicide risk and that economic gains have little effect. From 2015-2020, at least 6,000 people in the United States died by suicide as a result of declining oil prices. Exploring sources of heterogeneity, effects are largely driven by men, people without college degrees, and racial minorities. Results are robust to various modeling decisions and assumptions and are not easily explained by compositional changes. Implications are discussed, especially as they relate to the clean-energy transition.

Keywords: Oil Shocks; Suicide; Mental Health; Clean-Energy Transition

JEL Classification: Q33; Q32; I12; I15; D91

*Thanks to Eleanor Krause and Mark Curtis for helpful reactions and suggestions.
[†]Department of Economics, University of Wyoming. Laramie, WY. 82072.
[‡]Corresponding author. *email:* chubba12@uwyo.edu

1 Introduction

Each year, approximately 1.5 million Americans attempt suicide, and around 50,000 of these attempts result in death. To put this into perspective, suicide claims more lives annually in the United States than car accidents or homicides [CDC, 2025]. Mental health disorders play a key role in explaining this phenomenon, but there is also ample empirical evidence that worsening economic conditions increases suicide risk [Marcotte, 2003]. There is more limited evidence that improved economic conditions reduce the risk of suicide. However, there are two compelling reasons to think the relationship between economic opportunity and suicide is not symmetrical. First, loss-averse individuals may weigh losses more heavily than equivalent gains [Kai-Ineman et al., 1979, Kahneman et al., 1990, 1991]. Second, in the face of economic recession, financially-leveraged households may face loan delinquency, default, or bankruptcy. The resulting financial stress and "shame"—regardless of relative loss aversion—may increase the risk of suicide [Lester, 1997, Starrin et al., 2009]. For both of these reasons—loss aversion and shame—one may expect suicide risk to be more responsive to economic losses than to gains.

We estimate the relationship between suicide and positive and negative oil shocks. Leveraging a panel of restricted-use U.S. state-level mortality data, we find that, while suicide risk did not decrease during the oil-price boom of the 2000s, it significantly increased during the subsequent bust. We estimate that from 2015 to 2020, at least 6,000 people living in the United States died by suicide as a consequence of declining oil prices. This result is robust to alternative model specifications and cannot be easily explained by migration or compositional effects of oil-price shocks. Exploring heterogeneous effects, we find that people with low levels of education attainment, men, and racial minorities, are especially susceptible to suicide during economic decline.

In documenting asymmetric effects of economic shocks on suicide, we contribute to a few different, and individually sizable literatures. First and foremost, our work enhances economists' understanding of how negative energy shocks impact public health (see Black

et al. [2021] for a nice review of this literature). Most similar to our work in this regard is that of [Boslett and Hill, 2022] which estimates the effect of coal busts and unconventional oil & gas booms on deaths of despair, including suicide. This important paper leverages U.S. county-level data from 2000 to 2016 and finds that, while coal busts increase rates of suicide, the 2000's oil & gas boom did not decrease it. There were, however, two natural limitations of their research design. First, as the authors acknowledge, energy booms create tremendous county-to-county inward and outward migration. These compositional shifts can affect suicide rates, even if individuals' underlying risk of suicide remains the same. In such a case, it is possible that, say, the economic gains associated with enhanced oil & gas recovery reduced suicide risk, but that the effect was offset by compositional changes as suicide-prone individuals moved into the area. The second, and perhaps more important limitation surrounds the timing of the unconventional oil & gas boom-and-bust cycle. Because oil prices collapsed in 2015, a 2000-2016 panel is not well suited to capture the effect of oil busts on suicide. We build upon this work by using a longer (2000-2020) and more aggregated state-level panel of data. This allows us to estimate asymmetric effects of oil booms and busts, and helps to account for compositional changes.

Examining effects of fossil-fuel booms and busts on suicide is not only important for assessing asymmetries in economic shocks generally, but in evaluating the effect of declining energy-sector activity specifically. Economic volatility brought about by energy booms and busts is a standard feature of fossil-fuel-dependent economies [van der Ploeg and Poelhekke, 2009], and the clean-energy transition promises to bring additional economic challenges to these economies [Graham and Knittel, 2024, Clarke et al., 2024]. Understanding the economic and health implications of this transition is important in its own right.

Aggregating to the state level is also important as the vast majority of migration resulting from the 2000's oil & gas boom was intrastate [Richter et al., 2018, Wilson, 2022]. In fact, according to [Charles and Stephens Jr, 2013] "the vast majority of migration in response to the energy price shocks occurred across counties within states rather than between states...".

As a concrete example, while many shale-oil-rich counties in North Dakota experienced a 50%-70% increase in population from 2000 to 2014 (covering the fracking-boom period), the population of the state of North Dakota increased by just 16%, slightly more than the average U.S. state (for which the population growth rate was 13%). This allows us to estimate the effects of positive and negative economic shocks while reasonably holding constant unit compositions.

Second, we contribute to the broader literature on the economics of suicide. The theoretical framework proposed by [Hamermesh and Soss, 1974], critiqued and modified over the years by others [Dixit and Pindyck, 1994, Marcotte, 2003, Koo and Cox, 2008, Smith, 2019], suggests that the decision to die by suicide can be a rational one that reflects current and expected net benefits of remaining life. According to this theory, economic decline—and expectations of future decline—increases the risk of suicide. Empirical evidence is broadly consistent with this idea. For example, suicide has been linked to economic downturns and recessions [Piérard and Grootendorst, 2014, Norström and Grönqvist, 2015, Oyesanya et al., 2015], rising unemployment [Ruhm, 2000, Huikari and Korhonen, 2021], crop-damaging temperatures [Carleton, 2017, Mullins and White, 2019], and declining income [Machado et al., 2015]. There is also some, albeit more limited, evidence that improved economic conditions reduce suicide. For example, declining unemployment is associated with reduced suicide risk [Ruhm, 2000], as are cash transfers [Christian et al., 2019]. Consistent with Hamermesh's theory, *expected* economic gains have also been shown to reduce the risk of suicide [Viren, 2005]. See Marcotte and Zejcirovic [2020] for a review of the literature on the economic drivers of suicide. Non-monetary improvements to people's quality of life have also been shown to reduce the risk of suicide. For example, violence and conflict in the household, as well as unilateral divorce laws influence the rate of female suicide [Stevenson and Wolfers, 2006, Anderson and Genicot, 2015].

Our contribution to this literature is twofold. First, by leveraging economic variation originating from exogenous fossil-fuel booms and busts, we are reasonably able to measure

the causal effect of economic conditions on suicide within U.S. states. While existing literature has also explored the relationship between economic conditions and suicide within the United States (e.g., Whaley [2000], Ruhm [2000], Phillips and Nugent [2014], Swan [2021], Irish [2024]), these papers do not leverage exogenous variation in economic conditions, raising concerns of omitted variable bias. For example, state-specific declines in mental health or increases in substance abuse could independently increase both suicide risk and unemployment, inducing a positive correlation between suicide and labor market opportunities. This would create upward bias in the estimated effect of unemployment on suicide. Second, while Hamermesh did not explicitly incorporate loss aversion into his economic theory of suicide, doing so is straightforward. In particular, if individual utility is more sensitive to losses than to gains (and there is ample evidence this is true, see for example Kai-Ineman et al. [1979], Kahneman et al. [1991], Genesove and Mayer [2001], Rabin and Thaler [2001], Brown et al. [2024]), then suicide risk may follow a similar pattern. While existing literature has separately estimated the effect gains and losses on suicide, comparing these estimates to measure asymmetries is challenging as there could be considerable variation in the magnitude or type of economic gains and losses across studies. Our analysis of booms and busts is well suited to identify such asymmetries as the energy boom from 2004 to 2014 was similar in magnitude to the corresponding bust from 2015 to 2020.

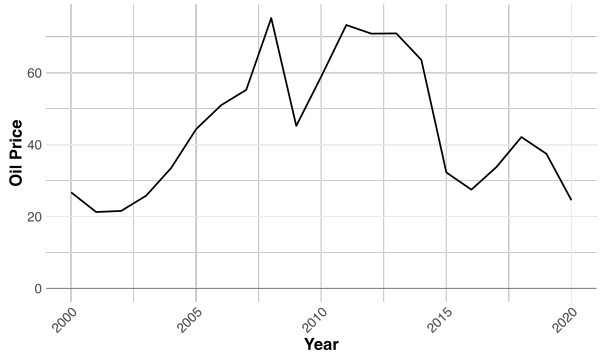
2 Booms, Busts, & Economic Opportunity

In response to the U.S. invasion of Iraq in 2003, oil prices substantially increased in the mid-2000s [Kollias et al., 2013]. This, in addition to national advancements in hydraulic fracturing technology, created massive oil booms in shale-rich states like North Dakota, Oklahoma, Wyoming, Texas, and Colorado. Theoretically, this should have increased wages in energy and non-energy sectors due to increased labor productivity in the energy sector and subsequent "labor-movement" and "spending" effects [Corden and Neary, 1982]. Empirical

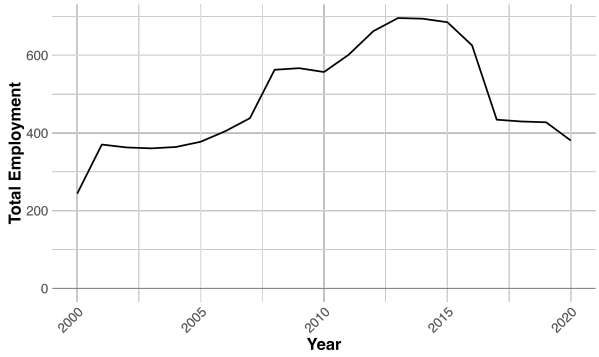
evidence supports this idea. The shale-oil boom created tremendous wealth and economic opportunity in affected communities. It raised wages [Feyrer et al., 2017, Allcott and Keniston, 2018, James and Smith, 2020], reduced poverty and unemployment [Munasib and Rickman, 2015, Richter et al., 2018], and enhanced overall economic welfare [Bartik et al., 2019]. See [Black et al., 2021] for a review of the literature on the economic gains associated with the hydraulic fracturing boom.

As with any energy boom, the hydraulic-fracturing boom was temporary. Between July and November of 2014, nominal oil prices plummeted from around $100 to $50 per barrel. Oil prices remained close to $50 per barrel until 2021, in the aftermath of the COVID-19 pandemic. Figure 1 describes the evolution of a) real oil prices, b) total oil and gas employment, and c) total oil and gas wage and salary income in the United States.

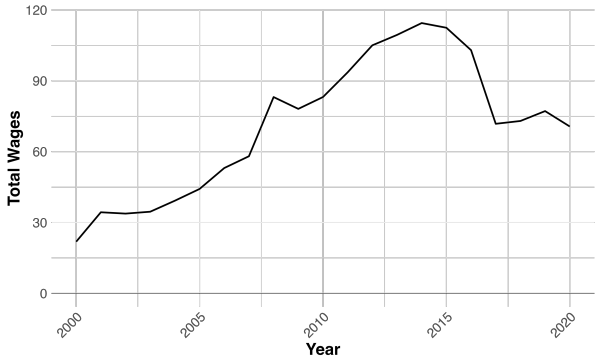
Figure 1: Shale Boom & Bust



(a) Oil Prices



(b) Employment in Oil and Gas



(c) Wages in Oil and Gas

Notes: Panel (a) shows the real (2000 is the base year) price of the domestic, first-purchase price of crude oil over the sample period (2000-2020). Nominal prices are converted to real ones using the Consumer Price Index. Price data collected from the U.S. Energy Information Administration. Panel (b) shows U.S. employment (full-time and part-time, measured in thousands) in the oil and gas industry according to the Bureau of Labor Statistics. Panel (c) shows real U.S. wage and salary income (measured in billions) in the oil and gas industry (according to the Bureau of Economic Analysis).

The boom-and-bust in shale-oil-rich U.S. states in the 2000s provides an ideal setting to test for asymmetries in the effect of economic shocks on suicide. In addition to the positive shock being similar in magnitude to the negative one that followed, the price shocks provide plausibly exogenous variation in economic opportunity across U.S. states. Rising oil prices in the early to mid 2000s resulted from the second Iraq War [Kollias et al., 2013], and the energy bust in 2015 largely reflected declining global economic growth rates and "unpredictable"

changes in global expectations of future oil prices [Baumeister and Kilian, 2016]. It is hard to imagine that such factors are associated with other determinants of suicide that were specific to oil-rich U.S. states.

3 Data

Our analysis relies on a panel of U.S. state geological, economic, and mortality data. This section provides detailed descriptions of these data, including their specific measurements, definitions, and sources.

3.1 Economic Data

State economic data comes from the Bureau of Labor Statistics (BLS) and Centers for Disease Control and Prevention (CDC). We collected data on state employment (by major industry) and wage and salary income (by major industry) from the Bureau of Economic Analysis (BEA). Unemployment and median household income data, alongside poverty estimates, are from the Census. For state population, we use the CDC Wonder database's bridged-race population estimates, which include population by age, sex, and race.

Across our datasets, we use the Consumer Price Index (CPI) from the St. Louis Federal Reserve to convert nominal values of both oil production and wage and salary income to real (2000) values.

