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Effects of 2017 US Federal Tax Overhaul on the Energy Sector

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Executive Summary

This paper examines how the Tax Cuts and Jobs Act (TCJA) will affect the US energy sector. It combines qualitative analysis of a range of TCJA provisions with estimates from the Tax Policy Center's Investment and Capital Model of how a narrower set of provisions will change marginal effective tax rates (METRs) for five major energy industries.

Key Findings:

- The TCJA initially lowered effective tax rates for the energy sector substantially.
    - However, long-run tax cuts are much smaller because of expiring provisions.
    - By 2027, many energy sector firms (especially pass-through entities, such as master limited partnerships) will face higher effective tax rates than under pre-TCJA tax law.
- Cuts to corporate income tax rates substantially reduce METRs for corporations, with the largest decreases going to sectors with higher pre-TCJA effective tax rates, which means energy sector corporations on average benefit less (as a percentage of income) than corporations in other sectors of the economy.
- Within the energy sector, corporate income tax rate cuts provide a relatively large METR cut for petroleum and coal products and a much smaller cut for oil and gas extraction.
    - Corporate tax rate cuts do not affect taxes for pass-through entities.
- Bonus depreciation for new investment cuts METRs more in the energy sector than in the rest of the economy.
    - Oil and gas extraction gains relatively little from bonus depreciation, because it already benefits from existing provisions that accelerate investment deductions.
    - Bonus depreciation phases down and then sunsets at the end of 2026.
- Limits on net interest deductions raise METRs for firms or sectors with relatively high debt loads. On average, this affects the energy sector more than other sectors of the economy. Renewable energy may be particularly affected by this provision, because it has a higher debt-to-equity ratio than other energy sectors (though we did not model that effect).
- Changes to the individual income tax also affect METRs. Cuts to individual income tax rates lower METRs for both corporations and pass-throughs. And the new 20 percent pass-through deduction substantially cuts taxes for qualified pass-throughs.
- Taken together, these two changes yield a relatively small METR reduction for corporations, which is largely similar across energy industries. They cut METRs more for pass-throughs, though that effect varies substantially across the energy sector, with relatively large cuts for petroleum and coal product pass-throughs but only a small increase for oil and gas extraction pass-throughs.

- Most individual income tax changes sunset at the end of 2025, including the individual rate cuts and pass-through deduction. But changes to inflation indexing (which slightly increase taxes) are permanent. Thus by 2026, changes to the individual income tax slightly raise METRs for all firms.
- The net effect of all the TCJA provisions modeled is lower METRs for the energy sector in the initial years after the TCJA took effect.
    - But because the interest-deduction-limit change (which raises tax revenue) is permanent and more restrictive after 2021, whereas several of the tax-cutting changes (bonus depreciation, individual rate cuts, and the pass-through deduction) are temporary, METRs rise over time.
    - By 2027, many energy subsectors (including pass-throughs in all energy subsectors modeled and oil and gas extraction corporations) face higher METRs than they would have under pre-TCJA law.
- The base erosion and anti-abuse tax could reduce the value of the production and investment tax credits, but this effect seems unlikely to be substantial.
- Repeal of the domestic production deduction raises taxes for energy sector firms that previously qualified for this deduction, such as those in domestic oil and gas extraction and refining, as well as electric generation. But even for those firms, the loss of this deduction only partially offsets the benefit of the TCJA's business tax cuts.
- New limits on net operating loss deductions substantially increase taxes for firms with highly variable income streams. This is potentially important for energy subsectors facing volatile prices, such as oil and gas.
- Repeal of the corporate alternative minimum tax provides a substantial benefit to industries that would otherwise have been subject to this tax. Mining and utilities have historically been disproportionately affected by this tax and thus are likely to benefit disproportionately from its repeal.
- The Joint Committee on Taxation (JCT 2017b) estimates that the TCJA cut revenues by $1.5 trillion over 2018–27 ($1.1 trillion when macroeconomic effects are included). All else equal, this will substantially increase federal borrowing.
    - Higher federal borrowing will eventually lead to higher interest rates. This will raise the cost of borrowing for firms, and the energy sector is relatively capital- and debt-intensive.
    - Increased borrowing will also likely lead to an appreciation of the dollar versus other currencies. This may have substantial effects on trade-exposed energy industries.
    - Increased borrowing will create a greater need for future federal spending cuts or revenue increases, which could affect the energy sector.
- Figures 1a and 1b summarize the effects of the provisions we model.

Figure 1. How Tax Reform Provisions Change Effective Tax Rates for Energy Companies

A. Corporations

	Lower Corporate Tax Rate	Bonus Depreciation	Reduce Interest Deduction Limit	Passthrough Deduction & Lower Individual Income Tax Rates	Total
Oil and Gas Extraction	minimal	lower	higher	slightly lower	slightly lower
Mining	lower	lower	higher	slightly lower	lower
Utilities	lower	lower	higher	slightly lower	lower
Petroleum and Coal Products	lower	lower	higher	slightly lower	lower
Pipelines	lower	lower	higher	slightly lower	lower

B. Pass-Throughs

	Lower Corporate Tax Rate	Bonus Depreciation	Reduce Interest Deduction Limit	Passthrough Deduction & Lower Individual Income Tax Rates	Total
Oil and Gas Extraction	no effect	lower	higher	slightly higher	slightly higher
Mining	no effect	lower	higher	slightly lower	lower
Utilities	no effect	lower	higher	slightly lower	lower
Petroleum and Coal Products	no effect	lower	higher	lower	lower
Pipelines	no effect	lower	higher	slightly lower	lower

Note: Effects for 2018 tax year

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1. Introduction

The Tax Cuts and Jobs Act (TCJA) made substantial changes to corporate and personal income taxes, with particularly notable tax cuts for businesses (both pass-through firms and C corporations).[1] Signed into law on December 22, 2017, it took effect starting in the 2018 tax year. The TCJA has broad effects, but our focus here is much narrower: we look at how key provisions in the TCJA affect US energy industries. The obvious rationale for studying this question is simply to understand the effects on an important sector of the economy. But there are subtler implications as well; for example, the tax changes may affect how rates are set for regulated pipelines and electric utilities. The analysis also provides insight into the potential effects of current proposals to reverse some TCJA provisions (e.g., increasing the corporate tax rate).

