The Impact of Section 301 Tariffs on U.S. Vehicle Production and Sales: Evidence from HS6-Level Exposure and Dynamic Difference-in-Differences

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1 Abstract

This paper examines how the 2018–2019 U.S. Section 301 tariffs affected downstream outcomes in the commercial and light vehicle sectors. Using monthly data and an HS6-level import-weighted tariff exposure index, the analysis combines continuous-treatment difference-in-differences models with event-study specifications to trace the dynamic effects of tariff exposure on production and sales.

The results show that higher tariff exposure is associated with declines in production in both the commercial and light vehicle sectors, with effects that are economically meaningful and statistically precise in the preferred specification. By contrast, the effects on nominal vehicle sales differ across sectors: commercial vehicle sales increase with tariff exposure, while light vehicle sales also exhibit a positive response, though more modest in magnitude. In the preferred specification, tariff exposure is associated with a statistically significant decline in commercial vehicle production, while nominal sales exhibit a positive response across sectors.

Event-study evidence supports the identifying assumptions and indicates that these effects emerge after tariff implementation rather than reflecting pre-existing trends. Taken together, the findings suggest that tariffs imposed on upstream supply chains are associated with

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weaker downstream production outcomes, even as nominal sales measures may remain stable or increase.

More broadly, the results highlight the importance of supply-chain linkages and the distinction between real production and nominal sales when evaluating the effects of trade policy in complex manufacturing sectors.

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JEL Codes: F13, L62, C23, L16

2 Introduction

How do tariffs imposed on upstream supply chains affect downstream manufacturing activity? Recent trade policy interventions in the United States provide a natural setting to examine this question. Beginning in 2018, the United States implemented a sequence of tariffs under Section 301 of the Trade Act targeting a wide range of imports from China. These measures were intended to encourage domestic production and reduce reliance on foreign suppliers.[1] At the same time, because many of the targeted goods were intermediate inputs used by U.S. manufacturers, the tariffs also had the potential to raise production costs for downstream industries. Understanding how these competing forces affect domestic production and demand remains an important empirical question.

The motor vehicle sector provides a particularly informative environment in which to study these effects. Vehicle manufacturing is highly capital intensive and deeply integrated into global supply chains. U.S. producers rely on a wide array of imported components and intermediate inputs, many of which were directly affected by the Section 301 tariff lists. Changes in the cost of these inputs can therefore propagate through the production process and ultimately affect downstream outcomes such as vehicle production and sales. Because vehicle manufacturing represents a major component of U.S. industrial activity, these responses have broader implications for manufacturing performance and supply chain organization.

This paper studies the effects of the 2018–2019 Section 301 tariffs on downstream production and demand conditions in both the commercial and light vehicle sectors. The analysis combines monthly sector-level outcome data with a product-level tariff exposure index constructed using pre-tariff import weights at the HS6 level. This measure maps tariff coverage across

[1] This paper does not attempt to evaluate the broader strategic, legal, or geopolitical objectives of Section 301. Its focus is narrower: the downstream production and sales responses of the U.S. vehicle sector.

thousands of product categories into a continuous index of exposure relevant for the vehicle sector. The empirical strategy exploits cross-product variation in tariff exposure together with the staggered timing of tariff implementation across products. The baseline design uses a continuous-treatment difference-in-differences specification and complementary event-study models that trace the dynamic response of outcomes following tariff implementation.[2]

The results reveal substantial dynamic adjustment following tariff exposure. Event-study estimates show no evidence of differential pre-treatment trends between more and less exposed products. Domestic production increases modestly in the months immediately following tariff implementation, consistent with short-run adjustment, inventory management, or anticipatory behavior. These gains are not sustained. Production declines relative to less exposed products in the medium run, especially in the commercial vehicle sector. Sales-based demand proxies display more mixed responses: event-study estimates suggest short-run weakness, while difference-in-differences results for nominal sales are less consistent across specifications and sectors.

The paper contributes to the literature in three ways. First, it develops a high-frequency exposure measure that links tariff changes across thousands of traded products to downstream outcomes in the vehicle sector. Second, the empirical design traces dynamic responses to trade policy using event-study methods that allow treatment effects to evolve over time. Third, by jointly examining production and sales outcomes, the analysis provides a fuller picture of how tariffs propagate through downstream manufacturing markets and how nominal and real responses can diverge.

These findings contribute to a growing body of research examining the economic consequences of recent U.S. trade policy. More broadly, the results highlight the importance of supply chain linkages, adjustment frictions, and nominal-versus-real outcome distinctions when evaluating tariffs applied to intermediate inputs in complex manufacturing industries.

The remainder of the paper proceeds as follows. Section 2 reviews the related literature and provides institutional background on the Section 301 tariffs. Section 3 describes the data and empirical strategy. Section 4 presents the main empirical results. Section 5 discusses interpretation and implications. Section 6 concludes.

[2] The production and sales outcomes are observed at the sector-month level rather than the HS6-month level. In the estimation dataset, the same sector-level monthly outcome is assigned to all HS6 observations within the relevant sector and month, so identification comes from differences in tariff exposure across HS6 products interacted with common downstream outcomes. The resulting estimates should therefore be interpreted as reduced-form exposure-response relationships rather than product-level effects on separately observed plants or models.

3 Related Literature

This paper contributes to a large literature studying the economic effects of trade policy, with particular emphasis on tariffs and their implications for domestic production, prices, and industrial adjustment. Early empirical work documents substantial distributional consequences of trade integration and significant adjustment costs in local labor markets. Studies of the China trade shock, for example, show that import competition can produce persistent employment and income effects in exposed regions of the United States Autor et al. (2013). Broader syntheses of trade liberalization similarly highlight the uneven distributional consequences of globalization across workers, industries, and regions Goldberg and Pavcnik (2007).

More recent research examines the reintroduction of U.S. tariffs beginning in 2018 and their aggregate economic effects. Using detailed product-level price data, Amiti et al. (2019) show that the Section 301 tariffs were largely passed through to U.S. import prices and generated measurable welfare losses. Complementary evidence from Fajgelbaum et al. (2020) documents substantial reallocation in trade flows and sizable consumer price effects following the tariff increases. Together, these studies indicate that recent tariffs imposed significant costs on U.S. consumers and downstream industries, despite providing protection to a limited set of domestic producers.