3.2 Mortality Data

Mortality data was obtained from the National Center for Health Statistics (NCHS) Multiple Cause of Death dataset [NCHS, 2021]. We use the restricted version of this dataset, which includes state-level identifiers over our sample period (2000-2020). The NCHS data is derived from death certificates filed at vital statistics offices in each county and the District of Columbia. These data record the cause of death according to the International Classification

of Diseases (ICD) for all deaths across counties and months. We define suicide as all deaths classified under "suicide"[1], based on the Universal Cause of Death Codes (UCD).

These mortality data provide the state and county of death, as well as the state and county of permanent residence for the deceased. This allows us to classify suicides based on the deceased's permanent state of residence. For example, if a permanent resident of state i dies in state j, their death is assigned to state i. We aggregate deaths across all counties within a given year and state to calculate the total number of suicides for each state-year pairing. Our preferred outcome variable, the suicide rate, is measured as suicides per 100,000 individuals according to the CDC Wonder population data.

3.3 Oil Data

Our identification strategy involves identifying "oil-rich" U.S. states, which are defined based on their total oil endowment. To compute oil endowment, we obtained state-level data on oil production from 1981 to 2021, oil reserves as of 2022, and oil prices from the Energy Information Administration (EIA).[2] The computation of "endowment" is discussed in detail in the next section.

4 Identification Strategy

We estimate the effect of economic shocks on suicide using a series of difference-in-difference estimating equations. Specifically, we assess the impact of rising and falling oil prices in oil-rich states relative to oil-poor ones. This type of shift-share method [Bartik, 1991] is common in the resource-economics literature (see, for example, James and Rivera [2022] which uses a very similar identification strategy). The benefit of this approach is that variation in the value of oil production is exogenously determined and is not subject to other factors that could be correlated with suicide. For example, economic decline in a

[1] UCD 33700-34400

[2] Data available at https://www.eia.gov/petroleum/

particular state may cause policy makers to relax drilling regulations, leading to an increase in oil production. Our identification strategy is robust to such scenarios.

Formally, our baseline difference-in-difference estimating equation takes the following form:

$$\begin{aligned}\text{Suicide Rate}_{i,t} = \delta_0 &+ \delta_1[\text{Oil-rich}]_i + \delta_2[\text{Boom Years}]_t + \delta_3[\text{Bust Years}]_t \\ &+ \delta_4([\text{Oil-rich}]_i \times [\text{Boom Years}]_t) \\ &+ \delta_5([\text{Oil-rich}]_i \times [\text{Bust Years}]_t) + \nu_{i,t}. \end{aligned} \tag{1}$$

We estimate Equation 1 using an Ordinary Least Squares (OLS) estimator. The outcome variable is the suicide rate, defined as the number of suicides per 100,000 members of the population in state i and year t. Oil-rich is a binary indicator for being a top-ten oil-rich state, which will be defined later in this section. "Boom Years" is a binary indicator for the period of rising oil prices (2004-2014). Similarly, "Bust Years" is an indicator for the post-boom period (2015-2020). We are particularly interested in the coefficients on the two interacted terms, δ_4 and δ_5. Conditional on year (λ_t) and state (ϕ) fixed effects, δ_4 is interpreted as the effect of being oil rich during the boom period relative to the pre-boom period, and δ_5 captures the effect of being oil-rich during the bust period relative to the pre-boom period. We allow for the error term to be correlated across time within states by clustering the standard errors at the state level.

The simple difference-in-difference estimating equation described above provides strong statistical tests of the effects of booms and busts on suicide. However, it is not designed to detect preexisting trends in the effect of being an oil-rich state, or provide nuance in the temporal dynamics of treatment effects. To address these shortcomings, we estimate annual treatment effects by interacting the indicator for oil-rich with year indicators:

$$\text{Suicide Rate}_{i,t} = \sum_{t=2001}^{2020} \beta_t[\text{Oil-rich}_i \times \text{year}_t] + \lambda_t + \phi_i + \epsilon_{i,t}, \tag{2}$$

where all variables are defined as before and 2000 is the reference year. Temporal variation in the suicide rate that is common to all states is again captured by time fixed effects, λ_t, and time-invariant state-fixed effects (including the fixed effect of being oil rich) are captured by ϕ_i.

4.1 Oil-Rich States

Within our estimating equations, oil-rich is a binary indicator that is equal to unity among the ten states with the greatest endowment of oil (effects are robust to using alternative definitions). Oil-endowment is defined as the sum of the real value of oil from 1981-2021, in addition to proven reserves in 2022, normalized by the average population from 1981 to 2022. More formally, oil endowment is defined as:

$$\text{Oil Endowment}_i = \frac{\sum_{t=1981}^{2021} \text{Oil Prod. Value}_{i,t} + \text{Reserves}_{i,2022}}{\text{Avg. Population}_i}, \tag{3}$$

which is an approximation of the total value of oil "endowed" to each U.S. state (as of 1981) relative to its average population over the next four decades. Table A1 in the Appendix lists the top 5, 10, and 20 states by oil-endowment (treated states are also shown in Figure A1 for spatial reference). Given this definition, treated states are: Alaska, Colorado, Kansas, Louisiana, Montana, New Mexico, North Dakota, Oklahoma, Texas, and Wyoming.

4.2 Boom & Bust Periods

As previously mentioned, the real price of oil began rising in the early 2000s, with a marked acceleration starting in 2003. These elevated prices persisted until a bust in November 2014, as illustrated in panel (a) of Figure 1. Defining our boom period as 2004-2014

provides four pre-boom years (2000-2003), eleven boom years (2004-2014), and six bust years (2015-2020). We truncate our data at the year 2020 due to the increase in the oil price in 2021.

5 Results

Before presenting the estimated effects of booms and busts on suicide, we first confirm that treated units were, indeed, treated with meaningful economic shocks. We do this in two stages. We first demonstrate that the energy sector experienced meaning expansion and contraction in treated units relative to control ones over the boom and bust periods. We then show that these shocks to the energy sector manifested into significant economic variation that could plausibly influence the decision to die by suicide.

5.1 Oil Booms, Busts & Economic Opportunity

Starting with the energy boom and bust, we explore two key indicators of oil-sector activity: i) the value of oil produced, and ii) the number of people employed in the oil and gas industry. As illustrated in panel (a) of Figure A2, oil production in treated states increased dramatically during the 2004-2014 boom period. From panel (b), there is also significant heterogeneity in terms of the value of oil produced across the ten treated units. Panel (c) of Figure A2 similarly shows average oil and gas employment across the treated and control states over our sample period. Prior to 2004, employment in the oil and gas industry was unsurprisingly higher in treated states, but was trending similarly to that in control states. From 2006 to 2015, oil and gas-sector employment grew rapidly in treated states compared to control ones, and then converged from 2015 to 2020. For example, during the boom, employment in the oil and gas sector in treated states roughly doubled, while that in control states remained relatively stable. Panel (d) highlights the heterogeneity that exists across treated states.

Having established that treated states did, in fact, experience an energy boom and bust over our sample period, we now estimate the effect of the price shocks on three key economic outcomes to confirm their economic importance at the state level: i) the unemployment rate, ii) the poverty rate, and iii) logged real ($2000) median household income. Regression estimates for equation 1 are reported in Table 1. For robustness, we estimate equation 1 with and without state and year fixed effects (swapping boom, bust, and treatment indicators for year and state fixed effects—unsurprisingly, this makes little difference). Starting with median income, the interaction term on Oil-Rich × Boom Years is .0417, and significant at the 5% confidence level. This means that people living in oil-rich states enjoyed a median income that was roughly 4.2% higher than it would have been in the absence of the fracking boom. Somewhat surprisingly, the coefficient on Oil-Rich×Bust Years is similar in magnitude, implying that the income gains associated with the fracking boom were somewhat persistent in at least some states. Turning to the poverty rate, we find that the interaction term associated with the boom is -1.05 (and statistically significant), implying that the fracking boom reduced the poverty rate by roughly 1% point. For reference, the average poverty rate prior to the energy boom in treated states was 12.8%, so a 1% point reduction in the poverty rate corresponds to a 7.8% decline. Finally, during the fracking boom, we find that the unemployment rate was 1.089% point lower than it otherwise would have been. For the unemployment rate, we find no statistically significant treatment effect during the bust period. These state-level estimated economic effects of the fracking boom are in line with those documented in existing literature. For example, [Munasib and Rickman, 2015] finds that the fracking boom reduced the poverty rate in the state of North Dakota by roughly 2% points over our "boom" period.

To provide a more nuanced perspective, Figure 2 presents the estimated dynamic treatment effects on the three economic outcomes using Equation 2. The fracking boom significantly reduced both the unemployment and poverty rate, and increased household income. Notably, the effect on poverty persisted even after the boom (albeit with smaller magnitude),

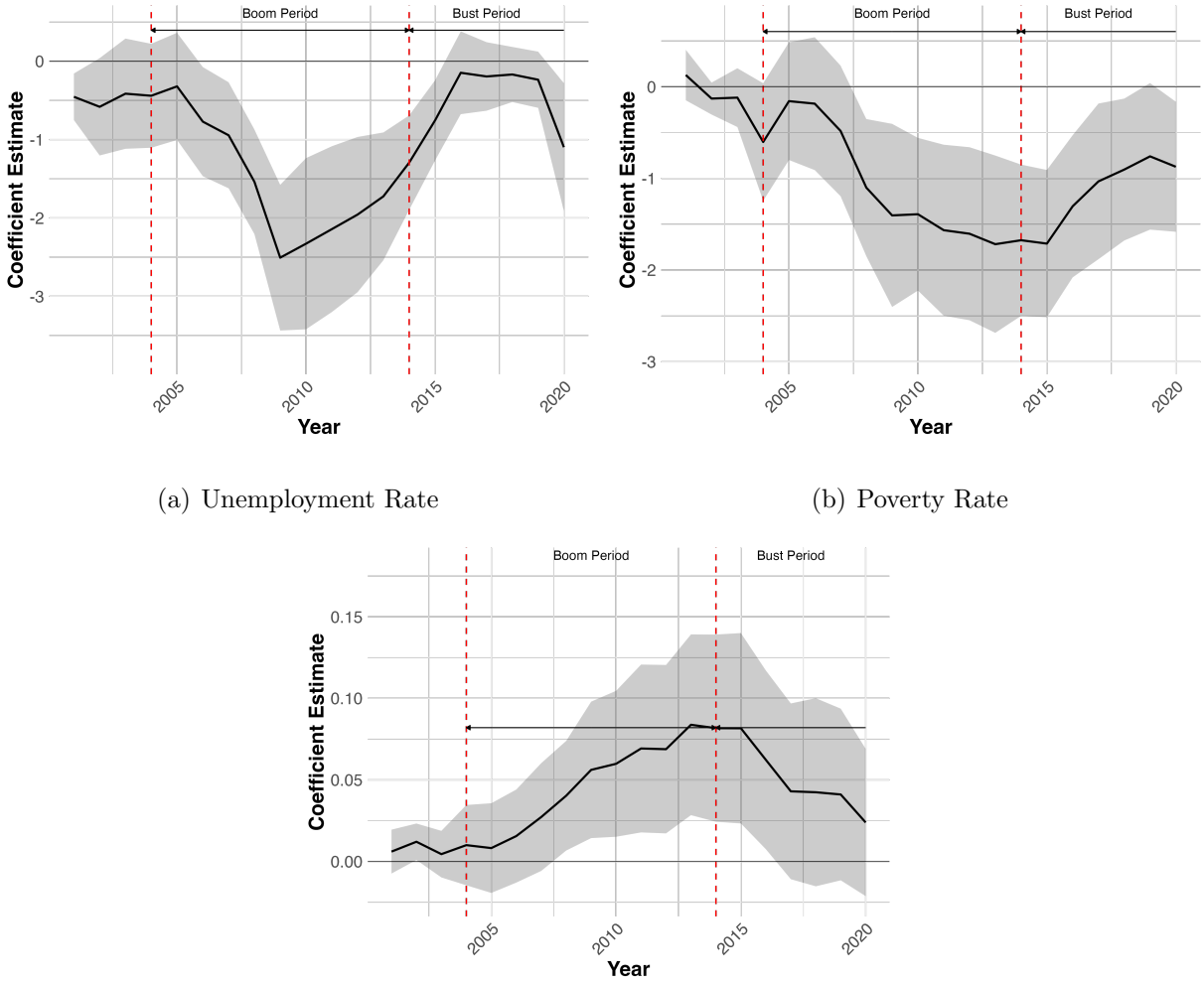
Table 1: Economic Effects of Fracking

	ln(Median Income)	ln(Median Income)	Poverty Rate	Poverty Rate	Unemp. Rate	Unemp. Rate
	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)
Constant	15.84***		11.22***		4.850***	
	(0.0218)		(0.4382)		(0.1421)	
Oil-Rich	-0.0837		1.641		0.0325	
	(0.0518)		(1.125)		(0.3496)	
Boom Years	0.3439***		2.589***		1.689***	
	(0.0083)		(0.1612)		(0.1346)	
Bust Years	0.6935***		1.596***		-0.0862	
	(0.0121)		(0.1704)		(0.1067)	
Oil-Rich × Boom Years	0.0417**	0.0417**	-1.050***	-1.050***	-1.089***	-1.089***
	(0.0172)	(0.0173)	(0.3171)	(0.3196)	(0.1908)	(0.1924)
Oil-Rich × Bust Years	0.0434*	0.0434*	-1.067***	-1.067***	-0.0713	-0.0713
	(0.0244)	(0.0246)	(0.3408)	(0.3436)	(0.2097)	(0.2114)
Oil-Rich × (Bust - Boom Years)	0.0017	0.0017	-0.0017	-0.0017	1.0177***	1.0177***
Fixed-effects						
State	No	Yes	No	Yes	No	Yes
State	No	Yes	No	Yes	No	Yes
Fit statistics						
Observations	1,071	1,071	1,071	1,071	1,071	1,071
R^2	0.62088	0.98647	0.08947	0.95441	0.16429	0.85304

Notes: In the first column for each outcome variable, we estimate equation 1. In the second column, we add state and year fixed effects. Oil-Rich is an indicator of whether a state is among 10 ten most heavily endowed with oil (see Table A1). Boom Years is an indicator (=1 if years 2004-2014), and Bust Years is an indicator (=1 if years 2015-2020). Oil-Rich × (Bust Years - Boom Years) is the difference between the two coefficients. Clustered standard errors are in parentheses below the coefficients. ***, **, *, correspond to 1%, 5%, and 10% significant levels, respectively.

whereas the treatment effect on unemployment and income was mostly statistically insignificant by the end of the sample period. It is also important to note that treatment effects are close to zero, and had little trend prior to the boom period. Further, effects tend to rise and fall contemporaneously with variation in the oil price. One exception is the treatment effect on the unemployment rate, which reverses its decline in 2009, well before the bust period begins in 2015. This possibly reflects that oil prices momentarily dipped in 2009. Taken together, there is clear evidence that the energy sector in treated units did experience a relative boom and bust over our sample period, and that this manifested into meaningful variation in economic conditions.