In this paper, we look at a range of TCJA provisions affecting the energy sector and provide a qualitative analysis of the effects they will have. We then use the Tax Policy Center's Investment and Capital Model to estimate how key provisions in the TCJA will change marginal effective tax rates for five major energy industries. This study does not attempt to trace potential follow-on implications, but our results should be useful inputs for anyone trying to address such questions.

We find that while the TCJA initially lowered effective tax rates for the energy sector substantially, expiring provisions mean that the tax cuts are much smaller in the long run. Indeed, by 2027, a significant fraction of energy sector firms, especially those that are structured as pass-through entities (such as master limited partnerships), will face higher effective tax rates than they would have under pre-TCJA tax law.

The paper proceeds as follows: Section 2 contains background on taxation of business income, an overview of the TCJA, and our rationale for which provisions and effects to analyze. Sections 3 and 4 then present analysis of each of those provisions, with a relatively shallow look at some and a deeper look at others. Section 3 covers those provisions for which we provide both qualitative analysis and estimates of how they change marginal effective tax rates for five major energy industries (and, for comparison, analogous estimates for all US firms). Section 4 discusses provisions for which we provide only qualitative analysis. Section 5 considers broader implications for the federal budget and what those might mean for the energy sector. Section 6 concludes and suggests directions for future research.

1 Note that Tax Cuts and Jobs Act is not the official short title of the bill; the Senate parliamentarian ruled that giving the bill that short title violated Senate rules for reconciliation, and consequently the bill does not have a short title. But the bill is nonetheless widely referred to as the TCJA, and therefore we use that term here.

2. Background and Approach

This section provides background on how the federal government taxes business income, an overview of tax changes under the TCJA, and discussion of how we selected which provisions to study and what effects of those provisions to address.

2.1. Brief Background on Taxation of Business Income

To understand how the TCJA affects energy sector firms, one must first understand some basic principles of business taxation. How business income is taxed depends on the legal form of the business. C corporations (named for the subchapter of the Internal Revenue Code covering them) pay corporate income tax on their profits, and shareholders in those corporations then pay individual income taxes on dividends (when distributed) and capital gains (when they sell shares) generated by their shareholdings. Other businesses (sole proprietorships, partnerships, and S corporations) are pass-through entities: they are not taxed at the firm level, but their profits are "passed through" and taxed as income to their owners under the individual income tax.[2] Most large publicly traded firms are organized as C corporations, and most small businesses are pass-throughs, but that division is far from exact: some large firms are pass-throughs, and most C corporations are small, although large firms account for most economic activity generated by C corporations.

Pass-through entities play a particularly important role in the energy sector because of the role of master limited partnerships (MLPs). An MLP is taxed as a partnership (a pass-through entity), but MLP units (analogous to shares of a corporation) are typically traded publicly on major stock exchanges, providing much more liquidity than a typical partnership investment. To qualify for pass-through status, at least 90 percent of an MLP's income must come from qualifying sources. As a result of the qualifying income rules, the energy sector accounts for the vast majority of MLPs (as of 2013, 82 percent). MLPs are especially prevalent in midstream oil and gas (55 percent of energy sector MLPs in 2013),[3] but they also play a significant role in oil and gas exploration and production (16 percent), downstream oil and gas (8 percent), and coal leasing and production (5 percent) (RBC Capital Markets 2013).

2 Some C corporations, such as real estate investment trusts (REITs), are also taxed as pass-through entities.

3 In 2018, the Federal Energy Regulatory Commission (FERC) updated its rules on recovery of income tax allowances in setting rates for cost-regulated pipelines, partly in response to the TCJA. The change reduces income tax allowances to account for the TCJA cuts to corporate income tax rates and disallows income tax recovery for MLPs (except those whose income or loss is consolidated on the income tax return of a corporate parent). See FERC (2018a, b) for details.

Because C corporations are potentially subject to tax at both the firm and shareholder levels, the total tax burden on investments in these firms is potentially affected by changes to both the corporate and individual income taxes. Pass-throughs, on the other hand, are affected only by changes to the individual income tax.

2.2. Overview of the Tax Cuts and Jobs Act (TCJA)

The TCJA implemented substantial cuts to corporate income taxes, somewhat smaller cuts to individual income taxes, and a substantial reduction in taxes on pass-through income. The reduction of the corporate tax rate from a top rate of 35 percent to 21 percent accounts for more than half of the drop in revenue from the TCJA over the first 10 years of the policy, and this proportion increases over time. The bill also eliminated the corporate alternative minimum tax and includes a variety of provisions that reduce taxes on both C corporations and pass-throughs, such as bonus depreciation for new investments. Other provisions increase revenue, such as limits on business interest deductions and changes to net operating loss rules. Most of the business tax changes are permanent, though not all (the bonus depreciation provision, for example, phases out starting after 2023).

Individual income tax rates are also lower, though the cuts are substantially smaller (the new rates are typically 2 to 3 points lower at any given level of income than the old rates). The bill also includes a new deduction of 20 percent of qualified business income (QBI), which represents a major tax cut for individuals with income from pass-through entities. Other individual income tax changes include increased standard deductions and alternative minimum tax exemptions, elimination of personal exemptions, and cuts to (or elimination of) some itemized deductions. The individual income tax changes generally apply for tax years 2018–25, but almost all the individual provisions, including the QBI deduction, expire for the 2026 tax year.[4]

Using conventional scoring, the Joint Committee on Taxation (JCT 2017b) estimated that the TCJA would lower tax revenues by nearly $1.5 trillion during 2018–27, a figure that declined to just under $1.1 trillion when macroeconomic feedback effects were included.[5]

4 Two individual income tax changes are permanent: zeroing out of the Affordable Care Act (ACA) individual mandate penalty and a change to the inflation measure used to index tax brackets and other inflation-indexed elements of the individual income tax system. The Joint Committee on Taxation estimates that each of these changes reduces the budget deficit.