A growing body of work highlights the importance of global supply chains in shaping the incidence of tariffs. Because many tariffs apply to intermediate inputs rather than final goods, they can raise production costs for downstream manufacturers. Focusing on U.S. manufacturing industries, Flaaen and Pierce (2019) show that the 2018 tariff increases adversely affected domestic firms through higher input costs and foreign retaliation. These findings emphasize that trade policy shocks can propagate through production networks and affect industries that are not directly targeted by tariffs.

This paper contributes to this literature by examining the downstream effects of Section 301 tariffs in the U.S. motor vehicle sector. Vehicle manufacturing is highly capital intensive and deeply embedded in global supply chains, making it particularly sensitive to changes in the cost of intermediate inputs. By jointly examining commercial and light vehicle outcomes, the analysis provides evidence on how tariffs affecting upstream components propagate through a major downstream manufacturing industry.

Methodologically, the paper builds on recent advances in difference-in-differences estimation that address treatment effect heterogeneity and staggered policy timing. In particular, the analysis uses dynamic event-study and continuous-treatment difference-in-differences frameworks that allow treatment effects to evolve over time and provide formal diagnostics for pre-treatment trends Sun and Abraham (2021); Callaway and Sant'Anna (2021).[3] Combining these methods with a product-level import-weighted tariff exposure index allows the paper to estimate how downstream production and nominal sales covary with policy exposure over time.

4 Institutional Background and Policy Timeline

Section 301 of the Trade Act of 1974 grants the United States Trade Representative (USTR) authority to investigate and respond to foreign trade practices deemed unfair or discriminatory. In August 2017, the USTR initiated a formal Section 301 investigation into China's policies related to intellectual property protection, forced technology transfer, and state-directed industrial practices. The investigation concluded in March 2018, finding that China's actions imposed unreasonable burdens on U.S. commerce. These findings provided the statutory basis for the imposition of retaliatory tariffs.

Between July 2018 and September 2019, the United States implemented four major waves of Section 301 tariffs targeting imports from China. The first wave, List 1, took effect in July 2018 and covered a relatively narrow set of intermediate goods. Subsequent waves, Lists 2, 3, and 4A, expanded tariff coverage substantially to include a broader range of intermediate inputs, capital goods, and selected final goods. Tariff rates also escalated over time, with ad valorem rates rising from 10 percent in some tranches to as high as 25 percent in others. Although some tariff increases were delayed or partially rolled back following the Phase One trade agreement in early 2020, the majority of the tariff structure remained in place throughout the estimation window.

A key feature of the policy rollout is that tariff coverage was implemented at the product level according to predetermined lists of HS-coded goods. Individual products entered tariff coverage at different points in time, generating substantial variation in exposure across industries depending on their input sourcing patterns. For the U.S. vehicle sector, exposure arose primarily through tariffs applied to upstream components and materials rather than to finished vehicles themselves. As a result, the policy shock is best interpreted as operating through input-cost and supply-chain channels.

This staggered implementation of tariff coverage provides useful variation for empirical

[3] Because treatment varies in intensity through a continuous exposure measure rather than a binary treated indicator, the empirical implementation here differs from the canonical staggered-adoption setting emphasized in much of the recent difference-in-differences literature. The cited papers are used primarily to motivate dynamic treatment-timing concerns and event-study interpretation.

analysis. Because different products became subject to tariffs at different points in time, sectors linked to more heavily affected inputs experienced larger changes in tariff exposure. This variation allows the analysis to compare common downstream sectoral outcomes across HS6 products with differing exposure intensity.

These institutional features motivate the empirical strategy used in the paper. By combining product-level tariff exposure with monthly data on vehicle production and sales, the analysis traces how downstream outcomes move with changes in tariff exposure over time. The staggered timing of tariff implementation makes it possible to examine dynamic responses using event-study methods within a difference-in-differences framework.

5 Data

The empirical analysis combines several datasets assembled at a monthly frequency. The core dataset links product-level tariff exposure to downstream outcomes in the U.S. motor vehicle sector. The final analysis dataset is organized as an HS6-by-month panel in which product-specific tariff exposure varies across HS6 categories and over time, while downstream production and sales outcomes are observed at the sector-month level and repeated across HS6 products within sector-month cells.[4]

Domestic outcomes include measures of vehicle production and sales for both commercial vehicles and light vehicles. These outcomes are combined with a product-level tariff exposure index constructed using import data and the statutory Section 301 tariff lists. Additional macroeconomic controls are included to account for aggregate shocks affecting the vehicle sector.

5.1 Construction of HS-Level Imports and Pre-Tariff China Import Shares

Product-level import data are obtained from the U.S. International Trade Commission (USITC) DataWeb at the Harmonized System six-digit (HS6) level U.S. International Trade Commission (2024). Monthly import values by source country are collected for the pre-tariff period January 2015 through December 2017. These years define the fixed pre-treatment window used to construct import weights and China sourcing shares.

[4] This data structure is central to interpretation. The panel is not a product-level panel of observed output or sales by HS6 category. Instead, it combines product-level policy exposure with sector-level downstream outcomes in order to ask whether common sectoral outcomes move differently with more versus less exposed input baskets over time.

For each HS6 product (h), total U.S. imports and imports originating from China are aggregated over the 2015–2017 period. The pre-tariff China import share is calculated as

$$ChinaShare_h = \frac{\sum_{t=2015}^{2017} \text{Imports}_{h,\text{China},t}}{\sum_{t=2015}^{2017} \text{Imports}_{h,\text{World},t}}$$

These China import shares are fixed throughout the sample and serve as weights in the construction of the tariff exposure index. Using pre-tariff import shares avoids mechanical endogeneity arising from tariff-induced changes in sourcing patterns after policy implementation. HS6 products with no pre-period imports from China are assigned a China share of zero.