Figure 2: Economic Indicators



(a) Unemployment Rate

(b) Poverty Rate

(c) ln(Median Household Income)

Notes: Across all panels, we use Equation 2, boom years are indicated with dashed lines, and 95% confidence intervals are shaded in grey. For each panel, the solid black line is the estimated effect of being an oil-rich state in year t relative to that effect in the year 2000.

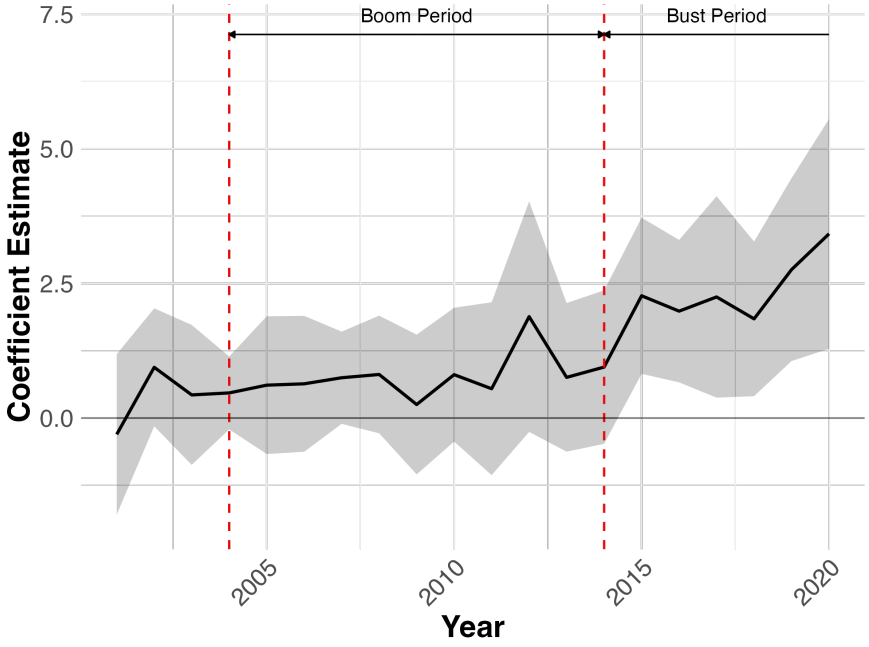
5.2 Oil Shocks & Suicide

Turning to our main analysis of oil shocks and suicide, we start by estimating equation 1, where the outcome variable is the number of deaths by suicide per 100,000 people. The results are provided in Table 2 and show that the fracking boom did not have a statistically significant effect on suicide (in line with the findings of [Boslett and Hill, 2022]. However,

the coefficient on the interaction term Oil-Rich× Bust Years, is 2.15 and is statistically significant at the 1% confidence level. This is properly interpreted as 2.15 additional deaths by suicide per 100,000 people each year of the bust period. Because there are six bust years, and the average treated state had a population of 4.65 million over our sample period, this amounts to $2.15 \times 100,000 \times 46.5 \times 6 \approx 600$ deaths caused by the oil bust in the average treated state. With ten treated states, this amounts to 6,000 additional deaths by suicide. These estimates effects on suicide are qualitatively significant, amounting to roughly 1.2% of the suicides that occur in the United States each year.[3]

Next, we estimate dynamic treatment effects using equation 2. The results are presented in Figure 3. Specific point estimates are provided in Table A2 in the appendix.

Figure 3: Dynamic Treatment Effects



Notes: This figure depicts the estimated effect of being a top-ten oil-rich state in year t relative to that effect in the year 2000. The boom period is indicated with dashed red lines. 95% confidence intervals are shaded in light grey. Specific point estimates can be found in Table A2.

As with the economic outcomes, prior to the oil boom starting, the suicide rate was evolv-

[3]Roughly fifty-thousand people die by suicide in the United States each year [CDC, 2025].

Table 2: Baseline Treatment Effects

Dependent Variable: Suicide Rate		
	Coef (Std. Error)	Coef (Std. Error)
Constant	11.340***	
	(0.4301)	
Oil-Rich	3.850**	
	(1.197)	
Boom Years	1.446***	
	(0.1103)	
Bust Years	3.838***	
	(0.2711)	
Oil-Rich × Boom Years	0.5018	0.5018
	(0.2450)	(0.2470)
Oil-Rich × Bust Years	2.154***	2.154***
	(0.5748)	(0.5796)
Oil-Rich × (Bust Years - Boom Years)	1.6522***	1.6522***
Fixed-effects		
State	No	Yes
Year	No	Yes
Fit statistics		
Observations	1,071	1,071
R^2	0.31990	0.93805

Notes: Results from estimating Equation 1. In the first column, we directly estimate the equation; in the second column, we add state and time fixed effects and re-estimate the equation. The outcome across both is the suicide rate measured as suicides per 100k population. Oil-Rich is an indicator of whether a state is in the top 10 for oil endowment from Table A1. Boom Years is an indicator (=1 if years 2004-2014), and Bust Years is an indicator (=1 if years 2015-2020). Oil-Rich × (Bust Years - Boom Years) represents the difference between the two coefficients, on which we perform a linear hypothesis test if the difference is statistically significant. State clustered standard errors are in parentheses below the coefficients. ***, **, *, correspond to 1%, 5%, and 10% significant levels, respectively.

ing similarly across treated and control states. While treatment effects qualitatively increase in the early 2010s (during the boom period), they do not become statistically significant until the bust in 2015. The average treatment effect in the bust period is similar to that estimated using the prior difference-in-difference model. Here, the average point estimate over the bust period is 2.42, which corresponds to 2.42 additional suicides per 100,000 population, compared to an average point estimate of 0.76 during the boom period (2004–2014).

5.3 Robustness

Here, we conduct a series of robustness checks to assess the sensitivity of our results to the various modeling choices that we made in our baseline model.

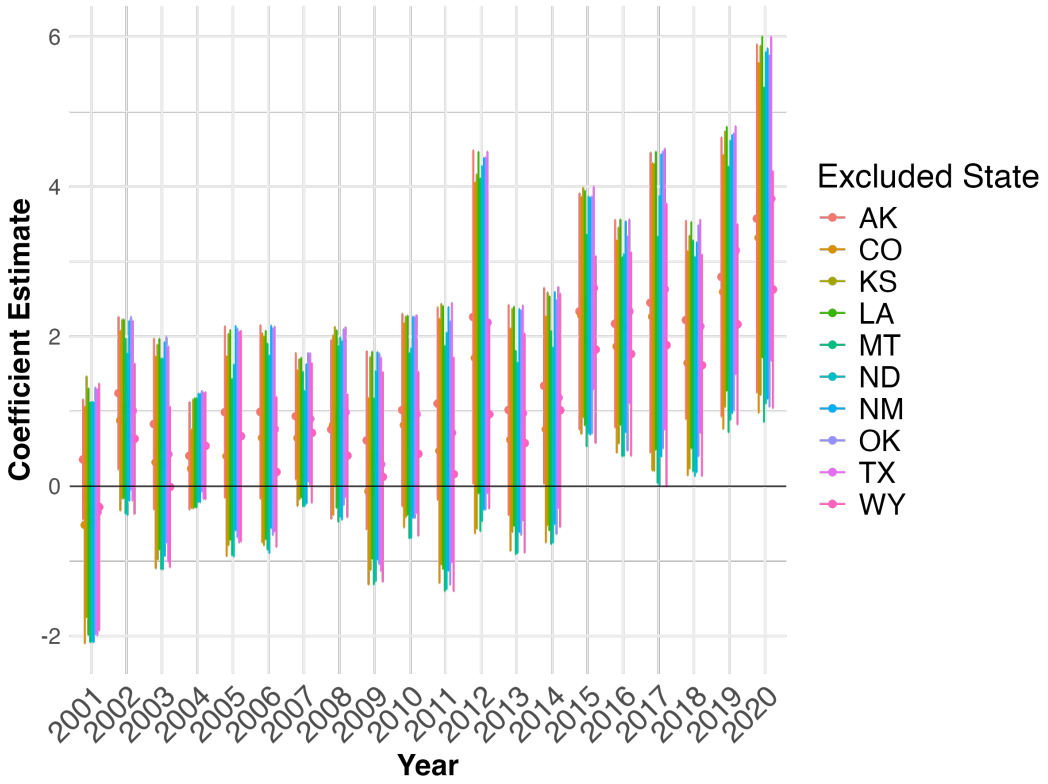
Our main analysis is based on comparing outcomes across the ten most oil-rich states to those in all other states. However, there is tremendous heterogeneity across treated units, both in terms of geographic size (Texas, for example, is home to roughly 24 million people, whereas Wyoming is home to just 580 thousand), and in terms of oil endowment. This heterogeneity is highlighted in panel (b) of Figure A2 in the appendix, which shows especially large oil booms in Texas and North Dakota. North Dakota is also unique from other treated states because it had not previously experienced an oil shock of the magnitude it experienced in the 2000s. Both of these factors potentially contributed to meaningful migration into North Dakota (although, we do not document extraordinary population growth in North Dakota over the boom period). We address these issues by dropping individual treated units from our analysis before re-estimating Equation 2 using the remaining nine treated states to make up the treated group. These results are provided in Figure 4. While treatment effects are somewhat sensitive to the exclusion of individual treated units, the broad pattern in treatment effects in maintained. For example, when Texas is removed from the event-study analysis, the average post-boom coefficient estimate increases to 2.66 (from 2.42). While the total number of predicted suicides decreases after dropping Texas[4], the higher point

[4]Texas is by far the most populous treated state in our sample

estimates suggest that oil busts are deadlier in smaller (perhaps more fossil-fuel-dependent) states.

Our analysis relies on the assumption that the oil boom and bust did not alter the composition of state populations. While we cannot explicitly test the validity of this assumption, we can explore its credibility. To do this, we test whether treatment effects significantly affect i) the natural log of population, ii) the male-to-female population ratio, and iii) the white to non-white population ratio. To reveal any pre-trends, we estimate dynamic treatment effects using specification 2, the results of which are provided in Figure A3 in the appendix. There is no evidence that total population, or the white to non-white population ratio responded to treatment. While the male-to-female population ratio was growing over the pre-boom and boom periods, it plateaued after 2014 (in tandem with declining oil prices). However, the coefficients are also statistically insignificant and qualitatively small. For example, the treatment effect on the male-to-female population ratio is maximized at roughly 0.005. Because the average male-to-female population ratio is roughly 1 among treated states, a coefficient of 0.005 implies roughly a 0.5% increase. Further, we find that the male suicide rate increased during the bust period - not the boom period. As such, a rising male population (a group of people who are disproportionately likely to die by suicide), cannot explain our findings.

Figure 4: Coefficient Estimates: Individually Dropping Treated Units



Notes: This figure shows the estimated effect of being a top-ten oil-rich state on the suicide rates (per 100,000 population) before, during, and after the 2000s oil boom. Individual point estimates and corresponding 95% confidence intervals are provided for each of the ten treatment definitions.

One may also be reasonably concerned that the Stable Unit Treatment Value Assumption is violated, as some control states produce oil. We address this concern by restricting our set of controls to the 18 states with no oil endowment (see Table A1 in the appendix), and re-estimate the dynamic treatment effects. These results are provided in Figure A4 in the appendix. As expected, this approach (slightly) increases treatment effects during the bust period.

Defining the treatment group as the top-ten oil endowed states is admittedly arbitrary (though, this decision seems reasonable given the observed exponential decline in energy endowment among the most endowed states). We explore the sensitivity of our results to this modeling decision by separately defining treatment as being a top-five, and top-20 oil-

endowed state. Estimated treatment effects are surprisingly insensitive to this procedure (see Figure A5 and Figure A6).

