# The economic and industry impact of protectionism tariffs on the off-highway equipment sector

**IHS Markit Economics and Country Risk**

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# Contributors

**John Anton,** Associate Director, Economics and Country Risk
Iron and Steel
+1 202 481-9231, John.Anton@ihsmarkit.com

**Michael Boldin,** Associate Director, Economics and Country Risk
Macroeconomic
+1 215 789-7469, Michael.Boldin@ihsmarkit.com

**Scott Hazelton,** Director, Economics and Country Risk
Machinery and Equipment
+1 781 301-9044, Scott.Hazelton@ihsmarkit.com

**John Mothersole,** Director, Economics and Country Risk
Aluminum
+1 202 481-9227, John.Mothersole@ihsmarkit.com

**Stewart Ramsey,** Associate Director, Economics and Country Risk
Agriculture
+1 215 789-7448, Stewart.Ramsey@ihsmarkit.com

**Yacine Rouimi,** Senior Economist, Economics and Country Risk
Macroeconomic and Modelling
+3 317 676-0070, Yacine.Rouimi@ihsmarkit.com

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# The economic and industry impact of protectionism tariffs

This independent report, commissioned by the Association of Equipment Manufacturers (AEM), estimates the impact of recently imposed tariffs on imports of iron, steel, and aluminum from all countries—except Argentina, Brazil, and South Korea, which avoided tariffs by voluntarily accepting restrictive quotas. In addition, China faces tariffs on a broader range of goods. The analysis ascertains the effects of the Trump administration's Section 232 and Section 301 tariffs that are collectively referred to as "protectionism." The analysis also evaluates the pre-tariff versus post-tariff cost of production of off-highway equipment, agricultural production, and construction activity based on the effects on prices of key raw materials and intermediate inputs. In addition, the report discusses the effects of potential retaliatory tariffs on US farm exports.

## Key findings

- Placing tariffs on approximately $265 billion of imports will hurt the US economy, largely from the direct effect of higher prices, yielding average lost GDP of $29 billion per year for 10 years.
- The effect on employment is negative; the tariffs suppress domestic job gains by 260,000 over 10 years.
- GDP growth will remain on an upward trajectory, albeit negatively impacted by as much as -0.2% on a year-on-year basis over the next two years.
- Consumers will pay higher prices and reduce their real spending by $23 billion per year throughout the forecast horizon (ending in 2027).
- Price increases for steel-, iron-, and aluminum-based inputs in the supply chain will have a negative impact on many downstream industries.
- Output from the machinery and equipment, computer and electronics, and electrical equipment sectors will experience the largest hits.
- Retaliatory tariffs depress US crop prices, especially soybeans, which constrains farm income and agricultural equipment sales.
- The indirect damage on global demand will particularly hurt US companies that rely on a growing export market.
- The tariffs will increase the costs of producing agricultural and construction equipment by 6%; with its higher steel-related product content, the costs of producing mining equipment will increase by 7%. Total loss in employment related to diminished output of all off-highway equipment is projected to end the forecast period with a loss of 20,700 jobs.

## Objective of the report

The main objective of this report is to quantify the effects and risks of the Trump Administration's tariffs on imports of iron, steel, and other metals; and additional tariffs that target a broader set of goods from China.

We consider the impact of these tariffs on the US macroeconomy and its industrial sectors—including direct and spillover effects that will be felt throughout the global economy. The explicit goals of the analysis are to quantify how US imports will fall; predict how import, export, and consumer prices will change; and assess the overall effects on US GDP, employment, and the general economy. The analysis indicates that domestic producers will be able to increase production only when they have the capacity and materials to provide either exact or close substitutes to the tariffed imports. In addition, a broad set of producer and consumer prices are likely to rise by a fraction of the tariffs, with the largest increases for intermediate and supply-chain products where domestic demand will continue to exceed domestic supply.

A rigorous analysis of the impacts of the tariffs will help AEM and other key stakeholders to better communicate the effects of tariffs on the overall health of the US economy and the industries that will be significantly impacted by direct and indirect effects.



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## Background

In March 2018, the Trump Administration invoked Section 232 of the Trade Expansion Act of 1962 (Section 232). These tariffs are based on a US law that allows the president to impose restrictions on imports for reasons of national security. The President imposed 25% tariffs on steel and 10% tariffs on aluminum on every country in the world except three—Argentina, Brazil, and South Korea—which voluntarily accepted quotas rather than tariffs. The three quota countries mostly ship energy grade steel to the United States, so this analysis will focus upon tariffs rather than quotas.