5 Conventional estimates account for a variety of behavioral responses to tax changes but hold macroeconomic variables such as GDP fixed. Accounting for macroeconomic feedback incorporates the effects of changes in GDP on federal receipts.

2.3. How We Chose Provisions to Analyze

This report looks at the effects of the TCJA on the energy sector as a whole. Therefore, we analyze provisions that substantially affect the tax burden on one or more individual energy subsectors. These include indirect provisions (provisions that generally affect all industries), such as corporate and individual income tax cuts and the new pass-through deduction, and direct provisions (much narrower provisions that specifically affect a particular energy subindustry), such as repealing the treatment of foreign base company oil–related income as subpart F income.[6] Indirect provisions affect different energy subindustries and different firms within each subindustry to different extents (and possibly even in different directions) depending on a range of characteristics of those businesses, most notably organizational form (C corporation or pass-through), the method of financing, and the business's effective tax rate prior to the TCJA.

We take a relatively shallow approach to analyzing some of these provisions. For others, we take a somewhat deeper look. In general, we reserve that deeper analysis for provisions with effects that are both substantial for multiple energy subsectors and relatively nonobvious; these are typically indirect provisions, as the direct provisions tend to have effects that are both narrower and more obvious. In many cases, our analysis is only qualitative, but for some of the indirect provisions, we use the Tax Policy Center's Investment and Capital Model (ICM) to estimate changes in effective marginal tax rates for key energy subsectors.

2.4. Key Questions for Each Provision

For each provision considered, we address several questions about its potential effects:

- What provision changed and how did it change?
- Which subsectors are affected by the change and why?
- How big is the effect of the change?
- What characteristics of particular firms determine whether they are affected and how big the effect is?
- Are the effects primarily on firm after-tax profits, or does the change also significantly affect output from that subsector?
- For the provisions where we apply the ICM, how much does the effective marginal tax rate change for each subsector and why?

6 A number of direct provisions relevant for the energy sector were included in earlier versions of the bill but not in the final version of the TCJA. For example, the House bill would have eliminated inflation indexing for the production tax credit (PTC) for renewable electricity, thus effectively cutting the PTC substantially, but that provision was not included in the final bill. As a result of that and other, similar changes, the number of direct provisions we analyze here is substantially smaller than it would have been if we were analyzing earlier versions of the bill.

3. Analysis and Modeling of the Effects of TCJA Provisions

In this section, we examine a range of provisions from the TCJA and how they will affect energy sector firms. Here we include the provisions for which we provide both qualitative analysis and estimates from the ICM of how the provisions affect marginal effective tax rates (METRs) across industries. Other provisions—those for which we provide only qualitative analysis—are covered in Section 4.

The ICM calculates METRs as the difference between the net user cost of capital of investments, net of depreciation, and the after-tax return received by individual savers divided by the net user cost of capital. The model uses the formula developed by Hall and Jorgenson (1967), which defines the user cost of capital as the pretax rate of return (gross of depreciation) that a project must earn to cover all taxes, depreciation, and investors' opportunity cost. The net user cost is the user cost less depreciation.[7]

The provisions we model are the reduction in the corporate income tax rate, the expansion of expensing and bonus depreciation, the reduction in the interest deduction limit, the new pass-through deduction, and the individual income tax rate changes. To explore the effects of these provisions on the energy sector, we look at how METRs change as a result of each provision, as well as for all the provisions taken together. We focus on METRs in five energy subsectors—oil and gas extraction; mining, except oil and gas; utilities; petroleum and coal products; and pipeline transportation—and an average across all five subsectors. For comparison, we also report how METRs change for the average across all US industries. We look at METRs in 2018, 2025, and 2027. We chose 2018 to show the effect of the TCJA during its first year; 2025 to show the effect once it is fully phased in and some provisions, notably bonus depreciation, expire; and 2027 to show the effect after many provisions (such as most individual income tax changes, including the pass-through deduction) expire.

Table 1 presents the METRs for each industry subsector in 2018 and 2027. The first panel gives the METRs under pre-TCJA tax law and the second panel under the TCJA. The third panel displays the differences between the two sets of rates. Table 2 provides more detail, looking step-by-step at how each individual provision affects METRs for each industry subsector in each of the three years. The first four panels in this table show how each of the four provisions affects METRs, with the fifth panel displaying the total change in METRs.[8]

7 The user cost of capital can be expressed as $c = (r + \delta)(1 - \mathrm{Z}\tau - k) \,/\, (1 - \tau)$, where r is the firm's real discount rate, δ is the rate of economic depreciation, Z is the present discounted value of tax depreciation allowances, τ is the firm's income tax rate, and k is the rate of any investment tax credit. The discount rate reflects the return savers could earn on alternative investments and debts on the nominal interest rate, the nominal equity yield, the inflation rate, the firm's debt-to-equity ratio, and marginal tax rates investors face on interest income, dividends, and capital gains. For a description of the ICM, see Rosenberg and Marron (2015).

8 Note that to the extent that the provisions interact with one another, the effect attributed to each provision will depend on the order in which they are applied (the "stacking order"). We start by reducing the corporate income tax rate, then change expensing and bonus

Table 1. Marginal Effective Tax Rates by Subsector, 2018 and 2027

	2018		2027	
	Corporate	Pass-Through	Corporate	Pass-Through
Pre-TCJA Law				
All industries	25.0%	20.0%	27.1%	21.9%
Oil and gas extraction	12.5%	2.1%	14.1%	2.9%
Mining, except oil and gas	18.6%	14.6%	21.5%	16.7%
Utilities	20.2%	16.4%	24.5%	19.3%
Petroleum and coal products	24.4%	19.9%	27.0%	22.1%
Pipeline transportation	20.9%	16.6%	25.0%	19.4%
All	*17.5%*	*11.3%*	*20.8%*	*13.4%*
Tax Cuts and Jobs Act				
All industries	18.2%	14.4%	23.4%	24.2%
Oil and gas extraction	12.1%	2.6%	15.9%	5.7%
Mining, except oil and gas	13.1%	8.2%	20.1%	19.2%
Utilities	10.5%	5.1%	21.7%	21.7%
Petroleum and coal products	16.7%	12.9%	23.2%	24.4%
Pipeline transportation	11.4%	5.9%	22.0%	21.8%
All	*11.5%*	*4.7%*	*19.6%*	*15.9%*
Difference				
All industries	-6.9%	-5.6%	-3.7%	2.3%
Oil and gas extraction	-0.3%	0.5%	1.8%	2.8%
Mining, except oil and gas	-5.5%	-6.4%	-1.5%	2.5%
Utilities	-9.6%	-11.3%	-2.8%	2.4%
Petroleum and coal products	-7.6%	-7.0%	-3.7%	2.3%
Pipeline transportation	-9.5%	-10.8%	-3.0%	2.4%
All	-6.0%	-6.6%	-1.1%	2.6%