Another reasonable concern is that exposure to treatment altered the rate of mortality reporting. Recall that the mortality data is voluntarily reported by county agencies to the NCHS. If exposure to treatment increased county budgets, this could immediately, or eventually, lead to an increase in reporting to the NCHS. To address this concern, we conducted a falsification test by estimating the effect of the oil boom on cancer deaths. Cancer is a relatively common, long-term cause of mortality that reasonably should not have been directly or immediately impacted by the oil boom and bust. The results are provided in Figure A7. Reassuringly, there is little evidence that cancer deaths responded to treatment, suggesting that the observed increase in suicide rates is unlikely to be driven by changes in reporting practices.

5.4 Heterogeneous Effects

5.4.1 Demographics

The restricted-use mortality data are sufficiently rich to allow us to explore sources of demographic heterogeneity, including sex, marital status, educational attainment, ethnicity, and age. We anticipate finding larger treatment effects among men for two reasons. First, men may be more susceptible to suicide during an energy bust because they may have weaker social networks and worse coping mechanisms [Freedman et al., 2002, Tamres et al., 2002]. Additionally, the oil and gas sector is disproportionately made up of young men[5], making them more likely to be directly affected by an oil-price bust.

Marital status can also play an important role in moderating the effects of negative economic shocks on suicide. Individuals in committed, long-term relationships often benefit from stronger social connections and greater emotional support, which can help lower the risk of suicide [Gove, 1972]. In line with this argument, Hubbard et al. [2025] finds that, in

[5]https://datausa.io/profile/naics/oil-gas-extraction

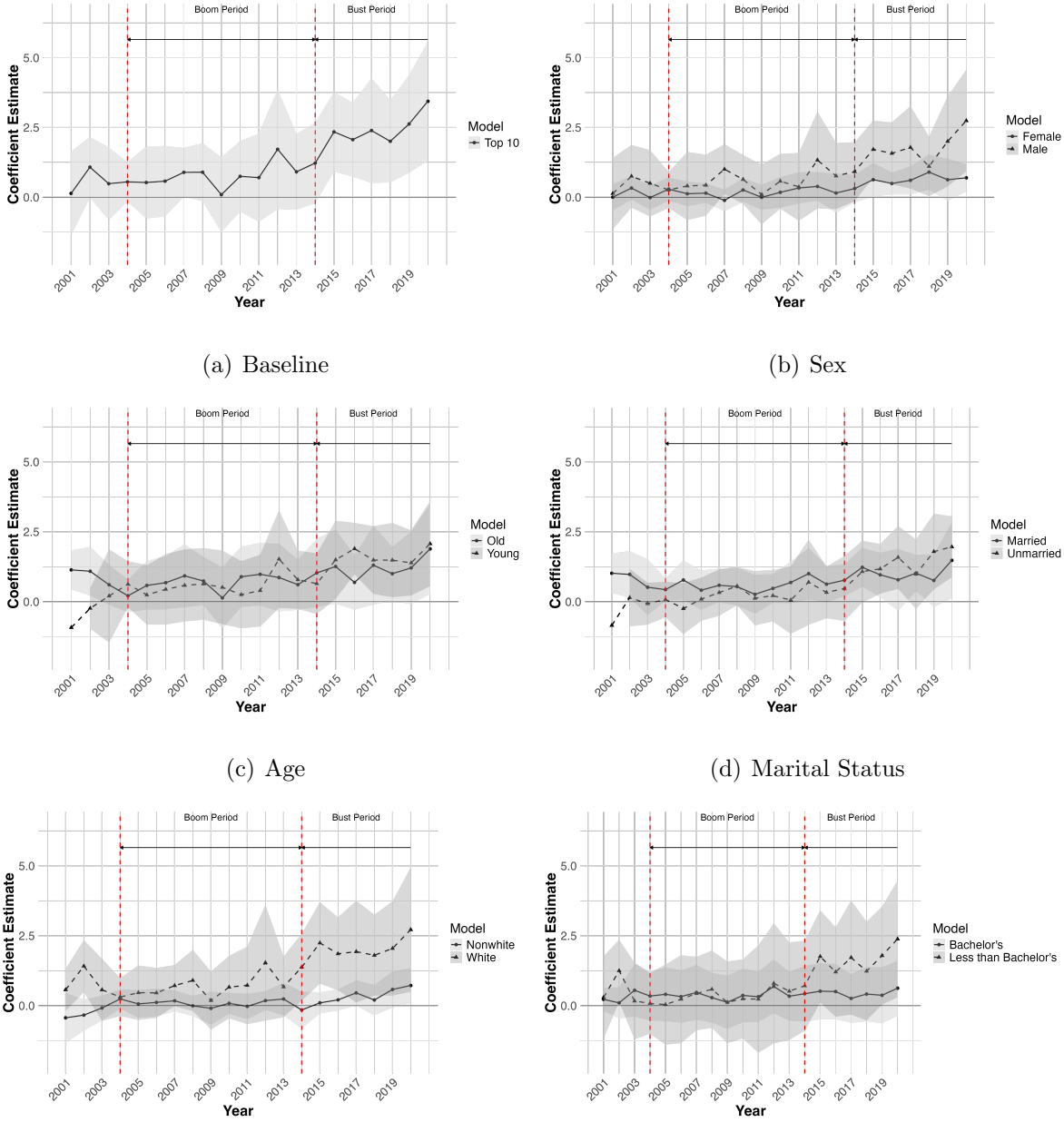
the aftermath of catastrophic wildfires, unmarried men are more vulnerable to suicide than other people. At the same time, economic losses may be especially stressful and hard to cope with for people with dependents and romantic partners Choi et al. [2022], rendering the heterogeneous effect of martial status ambiguous.

While income may also play a key role in helping people cope with economic recession [Adler and Ostrove, 1999, Thoits, 2010], we unfortunately do not observe the income levels of the people who died by suicide in our data. Instead, we proxy for income using race and education attainment, recognizing that income is positively associated with being white [Akee et al., 2019, Semega and Kollar, 2022, Sterling et al., 1993] and having a college degree [Griliches and Mason, 1972, Card, 1999].

Taken together, we anticipate documenting larger treatment effects among men, people without college degrees, people who are not married, and among racial and ethnic minorities.

To estimate heterogeneous effects, we subset the data on the respective demographic characteristics, and re-estimate dynamic treatment effects. The results are provided in Figure 5. For reference, panel (a) presents the baseline results that were reported earlier in Figure 3.

Figure 5: Heterogeneous Effects



(a) Baseline

(b) Sex

(c) Age

(d) Marital Status

(e) Race

(f) Education

Notes: Across all panels, outcomes are the suicide rate of a particular demographic group using a treatment definition of the top ten oil-rich states. Panel (a): average effects, panel (b): males vs. females, panel (c): young (44 and younger) vs. mature (45 and older), panel (d): married vs. non-married, panel (e): white vs. non-white, and panel (f): at least a bachelors degree vs. less than a bachelors degree. The boom period of 2004-2014 is indicated with dashed red lines. Coefficient estimates are paired with their respective 95% confidence intervals.

Consistent with our prior beliefs, treatment effects are qualitatively larger among men, racial minorities, those without college degrees. However, inconsistent with our prior beliefs, effects are largely independent of marital status.[6]

5.4.2 Firearm Ownership

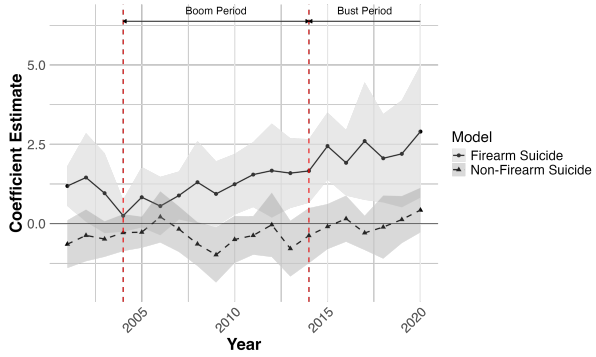
In the United States, suicide is most often carried out with use of a firearm [Kalesan et al., 2016].[7] Firearm ownership rates vary widely among oil-rich states, ranging from 62% in Alaska to 31% in Oklahoma. Notably, each oil-rich state has a firearm ownership rate above the national average rate of 29.1% [Kalesan et al., 2016]. In this section, we estimate i) the effect of booms and busts on rates of firearm and non-firearm-related suicide, and ii) test for heterogeneous effects based on average state-level gun-ownership rates.

We begin by examining treatment effects by method of suicide. To do this, we separately estimate equation 2, measuring the suicide rate as the number of suicides that involve a firearm per 100,000 people, and the number of suicides that do not involve a firearm per 100,000 people. These results are provided in panel (a) of Figure 6, and show that our baseline results are largely driven by firearm-related suicides. In panel (b), we provide dynamic treatment effects for states that had above and below median gun-ownership rates in the year 2013 according to [Kalesan et al., 2016]. Treated states with above median gun-ownership rates are Alaska (62%), Wyoming (54%), West Virginia (54%), Montana (52%), and New Mexico (50%). Treated states with below median gun-ownership rates are North Dakota (48%), Louisiana (45%), Texas (35%), Colorado (34%), and Oklahoma (31%).

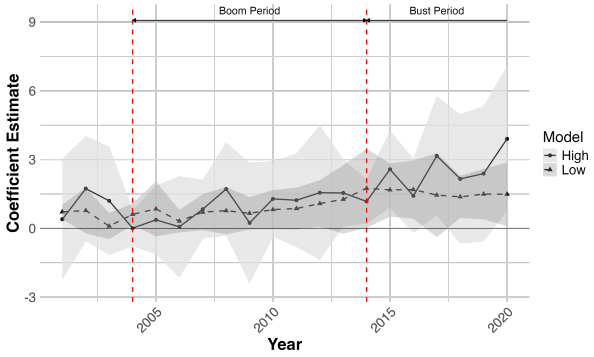
[6] Specific point estimates for the heterogeneous treatment effects estiamted using equation 1 are reported in Table A3 in the appendix.

[7] https://preventfirearmsuicide.efsgv.org/about-firearm-suicide/statistics/

Figure 6: Treatment Effects & Firearms



(a) Firearm & Non-Firearm Treatment Effects



(b) Firearm-related Treatment Effects by Firearm Ownership Rate

Notes: Panel (a) shows the estimated effect of being a top ten oil-rich state on the suicide rate by firearm and all other means. Panel (b) shows the dynamic effects of being oil-rich on suicide by firearm among states with above 50% firearm ownership ("High") and below 50% firearm ownership ("Low"). Across all panels the estimation is performed using Equation 2 and the boom period of 2004-2014 is indicated with dashed vertical red lines. 95% confidence intervals are shown in grey.

From panel (b) of Figure 6, we document larger (qualitative) effects of the energy bust on suicide by firearm in states with high firearm-ownership rates. A reasonable concern, though, is that the economic decline associated the energy bust happened to be more severe in high-gun-ownership states. Or, for some unobserved reason, people in high-gun-ownership states are more vulnerable to economic shocks. To the extent that this is true, though, one should expect to see similar heterogeneous effects on non-firearm suicide, and we document mixed evidence of this. For example, Figure A8 in the appendix shows treatment effects (by high and low-gun-ownership status) on non-firearm suicides and total suicides. There is only weak evidence that the effect of the bust on non-firearm-related suicides is higher in high-firearm states.[8]

[8]We repeat these analyses, dropping the middle four ownership states (Montana, New Mexico, North Dakota, and Louisiana), and the results are similar and available upon request.

6 Financial & Mental Health

Why do negative economic shocks cause suicide? While pinning down the underlying mechanism is beyond the scope of this paper, in this section, we explore two possible underlying mechanisms driving our main results: financial and mental health. We also acknowledge that these drivers are not mutually exclusive and could be interconnected.

6.1 Financial Health

Existing literature documents a strong relationship between financial stress and suicide [Lester, 1997, Starrin et al., 2009]. In particular, suicide has been linked to both loan delinquency and default [Meltzer et al., 2011, Jones, 2019], as well as bankruptcy [Kidger et al., 2011, Komoto, 2014]. To better understand the potential role of financial health in explaining our findings, we estimate the effect of energy booms and busts on both mortgage delinquency and personal bankruptcy rates.

There are two competing theories regarding how energy booms might affect mortgage delinquency. On one hand, energy booms increase income and employment, which should provide households with financial liquidity and reduce mortgage delinquency. On the other hand, energy booms are also associated with rising housing prices [Muehlenbachs et al., 2015, Jacobsen, 2019, Khan et al., 2022], which could increase mortgage delinquency and default. It's worth mentioning that, in shale-gas-rich Pennsylvania, the fracking boom was associated with a significant decrease in mortgage default risk for households that were above shale plays and had mortgages before the boom began [Cunningham et al., 2021]. Nonetheless, giving the competing theories discussed here, we do not have strong priors about the overall relationship between energy booms, busts, and mortgage delinquency.

Mortgage delinquency data, sourced from the Consumer Financial Protection Bureau, reports (by state and year) the percent of home mortgages that are 30-89 days late and those that are 90 or more days late. The data are available from 2008 to 2020, but we

exclude 2008 to avoid confounding effects of the financial crisis, which may have affected treatment and control states differently. Thus, 2009 serves as our reference year. For these outcomes, we estimate Equation 2, which captures dynamic treatment effects. The outcome variable is simply the percent of mortgages that are delinquent. Results for the 30-89 day and 90+ day delinquency rates are presented in panels (a) and (b) of Figure A9 in the appendix.