5.2 Construction of Section 301 Tariff Lists

Coverage of products subject to Section 301 tariffs is obtained from official notices published in the *Federal Register* by the Office of the United States Trade Representative (USTR).[5]

These notices define the legally binding scope of tariff coverage. Harmonized Tariff Schedule eight-digit (HTS8) codes are extracted from Annex A of the *Federal Register* notices corresponding to List 1, List 2, List 3, and List 4A. For each HTS8 product, the statutory tariff rate and implementation date are recorded.

The lists are verified to be mutually exclusive, consistent with the USTR design of distinct tariff tranches. List 4B products are excluded because those tariffs were announced but never implemented.[6]

For compatibility with the import data, HTS8 codes are concorded to the HS6 level using standard truncation. When multiple HTS8 codes map to a single HS6 category, the HS6 product is classified as treated if any constituent HTS8 code appears in the tariff lists. The HS6 category is then assigned the corresponding tariff rate and implementation date.[7]

[5] See Office of the United States Trade Representative, Notice of Action and Request for Public Comment Concerning Proposed Determination of Action Pursuant to Section 301, 83 Fed. Reg. 28710 (June 20, 2018); Notice of Determination and Request for Public Comment Concerning Proposed Modification of Action Pursuant to Section 301, 83 Fed. Reg. 40823 (August 16, 2018); Notice of Modification of Section 301 Action, 83 Fed. Reg. 47974 (September 21, 2018); and Notice of Modification of Section 301 Action, 84 Fed. Reg. 43304 (August 20, 2019).

[6] See Office of the United States Trade Representative, Notice of Determination Concerning Action Pursuant to Section 301, 84 Fed. Reg. 45821 (September 1, 2019). Excluding never-implemented lists avoids conflating realized policy exposure with unrealized announcements.

[7] This concordance necessarily introduces some aggregation. When only a subset of HTS8 lines within an HS6 category was covered, the HS6 treatment measure should be interpreted as an approximation to the underlying product-level policy shock.

5.3 Construction of the Tariff Exposure Index

Tariff exposure is measured using an import-weighted exposure index that combines statutory tariff rates with pre-tariff import shares from China. For each HS6 product (h) in month (t), the exposure measure reflects whether the product is subject to a Section 301 tariff and the degree to which U.S. imports previously relied on Chinese sourcing.

Formally, exposure varies across products and over time according to the tariff coverage schedule and the fixed China import shares described above. Because the weights are constructed from pre-policy trade flows, the resulting exposure index captures policy-driven variation in tariff intensity rather than endogenous changes in import patterns after the tariffs are implemented.

This product-level exposure measure forms the key treatment variable in the empirical analysis.

5.4 Construction of Production and Sales Outcomes

Domestic production outcomes are measured using monthly industrial production indices published by the Board of Governors of the Federal Reserve System and accessed through the Federal Reserve Economic Data (FRED) database.

Two production series are used in the analysis. Light vehicle production is measured using the motor vehicle production index (FRED series: IPG3361T3S), while commercial vehicle production is measured using the truck and bus production index (FRED series: IPG3363S). These indices capture real manufacturing output in the U.S. vehicle sector and are expressed relative to a base year. Both production series are transformed into logarithmic form in the empirical analysis.

Demand-side outcomes are proxied using monthly vehicle sales series obtained from FRED. Light vehicle demand is measured using total light vehicle sales (FRED series: TOTALSA), while commercial vehicle demand is proxied using heavy truck sales (FRED series: HTRUCKSSA). These series are reported at the national monthly level and are interpreted as sector-level demand proxies rather than product-specific quantities.[8] The sales series are also transformed into logarithmic form.

Macroeconomic control variables are obtained from FRED. These include the civilian unem-

[8]Because the sales outcomes are national aggregates rather than HS6-specific quantities, they should not be interpreted as direct measures of sales by treated product category. Instead, they provide evidence on how common downstream demand conditions move with differences in input exposure across HS6-linked product baskets.

ployment rate (UNRATE), the consumer price index (CPIAUCSL), and the 10-year Treasury yield (GS10). Inflation is measured as the year-over-year growth rate of the CPI series. All variables are harmonized to a monthly frequency consistent with the tariff exposure index used in the empirical analysis.

6 Summary Statistics

Table 1 reports summary statistics for the main outcome variables and tariff exposure measures used in the analysis. The production indices exhibit moderate variation over the sample period. Log industrial production averages 4.57 for commercial vehicles and 4.61 for light vehicles, with standard deviations of 0.12 and 0.17, respectively, indicating somewhat greater volatility in light vehicle output. Sales measures display similar dispersion. Log nominal sales average 3.63 for commercial vehicles and 2.80 for light vehicles, with standard deviations of 0.12 and 0.11.

The tariff exposure variables show meaningful but limited variation consistent with the staggered rollout of the Section 301 tariff lists. The import-weighted exposure index has a mean of 0.022 and ranges from zero in the pre-tariff period to 0.038 at its maximum level after the final tariff tranche is implemented. The interaction term capturing post-policy exposure exhibits similar variation, reflecting the gradual expansion of tariff coverage across product categories. Together, these statistics indicate that the key treatment variable varies over time in a manner consistent with the timing of the tariff policy, providing the identifying variation used in the empirical analysis.

Table 1: Summary Statistics for Production, Sales, and Tariff Exposure Variables

Variable / Statistic	N	Mean	Std. Dev.	Min	Max
Industrial Production					
Log industrial production (commercial vehicles)	133	4.5713	0.1216	3.5174	4.6550
Log industrial production (light vehicles)	133	4.6111	0.1723	3.0243	4.7395
Vehicle Sales					
Log nominal sales (commercial vehicles)	134	3.6312	0.1197	3.2151	3.8828
Log nominal sales (light vehicles)	134	2.8000	0.1083	2.1882	2.9218
Tariff Exposure Variables					

Variable / Statistic	N	Mean	Std. Dev.	Min	Max
Import-weighted Section 301 exposure index	144	0.0224	0.0155	0.0000	0.0381
Post × Exposure	144	0.0180	0.0128	0.0000	0.0313

Table 2 reports summary statistics for the key variables used in the construction of the tariff exposure measure. The pre-period China import share, calculated at the HS6 level using 2015–2017 trade data, has an average value of 0.216 and exhibits substantial dispersion across products, with a standard deviation of 0.254 and values ranging from zero to one. This variation reflects the heterogeneous reliance of U.S. imports on Chinese sourcing across product categories.