In modeling these provisions, we make the following assumptions: For corporations in the oil and gas extraction industry, 57.7 percent of costs are expensed through either intangible drilling costs or dry holes, 16.7 percent are recovered through cost depletion, 1.9 percent are recovered (or depreciated) over seven years, and the remaining 23.7 percent are recovered (or depreciated) over five years (Gravelle and Marples 2015). For pass-throughs in the oil and gas extraction industry, 81.4 percent of costs are expensed through either intangible drilling costs or dry holes, 16.7 percent are recovered through percentage depletion, and the remaining 1.9 percent are recovered (or depreciated) over two years. For percentage depletion of oil and gas pass-throughs, which allows a 15 percent deduction of gross income, limited by the lower of 100 percent of taxable income from the property or 65 percent of taxable income from all sources, we

depreciation, reduce the interest deduction limit, and finally, change individual rates and add the pass-through deduction. Thus the first panel shows the effect of reducing the corporate income tax rate, while keeping pre-TCJA tax law in all other respects; the second panel shows the effect of changing expensing and bonus depreciation, with the new lower tax rate already in place, but otherwise keeps pre-TCJA tax law; and so forth.

calculate the average deduction from net income (weighted by business receipts of partnerships, sole proprietorships, and S corporations), and then apply the marginal effective tax rate to the taxable remainder of net income.

Table 2. Provision-by-Provision Marginal Effective Tax Rate Change by Subsector, 2018, 2025, and 2027

	2018		2025		2027	
	Corporate	Pass-Through	Corporate	Pass-Through	Corporate	Pass-Through
Step 1. Reduction in Corporate Rate to 21%						
All industries	-5.1%		-5.6%		-5.6%	
Oil and gas extraction	0.0%		-0.4%		-0.4%	
Mining, except oil and gas	-2.5%		-3.5%		-3.5%	
Utilities	-3.4%		-4.8%		-4.8%	
Petroleum and coal products	-4.9%		-5.7%		-5.7%	
Pipeline transportation	-3.7%		-5.1%		-5.1%	
All	*-2.2%*		-3.2%		*-3.2%*	
Step 2. Change in Expensing (Bonus Depreciation)						
All industries	-3.0%	-5.3%	-1.6%	-1.7%		
Oil and gas extraction	-1.6%	-2.5%	-0.9%	-0.9%		
Mining, except oil and gas	-4.2%	-7.7%	-2.3%	-2.6%		
Utilities	-7.5%	-13.4%	-4.0%	-4.4%		
Petroleum and coal products	-3.9%	-7.1%	-2.1%	-2.3%		
Pipeline transportation	-7.1%	-12.6%	-3.7%	-4.1%		
All	-5.1%	-8.9%	-2.7%	-2.9%		
Step 3. Reduction in Interest Deduction Limit						
All industries	1.6%	1.9%	1.9%	2.2%	1.8%	2.2%
Oil and gas extraction	1.8%	2.3%	2.1%	2.8%	2.0%	2.8%
Mining, except oil and gas	1.7%	2.1%	2.0%	2.4%	1.9%	2.4%
Utilities	1.8%	2.2%	2.0%	2.4%	1.9%	2.4%
Petroleum and coal products	1.7%	2.0%	1.9%	2.2%	1.8%	2.2%
Pipeline transportation	1.8%	2.2%	2.0%	2.4%	1.9%	2.3%
All	*1.8%*	*2.2%*	2.0%	2.6%	*2.0%*	*2.5%*
Step 4. Individual Rate Changes & 20% Pass-Through Deduction						
All industries	-0.5%	-2.2%	-0.3%	-2.9%	0.1%	0.1%
Oil and gas extraction	-0.5%	0.7%	-0.4%	0.2%	0.1%	0.0%
Mining, except oil and gas	-0.5%	-0.8%	-0.3%	-2.0%	0.1%	0.1%
Utilities	-0.5%	-0.2%	-0.3%	-2.3%	0.1%	0.1%
Petroleum and coal products	-0.5%	-1.9%	-0.3%	-2.9%	0.1%	0.1%
Pipeline transportation	-0.5%	-0.4%	-0.3%	-2.3%	0.1%	0.1%
All	*-0.5%*	*0.0%*	-0.4%	-1.4%	*0.1%*	*0.1%*
Total Change						
All industries	-6.9%	-5.6%	-5.6%	-2.4%	-3.7%	2.3%
Oil and gas extraction	-0.3%	0.5%	0.4%	2.1%	1.8%	2.8%
Mining, except oil and gas	-5.5%	-6.4%	-4.1%	-2.2%	-1.5%	2.5%
Utilities	-9.6%	-11.3%	-7.1%	-4.2%	-2.8%	2.4%
Petroleum and coal products	-7.6%	-7.0%	-6.2%	-3.0%	-3.7%	2.3%
Pipeline transportation	-9.5%	-10.8%	-7.1%	-4.0%	-3.0%	2.4%
All	-6.0%	-6.6%	-4.2%	-1.8%	-1.1%	2.6%

Note : Change in individual income tax includes rate changes and 20% deduction on qualified business income for pass-throughs.