For 30-89 day delinquencies, treatment effects are positive and statistically significant for all years (even the pre-boom years), suggesting that treated states were different from control states in meaningful ways in the reference year (2009). Nonetheless, delinquency begins to increase during the boom years, and then plateaus during the oil bust. For 90+ day delinquencies, treatment effects are initially small and statistically insignificant, but begin to rise in 2013, becoming statistically significant in 2014, a year before the oil price collapsed. These effects plateau in 2016 at about 1.25, indicating a 1.25 percentage point increase in the rate of severe delinquencies. These results lend support for the idea that rising home prices in boom towns increased rates of mortgage delinquency.

Recall that we documented a statistically insignificant *increase* in treatment effects on suicide during the *boom* period. The increase in mortgage delinquency rates in 2013 may help explain this pattern. Notably, the treatment effect on household income also peaked in 2013, which may have contributed to rising delinquency in the years that followed. Moreover, analysis of heterogeneous effects indicated that uneducated men were most likely to die by suicide. Men are the most prone to risky financial decisions, and risky decisions more generally [Eckel and Grossman, 2002, Weaver et al., 2013, Powell and Ansic, 1997]. Here, risky behavior could also include purchasing expensive homes or missing bill payments under financial strain.

We further examine the possible role of financial health by estimating treatment effects on Chapter 7 bankruptcy rates, using data from the United States Justice Department.[9] Chapter 7 bankruptcy allows individual debtors to discharge most unsecured debts while

[9]Data available here: https://www.justice.gov/ust/bankruptcy-data-statistics/chapter-7-trustee-final-reports

retaining some assets [Culhane and White, 1999]. Panel (a) of Figure A10 in the appendix shows the dynamic effects of the oil boom on the logged number of Chapter 7 bankruptcies filed at the state-year level and panel (b) of Figure A10 shows the logged rate of chapter 7 bankruptcies (the number of bankruptcies scaled by population). We document little evidence that the oil boom or bust had any effect of chapter 7 bankruptcies.

6.2 Mental Health

Economic decline has been estimated to cause mental health disorders in both the short and long-run [Catalano et al., 2011, Frasquilho et al., 2015, Barling and Handal, 1980]. Additionally, specific mental health disorders such as Post Traumatic Stress Disorder (PTSD) [Krysinska and Lester, 2010, Silveira et al., 2021, Marshall et al., 2007], trauma [Keyes et al., 2014, Krysinska and Lester, 2010], and depression [Tang et al., 2014, McFarlane and Williams, 2012] have all been linked to suicide. We assess the effect of the oil boom and bust on mental health by analyzing survey data collected from CDC's Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS survey includes questions such as: "have you been diagnosed with depression", "how many poor mental health days have you had in the last 30 days", "do you binge drink (5+ drinks)", all of which offer insight into potential mental health struggles. The last question, regarding binge drinking, is not a direct measure of mental health, but mental health disorders have been associated with increased alcohol consumption [Bell and Britton, 2014, Mäkelä et al., 2015, Tembo et al., 2017]. We then estimate Equation 2 replacing the outcome variable with the share of survey respondents from state i who agreed with the various statements above. Across these specifications, we fail to reject the null hypotheses of no effect, as shown in Figures A11 in the appendix. One possible explanation for these null results is that people who are most vulnerable to suicide are unlikely to respond to survey requests. Therefore, these mental health results should be interpreted with caution.

7 Conclusion

Suicide remains one of the leading causes of death in the United States. While mental health is a critical factor determining suicide risk, economic conditions also play a significant role [Hamermesh and Soss, 1974, Whaley, 2000, Ruhm, 2000, Viren, 2005, Oyesanya et al., 2015]. While empirical contributions to this literature have evaluated the effect of positive and negative economic shocks, it is difficult to test for asymmetric effects because specific magnitudes, sources, and characteristics of individual shocks vary across studies.

We contribute to this literature by examining the relationship between economic opportunity and suicide, leveraging oil booms and busts as a natural experiment to identify asymmetries in the effect of positive and negative economic shocks. Using a series of difference-in-difference estimators and restricted-use mortality data from the National Center for Health Statistics, we find that the oil-price boom of the 2000s did not significantly alter suicide rates in oil-rich states, but the subsequent oil-price bust led to several years of increased suicide. Our baseline estimates suggest that, across the top ten oil-rich states, the bust resulted in approximately 600 additional suicides per state—totaling 6,000 deaths at an estimated cost of $78.6 billion. Notably, these elevated suicide rates persist through the end of our sample period in 2020, indicating that the consequences of the oil bust were still ongoing. Examining sources of heterogeneity, we find that men, people without college degrees, and racial minorities are especially vulnerable to economic decline originating from oil busts.

Future research should focus on developing and evaluating prevention and intervention techniques that can help individuals overcome suicidal ideation, particularly during economic turmoil. As highlighted in the mental health literature, those experiencing suicidal thoughts are often reluctant to engage with researchers and tend to have weaker social networks [Joiner, 2005], underscoring the need for targeted and sensitive outreach efforts. Such efforts will be especially important in light of a looming clean-energy transition [Clarke et al., 2024] that poses significant economic challenges to fossil-fuel-dependent states, and

the communities within them.

References

Nancy E Adler and Joan M Ostrove. Socioeconomic status and health: what we know and what we don't. *Annals of the New York academy of Sciences*, 896(1):3–15, 1999.

Randall Akee, Maggie R Jones, and Sonya R Porter. Race matters: Income shares, income inequality, and income mobility for all us races. *Demography*, 56:999–1021, 2019.

Hunt Allcott and Daniel Keniston. Dutch disease or agglomeration? the local economic effects of natural resource booms in modern america. *The Review of Economic Studies*, 85(2):695–731, 2018.

Siwan Anderson and Garance Genicot. Suicide and property rights in india. *Journal of Development Economics*, 114:64–78, 2015.

Phillip W Barling and Paul J Handal. Incidence of utilization of public mental health facilities as a function of short-term economic decline. *American Journal of Community Psychology*, 8(1):31, 1980.

Alexander W Bartik, Janet Currie, Michael Greenstone, and Christopher R Knittel. The local economic and welfare consequences of hydraulic fracturing. *American Economic Journal: Applied Economics*, 11(4):105–155, 2019.

Timothy J Bartik. Who benefits from state and local economic development policies? 1991.

Christiane Baumeister and Lutz Kilian. Understanding the decline in the price of oil since june 2014. *Journal of the Association of Environmental and resource economists*, 3(1): 131–158, 2016.

Steven Bell and Annie Britton. An exploration of the dynamic longitudinal relationship between mental health and alcohol consumption: a prospective cohort study. *BMC medicine*, 12(1):91, 2014.

Katie Jo Black, Andrew J Boslett, Elaine L Hill, Lala Ma, and Shawn J McCoy. Economic, environmental, and health impacts of the fracking boom. *Annual Review of Resource Economics*, 13(1):311–334, 2021.

Andrew Boslett and Elaine Hill. Mortality during resource booms and busts. *Journal of environmental economics and management*, 115:102696, 2022.

Alexander L Brown, Taisuke Imai, Ferdinand M Vieider, and Colin F Camerer. Meta-analysis of empirical estimates of loss aversion. *Journal of Economic Literature*, 62(2): 485–516, 2024.

David Card. The causal effect of education on earnings. *Handbook of labor economics*, 3: 1801–1863, 1999.

Tamma A Carleton. Crop-damaging temperatures increase suicide rates in india. *Proceedings of the National Academy of Sciences*, 114(33):8746–8751, 2017.

Ralph Catalano, Sidra Goldman-Mellor, Katherine Saxton, Claire Margerison-Zilko, Meenakshi Subbaraman, Kaja LeWinn, and Elizabeth Anderson. The health effects of economic decline. *Annual review of public health*, 32(1):431–450, 2011.

CDC. National center for health statistics. https://www.cdc.gov/nchs/fastats/default.htm, 2025.

Kerwin Kofi Charles and Melvin Stephens Jr. Employment, wages, and voter turnout. *American Economic Journal: Applied Economics*, 5(4):111–143, 2013.

Minjae Choi, Joshua Kirabo Sempungu, Eun Hae Lee, Shu-Sen Chang, and Yo Han Lee. Single and combined effects of marital status, education attainment, and employment status on suicide among working-age population: A case-control study in south korea. *SSM-population Health*, 19:101246, 2022.

Cornelius Christian, Lukas Hensel, and Christopher Roth. Income shocks and suicides: Causal evidence from indonesia. *Review of Economics and Statistics*, 101(5):905–920, 2019.

Leon Clarke, Mark Curtis, Ann Eisenberg, Emily Grubert, Julia Haggerty, Alex James, Nathan M Jensen, Noah Kaufman, Eleanor Krause, Daniel Raimi, et al. A research agenda for economic resilience in fossil fuel–dependent communities. *Environmental Research: Energy*, 1(3):033004, 2024.

W Max Corden and J Peter Neary. Booming sector and de-industrialisation in a small open economy. *The economic journal*, 92(368):825–848, 1982.

Marianne B Culhane and Michaela M White. Taking the new consumer bankruptcy model for a test drive: Means-testing real chapter 7 debtors. *Am. Bankr. Inst. L. Rev.*, 7:27, 1999.

Chris Cunningham, Kristopher Gerardi, and Lily Shen. The double trigger for mortgage default: Evidence from the fracking boom. *Management Science*, 67(6):3943–3964, 2021.

Avinash K Dixit and Robert S Pindyck. *Investment under uncertainty*. Princeton university press, 1994.

Catherine C Eckel and Philip J Grossman. Sex differences and statistical stereotyping in attitudes toward financial risk. *Evolution and human behavior*, 23(4):281–295, 2002.

James Feyrer, Erin T Mansur, and Bruce Sacerdote. Geographic dispersion of economic shocks: Evidence from the fracking revolution. *American Economic Review*, 107(4):1313–1334, 2017.

Diana Frasquilho, Margarida Gaspar Matos, Ferdinand Salonna, Diogo Guerreiro, Cláudia C Storti, Tânia Gaspar, and José M Caldas-de Almeida. Mental health outcomes in times of economic recession: a systematic literature review. *BMC public health*, 16(1):115, 2015.

Sara A Freedman, Natali Gluck, Rivka Tuval-Mashiach, Dalia Brandes, Tuvia Peri, and Arieh Y Shalev. Gender differences in responses to traumatic events: A prospective study. *Journal of traumatic stress*, 15:407–413, 2002.

David Genesove and Christopher Mayer. Loss aversion and seller behavior: Evidence from the housing market. *The quarterly journal of economics*, 116(4):1233–1260, 2001.

Walter R Gove. Sex, marital status and suicide. *Journal of Health and Social Behavior*, pages 204–213, 1972.

Kailin Graham and Christopher R Knittel. Assessing the distribution of employment vulnerability to the energy transition using employment carbon footprints. *Proceedings of the National Academy of Sciences*, 121(7):e2314773121, 2024.

Zvi Griliches and William M Mason. Education, income, and ability. *Journal of political Economy*, 80(3, Part 2):S74–S103, 1972.

Daniel S Hamermesh and Neal M Soss. An economic theory of suicide. *Journal of Political Economy*, 82(1):83–98, 1974.

Chandler Hubbard, Nino Abashidze, Hannah Hennighausen, and Alexander G James. Catastrophic wildfires & suicide. *Available at SSRN 5179556*, 2025.

Sanna Huikari and Marko Korhonen. Unemployment, global economic crises and suicides: evidence from 21 oecd countries. *Applied Economics*, 53(13):1540–1550, 2021.

Andrew J Irish. State-level income inequality as a determinant of suicide mortality in the united states. *Social work*, 69(4):339–346, 2024.

Grant D Jacobsen. Who wins in an energy boom? evidence from wage rates and housing. *Economic Inquiry*, 57(1):9–32, 2019.

Alexander James and Nathaly M Rivera. Oil, politics, and "corrupt bastards". *Journal of Environmental Economics and Management*, 111:102599, 2022.

Alexander G James and Brock Smith. Geographic dispersion of economic shocks: Evidence from the fracking revolution: Comment. *American Economic Review*, 110(6):1905–1913, 2020.

Thomas Joiner. *Why people die by suicide*. Harvard University Press, 2005.

Roderick W Jones. The impact of student loan debt and student loan delinquency on total, sex-, and age-specific suicide rates during the great recession. *Sociological Inquiry*, 89(4): 677–702, 2019.

Daniel Kahneman, Jack L Knetsch, and Richard H Thaler. Experimental tests of the endowment effect and the coase theorem. *Journal of political Economy*, 98(6):1325–1348, 1990.

Daniel Kahneman, Jack L Knetsch, and Richard H Thaler. Anomalies: The endowment effect, loss aversion, and status quo bias. *Journal of Economic perspectives*, 5(1):193–206, 1991.

DANIEL Kai-Ineman, Amos Tversky, et al. Prospect theory: An analysis of decision under risk. *Econometrica*, 47(2):363–391, 1979.

Bindu Kalesan, Marcos D Villarreal, Katherine M Keyes, and Sandro Galea. Gun ownership and social gun culture. *Injury prevention*, 22(3):216–220, 2016.