The statutory Section 301 tariff rate applied at the HS6-month level averages 11.1 percent over the sample, with a maximum rate of 25 percent corresponding to the highest tariff tranches introduced during the policy rollout. Because tariff coverage expands over time across successive lists, the share of HS6-month observations with a positive tariff rate equals 0.554. Together, these statistics highlight two key sources of variation used in the empirical analysis: differences in pre-policy dependence on Chinese imports across products and the staggered timing and intensity of tariff implementation across HS6 categories.

Table 2: Summary Statistics for Tariff Exposure Variables

Variable / Statistic	N	Mean	Std. Dev.	Min	Max
Tariff Exposure Construction Variables					
Pre-period China import share (HS6, 2016–2017)	774288	0.2155	0.2539	0.0000	1.0000
Section 301 ad valorem tariff rate (HS6-month)	774288	0.1110	0.1149	0.0000	0.2500
Share of HS6-month observations with positive tariff rate	774288	0.5542	0.4970	0.0000	1.0000

The data in Table 1 and Table 2 provide a useful overview of the variables used in the analysis. The production and sales outcomes exhibit meaningful time-series variation, while the tariff exposure measures capture the staggered implementation of the Section 301 tariffs and the heterogeneous reliance on Chinese imports across products. This variation forms the basis for the empirical strategy used to estimate how downstream manufacturing outcomes are associated with tariff exposure.

7 Empirical Strategy

The empirical analysis evaluates the relationship between the 2018–2019 Section 301 tariffs and U.S. vehicle production and sales using a continuous-treatment difference-in-differences framework combined with dynamic event-study specifications.

The analysis exploits variation in tariff exposure across HS6 product categories and over time. Different products first became subject to Section 301 tariffs in July 2018, August 2018, September 2018, and September 2019, generating staggered treatment timing across products. The identifying assumption is that, absent the tariff shock, downstream sectoral outcomes linked to more exposed and less exposed HS6 product baskets would have evolved in parallel after conditioning on common macroeconomic controls and seasonality.

The outcome variable y_{it} represents one of four monthly outcomes associated with HS6 product i in month t: log commercial vehicle production, log light vehicle production, log commercial vehicle sales, or log light vehicle sales. Because these outcomes are observed at the sector-month level and repeated across HS6 products within sector-month cells, the empirical design should be interpreted as relating common downstream sectoral outcomes to differences in tariff exposure across products rather than as estimating product-specific output responses.[9]

All specifications include month-of-year fixed effects to absorb seasonality and a common set of macroeconomic controls capturing aggregate conditions affecting the automotive sector. These controls include the civilian unemployment rate, year-over-year CPI inflation, and the 10-year Treasury yield.[10]

Inference is conducted using heteroskedasticity-and-autocorrelation consistent (HAC) standard errors with 12 lags to account for serial correlation in monthly data.

[9] This repeated-outcome structure also shapes inference. The main source of serial dependence is temporal, so the paper reports heteroskedasticity-and-autocorrelation consistent standard errors with 12 lags.

[10] A richer set of time fixed effects, such as year-month indicators, would absorb most of the aggregate variation in the downstream outcome series. The preferred specification instead combines month-of-year fixed effects with macroeconomic controls so that policy-related time variation remains interpretable while still accounting for common aggregate conditions.

7.1 Difference-in-Differences Specification

Let Exposure_{it} denote the import-weighted Section 301 tariff exposure index for product i in month t. Let Post_t equal one after tariff implementation and zero otherwise. The baseline difference-in-differences specification is

$$y_{it} = \alpha + \beta\,(\text{Post}_t \times \text{Exposure}_{it}) + \Gamma' Z_t + \lambda_{m(t)} + \varepsilon_{it}.$$

The coefficient β captures the differential post-policy association between the outcome and tariff exposure.

7.2 COVID Robustness Specifications

To assess whether the estimated associations are sensitive to disruptions related to the COVID-19 pandemic, two robustness checks are implemented.

First, the analysis estimates a specification that allows tariff exposure to interact with a pandemic indicator. Let COVID_t equal one during the COVID disruption window.

$$y_{it} = \alpha + \beta\,(\text{Post}_t \times \text{Exposure}_{it}) + \delta\,(\text{COVID}_t \times \text{Exposure}_{it}) + \Gamma' Z_t + \lambda_{m(t)} + \varepsilon_{it}.$$

Second, the baseline model is re-estimated after excluding months corresponding to the COVID disruption period.[11]

7.3 Event-Study Specification

To examine dynamic responses and assess the plausibility of parallel trends, the analysis estimates an event-study specification.

Event time is defined relative to the first month in which each HS6 product becomes subject to a Section 301 tariff. Let k denote event time in months relative to the tariff implementation month, with $k = 0$ corresponding to the first treated month. The month immediately prior to implementation, $k = -1$, is omitted as the reference period.

The event-study specification is

[11] In the final submitted version, the paper should state the exact start and end months used for the COVID window in both the text and table notes.

$$y_{it} = \alpha + \sum_{k \in \mathcal{K},\, k \neq -1} \beta_k \left(\mathbf{1}\{\text{event\_time}_{it} = k\} \times \text{Exposure}_{it} \right) + \Gamma' Z_t + \lambda_{m(t)} + \varepsilon_{it}.$$

The coefficients β_k trace out the dynamic relationship between tariff exposure and the outcome relative to the pre-treatment period.[12]

To improve precision in later periods where event-time observations become sparse, the paper also estimates a binned event-study specification in which event-time months are aggregated into broader intervals. Parallel trends are assessed using the joint behavior of the pre-treatment coefficients.

7.4 Aggregate Policy-Intensity Specification

As a complementary robustness exercise, the paper estimates an aggregate specification relating national outcomes to the overall intensity of Section 301 tariff coverage.

