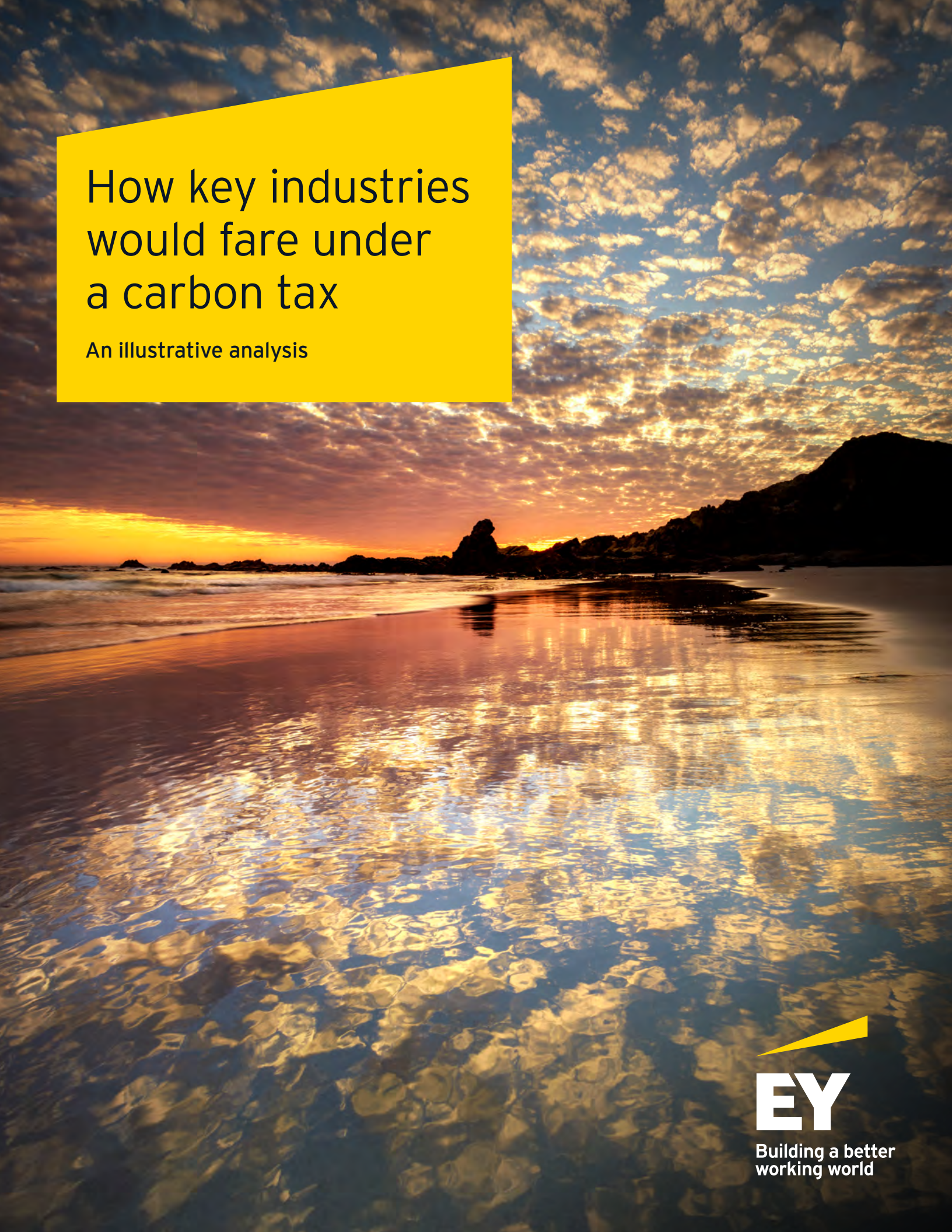
How key industries would fare under a carbon tax

An illustrative analysis



EY
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Calls to address climate issues are growing. Tax policies that aim to curtail CO_2 emissions are already in place in many countries, and several US policymakers are putting forth proposals to address the issue.

How key industries would fare under a carbon tax: an illustrative analysis

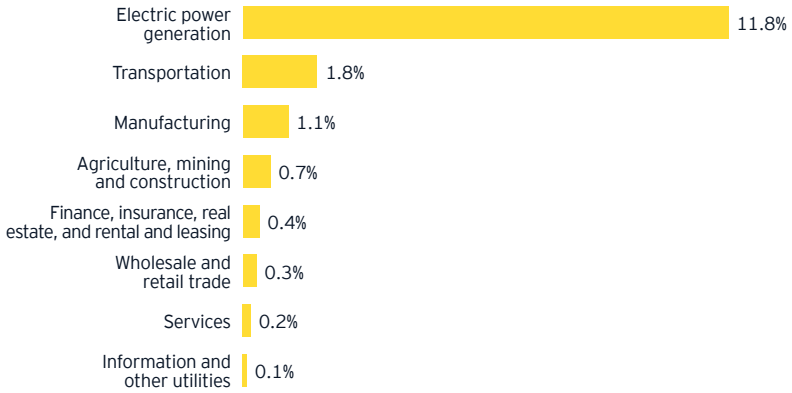
Taxing carbon is one option receiving increasing attention as a way to reduce CO_2 emissions in the US, fund spending and tax policy priorities, and address the federal fiscal imbalance. Several Democratic presidential candidates have proposed carbon pricing initiatives, and multiple carbon tax proposals have recently been introduced in Congress (see the Appendix).