3.1. Reduction in the Corporate Income Tax Rate

The most significant single provision in the TCJA is the reduction of the corporate tax rate from 35 to 21 percent, the lowest top corporate rate since 1939. This cut taxes for any firm or industry with positive taxable profits, but the magnitude of the cut as a fraction of income varies widely across firms and industries, with the biggest benefit to those with the highest effective tax rates. A firm that benefits heavily from deductions and other tax preferences would have taxable income that is only a small fraction of its net profits, and thus it would have a low effective tax rate and get relatively little benefit from the rate cut. A firm with less benefit from tax preferences, and thus having a large fraction of its profits subject to tax and corresponding high effective tax rate, would benefit much more. The JCT (2017a) estimated that this change will lower revenue by $1,348.5 billion over 10 years. To put that figure in context, the JCT estimated that the TCJA as a whole will lower revenue by $1,456 billion over 10 years.

The first panel of Table 2 shows how the reduction in the corporate income tax rate affects METRs across industries in different years. Note the change affects only C corporations, not pass-throughs, because pass-throughs are not subject to the corporate income tax. The rate reduction lowers METRs across the energy sector, though because energy sector firms generally had lower effective tax rates pre-TCJA (reflecting a greater ability to utilize deductions and other tax preferences) than firms in other sectors of the economy, METRs drop by less in the energy sector. (The weighted average of METR changes across the five energy subsectors we examine in 2018, 2025, and 2027 are –2.2, –3.2, and –3.2 percentage points, respectively, compared with –5.1, –5.6, and –5.6 percentage points for all corporations.) A comparison among the energy subsectors shows a similar pattern: sectors with higher pre-TCJA effective tax rates see a larger drop in METR from the reduction in the corporate tax rate. (In 2025, for example, the drop in the METR caused by the corporate rate cut ranges from as little as –0.4 percentage points for oil and gas extraction to as much as –5.7 percentage points for petroleum and coal products.)

3.2. Expansion of Expensing and Bonus Depreciation

The TCJA includes several changes that provide tax preferences for new investments. It increased Section 179 expensing, which allows companies to expense a certain amount of qualified investment (machinery and equipment), with the benefit phased out as investment increases. The TCJA increased the maximum amount that can be expensed under Section 179 to $1 million, raised the start of the phaseout to $2.5 million (with both figures indexed for inflation after 2018), and expanded the definition of qualified property (adding, among other items, energy-efficient heating and air-conditioning property). Because of the phaseout, this provision is primarily of value to relatively small firms.

The TCJA also allows 100 percent bonus depreciation (i.e., full expensing) of investment in machinery and equipment for five years (placed in service before 2023).

The bonus depreciation is then phased down at 20 percent per year for 2023–26 and sunsets at the end of 2026. Bonus depreciation benefits any business making qualifying investments during the period it is in effect. Capital-intensive energy industries seem particularly likely to benefit. The JCT (2017a) estimated that the changes to Section 179 expensing and bonus depreciation will lower revenue by $25.9 billion and $86.3 billion, respectively, over 10 years (with the bonus depreciation provision lowering revenue sharply in early years and then increasing revenue starting in 2024, because the revenue gain from lower depreciation on pre-2024 investments will exceed the revenue loss from the reduced amount of bonus depreciation deductions in 2024 and after).

We model the effect of the bonus depreciation (though not the expansion of Section 179 expensing). Changes in METRs caused by this provision appear in the second panel of Table 2. Note that the provision applies to all businesses, whether they are C corporations or pass-throughs. But because the bonus depreciation provision phases down (starting in 2023) and then sunsets (at the end of 2026), it provides a smaller tax break in 2025 than in 2018 and no break at all in 2027. The energy sector benefits substantially from this provision, getting a larger average effective rate cut than businesses in other sectors of the economy, even though energy sector firms face a lower average pre-TCJA rate. For example, bonus depreciation lowers the average energy sector corporation's METR by 5.1 percentage points, compared with 3 percentage points for all US corporations; the analogous figures for pass-throughs are a cut of 8.9 percentage points versus 5.3 percentage points. Oil and gas extraction stands out as the energy subsector that gets a relatively small benefit from bonus depreciation, because much of the investment in this industry can already be deducted quickly (through being expensed, recovered through depletion, or depreciated over relatively few years), so bonus depreciation does not substantially accelerate those deductions.

3.3. Limitation on Net Interest Deductions

The largest revenue-raising corporate income tax provision in the bill limits deductible interest to 30 percent of adjusted taxable income (income excluding deductions for interest, taxes, depreciation, and amortization, or EBITDA).[9] This will disallow some interest deductions, thus increasing taxes. But because the 30 percent limit is relatively high, it should matter only for highly leveraged firms. And some companies may be able to rearrange their financing structures or engage in mergers or leasing transactions to avoid this limitation. The JCT (2017a) estimated that this change will increase revenue by $253.4 billion over 10 years.

We modeled this as a fixed percentage reduction in all interest deductions and used the JCT revenue score to compute the size of the percentage haircut that would be equivalent to the 30 percent limitation. Using this methodology, we estimated changes in METRs caused by this provision, which appear in the third panel of Table 2. On average, the interest limitation will have a modest effect on energy sector firms, raising their METRs by roughly 2 percentage points, a figure that is slightly higher than for

9 After 2021, the limitation will change to income excluding deduction of interest and taxes (EBIT).

other sectors of the economy and does not vary substantially across subsectors within the energy sector. This reflects somewhat higher debt loads in the energy sector than in other sectors of the economy.[10] While the average effects are relatively uniform across subsectors, that masks substantial heterogeneity at the level of individual firms: those with interest deductions below the limit will not be affected at all, while those above the limit could see substantial METR increases.

Note that while the METR analysis does not separate out renewable energy firms, those firms could be particularly affected by this provision because they rely heavily on debt financing. (Renewable energy has a substantially higher average debt-to-equity ratio than other energy subsectors and the market as a whole.)

3.4. Individual Income Tax Rate Changes and 20 Percent Pass-Through Deduction

The TCJA also makes substantial changes to the individual income tax. Because business income is taxed at the individual level (pass-through income is taxed only at the individual level, and corporate income is subject to individual income taxation when dividends are paid or shares are sold), the individual income tax changes matter for effective tax rates on business income. We focus here on two individual income tax changes: the reduction in individual income tax rates and the new 20 percent pass-through deduction. Although changes in bracket definitions reduced rates on capital gains and dividends for some taxpayers, the top rates on gains and dividends remained the same under the new law.