Katherine M Keyes, Charissa Pratt, Sandro Galea, Katie A McLaughlin, Karestan C Koenen, and M Katherine Shear. The burden of loss: unexpected death of a loved one and psychiatric disorders across the life course in a national study. *American Journal of Psychiatry*, 171(8):864–871, 2014.

Khalid Khan, Chi Wei Su, and Adnan Khurshid. Do booms and busts identify bubbles in energy prices? *Resources Policy*, 76:102556, 2022.

Judi Kidger, David Gunnell, Jeffrey G Jarvik, Karen A Overstreet, and William Hollingworth. The association between bankruptcy and hospital-presenting attempted suicide: A record linkage study. *Suicide and Life-Threatening Behavior*, 41(6):676–684, 2011.

Christos Kollias, Catherine Kyrtsou, and Stephanos Papadamou. The effects of terrorism and war on the oil price–stock index relationship. *Energy Economics*, 40:743–752, 2013.

Yasunobo Komoto. Factors associated with suicide and bankruptcy in japanese pathological gamblers. *International Journal of Mental Health and Addiction*, 12:600–606, 2014.

Jahyeong Koo and W Michael Cox. An economic interpretation of suicide cycles in japan. *Contemporary Economic Policy*, 26(1):162–174, 2008.

Karolina Krysinska and David Lester. Post-traumatic stress disorder and suicide risk: a systematic review. *Archives of suicide research*, 14(1):1–23, 2010.

David Lester. The role of shame in suicide. *Suicide and Life-Threatening Behavior*, 27(4): 352–361, 1997.

Daiane Borges Machado, Davide Rasella, and Darci Neves Dos Santos. Impact of income inequality and other social determinants on suicide rate in brazil. *PloS one*, 10(4):e0124934, 2015.

Pia Mäkelä, Kirsimarja Raitasalo, and Kristian Wahlbeck. Mental health and alcohol use: a cross-sectional study of the finnish general population. *The European Journal of Public Health*, 25(2):225–231, 2015.

Dave E Marcotte. The economics of suicide, revisited. *Southern Economic Journal*, 69(3): 628–643, 2003.

Dave E Marcotte and Dijana Zejcirovic. Economics of suicide. *Handbook of Labor, Human Resources and Population Economics*, pages 1–26, 2020.

G. N. Marshall, T. L. Schell, M. N. Elliott, N. R. Rayburn, and L. H. Jaycox. Psychiatric disorders among adults seeking emergency disaster assistance after a wildland-urban interface fire. *Psychiatric Services*, 58(4):509–514, 2007. doi: 10.1176/ps.2007.58.4.509. URL https://doi.org/10.1176/ps.2007.58.4.509.

Alexander Cowell McFarlane and Richard Williams. Mental health services required after disasters: Learning from the lasting effects of disasters. *Depression research and treatment*, 2012(1):970194, 2012.

Howard Meltzer, Paul Bebbington, Traolach Brugha, Rachel Jenkins, Sally McManus, and Michael S Dennis. Personal debt and suicidal ideation. *Psychological medicine*, 41(4): 771–778, 2011.

Lucija Muehlenbachs, Elisheba Spiller, and Christopher Timmins. The housing market impacts of shale gas development. *American Economic Review*, 105(12):3633–3659, 2015.

Jamie T Mullins and Corey White. Temperature and mental health: Evidence from the spectrum of mental health outcomes. *Journal of health economics*, 68:102240, 2019.

Abdul Munasib and Dan S Rickman. Regional economic impacts of the shale gas and tight oil boom: A synthetic control analysis. *Regional Science and Urban Economics*, 50:1–17, 2015.

NCHS. Restricted-use vital statistics data. 57:1990–2013, 2021.

Thor Norström and Hans Grönqvist. The great recession, unemployment and suicide. *J Epidemiol Community Health*, 69(2):110–116, 2015.

Mayowa Oyesanya, Javier Lopez-Morinigo, and Rina Dutta. Systematic review of suicide in economic recession. *World journal of psychiatry*, 5(2):243, 2015.

Julie A Phillips and Colleen N Nugent. Suicide and the great recession of 2007–2009: The role of economic factors in the 50 us states. *Social Science & Medicine*, 116:22–31, 2014.

Emmanuelle Piérard and Paul Grootendorst. Do downturns cause desperation? the effect of economic conditions on suicide rates in canada. *Applied Economics*, 46(10):1081–1092, 2014.

Melanie Powell and David Ansic. Gender differences in risk behaviour in financial decision-making: An experimental analysis. *Journal of economic psychology*, 18(6):605–628, 1997.

Matthew Rabin and Richard H Thaler. Anomalies: risk aversion. *Journal of Economic perspectives*, 15(1):219–232, 2001.

Johanna Richter, Alliana Salanguit, and Alexander James. The (uneven) spatial distribution of the bakken oil boom. *Land Economics*, 94(4):577–592, 2018.

Christopher J Ruhm. Are recessions good for your health? *The Quarterly journal of economics*, 115(2):617–650, 2000.

Jessica Semega and Melissa Kollar. Income in the united states: 2021. *US Census Bureau*, 2022.

Sarita Silveira, Mariah Kornbluh, Mathew C Withers, Gillian Grennan, Veerabhadran Ramanathan, and Jyoti Mishra. Chronic mental health sequelae of climate change extremes: A case study of the deadliest californian wildfire. *International journal of environmental research and public health*, 18(4):1487, 2021.

Gary N Smith. It is time to kill the economic theory of suicide. 2019.

Bengt Starrin, Cecilia Åslund, and Kent W Nilsson. Financial stress, shaming experiences and psychosocial ill-health: studies into the finances-shame model. *Social Indicators Research*, 91:283–298, 2009.

Theodor Sterling, Wilf Rosenbaum, and James Weinkam. Income, race, and mortality. *Journal of the National Medical Association*, 85(12):906, 1993.

Betsey Stevenson and Justin Wolfers. Bargaining in the shadow of the law: Divorce laws and family distress. *The Quarterly Journal of Economics*, 121(1):267–288, 2006.

Bruce Q Swan. Economic disparities and suicides: The dynamic panel data analyses of 50 states in the united states. *J. Forensic Sci. Res*, 5:20–29, 2021.

Lisa K Tamres, Denise Janicki, and Vicki S Helgeson. Sex differences in coping behavior: A meta-analytic review and an examination of relative coping. *Personality and social psychology review*, 6(1):2–30, 2002.

Bihan Tang, Xu Liu, Yuan Liu, Chen Xue, and Lulu Zhang. A meta-analysis of risk factors for depression in adults and children after natural disasters. *BMC public health*, 14:1–12, 2014.

Chimwemwe Tembo, Sharyn Burns, and Fatch Kalembo. The association between levels of alcohol consumption and mental health problems and academic performance among young university students. *PloS one*, 12(6):e0178142, 2017.

Peggy A Thoits. Stress and health: Major findings and policy implications. *Journal of health and social behavior*, 51(1_suppl):S41–S53, 2010.

Rick van der Ploeg and Steven Poelhekke. The volatility curse: revisiting the paradox of plenty. 2009.

Matti Viren. Suicide and business cycles: new empirical evidence. *Applied Economics Letters*, 12(14):887–891, 2005.

Jonathan R Weaver, Joseph A Vandello, and Jennifer K Bosson. Intrepid, imprudent, or impetuous? the effects of gender threats on men's financial decisions. *Psychology of Men & Masculinity*, 14(2):184, 2013.

RE Whaley. Economic uncertainty and suicide in the united states. *European Journal of Epidemiology*, 26(3):12–17, 2000.

Riley Wilson. Moving to economic opportunity: the migration response to the fracking boom. *Journal of Human Resources*, 57(3):918–955, 2022.

8 Supplementary Tables & Figures

8.1 Tables

Table A1: List of States by Oil Endowment per Capita.

Top 5 Oil States	Top 10 Oil States	Top 20 Oil States	No Oil Endowment
Alaska	Alaska	Alabama	Connecticut
New Mexico	Colorado	Alaska	Delaware
North Dakota	Kansas	Arkansas	Georgia
Texas	Louisiana	California	Hawaii
Wyoming	Montana	Colorado	Iowa
	New Mexico	Kansas	Maine
	North Dakota	Louisiana	Maryland
	Oklahoma	Michigan	Massachusetts
	Texas	Mississippi	Minnesota
	Wyoming	Montana	New Hampshire
		Nebraska	New Jersey
		New Mexico	North Carolina
		North Dakota	Oregon
		Oklahoma	Rhode Island
		Ohio	South Carolina
		South Dakota	Vermont
		Texas	Washington
		Utah	Wisconsin
		West Virginia	
		Wyoming	

Notes: This table shows the ranking of different groups of oil-rich states. States are sorted alphabetically, not in terms of endowment. Oil endowment is defined as the sum of state-level oil production (1981–2021) and 2022 oil reserves divided by the average population over the sample period. We exclude from the sample the District of Columbia. These rankings are computed using Equation 3.

Table A2: Baseline Treatment Effects: Resource Rich (Top 5, 10, 20)

	Top 5	Top 10	Top 20
	Coef. (Std. Err.)	Coef. (Std. Err.)	Coef. (Std. Err.)
2001	-0.8556	-0.3503	-0.0897
	(1.298)	(0.8194)	(0.4548)
2002	1.100	1.006*	0.7029*
	(0.9411)	(0.5985)	(0.3582)
2003	0.5921	0.4277	0.1052
	(1.141)	(0.7155)	(0.4016)
2004	0.0585	0.5416	0.4366
	(0.2718)	(0.3548)	(0.3294)
2005	-0.2103	0.6565	0.5719
	(0.8887)	(0.7007)	(0.4201)
2006	0.5934	0.7626	0.5513
	(1.196)	(0.6814)	(0.3886)
2007	0.6497	0.8989**	0.4886
	(0.6649)	(0.4371)	(0.3465)
2008	1.435*	0.9877*	0.5244
	(0.7948)	(0.5656)	(0.4024)
2009	-0.3985	0.2914	-0.0502
	(0.7865)	(0.7096)	(0.4618)
2010	0.9606	0.9622	0.4319
	(0.9874)	(0.6585)	(0.4536)
2011	0.0396	0.7129	0.1509
	(1.366)	(0.8627)	(0.5274)
2012	1.823	2.185*	1.420**
	(1.961)	(1.135)	(0.6287)
2013	0.5813	0.9745	0.6903
	(1.053)	(0.7153)	(0.5120)
2014	0.0558	1.182	0.5542
	(1.124)	(0.7366)	(0.5113)
2015	2.009*	2.646***	1.773***
	(1.130)	(0.6752)	(0.6137)
2016	1.326	2.334***	1.413**
	(1.003)	(0.6110)	(0.5597)
2017	1.858	2.630***	1.956***
	(1.282)	(0.9337)	(0.7021)
2018	1.490	2.134***	1.386**
	(1.150)	(0.7084)	(0.6264)
2019	2.651*	3.150***	1.932***
	(1.366)	(0.8250)	(0.6436)
2020	3.280*	3.838***	2.494***
	(1.732)	(1.078)	(0.7750)
Fixed-effects			
state	Yes	Yes	Yes
year	Yes	Yes	Yes
Fit statistics			
Observations	1,071	1,050	1,071
R^2	0.93719	0.9412	0.9391

Notes: Across all columns, the outcome variable is the suicide rate at the state-year level. In the first column, treated units are in the top 5 of oil and gas endowment, in the second column, the top 10, and in the third column, the top 20 as shown in Table A1. Table corresponds to Figures 3, A6, and A5. State clustered standard errors are in parentheses below the coefficients. ***, **, * correspond to 1%, 5%, and 10% significance levels, respectively.

Table A3: Baseline Effects: Heterogeneity

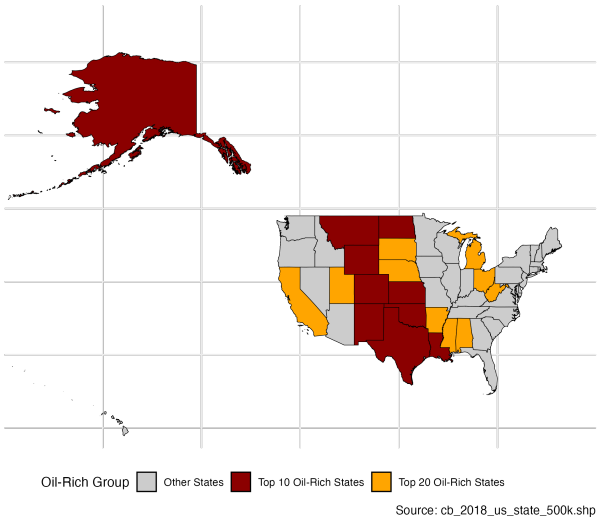
Outcome Group:	Male Coef. (Std. Error)	Female Coef. (Std. Error)	Bachelors + Coef. (Std. Error)	Less Bachelors Coef. (Std. Error)	Old Coef. (Std. Error)
Variables					
Oil-Rich × Boom Years	0.3991*	0.1027	0.2549	-0.0962	0.0094
	(0.2273)	(0.1314)	(0.3186)	(0.4741)	(0.2846)
Oil-Rich × Bust Years	1.589***	0.5654***	0.3691	1.155	0.4218
	(0.4296)	(0.1891)	(0.3483)	(0.7291)	(0.4357)
Fit statistics					
Observations	1,071	1,071	1,071	1,071	1,071
R^2	0.92777	0.84151	0.41008	0.88416	0.89569

Outcome Group:	Young Coef. (Std. Error)	Married Coef. (Std. Error)	Non-Married Coef. (Std. Error)	White Coef. (Std. Error)	Non-White Coef. (Std. Error)
Variables					
Oil-Rich × Boom Years	0.8483***	0.0420	0.4801**	0.1799	0.3218***
	(0.2711)	(0.1219)	(0.2344)	(0.2022)	(0.1164)
Oil-Rich × Bust Years	1.928***	0.4183**	1.708***	1.474***	0.6808**
	(0.4120)	(0.1993)	(0.4424)	(0.5388)	(0.2959)
Fit statistics					
Observations	1,071	1,071	1,071	1,071	1,071
R^2	0.89420	0.85747	0.91966	0.94118	0.93489

Notes: Results from estimating Equation 1 for each of our heterogeneous groups, which are labeled as Outcome Group, for each group, we measure the suicide rate per 100,000 state population. Oil-Rich is an indicator of whether a state is in the top 10 for oil endowment from Table A1. Boom Years is an indicator (=1 if years 2004-2014), and Bust Years is an indicator (=1 if years 2015-2020). State clustered standard errors are in parentheses below the coefficients. ***, **, *, correspond to 1%, 5%, and 10% significant levels, respectively.