Regardless of who would be required to remit the tax, nearly all taxpayers would be affected by a carbon tax. As such, businesses across all industries and sectors need to be informed and participate in the conversation as the debate unfolds.

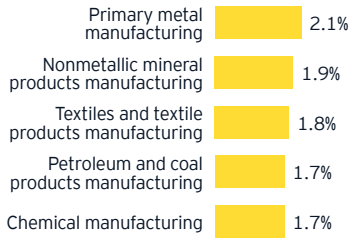
This report looks at the potential industry impacts of an illustrative $25/ton[1] carbon tax on all energy-related CO_2 emissions in the United States, examining direct and indirect production costs and changes in consumer prices. Such a tax could raise $1.1 trillion in tax revenue over 10 years.[2] While this analysis provides a general overview of potential impacts, businesses should consider undertaking more detailed analyses that quantify the effects on their specific company, subindustry, suppliers, competitors, customers and markets. Such information can be helpful when discussing the effects of a carbon tax with stakeholders and policymakers.

Key findings:

- Overall, across eight key industries that make up the US economy, a carbon tax would increase production costs by 0.7% — although the impact varies widely by industry. Across those industries, production costs would increase as follows:

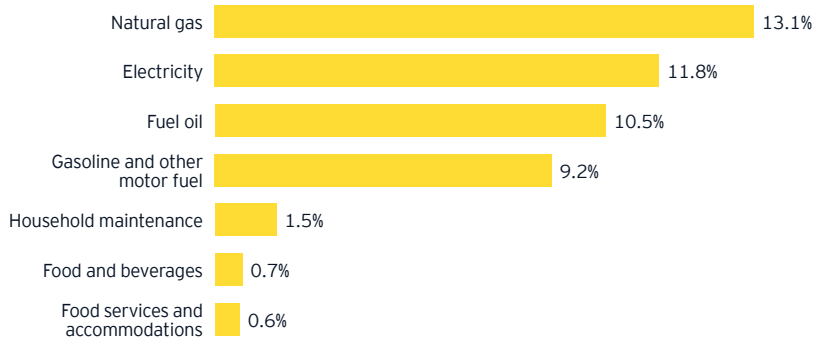


- The impacts also vary within these eight key industries. Within manufacturing, for example, production costs would increase most for the following subindustries:



These impacts reflect increases in production costs from the carbon tax imposed on an industry's CO_2 emissions and costs passed along by suppliers.

- If businesses pass all their increased production costs through to consumers,[3] there would be less than a 1% overall increase in consumer prices. The impact varies widely across products. As shown below, the largest increases in consumer prices are estimated to occur in nonrenewable energy consumables:



[1] Although higher and lower carbon taxes have been proposed, a $25/ton carbon tax has historically been the starting point for discussion of a carbon tax in the context of US policy. The carbon tax modeled here is uniformly applied to all US energy-related carbon emissions and does not include border adjustments. Additionally, while a carbon tax is the primary mechanism for pricing carbon under consideration in the United States, other carbon pricing mechanisms (e.g., "cap and trade") are being considered or have been adopted in other jurisdictions (e.g., the European Union and China).

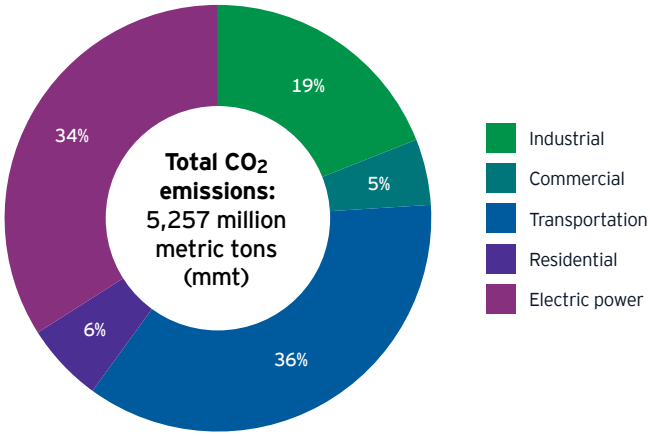
[2] The carbon tax is assumed to be adjusted for inflation (2%/year); see Congressional Budget Office, *Options for Reducing the Deficit: 2019 to 2028*, December 2018.

[3] While this analysis assumes businesses pass all their increased production costs on to consumers, it is likely that some of the burden of a carbon tax would fall on labor (through lower wages) and capital (through reduced profits). For a more extensive discussion of this point, see John Horowitz, Julie-Anne Cronin, Hannah Hawkins, Laura Konda and Alex Yuskavage, "Methodology for Analyzing a Carbon Tax," U.S. Department of the Treasury Office of Tax Analysis Working Paper 115, 2017.