The individual income tax rate changes are much smaller than the corporate rate cut but still significant: new rates are typically 2 to 3 points lower at any given level of income than the old rates. Because the base of the individual income tax is much larger than that of the corporate income tax, these relatively small rate changes still have a large effect on revenue: the JCT (2017a) estimated that this change will reduce revenue by $1,214 billion over 10 years. This change lowers effective taxes on all businesses, with a somewhat larger effect for pass-throughs. (A large fraction of the corporate income that is taxed under the individual income tax comes in the form of dividends and long-term capital gains; these already receive preferential rates, which were not cut under the TCJA.)

The TCJA also added a major new deduction of 20 percent of qualified income from pass-through businesses, with the stated goal of ensuring that they remain competitive with corporations without having to restructure.[11] This effectively lowers

10 See **http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/dbtfund.htm** for data on debt-to-capital and debt-to-equity ratios by industry. Almost all energy sector industries have debt-to-equity ratios higher than that of the average nonfinancial firm, with integrated oil and gas being a notable exception.

11 The rules for what pass-through income qualifies for the deduction are complex, and a full discussion of those rules is beyond the scope of this paper. The general intent of these rules is to prevent high-income taxpayers from being eligible for this deduction

the tax on such income by 20 percent of the rate currently paid; thus, for example, it lowers the top rate on such income from 37 percent (the new top individual income tax rate) to 29.6 percent (80 percent of 37 percent). The JCT (2017a) estimated that this change will reduce revenue by $414.5 billion over 10 years. Both the individual rate cuts and the pass-through deduction sunset at the end of 2025, along with almost all the other changes the TCJA makes to the individual income tax.[12]

Panel 4 of Table 2 shows how these two changes together affect METRs across industries. The effects on corporations are relatively small: the individual income tax rate cuts cause METRs to fall by 0.5 percentage points in 2018 and 0.3–0.4 percentage points in 2025, figures that are largely uniform across industries. The effects on pass-throughs are generally larger than for corporations, mostly due to the effect of the pass-through deduction; in 2025, for example, the average METR for energy sector pass-throughs drops by 1.4 percentage points, compared with 2.9 percentage points on average for pass-throughs in all sectors.

The effect also varies much more across subsectors, ranging from a 2.9 percentage point decrease for petroleum and coal products to a 0.2 percentage point increase for oil and gas extraction pass-throughs. The increase for oil and gas extraction pass-throughs arises because these firms already face a very low effective tax rate, thus limiting the potential benefit from lower rates and the pass-through deduction, and those changes reduce the value of interest deductions for these firms, so the net effect is a higher METR. Because the changes sunset at the end of 2025, the effect in 2027 is close to zero, though the change in inflation indexing (which does not sunset) causes a small increase in METRs that year.

3.5. Net Effect of the TCJA on Energy Industry Tax Rates

The bottom panel of Table 2 shows the total change in METRs from the TCJA provisions we model. These effects vary widely across years, subsectors, and organizational form. While the TCJA lowers METRs substantially in the near term, expiring provisions mean those cuts get smaller over time, and by 2027, pass-throughs actually face higher METRs than they would have in the absence of the TCJA.

For the average energy sector corporation, the METR drops by 6 percentage points in 2018, 4.2 percentage points in 2025, and 1.1 percentage points in 2027. Those changes are driven primarily by the bonus depreciation provision, with the corporate rate reduction and interest deduction limit also playing significant (though largely

on what are essentially wages (i.e., income generated by their own labor), though some categories of professional services (e.g., architects and engineers) are exempt from limits that apply to others (e.g., doctors, lawyers, and accountants).

12 A notable exception—a permanent change to the individual income tax in the TCJA—changes the inflation measure used to index a wide variety of dollar figures in the tax code, thus effectively increasing taxes slightly over time.

offsetting) roles. The magnitude of the METR drop shrinks substantially over time, largely because the bonus depreciation provision starts to phase out in 2023 and sunsets at the end of 2026.

Energy sector pass-throughs see average METR decreases of 6.6 percentage points in 2018 and 1.8 percentage points in 2025, again driven primarily by the bonus depreciation provision, with the pass-through deduction and interest deduction limit also being important (but largely offsetting each other). However, by 2027, these firms actually face a net increase, because by then the two provisions that substantially reduce taxes for those firms will have expired: the pass-through deduction sunsets at the end of 2025 and bonus depreciation at the end of 2026.

These effects also vary significantly across energy subsectors, with that variation coming primarily from the effect of bonus depreciation and to a lesser extent from the effects of the corporate rate cuts and the pass-through deduction. In 2018, for example, the METR changes range from a drop of 9.6 percentage points (corporations) and 11.3 percentage points (pass-throughs) for utilities to a 0.3 percentage point drop (corporations) and 0.5 percentage point increase (pass-throughs) for oil and gas extraction.

The middle panel of Table 1 shows the resulting METRs under the TCJA. Energy sector firms already faced low METRs prior to the TCJA, and the TCJA cut those METRs substantially (at least in the early years), resulting in very low effective rates. For example, the average METR for all energy sector pass-throughs in 2018 is estimated at 4.7 percent, down from 11.3 percent pre-TCJA. The parallel METR for energy sector corporations in 2018 is 11.5 percent, down from 17.5 percent pre-TCJA.

It is hard to evaluate the effects of these tax changes on investment and production in the energy sector. One would expect the relatively large initial reductions in METRs to lead to increases in investment in the early years of the TCJA, with resulting higher production once that investment is completed, but separating out those effects from other factors influencing investment and production during 2018–21 is challenging. And because some of the TCJA provisions that provide the strongest investment incentives are temporary, the long-run effect on investment will be much smaller, and a substantial share of any short-run increase may have come from shifting investment sooner to take advantage of those temporary incentives.

For certain sectors, other market conditions and constraints might limit the response to tax changes. Oil and gas extraction firms, for example, were already investing heavily, driven by new opportunities created by advances in fracking technology. Given various constraints (e.g., pipeline capacity, shortages of some types of labor), it's unclear how much investment in that subsector could increase in response to tax changes.[13] And given that the coal subsector seems to be on a long-term decline and that capital in that subsector is relatively long-lived, it seems unlikely that even substantial tax cuts would lead to much new investment there (see DOE 2017, 22).