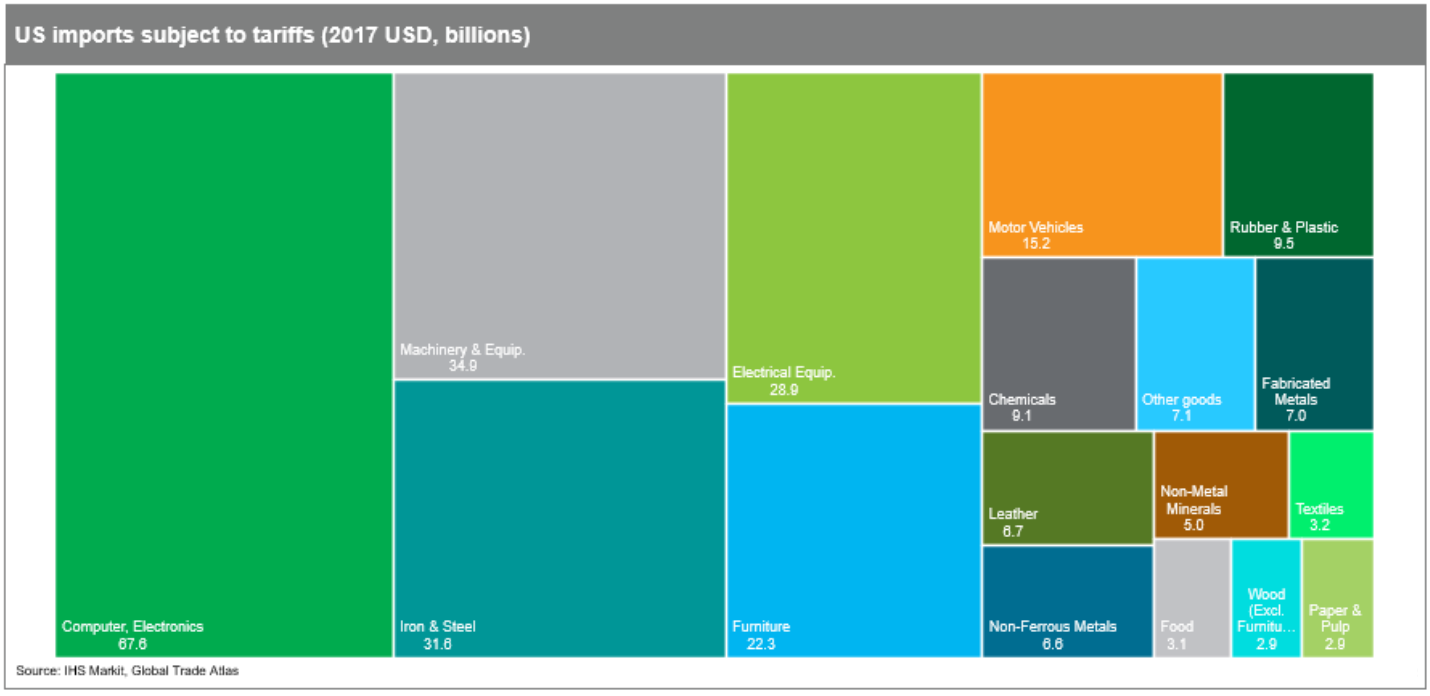
Throughout the first half of 2018, the President also announced tariffs on various import goods from China; such as solar panels, washing machines, computer and electronic equipment, as well as iron and steel. These tariffs are being enacted in three phases (under Section 301 of the Trade Act of 1974) on the basis of allegations and findings of unfair practices by the Chinese government that could harm US intellectual property rights, innovation, or technological development. More than one-half of targeted imports involve computer, electronics, electrical equipment, and machinery. Tariffs on computer and electronic equipment from China were imposed at a 25% rate in mid-2018 on two lists of imports, while a third list with a larger volume of imports incurred 10% tariffs in late-September 2018. All of the Section 301 tariffs were slated to be set at 25% in 2019, but the 10% rate has been extended for the third listwhile negotiations continue.

The largest impact of the new tariffs is on US-China trade, which is currently worth more than $650 billion, making this the largest global trading relationship between two countries. We estimate the Section 232 tariffs will impact $236 billion in imported Chinese goods, and an additional $29 billion of iron, steel, and aluminum imports from other countries. The total imports labeled "steel protectionism" equal $38 billion after combining the imports covered by Section 232 with the imports on iron, steel, and other raw metals from China under Section 301.

## Methodology

Results were computed using the IHS Markit Global Link Macro-Industry Model (GLM-IM) that is well suited to assess the macroeconomic and sectoral impacts of tariffs of this type. The GLM-IM is a quarterly econometric model describing the macroeconomic, financial, and sectoral dynamics of 68 countries and 57 industry and service sectors. It integrates the IHS Markit original Global Link Model (GLM) with an industry module that is consistent with our World Industry Service framework. The model is structured in a way so it can be used in top-down (macroeconomy to industry) and bottom-up (industry to macroeconomy) simulations.

The industry module of the GLM-IM explicitly accounts for the unique industry structure of each territory, using



the latest available national input-output table. For each sector, the model addresses factors including production, value added, exports, imports, fixed capital investment, operating purchases of inputs and supplies, employment, compensation, gross output price, price of value added, and current operating profits. The GLM-IM also considers the geographic orientation of trade by sector, utilizing bilateral trade shares from the IHS Markit World Trade Service. Knowing the source of US imports by sector is key to assessing how world trade will be affected by a US import tariff on any specific product group.

The model was first run to produce baseline results that assume the new tariffs were not enacted. The second run—the tariff scenario—added two sets of shocks:

- Import dimension: US demand for imports of the targeted products is reduced because of the direct effect of the tariffs on import prices. Import price elasticities are used for each product category to capture the effect, based on the existing research and IHS Markit industry experts.
- Price dimension: Prices in the US are increased because of tariff-induced inflation on foreign prices, and because domestic producers can more freely adjust their prices upward, introducing increased costs across various industrial sectors. These shocks are based on the size of the tariff and the relative share of goods subject to the tariff (i.e., imports as a percentage of total purchases for each product category), with adjustments that depend on the competitive environment of each affected industry.