Carbon tax — the pressure points
Sources of US energy-related CO_2 emissions

Understanding where carbon emissions come from within the economy is the first step in analyzing the broader impact of a carbon tax. Carbon emissions are primarily concentrated in a few types of economic activities, as shown in Figure 1. The transportation sector accounts for 36% of CO_2 emissions, while electric power accounts for 34% and industrial activity for 19%. By contrast, residential activity only accounts for 6%, and commercial activity for 5%.

Figure 1. US energy-related CO_2 emissions, by major type of economic activity (2018)

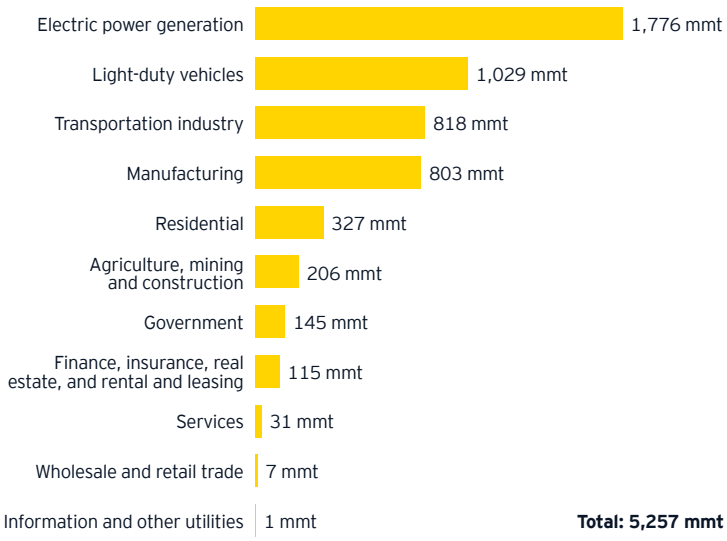


Note: The transportation sector includes personal and commercial vehicles. Figures are rounded.

Source: U.S. Energy Information Administration (EIA), Annual Energy Outlook 2018, February 2018.

Breaking down these broad categories further, nearly 20% of total US energy-related CO_2 emissions comes from the use of light-duty vehicles (which includes passenger and fleet cars and trucks), and the transportation (e.g., air travel, shipping) and manufacturing industries (reflected in industrial in Figure 1) account for 16% and 15% of emissions, respectively. Figure 2 shows a more complete breakdown of emissions by source.

Figure 2. US energy-related CO_2 emissions, by source (2018)



Note: Bars sum to total 2018 US energy-related CO_2 emissions. Industry definitions are based on the North American Industry Classification System (NAICS). Figures are rounded.

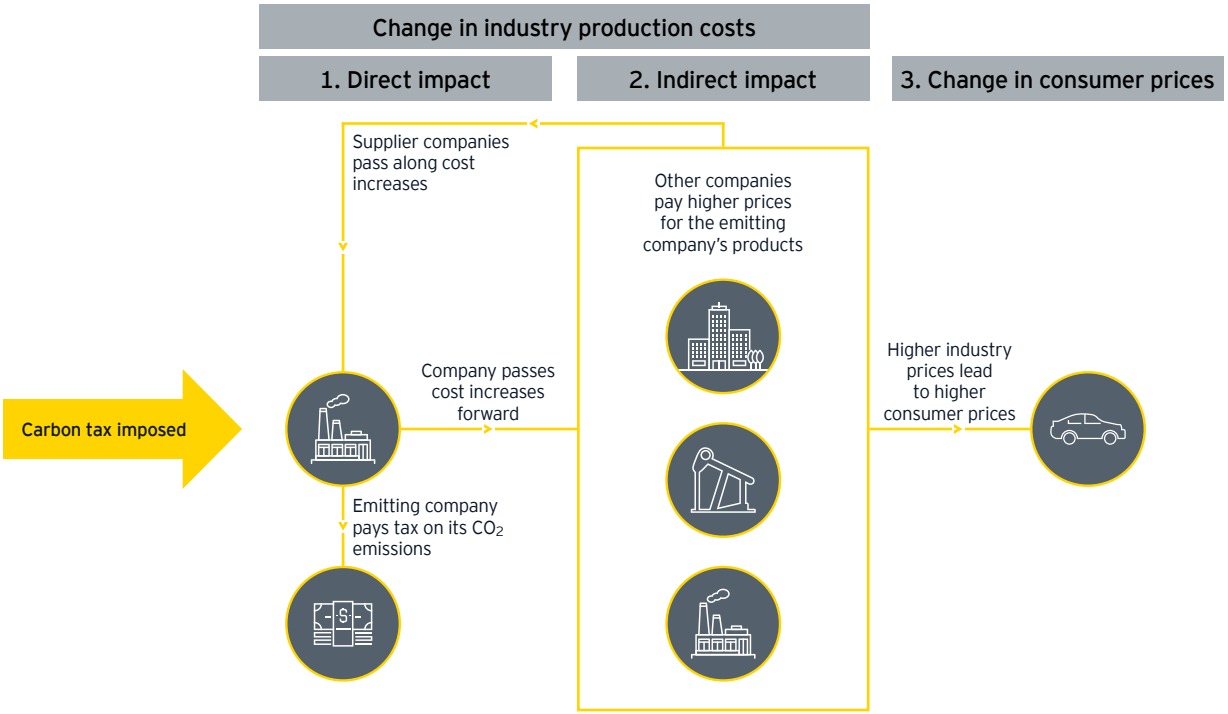
Source: EIA, Annual Energy Outlook 2018, February 2018; EY analysis.