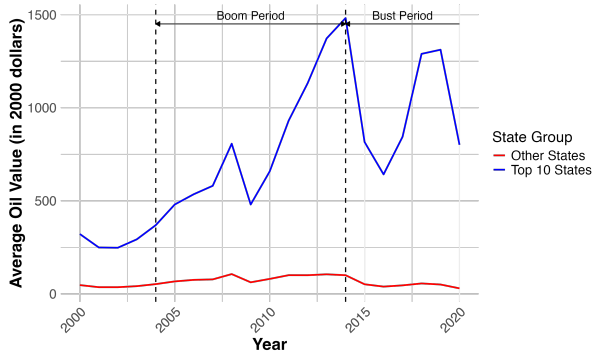
8.2 Figures

Figure A1: Treated State Map

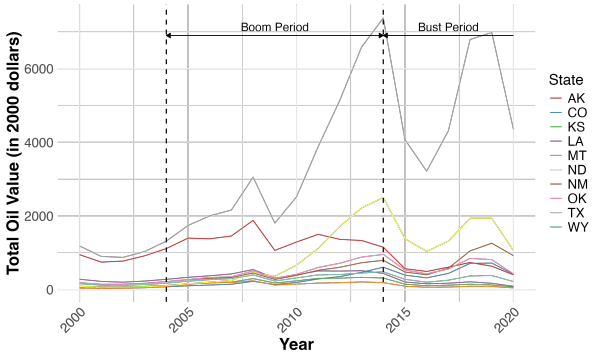


Notes: Map of the United States highlighting the top ten oil-rich states in red and the next 10 states (ranking 11–20) in yellow. The corresponding state rankings are listed in Table A1.

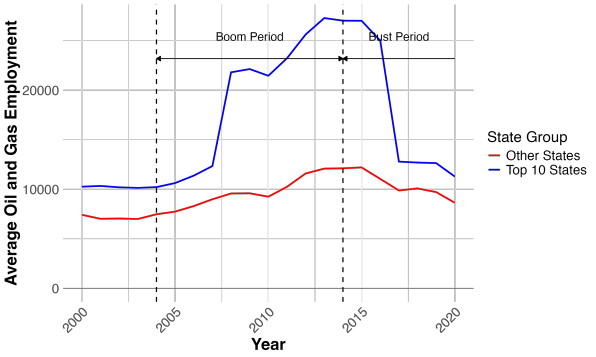
Figure A2: Oil Production Value and Employment



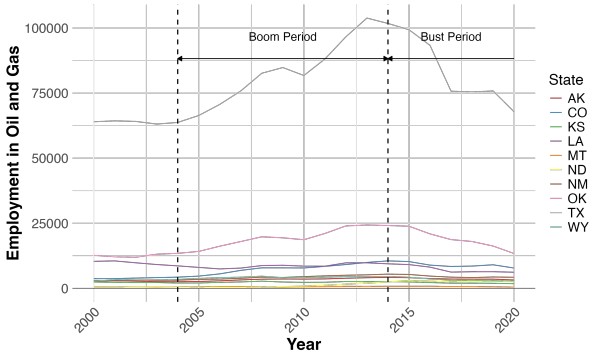
(a) Treated and Control States - $ Oil Production



(b) Treated States - $ Oil Production



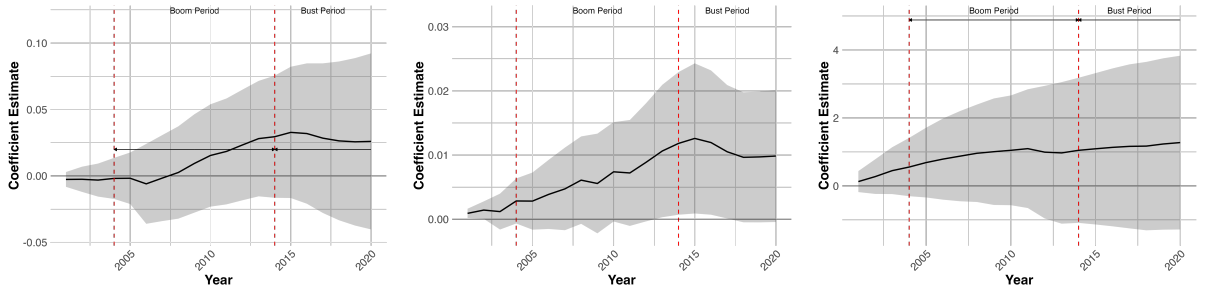
(c) Treated and Control States - Oil & Gas Employment



(d) Treated States - Oil & Gas Employment

Notes: Panel (a) shows the average value of oil produced by the top ten oil-rich states versus the remaining states over the years of our sample. Panel (b) shows the value of oil produced by the top ten oil-rich states individually over the years of our sample. Panel (c) show the average total number of employees in the oil and gas extraction sector for the top ten oil-rich states versus the remaining states over the years of our sample. Panel (c) shows the number of employees in the oil and gas extraction sector by state for each of the top ten oil-rich states over the years of our sample. A list of the top ten oil-rich states is shown in Table A1. Across panels, the real value of oil is computed as the volume of oil produced multiplied by the inflation-adjusted first-purchase oil price scaled to 2000 dollars. The "boom" period (2004-2014) is indicated with vertical black dashed lines.

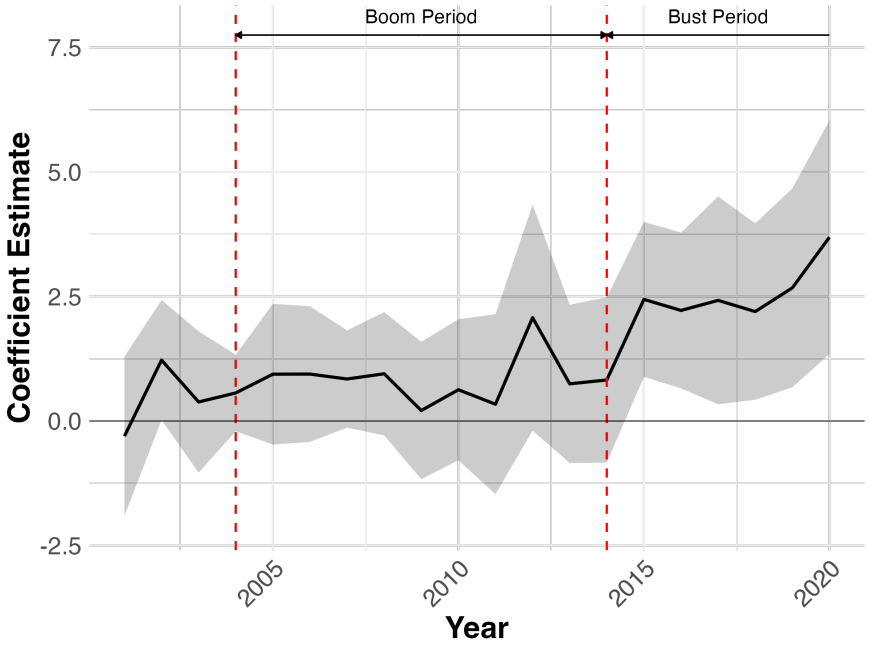
Figure A3: Population Results



(a) log(Population) (b) (Male/Female) Population (c) (White/Non-white) Population

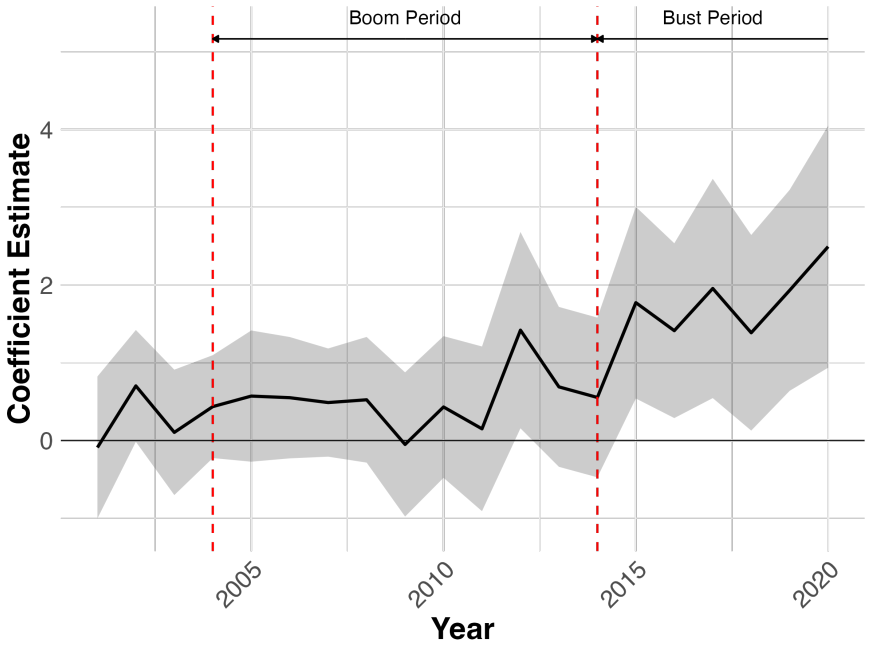
Notes: All panels are estimated using Equation 2 and a reference year of 2000, with state and year fixed effects, using the full set of top-10 oil-rich states. 95% confidence intervals are shown in grey.

Figure A4: Coefficient Estimates: Using States with Zero Oil Endowment as Controls



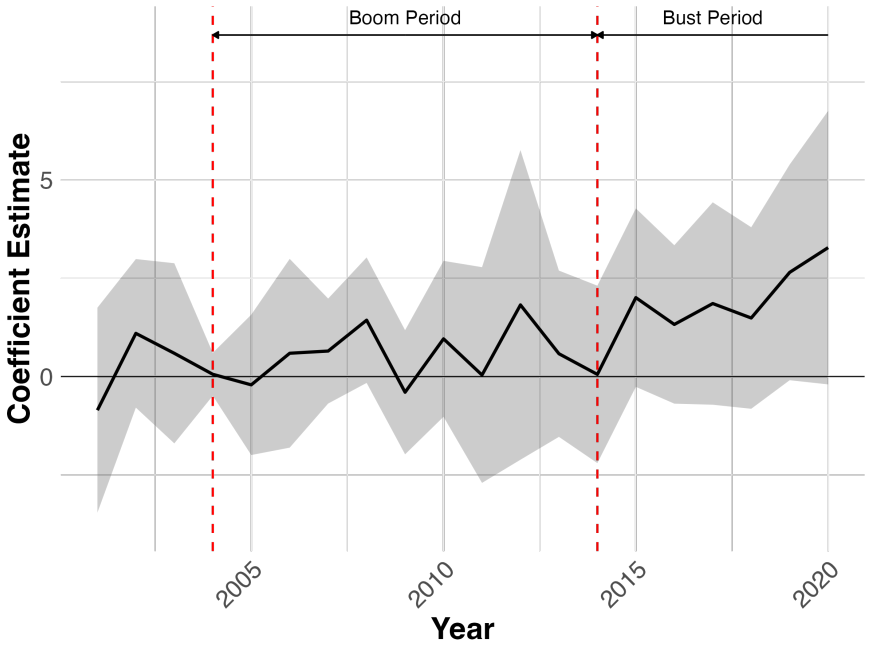
Notes: The estimated effect of being a top ten oil-rich state on suicide rates (per 100,000 population) before, during, and after the 2000s oil and gas boom. States with any oil endowed over the sample period are excluded from the control group, making our controls the 18 states with no oil endowment. The boom period of 2004-2014 is indicated with dashed red lines. 95% confidence intervals are shown in light grey.