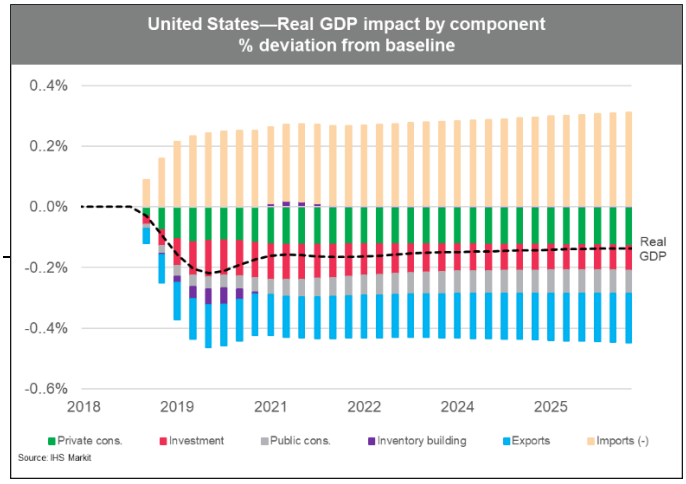
In order to most cleanly capture the combined effects of tariffs on imports of iron, steel, and other metals from many countries—as well as tariffs on general goods from China—it was assumed that all tariffs start in the first quarter of 2019. This assumption, albeit slightly different than the exact timing of tariff implementation, makes it easier to trace the direct, short-run effects of the tariffs with negligible implications on the estimates of the long-run effects.

Spillover effects from both types of shocks previously mentioned produce many indirect and induced effects. The model measures the loss of exports by all countries, producing a feed-through mechanism on world income and trade. The model also includes price markups by domestic producers that translate higher costs for inputs to higher final prices. In addition, it handles how increases in US prices and changes in industry output and national income affect the domestic and world economies. In the end, the underlying assumptions and shocks for the tariff scenario yield changes in the relative prices of imports that carry over to all parts of the model—affecting worldwide trade and potentially affecting the output of all industrial sectors of the US economy (beyond those that purchases the tariffed goods).

## US macroeconomic impact

The impact on total US economic output is negative, rising to a high of 0.22% of GDP in 2020. Limiting the effects to tariffs on steel and other metal products (including goods from China in this category), the impact is much smaller, peaking at approximately 0.1% of GDP in 2020; these goods are about one-seventh of the total tariffed goods, but have a higher proportional impact on the domestic economy.

The following figure provides an estimate of the incremental effects of the full set of tariffs on US real GDP through 2027, measured as a percent deviation from the baseline with the breakdown by major categories. We estimate a $22-billion (0.12%) incremental drop in the average level of real GDP in 2019 and a $31-billion (0.17%) incremental drop in 2020. Real GDP growth will be dampened by 0.12% in 2019 and 0.20% in 2020. While the negative effects on output will fall after 2020, the average annual loss will be $29.3 billion through the next 10 years.



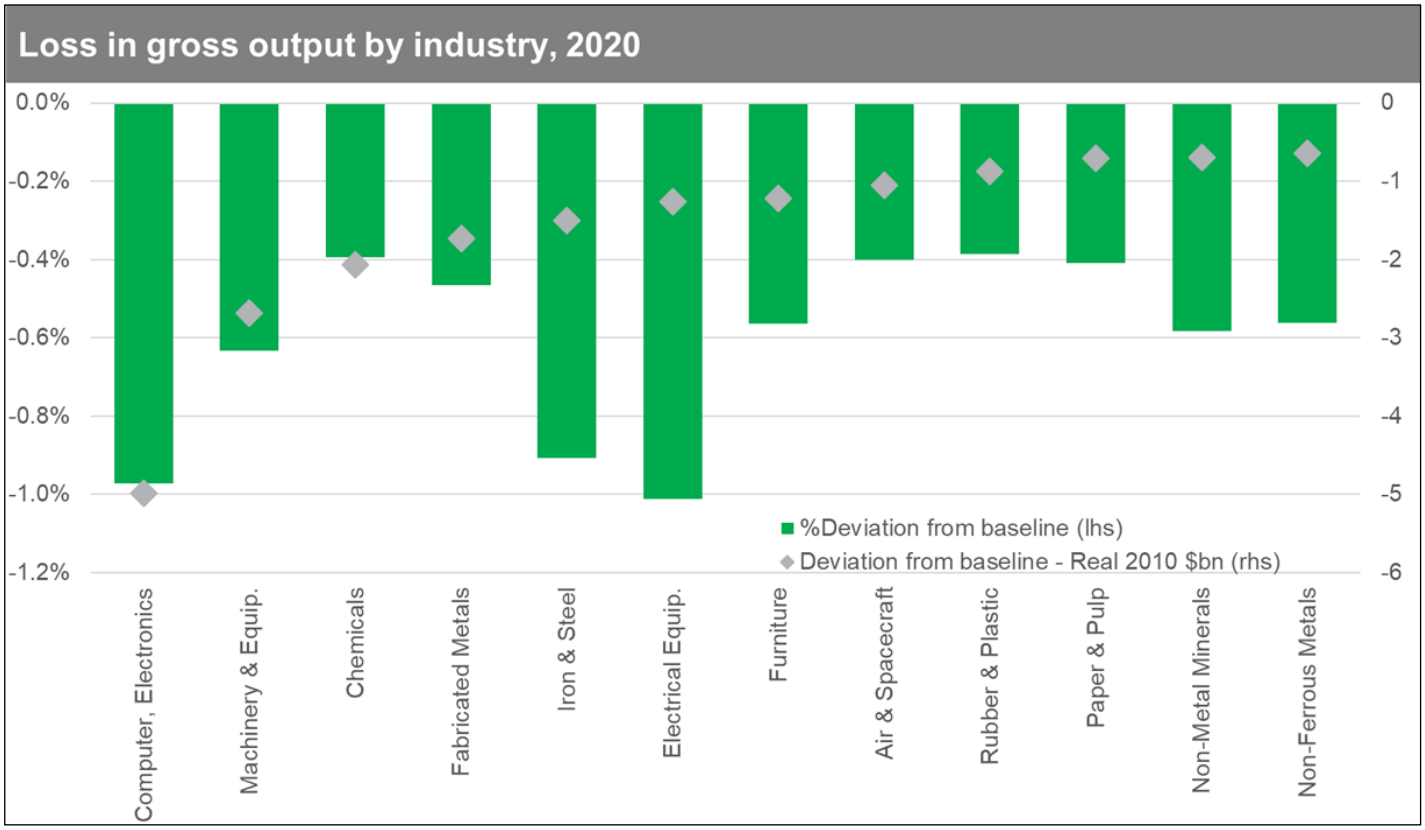
The tariffs will decrease real consumer spending by $21 billion in 2020 and lead to an average annual loss of $23 billion over the entire 10-year forecast period. The loss in consumer spending is largely due to higher prices for consumer goods affected by the tariffs and additional indirect effects on the US and world economy. The effect on consumer price index (CPI) inflation will peak at 0.6% (annualized), but be short-lived.