Using pre-tariff import data from 2015–2017, the analysis constructs fixed weights w_i representing the importance of each HS6 product in U.S. imports from China. These weights remain constant throughout the sample to avoid contamination from endogenous trade reallocation following tariff implementation.

The monthly policy-intensity measure is defined as

$$Policy_t = \frac{\sum_i \mathbf{1}\{\tau_{it} > 0\} \cdot w_i}{\sum_i w_i}.$$

The aggregate regression is

$$y_t = \alpha + \delta Policy_t + Z_t' \Gamma + \varepsilon_t.$$

Here y_t represents aggregate outcomes such as log commercial vehicle production or log nominal vehicle sales.

Because the policy-intensity measure equals zero throughout the pre-tariff period, this specification should be interpreted as a reduced-form association between aggregate outcomes and tariff coverage rather than as a quasi-experimental estimate.[13] It serves as a transparent

[12] As in most event-study applications, small and statistically insignificant pre-treatment coefficients are supportive of the identifying assumptions but do not by themselves prove parallel trends.

[13] Since the aggregate policy measure varies only over time and is common to all observations in a given month, identification in this specification is limited relative to the product-level exposure designs.

benchmark and complements the richer cross-product identification provided by the difference-in-differences and event-study specifications.

8 Results

8.1 Difference-in-Differences Estimates

Table 3 reports the difference-in-differences estimates for vehicle production. The baseline specification indicates that greater tariff exposure is associated with a statistically significant decline in manufacturing output in both sectors. The estimated coefficient on the exposure interaction implies a negative post-policy relationship between tariff exposure and production for both commercial vehicles (CV) and light vehicles (LV), with somewhat larger sensitivity in the light vehicle sector.

Including the COVID interaction in Column 2 shows that the pandemic period coincided with substantially larger declines in production, particularly for light vehicles. When the COVID window is excluded in Column 3, the estimated effect on commercial vehicle production remains negative and statistically significant, although economically smaller, while the effect for light vehicles becomes statistically insignificant. These results suggest that pandemic-related disruptions amplified the production response, especially in the light vehicle sector.

Table 3: Difference-in-Differences Estimates for Vehicle Production.

	(1) Baseline	(2) COVID × Exposure	(3) Drop COVID Window
Panel A. Commercial Vehicles			
Post × Exposure	-0.0377***	-0.0964***	-0.0079***
	(0.0037)	(0.0030)	(0.0011)
Panel B. Light Vehicles			
Post × Exposure	-0.0507***	-0.1313***	-0.0003
	(0.0057)	(0.0044)	(0.0017)
Month-of-Year Fixed Effects	Yes	Yes	Yes
HAC Standard Errors (12 lags)	Yes	Yes	Yes

Notes: Dependent variable is log industrial production. Panel A reports estimates for commercial vehicles and Panel B reports estimates for light vehicles. All specifications control for macroeconomic conditions including the unemployment rate, CPI inflation (year-over-year), the 10-year Treasury yield, a linear time trend, and a quadratic time trend. Month-of-year fixed effects are included in all specifications. Standard errors in parentheses are Newey-West HAC with 12 lags. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 4 presents the difference-in-differences estimates for nominal vehicle sales. In contrast to the production results, the sales estimates are more mixed across sectors and specifications. In the baseline specification, tariff exposure is associated with higher nominal sales in both sectors, and the estimates are statistically significant. However, these positive nominal associations should be interpreted cautiously because sales are measured in current values rather than physical units and may therefore reflect price pass-through, compositional changes, or markup adjustments rather than stronger underlying demand.

The COVID interaction in Column 2 indicates that the pandemic period coincided with an additional increase in sales, particularly for commercial vehicles, which may reflect elevated freight and logistics demand during the pandemic. When the COVID window is excluded in Column 3, the effect for commercial vehicle sales becomes slightly negative and statistically insignificant, while the light vehicle sector continues to exhibit only a modest positive association between tariff exposure and sales. Taken together, the sales estimates do not provide strong evidence of a persistent contraction in nominal demand, but they also do not overturn the production-side evidence that tariff exposure is associated with weaker downstream manufacturing performance.

Table 4: Difference-in-Differences Estimates for Vehicle Sales.

	(1) Baseline	(2) COVID × Exposure	(3) Drop COVID Window
Panel A. Commercial Vehicles			
Post × Exposure	0.0233***	0.0701***	-0.0099**
	(0.0026)	(0.0045)	(0.0041)
Panel B. Light Vehicles			
Post × Exposure	0.0261***	0.0412***	0.0163***
	(0.0034)	(0.0029)	(0.0009)
Month-of-Year Fixed Effects	Yes	Yes	Yes
HAC Standard Errors (12 lags)	Yes	Yes	Yes

Notes: Dependent variable is log nominal sales. Panel A reports estimates for commercial vehicles and Panel B reports estimates for light vehicles. All specifications control for macroeconomic conditions including the unemployment rate, CPI inflation (year-over-year), the 10-year Treasury yield, a linear time trend, and a quadratic time trend. Month-of-year fixed effects are included in all specifications. Standard errors in parentheses are Newey-West HAC with 12 lags. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

8.2 Event-Study Estimates

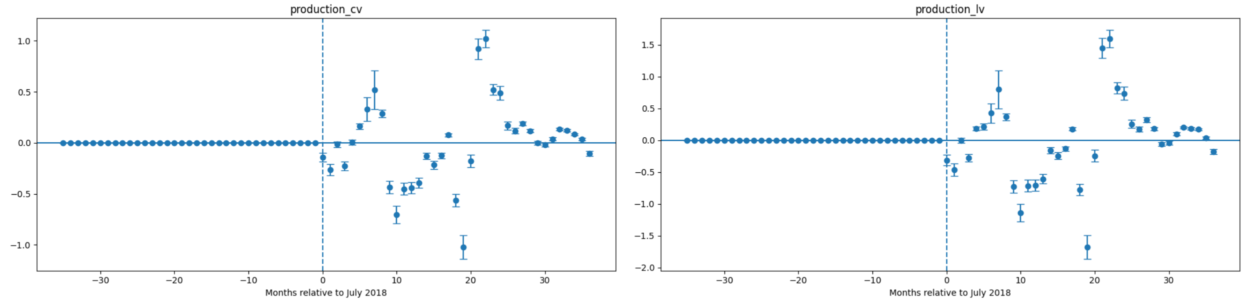
The dynamic response of production to tariff exposure is examined using event-study specifications. The binned event-study estimates reported in Table 5 trace the evolution of production outcomes relative to tariff implementation.