Indirect vs. direct costs

A carbon tax would give rise to additional direct and indirect business costs, with emissions-intensive industries incurring more of the former and other industries more of the latter. Direct impacts are the tax costs that the carbon tax would impose on CO_2-emitting industries, the tax cost of the fuel, or energy used directly in production. Indirect impacts are the carbon tax-induced costs a business would incur through inputs or production processes subject to the carbon tax in prior stages of production. Industries that are not directly subject to the tax may still experience potentially significant overall cost increases if they rely heavily on inputs that use emissions-intensive production processes.

Figure 3 illustrates how the direct cost impact of a carbon tax imposed on one company can spread through the broader economy and, ultimately, to the end consumer through higher prices on consumer goods.

Figure 3. Impact of a carbon tax on industry production costs and consumer prices

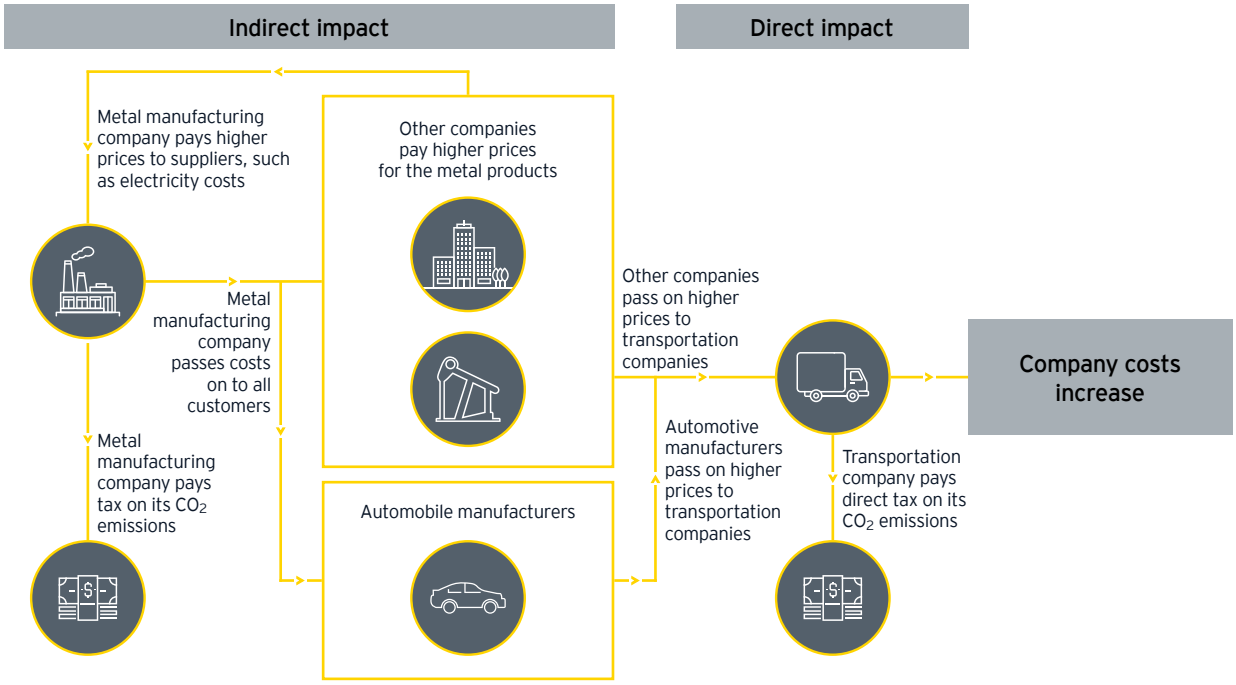


While Figure 3 presents a very general picture of the potential effects of a carbon tax, more industry-specific or company-specific modeling can offer a clearer picture of how interrelationships and supply-chain factors would affect overall production costs in specific business scenarios.

Take the examples of a transportation company and a textile manufacturer. A carbon tax may increase the overall costs of both companies by the same approximate amount — roughly 1.8% (see Figures 4 and 5). However, for the transportation company, the bulk of that cost, 1.7%, is a direct impact, while for the textiles company, 1.3% of the cost is attributable to indirect impacts.