The US balance of trade will improve throughout the forecast horizon due to the negative effect of the tariffs on imports. Net exports will rise $14 billion in 2019 and $21 billion in 2020. The positive contribution from net exports is significantly less than the projected decline for imports, as US exports will also be negatively impacted by higher prices from US-produced goods that use the tariffed items and a dampening of worldwide demand (including a negative effect on China and other economies). Over time, we expect the combined direct and indirect effects of the tariffs on imports to build and lower total imports by an average of $52 billion over 10 years. However, negative effects on exports will continue to partially offset the reduced imports, such that the incremental contribution of net exports to GDP will average $28.0 billion over 10 years.

The effects on US business investment and public spending will be negative, but are relatively small in the short run. A long-run negative effect on these components of GDP is expected, owing to lower domestic incomes and lower long-run demand. The effects on employment will be noticeable, suppressing job growth by more than 260,000 over 10 years.

## Aggregate industry impacts

The figure shows the tariffs will have differential effects on individual US industries. (Note that the chart is based on gross output concepts, as opposed to the net value-added concepts that are used to compute GDP.) Sectors such as computer and electronics, electrical equipment, and iron and steel will be directly impacted and feel the largest negative effects. The chemicals, machinery and equipment, and motor vehicles sectors will be hurt by a dampening of US export growth. The losses in other sectors will be primarily due to higher costs for technology-oriented and metal inputs, and an overall drop in aggregate domestic demand.



## Detailed industry analysis

The effects of the tariffs on market prices for iron, steel, and aluminum will hit some sectors of the domestic economy in specific and direct ways. While metal producers are enjoying higher prices, US equipment manufacturers must either lose market share when they pass on the higher material costs or see their margins squeezed. This predicament is especially significant for makers of off-highway equipment. In addition, farm income is dampened by retaliatory tariffs on US agricultural exports to China.

### Aluminum

While the Section 232 tariffs were designed to address a perceived national security threat to the US steel and aluminum industries posed by imports, the imposition of the tariffs does very little to improve the long-term position of aluminum producers. Moreover, when the impacts on the larger and higher value-added downstream segment of the industry are considered, there is a negative effect on the broader aluminum industry (in terms of both output and employment).

For the US aluminum industry, the 10% tariff on imports of primary ingot, mill products, castings and forgings has pushed up prices. But the benefit has been confined to primary aluminum producers. Because there is no certainty about how long the tariffs will remain in place, higher prices have generated only a limited increase in primary production while imposing sizeable cost increases on the rest of the industry.

To date, restarted primary aluminum capacity has amounted to less than 275,000 metric tons of the 1.9 million metric tons idle. Announced restarts will eventually lift the industry's capacity utilization rate from just under 37% in 2017 to around 55% by the end of 2020, well short of the Trump Administration's proclaimed target of 80%.

The primary segment of the industry, including rolling mills, extruders, forge shops, and casters, are facing sizeable cost increases because of the Section 232 tariffs. Additionally, the Section 301 tariffs are making equipment purchases from China more expensive. It is estimated, for instance, that roughly 30% of US die-casters source tooling and other equipment from China. Finally, the exclusion process, whereby producers can petition the Commerce Department for relief from both Section 232 and 301 tariffs, injects a degree of uncertainty into the competitive landscape and therefore into business planning, which results in investment constraints.

Direct price effects highlight the predicament of the broader industry. US price differentials can be measured by tracking regional aluminum premiums for P1020 ingot. Worldwide, the London Metal Exchange (LME) price serves as the global reference. However, regionally, actual transaction prices are the sum of the LME price, logistics charges, and other factors tied to local market conditions—such as taxes or tariffs. The difference between the LME price and these regional prices (the regional premiums) can be used to show the disadvantage facing the downstream segments of the US aluminum industry.

The US Midwest delivery premium has more than doubled since 232 tariffs were imposed in the first quarter of 2018, jumping from roughly 10 cents per pound (cents/lb) in late 2017 to just under 20 cents/lb in late-2018. In contrast, premiums in Europe rose only slightly from 2017 levels and then fell, while by the end of 2018 Japanese premiums were below their average level in 2017.