13 For example, see the S&P Global Platts (2018) discussion of constraints to expanding oil and gas production in the Permian Basin.

4. Qualitative Analysis of the Effects of TCJA Provisions

This section discusses the TCJA provisions for which we provide qualitative analysis but do not model the resulting changes in tax rates. We do not model these provisions either because they are difficult to model well with readily available data or because they are smaller and less important than the provisions covered in Section 3.

4.1. Interaction of Renewable Energy Tax Credits with the Base Erosion and Anti-Abuse Tax

Restrictions on foreign payments and transfers may affect the value of renewable energy tax credits. The base erosion and anti-abuse tax (BEAT) is a new alternative minimum tax with a lower rate than the regular corporate tax but a tax base that limits deductions of certain cross-border payments to foreign affiliates. If a firm's BEAT calculation exceeds its ordinary corporate income tax liability, it pays the difference as an additional tax.

The BEAT may in some cases limit the value of tax incentives such as the production tax credit (PTC) and investment tax credit (ITC). Many renewable energy companies do not have sufficient income tax liabilities to fully utilize these credits themselves and therefore sell the credits to tax equity investors (other firms that have sufficient tax liabilities to get the full benefit of the credits).[14] But the value of the PTC and ITC is reduced for a firm that is subject to the BEAT: through 2025, 80 percent of the value of the PTC and ITC can be credited against the BEAT (thus effectively cutting the value of those credits by 20 percent for a firm subject to the BEAT), and after 2025, the PTC and ITC can no longer be credited against the BEAT (so a firm subject to the BEAT would get no benefit from the credits).[15] Thus, to the extent that tax equity investors are subject to the BEAT, this provision could reduce the availability of tax equity financing for renewable energy.

Nonetheless, the BEAT does not appear to have had a significant effect on the value of these credits. While the credits are worth less to potential tax equity investors subject to the BEAT, they still have full value for firms not subject to the BEAT, and indications are that such firms have more than enough tax liability to fully utilize all available credits (thus ensuring a sufficient supply of tax equity financing). It is possible that the BEAT could have a more noticeable effect in the longer term, if the fraction of firms subject to the BEAT eventually turns out to be much larger. But that seems unlikely.

14 This tax equity financing approach is very common. Plumer and Tankersley (2017) report that "roughly two-thirds of wind projects and three-fourths of solar projects in the United States are supported by such tax equity financing."

15 Under the original Senate bill version of the BEAT, the PTC and ITC could not be credited against the BEAT at all. The provision allowing 80 percent of the value of these credits to offset the BEAT was added in the conference agreement.

4.2. Repeal of the Domestic Production Deduction

Another revenue-raising provision in the TCJA is the repeal of the Section 199 domestic production deduction. Previously, firms could deduct 9 percent of profits from domestic production activities, reducing the effective top corporate tax rate from 35 to 31.85 percent (the latter is equal to 35 percent of the 91 percent of profits that remain taxable after the deduction).[16] A number of energy sector activities qualified for this deduction, including domestic oil and gas extraction and refining, as well as electric generation. Thus repealing the deduction effectively raises taxes on those activities. However, the value of this deduction is small compared with the TCJA's business tax cuts—the new corporate rate is 21 percent and there is a new 20 percent deduction for pass-throughs—so on net, these activities still face a substantially lower tax rate than they did prior to the TCJA. (Losing the deduction simply means that they get a smaller tax cut than they otherwise would have.)

4.3. Repeal Treatment of Foreign Oil–Related Income as Subpart F

Under prior law, US taxation of income from foreign subsidiaries of US multinationals was generally deferred until the profits were repatriated to the US parent company. Under Subpart F, certain forms of passive and easily shiftable income were taxed immediately instead of being deferred. TCJA eliminated the tax on repatriated profits but retained Subpart F and introduced a new tax at rate of 10.5 percent (13.125 percent in years 2026 and after) on global intangible low-tax income (GILTI), defined as income in excess of a 10 percent return on tangible investments. The TCJA removes foreign oil–related income from Subpart F, but some of that income may still be taxable as GILTI, albeit at a lower rate than Subpart F income. The JCT (2017a) revenue estimate for this provision is roughly $4 billion over 10 years, making it relatively insignificant in relation to the overall bill, though still a potentially important tax cut for firms that are directly affected.

4.4. Modifications to Net Operating Loss Deduction Rules

The TCJA implemented new limits on the extent to which net operating losses (NOLs) in one year can be used to offset taxable profits in other years. Under previous law, NOLs could generally be carried back (to offset prior-year profits) up to 2 years or carried forward for 20 years to offset future profits. The TCJA in general no longer allows NOLs to be carried back. It allows them to be carried forward without a time limit but limits the deduction on losses carried forward (for losses incurred in tax years starting after 2017) to 80 percent of taxable income. This effectively increases taxes

16 For certain oil and gas activities, this deduction was 6 percent, implying an effective tax rate of 32.9 percent.

for firms with highly variable income streams (profits in some years, losses in others) and for subsectors with significant numbers of such firms. This seems potentially important for some energy subsectors, such as oil and gas, where volatile prices can lead to highly variable income streams. The JCT (2017a) estimated that this change will increase revenue by $201 billion over 10 years, making it one of the largest revenue-raising changes to the corporate tax in the TCJA. But quantitatively determining the effects on particular subsectors would be complex (one would need to look at tax data for individual firms) and thus is beyond the scope of this paper.

4.5. Repeal of the Corporate Alternative Minimum Tax

The corporate alternative minimum tax (AMT) was a parallel system to the regular corporate income tax. The corporate AMT had a much lower rate (20 percent, versus a top rate of 35 percent under the regular corporate income tax) but limited or disallowed a range of deductions, credits, and other tax preferences. If a corporation's AMT was more than the regular corporate income tax, it paid the difference as an additional tax (in effect, paying the AMT instead). The TCJA repealed the corporate AMT, thus lowering taxes (perhaps substantially) for firms that would otherwise pay the corporate AMT. The effect of the repeal of the corporate minimum AMT varies significantly by industry, with multiple energy subsectors standing to gain dramatically. Mining and utilities are among the industries that had been disproportionately affected by this tax.