Figure A5: Coefficient Estimates - Top 20 Oil-Rich States



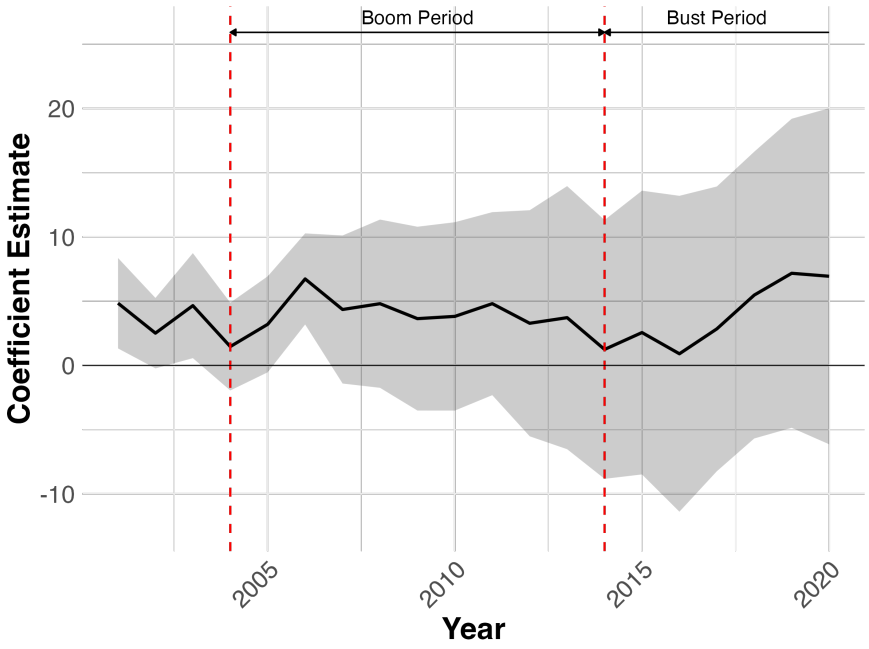
Notes: This figure shows the estimated effect of being a top-20 oil-rich state on suicide rates (per 100,000 population) before, during, and after the 2000s oil boom. The boom period is indicated with dashed red lines. 95% confidence intervals are shown in light grey. Specific point estimates are provided in Table A2.

Figure A6: Coefficient Estimates - Top 5 Oil-Rich States



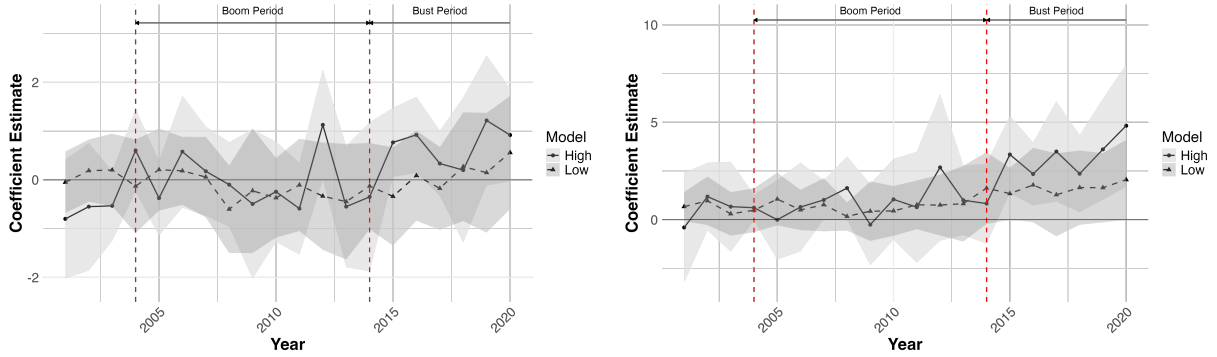
Notes: This figure shows the estimated effect of being a top-5 oil-rich state on suicide rates (per 100,000 population) before, during, and after the 2000s oil boom. The boom period is indicated with dashed red lines. 95% confidence intervals are shown in light grey. Specific point estimates are provided in Table A2.

Figure A7: Coefficient Estimates - Cancer Falsification



Notes: The estimated effect of being a top ten oil-rich state on cancer death rates (per 100,000 population) before, during, and after the 2000s oil boom. The boom period of 2004-2014 is indicated with dashed red lines. 95% confidence intervals are shown in light grey.

Figure A8: Treatment Effects & Firearms: Additional Results

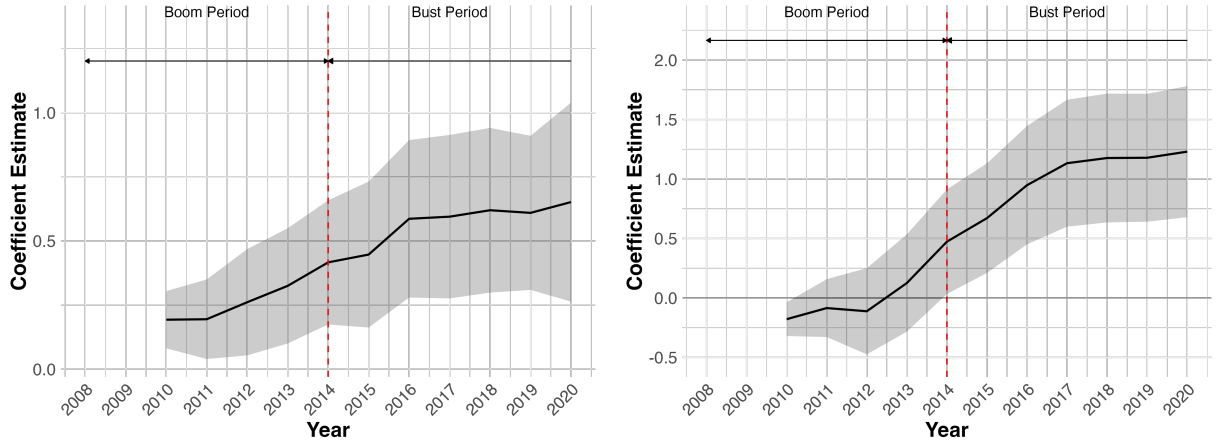


(a) Non-Firearm Treatment Effects: By Firearm Ownership

(b) All Cause Suicide Treatment Effects: By Firearm Ownership

Notes: Panel (a) shows the dynamic effects of being oil-rich on non-firearm suicides among states with above 50% firearm ownership ("High") and below 50% firearm ownership ("Low"). Panel (b) shows the dynamic effects of being oil-rich on total suicide among states with above above and below median firearm ownership. Across all panels the estimation is performed using Equation 2 and the boom period of 2004-2014 is indicated with dashed vertical red lines. 95% confidence intervals are shown in grey.

Figure A9: Mortgage Delinquency

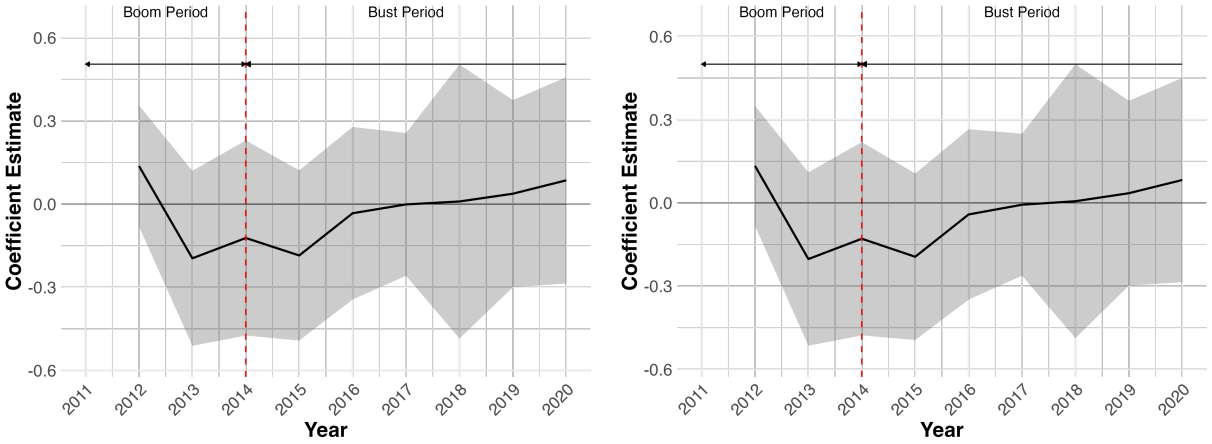


(a) 30-89 Day Mortgage Delinquency Rate

(b) 90+ Day Mortgage Delinquency Rate

Notes: Panel (a) shows the estimated effect of being a top ten oil-rich state on mortgage delinquency (30-89 days) rate. Panel (b) shows the estimated effect of being a top ten oil-rich state on mortgage delinquency (90+ days) rates. Across all panels, estimates use Equation 2 and a reference year of 2009. 95% confidence intervals are shown.

Figure A10: Chapter 7 Bankruptcies

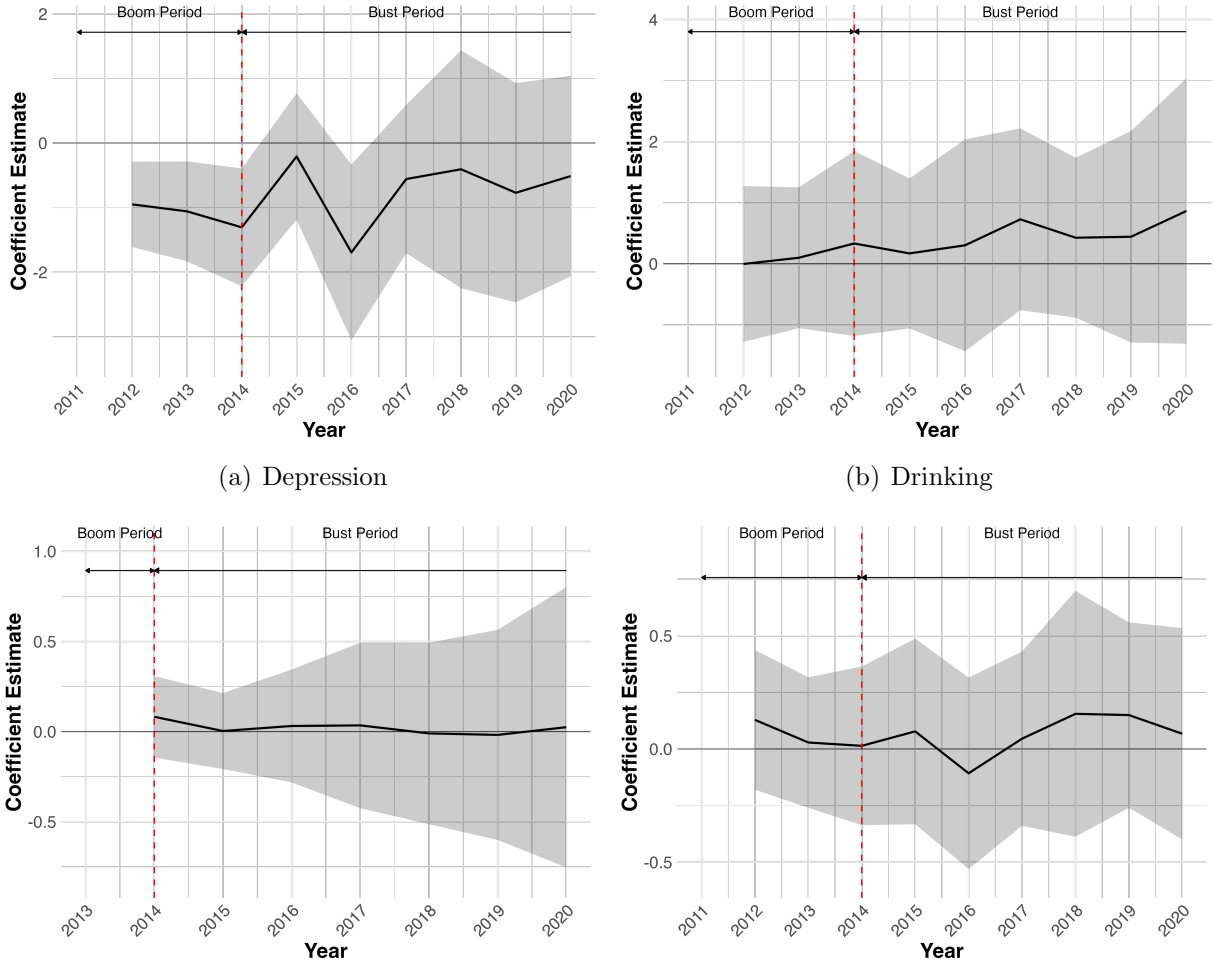


(a) Chapter 7 Bankruptcy

(b) Chapter 7 Bankruptcy Scaled

Notes: Panel (a) shows the estimated effect of being a top ten oil-rich state on the log number of chapter 7 bankruptcies. Panel (b) shows the results after scaling the number of chapter 7 bankruptcies by state population. Across all panels the reference year of 2011. 95% confidence intervals are shown.

Figure A11: Mental Health Outcomes



(a) Depression

(b) Drinking

(c) Home Ownership

(d) Mental Health

Notes: Panel (a) shows the estimated effect of being a top ten oil-rich state on the percent of the population that has been diagnosed with depression. Panel (b) shows the estimated effect of being a top ten oil-rich state on the percent of the population that reports drinking in the last 30 days. Panel (c) shows the estimated effect of being a top ten oil-rich state on the percentage of the population that reports owning their house. Panel (d) shows the estimated effect of being a top ten oil-rich state on the average number of poor mental health days experienced by the population. Estimated using Equation 2 and a reference year of 2011. 95% confidence intervals are shown.