The estimates indicate that production declines in the early post-treatment period, particularly within the first year following tariff implementation. However, the magnitude and persistence of these effects vary across sectors and specifications. In the baseline model, production partially recovers in later periods, while the specification excluding the COVID window indicates that the production response becomes economically smaller over time.

Table 5: Binned Event-Study Estimates for Vehicle Production.

	(1) Baseline	(2) COVID × Exposure	(3) Drop COVID Window
Panel A. Commercial Vehicles			
Post (0–12) × Exposure	-0.3212***	-0.1235***	-0.0131***
	(0.0118)	(0.0122)	(0.0043)
Post (13–24) × Exposure	0.0790***	0.0572***	-0.0026
	(0.0149)	(0.0113)	(0.0048)
Post (25–36) × Exposure	0.1013***	-0.1860***	0.0078
	(0.0071)	(0.0248)	(0.0117)
Panel B. Light Vehicles			
Post (0–12) × Exposure	-0.4794***	-0.1840***	-0.0073*
	(0.0182)	(0.0187)	(0.0039)
Post (13–24) × Exposure	0.1345***	0.1172***	-0.0050
	(0.0229)	(0.0174)	(0.0052)
Post (25–36) × Exposure	0.1503***	-0.2751***	0.0061
	(0.0112)	(0.0377)	(0.0075)
Month-of-Year Fixed Effects	Yes	Yes	Yes
HAC Standard Errors (12 lags)	Yes	Yes	Yes

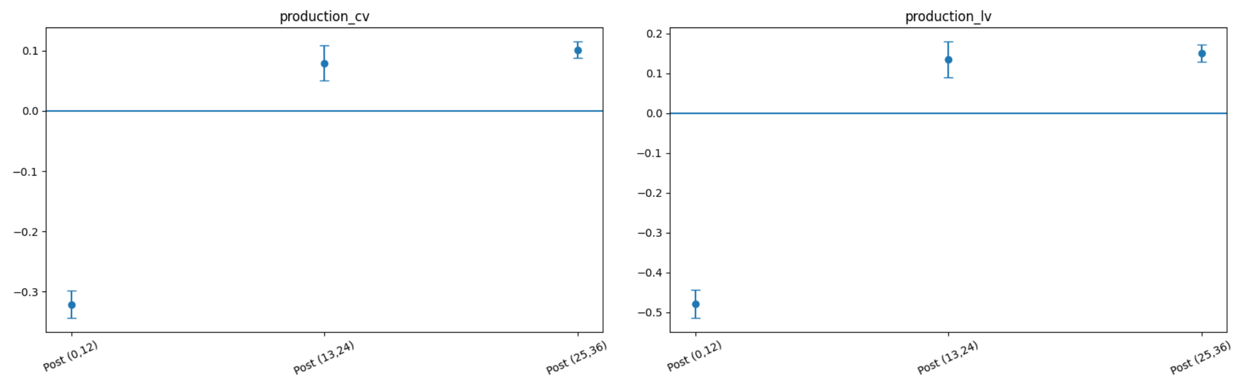
Notes: Dependent variable is log industrial production. Event-time bins correspond to months relative to tariff implementation. Panel A reports estimates for commercial vehicles and Panel B reports estimates for light vehicles. All specifications include macroeconomic controls (unemployment rate, CPI inflation, 10-year Treasury yield), a linear and quadratic time trend, and month-of-year fixed effects. Standard errors in parentheses are Newey–West HAC with 12 lags. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.



(a) Production CV Analysis (b) Production LV Analysis

Figure 1: Event-study estimates for commercial and light vehicle production.

Figure 1 presents the unbinned event-study estimates for commercial vehicle production (left) and light vehicle production (right). In both panels, the pre-treatment coefficients are small and statistically indistinguishable from zero, which is consistent with the identifying assumptions used in the paper. Following tariff implementation, commercial vehicle production exhibits a modest short-run increase followed by a gradual decline, whereas light vehicle production shows less systematic deviation from the pre-treatment baseline.



(a) Production CV Analysis (b) Production LV Analysis

Figure 2: Binned event-study estimates for commercial and light vehicle production.

The binned event-study estimates shown in Figure 2 reinforce these patterns. Commercial vehicle production declines in the first post-treatment period and then gradually converges back toward the pre-treatment baseline. By contrast, light vehicle production shows relatively small and statistically insignificant responses across event-time bins.

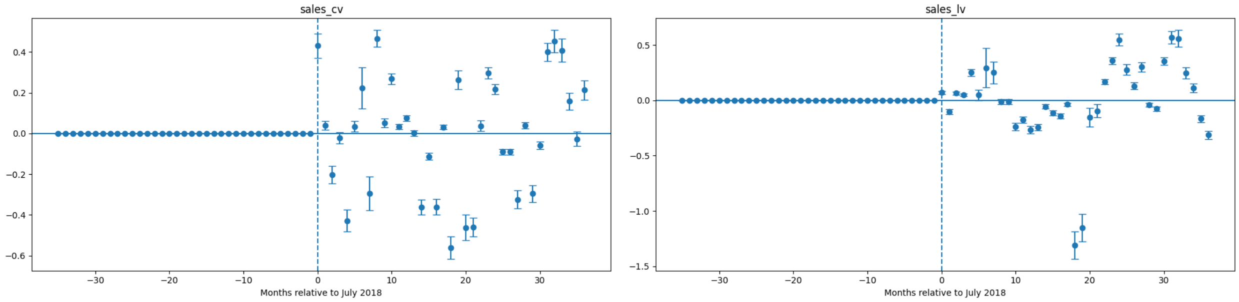
Taken together, the production event-study results suggest that tariff exposure is associated with short-run and medium-run adjustments in downstream production, particularly for commercial vehicles, even if the estimates become less precise at longer horizons.