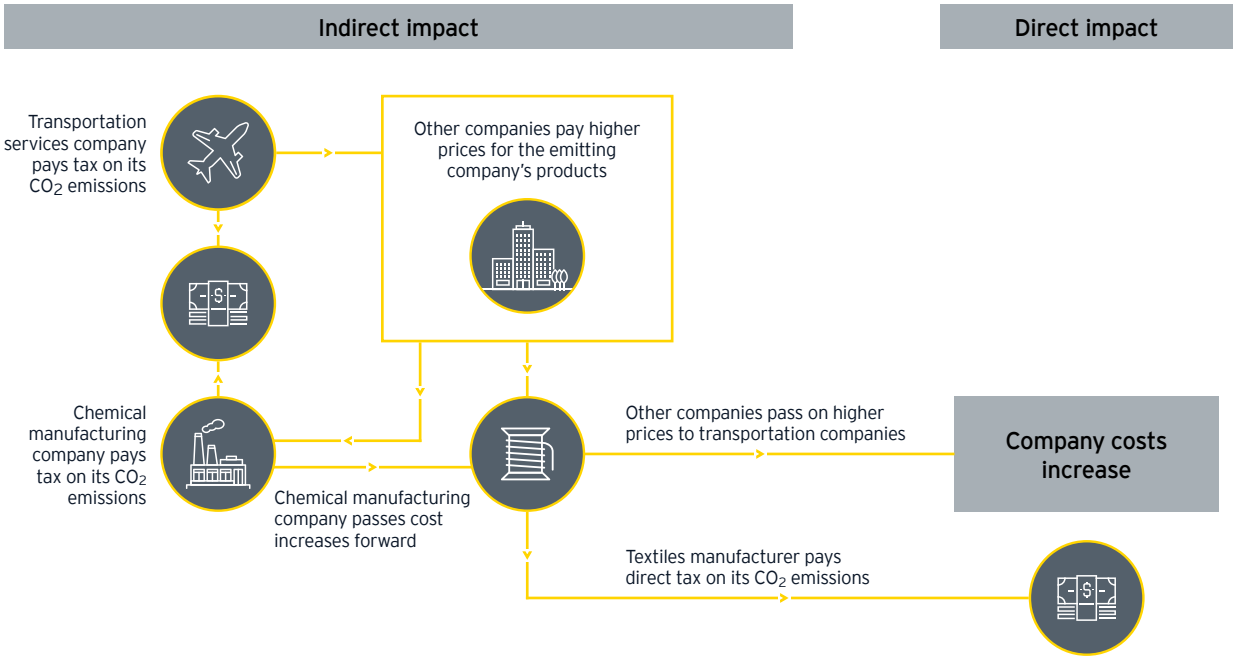
A closer look at illustrative companies in each industry demonstrates more precisely at which points in the supply chain the costs might apply for each.

Figure 4. Illustrative transportation company



The illustrative transportation company ships products between locations. Traditional shipping methods such as trucks, aircraft, trains and ships all use petroleum combustion engines and produce significant carbon emissions. This leads to a direct cost increase from a carbon tax. The illustrative transportation company also uses products made by the automobile industry (e.g., cars and trucks) that require metals in their production process. Fabricated metals such as steel and aluminum produce carbon emissions through their refining and smelting process, which results in an increase in their price. This is then passed on through the supply chain to the transportation company as higher prices for cars and trucks, ultimately contributing to the 0.1% indirect product cost increase for the transportation industry.

Figure 5. Illustrative textile manufacturer

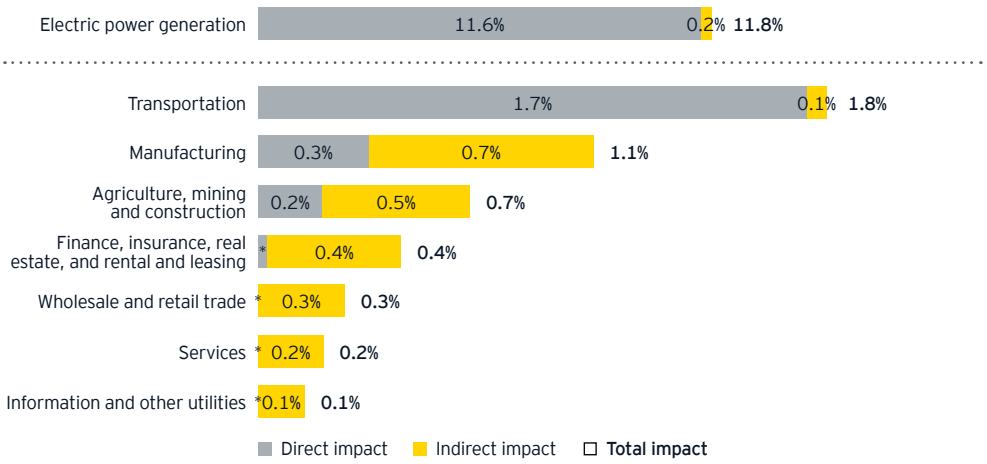


The illustrative textile manufacturer differs from the carbon-intensive transportation company in that it does not directly emit significant carbon emissions. As a result, the textile manufacturer faces greater direct cost increases within its supply chain stemming from a carbon tax. To produce and get its product to market, the textile industry uses inputs from the chemical and transportation industries. Chemicals are an essential part of refining and dying fibers in textile production. While textile production itself has only minimal carbon emissions, the production of chemicals such as dyes and refining and cleaning agents involves significant carbon emissions. As a result, chemical producers are required to pay additional taxes that they pass on as higher costs to the textile producer that purchases their product. Similarly, the textile producer must also pay transportation companies a higher price for their services because transportation companies pay additional taxes due to their carbon emissions. This combined increase in input prices indirectly drives up the textile manufacturer's production costs, which may then be passed on to consumers as higher prices.