Because the elevated US premium represents a higher cost profile for downstream aluminum producers, it offsets the advantage these producers receive from the aluminum tariffs on downstream aluminum products. Moreover, competitive pressures in these downstream product categories has meant that producers have not been able to raise prices to the full extent to compensate for the tariffs. Thus, the wide cost differential upstream

**Table 1: P1020 Ingot regional premiums, cents/lb**

| | US | Europe | Japan |
|---|---|---|---|
| Q1 2017 | 10.0 | 6.7 | 4.9 |
| Q2 2017 | 9.5 | 6.8 | 5.3 |
| Q3 2017 | 9.3 | 6.7 | 4.6 |
| Q4 2017 | 9.7 | 7.1 | 4.7 |
| Q1 2018 | 13.9 | 7.8 | 5.2 |
| Q2 2018 | 18.9 | 8.8 | 6.0 |
| Q3 2018 | 19.6 | 8.2 | 4.4 |
| Q4 2018 | 19.5 | 6.1 | 3.4 |

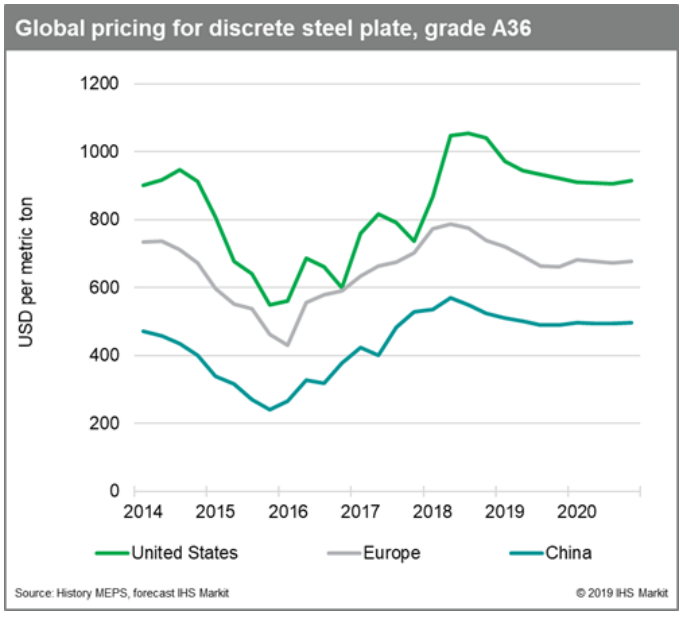
Source: CME

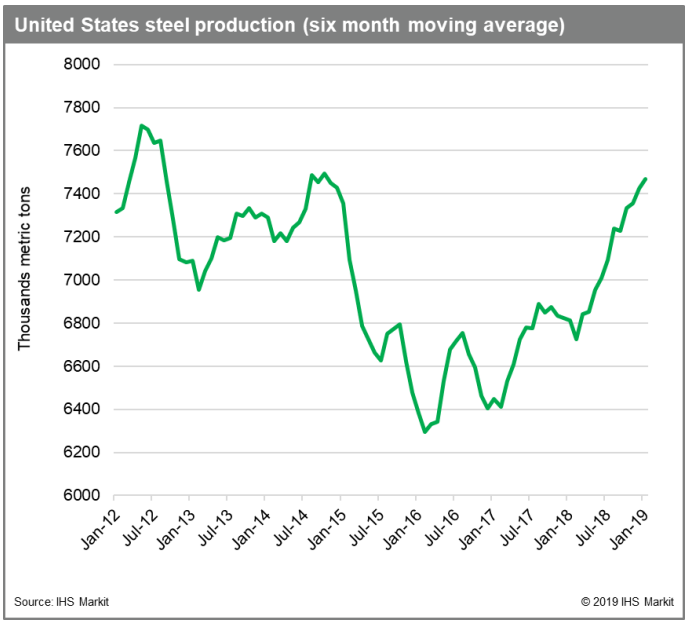
has resulted in a degree of margin compression—downstream industry segments find themselves worse off than before the imposition of the tariffs.

## Iron and steel

The price of steel has moved to extraordinary levels, and buyers in the United States face major competitive disadvantages when negotiating with sellers and when competing against foreign fabricators and manufacturers. For relative cost analysis, Europe is useful for comparison, as it is similar to the US in terms of labor costs, technology, and facilities age. During 2013–2017, hot rolled carbon sheet averaged roughly 11% more per metric ton in the US than in Europe; however, in 2018 the US-Europe premium surged to almost 50%.

Prior to the expiration of the exemption from the tariffs for key trading partners such as Mexico, Canada, and the European Union and the imposition of the Section 232 tariffs, the volume of steel imports peaked in early 2018 at 3.4 million metric tons. Imports of semi-finished blooms, billets, and slab have since decreased, although imports of hot rolled sheet and coiled plate have increased (22% and 16% year to date, respectively, through November 2018) as domestic prices rose by more than the 25% tariffs. Steel imports from Canada, the United States' largest foreign source, have increased by just under 5% and from Mexico by 16% (year-to-date through November 2018), while imports of pig iron from Russia and the Ukraine rose by double digits compared to 2017.




Domestic production has picked up and is close to 2014 levels. Nonetheless, some producers have been slow to bring idled capacity back online. Lead times were extended throughout the first half of the year, as buyers rushed to place orders over the summer months. For most products, lead times are back to normal levels. Capacity utilization has reached the 80% mark with large differences in different types of mills. Electric arc furnace mills are operating at exceptionally high utilization rates and have little room to increase production. Blast furnaces have been slower to ramp up and represent the bulk of future supply growth that is available.

An important feature of the Section 232 tariffs is that they are not placed on fabrications made from steel. Thus, it is not applied to a stamping made in Germany, which already had an advantage on steel costs. Assuming that steel is 30% of the input cost, a German product started with a 4% lower cost of production. In 2018, that advantage swelled to 16%.