The dynamic response of vehicle sales to tariff exposure is reported in Table 6. Similar to the production estimates, pre-treatment coefficients are generally small and statistically insignificant, supporting the use of the event-study framework.

Table 6: Binned Event-Study Estimates for Vehicle Sales.

	(1) Baseline	(2) COVID × Exposure	(3) Drop COVID Window
Panel A. Commercial Vehicles			
Post (0–12) × Exposure	0.2282***	0.2389***	0.0705***
	(0.0078)	(0.0091)	(0.0101)
Post (13–24) × Exposure	-0.1827***	-0.1712***	-0.0584***
	(0.0077)	(0.0070)	(0.0100)
Post (25–36) × Exposure	0.0186***	0.0061	-0.0061
	(0.0062)	(0.0137)	(0.0247)
Panel B. Light Vehicles			
Post (0–12) × Exposure	0.0080	-0.0523***	0.0499***
	(0.0097)	(0.0101)	(0.0041)
Post (13–24) × Exposure	-0.2049***	-0.1296***	-0.0244***
	(0.0124)	(0.0096)	(0.0041)
Post (25–36) × Exposure	0.1730***	0.2776***	-0.0128
	(0.0093)	(0.0230)	(0.0112)
Month-of-Year Fixed Effects	Yes	Yes	Yes
HAC Standard Errors (12 lags)	Yes	Yes	Yes

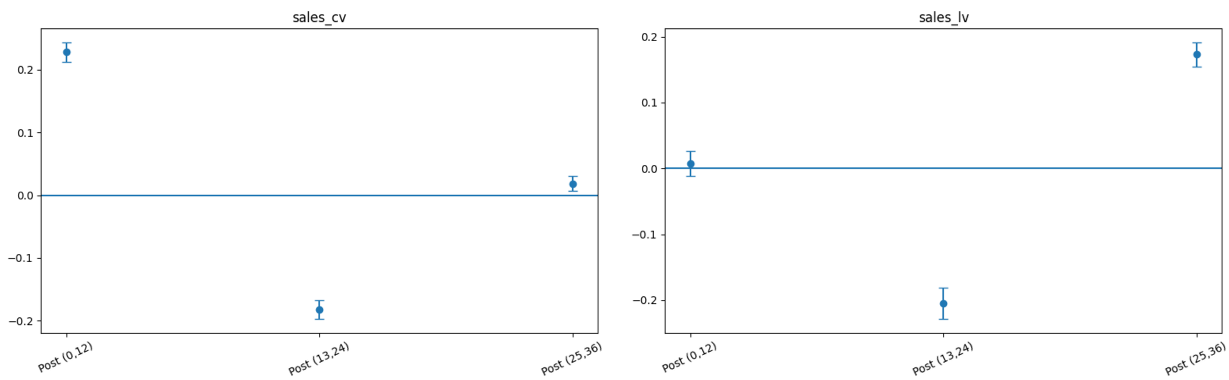
Notes: Dependent variable is log nominal vehicle sales. Event-time bins correspond to months relative to tariff implementation. Panel A reports estimates for commercial vehicles and Panel B reports estimates for light vehicles. All specifications include macroeconomic controls (unemployment rate, CPI inflation, 10-year Treasury yield), a linear and quadratic time trend, and month-of-year fixed effects. Standard errors in parentheses are Newey–West HAC with 12 lags. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.



(a) Sales CV Analysis (b) Sales LV Analysis

Figure 3: Event-study estimates for commercial and light vehicle sales.

Figure 3 shows that commercial vehicle sales decline in the immediate post-treatment period before gradually returning toward baseline. The light vehicle sector exhibits comparatively smaller responses and less systematic deviation from the pre-treatment trend.



(a) Sales CV Analysis (b) Sales LV Analysis

Figure 4: Binned event-study estimates for commercial and light vehicle sales.

The binned estimates confirm that the sales response is concentrated in the early post-treatment period and dissipates over time. Overall, the event-study evidence indicates some short-run weakness in nominal vehicle sales following tariff implementation, especially for commercial vehicles, but limited evidence of a persistent nominal demand contraction.

8.3 Aggregate Policy-Intensity Specification

Table 7 reports estimates from the aggregate policy-intensity specification relating national vehicle outcomes to the overall share of imports covered by Section 301 tariffs. The results indicate that higher aggregate tariff coverage is associated with a statistically significant decline in commercial vehicle production. The estimated effect on vehicle sales, however, is positive but not statistically significant.

Table 7: Aggregate Policy Estimates for Production and Sales Outcomes

	Production LV	Production CV	Sales LV	Sales CV
Exposure	-0.0132***	-0.0408***	-0.0289***	0.1523***
	(0.0043)	(0.0027)	(0.0026)	(0.0027)
Observations	709,764	709,764	715,141	715,141
R-squared	0.602	0.676	0.637	0.473

Notes: Each specification includes the tariff exposure measure and controls for the unemployment rate, CPI inflation (year-over-year), the 10-year Treasury yield, a COVID indicator, a linear time trend, and a quadratic time trend. Standard errors in parentheses. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Because the aggregate policy measure varies only with the rollout of successive tariff lists, the available identifying variation is limited. Consequently, the estimates from this specification should be interpreted primarily as descriptive evidence that complements the product-level exposure designs. The contrast between the aggregate and product-level approaches underscores the importance of cross-product exposure heterogeneity when studying the downstream consequences of trade policy shocks.

8.4 Summary of Results

Across specifications, tariff exposure is most consistently associated with reductions in domestic vehicle production, particularly in the commercial vehicle sector. Sales outcomes are more mixed. Event-study estimates suggest short-run weakness in nominal sales, but difference-in-differences specifications provide less consistent evidence of persistent contraction and in some cases indicate positive nominal responses.