Based on the supply chains in these case studies, the illustrative transportation company might have different responses to a carbon tax policy, and might pursue different planning options, than the illustrative textile manufacturer.

Figure 6. Estimated impact of carbon tax on industry production costs

$25/ton carbon tax



*Less than 0.05% in magnitude.

Note: Industries included cover all private industry in the United States. Industry definitions are based on the NAICS. Figures are rounded.

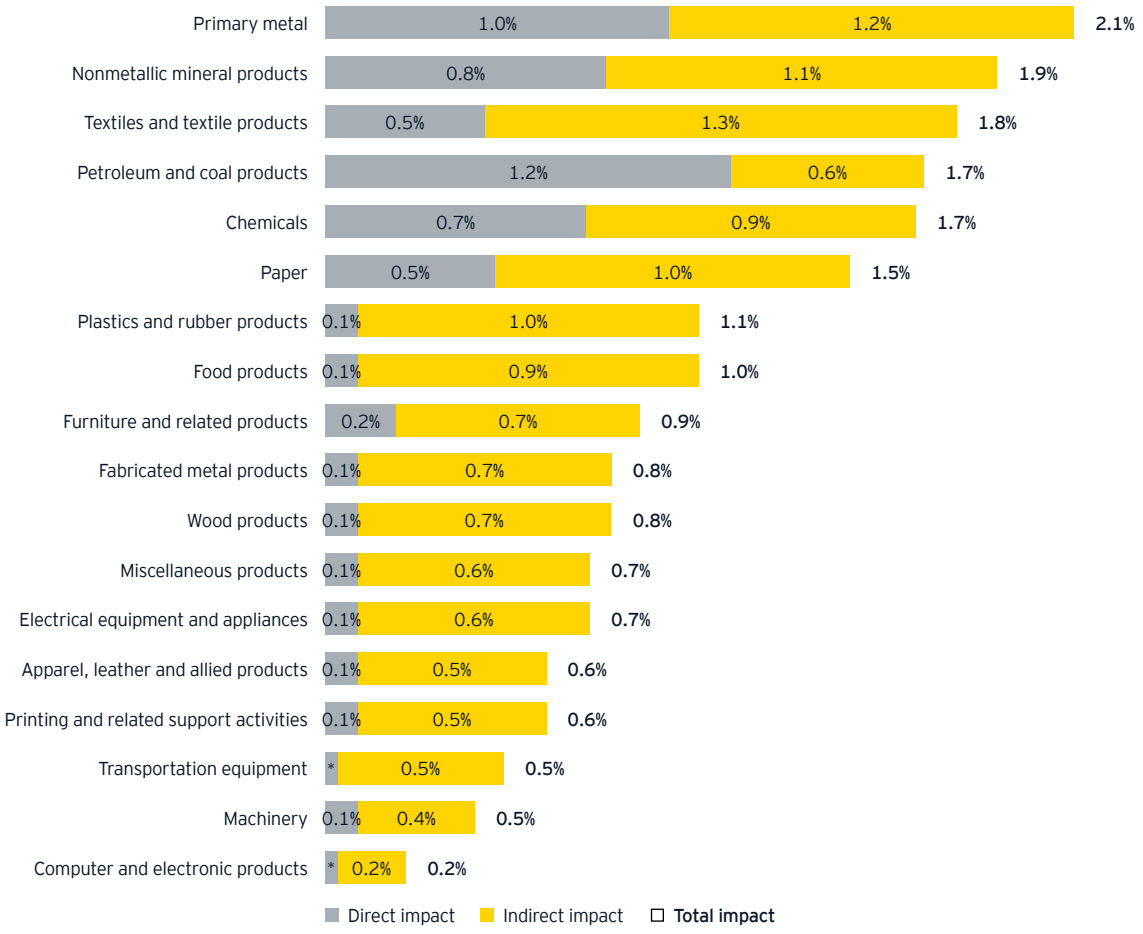
Source: EY analysis.

As shown in Figure 6, the electric power industry would experience a far greater impact from a carbon tax – 11.8% – than would most other industries. The next largest direct impact would be on transportation, which is about 1/10 the impact on electric power. For electric power producers, the 11.6% in direct added production costs dwarfs the 0.2% indirect impact, for a total cost increase of 11.8%. A similar proportional division applies to transportation.

For many other industries, however, the indirect impact makes up a much higher percentage of the overall cost increase. For example, most industries rely on electric power and transportation in some way, even if the industries are not directly heavy users of carbon-based fuels. Figure 6 may at first seem to suggest that industries such as wholesale and retail trade, for example, which accounts for approximately 0.1% of emissions, would not be significantly impacted by a carbon tax. However, this industry – like many others – must rely on suppliers that use electric power, as well as transportation. They would face indirect cost increases at a variety of points in their supply chains.