Lu and Rosenberg (2017) discuss how this repeal will affect different industries, citing data from the IRS Statistics of Income. They compare the share of total corporate AMT paid in the United States by industry with the corresponding corporate income tax figures, showing which industries were disproportionately affected by the corporate AMT in 2013 (the most recent data available). Mining (16 percent of all US AMT payments versus 2 percent of corporate income tax), utilities (7 versus 0 percent), insurance (35 versus 9 percent), and finance (14 versus 9 percent) stand out as industries that were disproportionately paying the corporate AMT and thus will disproportionately benefit from its repeal.

5. Budget Implications and Possible Future Changes

As of 2017, before passage of the TCJA, federal debt held by the public was approximately 77 percent of GDP, the highest level since the end of World War II, and the Congressional Budget Office projected that without any changes in the law, that debt would reach 89 percent of GDP by 2027 and 150 percent by 2047 (CBO 2017). The equivalent projections as of January 2021, are 102 percent of GDP by the end of 2021, 107 percent by 2031, and 202 percent by 2051 (CBO 2021), a dramatic increase. The TCJA cut tax revenues substantially, which accelerated the rise in federal debt, though that represents only a small share of the overall increase over the last four years. The JCT (2017b) estimated that the TCJA would cut revenues by roughly $1.5 trillion over 10 years, and even when estimated macroeconomic effects are included, that drop is still $1.1 trillion. That increase in borrowing affects the economy (and in turn, the energy sector). And eventually, some combination of revenue increases and spending cuts will be necessary to put the federal debt on a more sustainable path. This section briefly discusses those issues.

Higher federal borrowing will eventually lead to higher interest rates. That interest rate increase will raise costs for any firm that incurs debt, and since the energy sector on average is more debt-intensive than other sectors of the economy, it will be disproportionately affected. That increased borrowing will also likely lead to an appreciation of the dollar relative to other currencies. The effects of that appreciation will vary widely across different parts of the energy sector, depending on the extent to which different subsectors are exposed to trade and whether they are net exporters or importers. A detailed discussion of how changes in interest rates and exchanges rates would affect the energy sector is beyond the scope of this paper, but those effects could be significant.

Another implication of the rising national debt is that future policymakers may look to revenue-raising policies that could affect the energy sector. Increases in the corporate or personal income tax, for example, would boost the tax burden on the sector. One can get a sense of what those effects might be by reversing the effects this paper estimates of the TCJA's cuts to those taxes. Given that the TCJA will already lead to higher effective tax rates by 2027 for parts of the energy sector (oil and gas extraction corporations and pass-throughs in all energy subsectors), taking into account the possibility of further tax increases to offset the near-term revenue cost of the TCJA suggests that in the long term, the TCJA could easily be a net drag on the energy sector.

Another potential future revenue-raising change, a carbon tax, would have a more dramatic effect on the energy sector, while also potentially raising large amounts of revenue.[17] Resources for the Future's carbon tax calculator (Hafstead 2017) provides

17 Recent legislative proposals for a carbon tax include the MARKET CHOICE Act, sponsored by Representatives Brian Fitzpatrick (R-PA) and Salud Carbajal (D-CA), and the Save Our Future Act, sponsored by Senators Sheldon Whitehouse (D-RI) and Brian

estimates of revenue from different levels of a carbon tax at different growth rates. Table 3 shows the projected revenues from different levels of a carbon tax (implemented in 2018) for the duration of the TCJA. This gives an idea of the revenue-raising potential of a carbon tax. In the more aggressive pricing and growth scenarios, the carbon tax revenues could offset the debt increase from the TCJA almost entirely.

Table 3. 2018–27 Revenue (2018 $US billions)

		Growth rate (above inflation)		
		1%	2%	3%
Carbon price ($/metric ton)	$10	517	538	561
	$15	747	777	808
	$20	964	1,001	1,039

A carbon tax would impose a substantial burden on energy subsectors that produce or use coal and oil. Goulder and Hafstead (2017) estimate that a $20/ton carbon tax (rising at 4 percent per year until it hits $60) would reduce the present value of after-tax profits from coal mining by roughly 45 percent, from petroleum refining by roughly 6 percent, and from natural gas extraction by 23 percent. The effect on electric utilities would vary widely based on fuel mix: profits from coal-fired generation would drop sharply, while profits from non-fossil generation (nuclear and renewables) would rise by a similar percentage.

Schatz (D-HI). Neither bill would use the carbon tax revenue to reduce the deficit.

6. Conclusions

This paper has looked at the effects of provisions in the TCJA on the energy sector. It finds that though the TCJA initially cut effective tax rates for energy sector firms substantially, expiring provisions mean that those tax cuts decline over time, and by 2027, a large fraction of energy sector firms (especially pass-through entities) will face higher effective tax rates than they would have under pre-TCJA tax law.

Evaluating the effects of those tax changes on investment and production is more difficult (and predicting effects on energy prices would be more difficult still). It seems likely that there was at least some short-term increase in investment in response to the changes, but that may simply represent some projects having been shifted earlier in time, rather than any sustained long-run increase in investment.

These results also have potential implications for price regulation of energy sector firms such as pipelines and electric utilities. To the extent that regulators take into account taxes in setting rates, those rates should be adjusted downward in the near term. But because some of the large tax-reducing provisions are temporary, those rates may need to be adjusted back up in the future.

There are many promising directions for future research in this area. While this paper includes modeling the effects of some TCJA provisions, we are limited to qualitative analysis of others. It would be useful to take a more careful quantitative look at some of those other provisions, though in many cases, doing so would require more detailed tax data than we were able to access. Looking more carefully at how energy sector investment responds to changes in effective tax rates would also be highly valuable. And because the TCJA has potentially broad effects across the whole economy, a large-scale general equilibrium model could provide useful insights into those broader effects. Integrating that kind of general equilibrium modeling with modeling of the energy sector could yield interesting results.

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