US fabricators and manufacturers have struggled to compete with foreign products prior to Section 232. Now they face a conundrum: pass on the input costs and lose their customer base to imports, or eat the input cost increase and lose money on each item. In either case, the continued viability of US manufacturing is uncertain. It must also be noted that the United States is a major exporter of machinery. In any given year, the US has exported about 40% of construction machinery. With the increase in steel costs, these export markets are at a severe disadvantage. If countries that buy US made equipment

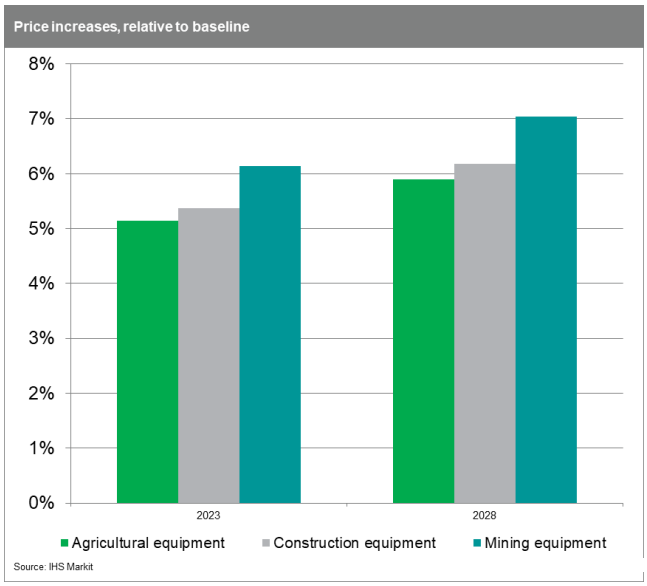
start to retaliate with protectionism of their own, the situation will become even more grave.

## Off-highway equipment

The primary impact of tariffs on the production cost of off-highway equipment is through the transmission of steel price increases, thereby raising producer costs and prices for purchasers, and lowering demand. To assess the effects, IHS Markit utilized the Bureau of Economic Analysis US Input-Output Use Table (BEA Use Table) to gauge the relative importance of steel-related inputs into the production processes of off-highway equipment manufacturers. This table indicates that direct purchases from iron and steel mills represent 13.4% of intermediate materials in the manufacturing of agricultural equipment. Equivalent figures for the manufacture of construction and mining equipment are 14.3% and 18.0% respectively. Steel also enters the off-highway equipment supply chain via other components with steel content, such as valves, bearings, hardware, and fittings. Accounting for all inputs, the steel related content of the total is 18.5% for agricultural equipment, 22.3% for construction equipment, and 25.8% for mining equipment.

Most of the higher cost of direct steel purchases will be passed through to off-highway equipment producers. However, the price impact on steel-related products is muted significantly before being absorbed by producers. First, the steel-related products are not exclusively, or even mostly, composed of steel as a fraction of their intermediate materials. Additionally, these are typically fabricated metal components, which are not subject to tariffs.

Price increases for key inputs from the tariff economic analysis were applied to the shares of these inputs into off-highway equipment production. The results indicate a broad price increase in off-highway equipment prices in the 5–7% range. The steepest impacts occur in the early years of the outlook with the introduction of the tariffs, but increase slightly over time as cost pressures pervade through the economy. There is a near-term price spike of 4–5% as tariffs are implemented with a further increase of roughly 100 basis points in the second year—as pre-tariff inventory is exhausted and the tariffs impact the supply chain more completely. By the end of the analysis period, the tariffs will cause costs of production to increase by 6% for agricultural and construction equipment; with its higher steel-related product content, mining equipment production costs rise by 7%.




Capital equipment expenditures are driven by a wide variety of factors that extend beyond the effects of fluctuations in input costs. Market forces, competitive considerations, strategic planning, and other factors all have a significant impact on prices, output, and employment in each individual sector. The impacts shown in the following table are based solely on the direct effects of the tariffs on equipment prices as final products. To determine the full impact on domestic production and employment, we derived and traced a larger set of direct and indirect effects. This analysis is based on a prior study by IHS Markit for AEM to define and quantify the size of the US off-highway equipment industry. Building off that study, the employment impacts of the resulting loss in output can be quantified for the companies directly

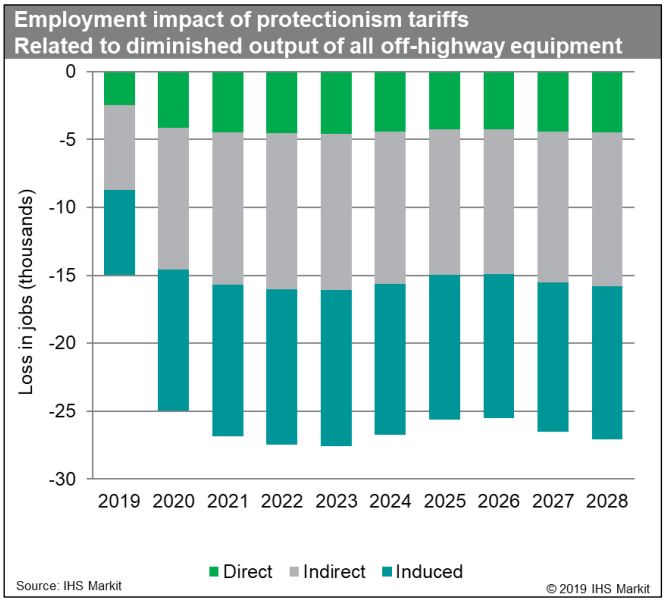


**Table 2: Employment impact of protectionism tariffs, related to diminished output of off-highway equipment**

Difference in employment relative to baseline (thousands)

| | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mining equipment -- Direct | -0.6 | -0.8 | -0.9 | -0.9 | -0.9 | -1.0 | -1.0 | -1.0 | -1.0 | -1.0 | -0.9 |
| Indirect | -1.6 | -2.3 | -2.5 | -2.6 | -2.6 | -2.6 | -2.7 | -2.7 | -2.8 | -2.8 | -2.5 |
| Induced | -1.5 | -2.3 | -2.5 | -2.6 | -2.6 | -2.6 | -2.6 | -2.7 | -2.8 | -2.8 | -2.5 |
| Total | -3.7 | -5.5 | -6.0 | -6.1 | -6.1 | -6.2 | -6.3 | -6.4 | -6.6 | -6.6 | -5.9 |
| Construction equipment -- Direct | -0.4 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.7 | -0.7 | -0.7 | -0.6 |
| Indirect | -1.4 | -2.1 | -2.1 | -2.1 | -2.1 | -2.1 | -2.1 | -2.2 | -2.2 | -2.2 | -2.1 |
| Induced | -1.3 | -2.0 | -2.0 | -2.0 | -2.0 | -2.0 | -2.0 | -2.1 | -2.1 | -2.1 | -1.9 |
| Total | -3.1 | -4.7 | -4.8 | -4.7 | -4.7 | -4.7 | -4.8 | -4.9 | -5.0 | -5.0 | -4.6 |
| Agriculture equipment -- Direct | -0.4 | -0.5 | -0.6 | -0.5 | -0.5 | -0.5 | -0.5 | -0.5 | -0.6 | -0.6 | -0.5 |
| Indirect | -0.9 | -1.3 | -1.4 | -1.3 | -1.3 | -1.3 | -1.3 | -1.4 | -1.4 | -1.4 | -1.3 |
| Induced | -0.8 | -1.3 | -1.3 | -1.3 | -1.2 | -1.2 | -1.3 | -1.3 | -1.3 | -1.3 | -1.2 |
| Total | -2.1 | -3.1 | -3.3 | -3.1 | -3.0 | -3.1 | -3.1 | -3.2 | -3.3 | -3.3 | -3.1 |
| Other -- Direct | -0.8 | -1.2 | -1.2 | -1.2 | -1.1 | -1.1 | -1.1 | -1.2 | -1.2 | -1.2 | -1.1 |
| Indirect | -1.5 | -2.3 | -2.3 | -2.2 | -2.2 | -2.2 | -2.2 | -2.2 | -2.3 | -2.3 | -2.2 |
| Induced | -1.6 | -2.5 | -2.5 | -2.4 | -2.3 | -2.3 | -2.3 | -2.4 | -2.4 | -2.4 | -2.3 |
| Total | -3.9 | -5.9 | -6.0 | -5.8 | -5.6 | -5.6 | -5.7 | -5.8 | -5.8 | -5.9 | -5.6 |
| **All Categories -- Total** | **-12.7** | **-19.3** | **-20.1** | **-19.8** | **-19.4** | **-19.5** | **-19.8** | **-20.3** | **-20.6** | **-20.8** | **-19.2** |

Notes: The chart on page 10 shows the totals for the three main equipment categories (mining, construction, agriculture) and the 'Other' category.

The annual values are in level form and reflect cumulative job losses through that year. The 'Average' column reflects the average suppression in jobs gains on a per year basis.

Source: IHS Markit



involved in the production of off-highway equipment, the indirect impact of the industry through their supply chain, and the induced economic impact achieved by the direct and indirect activities.

Table 2 shows that the total, cumulative loss in employment related to diminished output of all off-highway equipment is projected to reach 20,100 in 2021 and end the forecast period at a loss of 20,800 jobs. The largest loss is related to mining equipment (down 6,600 thousand in 2028). All categories of off-highway equipment manufacturing generate a significant employment multiplier effect, so while the direct industry employment at risk may be modest, the 6:1 employment multiplier effect generated by the industry's activity results in a total employment impact that is much greater and reaches into nearly every industry across the country.

## Agriculture

The US agriculture sector is feeling the negative effects of the retaliation on US soybeans and other exports into China. Over 60% of US soybeans production is exported as whole beans or processed soybean product, and China had been purchasing about 60% of these exports. China is also the predominant destination for US sorghum, accounting for over 80% of all US sorghum exports.

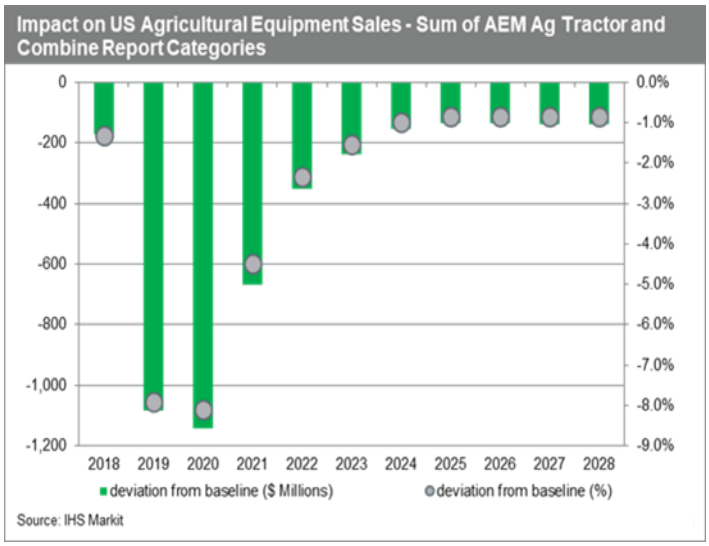
The scenario results outlined in the following chart assume that both US and China-imposed tariffs are maintained during the forecast horizon (through 2028). From a big-picture standpoint, there is significant near-term disruption to both commodity prices and US agricultural trade volume. Over time, the demand for and the makeup of our exports will realign, but leave the agriculture sector with an inefficient flow of exports. The cost of the tariffs is seen in lower commodity prices and reduced US Farm income. In addition, the US share of world soybean trade will fall as other nations, such as Brazil, gain market share.