Figure 7. Estimated impact of carbon tax on industry production costs, by manufacturing subindustry

$25/ton carbon tax



*Less than 0.05% in magnitude.

Note: Industries included cover all manufacturing industries in the United States. Industry definitions are based on the NAICS. Figures are rounded.

Source: EY analysis.

Figure 7 breaks down manufacturing into its subindustries. It illustrates the wide variation in estimated carbon tax impacts across even broadly similar industries. The primary metal subindustry, for example, is estimated to have a 2.1% impact, fairly evenly divided between direct (1.0%) and indirect (1.2%) impacts on production costs. By contrast, for the paper industry's estimated 1.5% production cost increase, the indirect impact (1.0%) is double the direct impact (0.5%). For many other subindustries — such as fabricated metal products; apparel, leather and allied products; and printing and related support activities — nearly all of the estimated production cost impact is indirect.

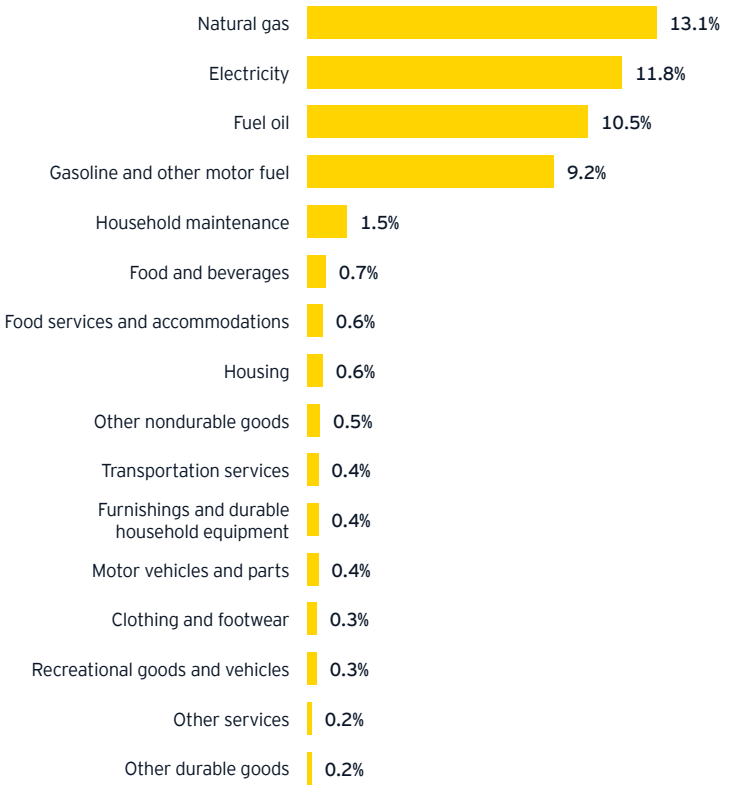
Consumer prices

Ultimately, businesses need to understand how a carbon tax would apply to their specific situations, as well as those of their employees, competitors and consumers. An increase in consumer prices could affect purchasing power, which could have larger effects on the economy. How policymakers discuss these consumer impacts may affect popular perceptions about carbon tax proposals and those proposals' chances of enactment.

As is shown in Figure 8, the largest consumer price increases from a carbon tax are estimated to be in the categories of natural gas (13.1%), electricity (11.8%), fuel oil (10.5%), and gasoline and other motor fuel (9.2%).

Figure 8. Estimated impact of carbon tax on consumer prices

$25/ton carbon tax



Note: Consumer goods included cover all consumer spending in the United States. Consumer spending categories are based on the U.S. Bureau of Economic Analysis' personal consumption expenditure categories. The modeling assumes that the full cost of the carbon tax will be passed on as higher consumer prices. However, to some extent the burden of the carbon tax may fall on labor (via lower wages) and capital (via reduced profits). Figures are rounded.

Source: EY analysis.

Conclusion

Climate policy continues to be a focus of attention in public debate, in Congress and on the presidential campaign trail. As proposals evolve and more legislators develop or sign onto plans that may involve carbon taxes, businesses need to pay attention and determine what such policies would mean for their industries, companies, competitors and consumers. They should be cognizant of whether a carbon tax proposal grants particular industries or mitigation technologies assistance, free allowances or exemptions, as well as how the revenue raised from a carbon tax would be used.

Financial modeling can help determine a company's CO_2 emissions to better measure direct impacts, as well as the more elusive indirect impacts that companies might not readily anticipate. This indirect impact may be harder to quantify and manage without engaging in more company-specific modeling and scenario planning, as there can be a great degree of variation from company to company within an industry depending on specific circumstances.

About these estimates

This analysis was conducted using an input-output (IO) model similar to one constructed by the Congressional Budget Office.[4] An IO model is a quantitative economic model representing the interdependencies of different sectors in the economy. The model shows how the output of one industry may become an input to another through an interindustry matrix. This shows how dependent each industry is on the outputs of other industries. The model assumes that production is characterized by fixed proportions of labor, capital and intermediate inputs and that a tax-induced cost increase is fully passed forward in prices.

To determine the impact of a carbon tax by industry, this analysis relied on data from the EIA on emissions by type and source. These data were mapped to U.S. Bureau of Economic Analysis (BEA) defined industries at a detailed level and distributed with data on the degree to which each industry uses the source emission product in its production process. This mapping provided an estimate of total emissions by industry, which was then used to estimate an effective tax rate per dollar of industry output. These effective tax rates were applied to the IO framework. This resulted in an estimate of the direct, indirect and total production cost increase by industry. BEA also provides data on mapping industry production to consumer good categories. These data were used to map the estimated industry production cost increases to BEA consumer good categories.

[4] See Congressional Budget Office, *Input-Output Model Analysis: Pricing Carbon Dioxide Emissions: Working Paper 2010-04*, June 2010.

Appendix: a comparison of US federal carbon tax legislation (as of January 2020)

	Introduced	Sponsor(s)	Initial price	Annual increase	2030 rate (in 2019 $)	Emissions reduction*	Border adjustments	Use of revenue	Regulatory rollback
Market Choice Act of 2019 (H.R. 4520)	Reintroduced September 2019	Reps. Brian Fitzpatrick (R-PA), Francis Rooney (R-FL), Scott Peters (D-CA), Salud Carbajal (D-CA)	$35 per tCO_2e*	5.0% plus inflation ($4 biennially if targets are not met)	~$54/$tCO_2e$	42% in the first 10 years	Yes	70% to Highway Trust Fund, 30% to energy assistance, adaptation, R&D	12-year moratorium on Clean Air Act regulations***
America Wins Act (H.R. 4142)	August 2019	Rep. John Larson (D-CT)	$52 per tCO_2e	6% plus inflation	~$90/$tCO_2e$	80% by 2050	Yes	$1.2 trillion infrastructure investment; $70 billion clean energy transition assistance for workers and communities; $900 billion offset of higher energy costs for low-income Americans	Not specified
Raise Wages, Cut Carbon Act of 2019 (H.R. 3966)	July 2019	Reps. Dan Lipinski (D-IL) and Rooney (R-FL)	$40 per tCO_2e	2.5% plus inflation	~$48/$tCO_2e$	80%	Yes	94% payroll tax credits and Social Security payments; 5% Low-Income Home Energy Program; 1% Weatherization Assistance Program	Moratorium on Clean Air Act regulations through 2030**
Stemming Warming and Augmenting Pay Act (H.R. 4058)	July 2019	Reps. Rooney (R-FL) and Lipinski (D-IL)	$30 per tCO_2e	5% plus inflation ($3 biennially if targets are not met)	~$40/$tCO_2e$	42.8% by 2031	Yes	70% payroll tax reduction (~1% cut in rate); 10% payments to Social Security recipients; 20% offset of higher energy costs for low-income Americans and R&D	12-year moratorium on Clean Air Act regulations***
Climate Action Rebate Act of 2019 (S. 2284)	July 2019	Sens. Chris Coons (D-DE) and Dianne Feinstein (D-CA); Rep. Jimmy Panetta (D-CA)	$15 per tCO_2e	$15 ($30 if targets are not met)	~$165/$tCO_2e$	88% by 2050	Yes	70% monthly dividend to low- and middle-income Americans; 20% infrastructure investment; 5% R&D; 5% clean energy transition assistance for workers and communities	Not specified
American Opportunity Carbon Fee Act (S. 1128)	Reintroduced April 2019	Sens. Sheldon Whitehouse (D-RI) and Brian Schatz (D-HI), Martin Heinrich (D-NM) and Kirsten Gillibrand (D-NY)	$52 per tCO_2e	Inflation (plus 6% if targets are not met)	~$90/$tCO_2e$	80% by 2050	Yes	Refundable tax credits and payments to Social Security recipients and veterans, and $10 billion annually in energy transition assistance	Not specified
Energy Innovation and Carbon Dividend Act (H.R. 763)	Reintroduced January 2019 (House) December 2018 (Senate)	Reps. Ted Deutch (D-FL) and Rooney (R-FL); Sens. Coons (D-DE) and Jeff Flake (R-AZ)	$15 per tCO_2e	$10 ($15 if targets are not met)	~$100/ tCO_2e	80% by 2050	Yes	100% Carbon Dividend Trust Fund	Moratorium on Clean Air Act regulations through 2030**

Key:

* Tons of carbon dioxide equivalents

** Before 2030, the United States Environmental Protection Agency (EPA) can suspend the moratorium if cumulative emissions are higher than what would have occurred had the regulations not been suspended.

*** In 2024 and 2028, the EPA can suspend the moratorium if emissions targets are not met.

Ernst & Young LLP contacts:

Cathy Koch
Americas Tax Policy Leader
cathy.koch@ey.com

Brandon Pizzola
Senior Manager
Quantitative Economics and Statistics (QUEST)
brandon.pizzola@ey.com

Nick Hallmark
Senior
Quantitative Economics and Statistics (QUEST)
nick.g.hallmark@ey.com

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