The most severe impact is a dive in soybean prices, of nearly $2.00 per bushel in 2019. Eventually, US farmers will realign planted areas to reflect the loss in trade, the adjusted supply/demand balance, and the gap between the continued tariff scenario case, and the baseline will decline to $0.14 per bushel. Given that China is expected to maintain the magnitude of its soybean import volume from the world, it will continue to source soybeans from the US, but at levels significantly below pre-tariff

conditions. While China imports the vast majority of all US sorghum exports, the impact on the US agriculture sector will be less significant due to its limited scale. The value of the US sorghum crop is less than 3% of the value of the US soybean crop.

US Farm income will suffer significant impact from retaliation by China. The annual impact on crop receipts will primarily be felt in the grain sector, which is projected to be hit by a negative impact of roughly $13 billion in 2019 and 2020, tapering to $1.3 billion in 2025. Net cash income will see significant reductions relative to the baseline in 2019–2022, peaking at a loss of $10 billion (9% in 2020) before leveling off at about $1.2 billion below the baseline.

Sales of agricultural equipment will see a significant adverse impact over the next three years. The equipment categories will be impacted the most, as their economic drivers are tied to grain production. Thus, combine sales will take the largest hit relative to the baseline, with a projected loss of 15% in 2019 and 2020 for this category. Sales of large 4-wheel drive, articulated tractors will drop nearly as much, contracting nearly 12% in 2019 and 2020. On the other end of the scale, sales of under–40 horsepower tractors (not used in grain production nor typical commercial agriculture) will be relatively immune. To yield a big picture impact, we applied projected losses to constant dollar weights for five major equipment categories. The results yield an annual effect of roughly $1.1 billion (roughly 8%) in lost sales in 2019 and 2020. Over the next decade, the losses in agricultural equipment sales will swell to over $4 billion.




## Construction

Construction activity will be negatively impacted as the higher cost of steel feeds through the supply chain and increased construction costs. Initially, some of these increased costs will be absorbed by contractors and subcontractors, depending upon whether the contract allows for pass through of cost escalation or whether it falls into a contingency budget. As new projects commence, most of the higher steel cost will be passed through to the eventual building owner and decrease the demand for construction.

Unlike off-highway equipment, very little steel is purchased directly from steel mills by the construction industry. The BEA Use Table indicates that direct steel purchases represent only 0.5% of intermediate goods used by construction. The steel products that are most commonly associated with construction (such as rebar, beams, and girders) are fabricated metal products. These types of steel-derived components comprise about 15% of construction intermediate goods. The BEA Use Table also shows the use of equipment rental by the construction industry, which makes up 2.5% of construction intermediate materials.

The tariff analysis indicates that these factors will contribute to construction price increases as high as 1.5% relative to the baseline by 2028. Such a small price impact, even when combined with other changes in the economy, will drop real construction output by a modest 0.15% in 2019, with a 0.34% drop relative to baseline by 2028.

The level of detail in the models for economic analysis confine the construction impact to the total industry. However, the BEA Use Table offers additional detail to consider how infrastructure spending would fare. Since the main transmission of tariffs into construction is through steel-related intermediate materials, we can examine the relative composition of these materials between the broad construction industry and infrastructure detail.

As noted above, direct steel purchases are about 0.5% of total construction. They remain small for infrastructure, ranging from 0.16% in road transportation to 0.66% in power and communication structures. However, when the cost impacts for direct steel, steel-related products, and equipment is factored together, infrastructure absorbs about a 15% stronger impact from tariffs than general

construction, and this impact differential is relatively constant over time. We expect the impacts on both general construction and infrastructure development will peak in 2021, subsiding over the remainder of the outlook as the cost impact stabilizes, some material substitution occurs, and supply chains adjust.

While steel comprises a relatively small fraction of total infrastructure materials, it is profoundly important for certain segments, such as bridges, pipelines, municipal water systems and high-tension power transmission towers. As such, the tariff impact will not be felt uniformly over the infrastructure spectrum. While the impact on total infrastructure may be light, price increases are likely to make some projects financially less feasible, particularly in budget constrained state and municipal projects. This is particularly critical as given the need for energy transmission lines to link solar and wind farms to population centers, the need for pipelines to transport shale oil to refining centers and given the condition of the country's bridges.

The implications of steel tariffs in conjunction with Buy American regulations are project dependent. In general, the U.S. will produce more steel under tariffs. However, outright embargoes on steel from South Korea, Brazil and Argentina have created new steel demand, particularly in the energy sector and even more particularly for drill pipe. As U.S. manufactured steel is potentially sourced to the higher demand and higher margin energy industries, it has the potential to decrease availability and increase cost to construction and off-highway machinery industries.

## Conclusion

The IHS Markit Global Link Macro-Industry Model shows an unmistakable negative impact from the newly enacted tariffs on aluminum, iron, and steel imports and a broader set of goods from China. The direct, indirect, and induced effects will have a negative, but relatively small, effect on GDP growth in the next two years as the broader economy adjusts to tariffs as the status quo.

From an employment standpoint, the impact of the tariffs on the off-highway equipment manufacturing industry will significantly cut into the growth expected within the industry. Furthermore, off-highway equipment manufacturing generates a significant 6:1 employment multiplier effect, and the negative effect on this industry will reach into many other industries across the country.

The effect on the level of GDP will be long-lasting, even though the amount of goods that are subject to the tariff are a fraction of US imports and of world trade. While imports will decline, and thus incrementally boost GDP, the effect from higher US producer and consumer prices, as well as a negative impact on world trade, will more than offset any boost to the domestic economy from an improvement in the US balance of trade. One problem is that domestic and other global producers lack the capacity to fully replace the targeted imports, and many have already raised their prices in response to the tariffs. Sectors that rely on technology-oriented and metal inputs will surely pass on higher costs to consumers.