The event-study analysis indicates that production declines are concentrated in the early and medium-run post-treatment periods, while sales responses exhibit relatively limited persistence. Finally, the aggregate policy-intensity specification confirms that increases in overall tariff coverage coincide with weaker commercial vehicle production but provides weaker evidence for effects on nominal vehicle sales.

Taken together, these results suggest that tariffs imposed on upstream supply chains are associated with weaker downstream manufacturing performance, especially on the production side, while nominal demand indicators remain comparatively less stable and more difficult to interpret. From a policy perspective, the findings imply that trade interventions aimed at upstream inputs can impose meaningful downstream production costs even when nominal revenue measures do not show parallel deterioration.

9 Discussion

The results suggest that the effects of Section 301 tariffs on a capital-intensive, input-reliant manufacturing sector are fundamentally dynamic and may be mischaracterized if evaluated only in the immediate post-implementation period. Across both production and sales outcomes, the empirical evidence is most consistent with an adjustment process in which firms initially respond to tariff-induced cost shocks through short-run operational adjustment, followed by economically meaningful medium-run headwinds that dampen real activity.

On the production side, the event-study estimates show no evidence of differential pre-treatment trends and reveal a contraction that emerges gradually after tariff implementation. The absence of an immediate decline suggests that firms initially adjust through mechanisms such as inventory accumulation, production smoothing, or temporary substitution across suppliers. However, these responses appear to be short-lived. As inventories are drawn down, supply contracts adjust, and higher input costs propagate through production networks, output declines become more visible over time. This delayed response is consistent with adjustment frictions in capital-intensive manufacturing and underscores the importance of dynamic empirical designs when evaluating trade policy shocks.

The difference-in-differences estimates reinforce this interpretation. Baseline specifications indicate negative and statistically significant associations between tariff exposure and production outcomes. The magnitude of these estimates increases once differential exposure during the COVID period is explicitly modeled. By contrast, specifications that exclude the COVID window yield smaller and less precise estimates, especially for light vehicles. This pattern suggests that the pandemic period contains important variation in medium-run adjustment to tariffs and that removing it may discard economically relevant variation rather than simply eliminating noise. In this context, COVID-era disruptions appear to interact with tariff exposure rather than merely obscuring its effects.

Demand-side outcomes exhibit a different but complementary pattern. Event-study estimates for nominal sales indicate short-run declines following tariff implementation followed by partial recovery among more exposed series. Because sales are measured in nominal rather than real terms, this recovery should not be interpreted as evidence of expanding quantities. Instead, it is consistent with mechanisms such as price pass-through, compositional shifts toward higher-priced vehicles, changes in markups, or sourcing adjustments. In this sense, nominal revenue can stabilize or even rise while real production weakens.

The difference-in-differences sales estimates are accordingly more difficult to interpret than the production estimates. In baseline specifications, tariff exposure is positively associated with nominal sales, but these estimates become smaller, less stable, or statistically insignificant once the COVID period is modeled differently. Rather than implying robust gains in downstream demand, this pattern is more consistent with the idea that nominal sales reflect a mixture of pricing, composition, and demand conditions that are jointly shaped by tariffs and large macroeconomic shocks.

Taken together, the combined production and sales evidence points toward a mechanism emphasized in the broader literature on the U.S.–China trade conflict. In sectors characterized by complex global supply chains, tariffs imposed on intermediate inputs are likely to operate primarily through cost channels rather than simple demand-substitution channels. Short-run adjustments may temporarily mask these effects, but medium-run outcomes increasingly reflect higher input costs and supply-chain frictions. This interpretation is consistent with evidence that Section 301 tariffs were largely passed through to U.S. prices rather than absorbed by foreign exporters (Amiti et al. (2019), Fajgelbaum et al. (2020)) and with findings that downstream industries bear a substantial share of tariff-induced costs through higher input prices and disrupted production networks (Flaaen and Pierce (2019)).

10 Conclusion

This paper examines how the 2018–2019 Section 301 tariffs were associated with downstream production and demand outcomes in the U.S. vehicle sector. Using a dynamic difference-in-differences design and an import-weighted tariff exposure index constructed at the HS6 product level, the analysis exploits variation in tariff timing and exposure intensity to trace the adjustment path of a capital-intensive manufacturing industry.

Three main findings emerge. First, tariff exposure is consistently associated with weaker production outcomes, especially in the commercial vehicle sector. Event-study estimates reveal no evidence of differential pre-treatment trends and show that production declines emerge after implementation, even when some short-run increases appear immediately around treatment. These short-run movements are more consistent with adjustment or inventory responses than with sustained expansion.

Second, the pandemic period plays an important role in medium-run dynamics. Specifications that explicitly account for the COVID period yield larger and more precisely estimated production responses, while estimates that exclude the pandemic window tend to become smaller and less precise. These results suggest that tariff exposure interacted with broader disruptions to supply chains and production networks rather than operating independently of them.

Third, nominal sales display more mixed dynamics than production. Event-study estimates suggest short-run weakness in sales, but difference-in-differences specifications provide less consistent evidence of persistent contraction and in some cases indicate positive nominal associations. Because these outcomes are measured in nominal values rather than physical units, such patterns are consistent with price pass-through, compositional shifts, or markup adjustments and should not be interpreted mechanically as stronger real demand.

The aggregate policy-intensity specifications provide complementary evidence. Higher tariff coverage is associated with lower aggregate production but does not generate statistically significant changes in nominal sales. While these aggregate regressions are not designed to deliver causal estimates, they illustrate how national outcomes move with overall tariff intensity and underscore the limited identifying variation available in purely time-series approaches.

More broadly, the findings indicate that tariffs on upstream inputs can weaken downstream production even when nominal revenues appear comparatively stable. In supply-chain-intensive industries such as motor vehicles, trade protection may therefore operate less through import substitution and more through higher input costs and production-network frictions. Evaluating such policies requires attention to dynamic adjustment and to the distinction between real activity and nominal outcomes.

These findings also carry a broader policy implication. Trade interventions designed to protect domestic industry can impose unintended downstream costs when targeted goods are important intermediate inputs. In complex manufacturing sectors, tariff policy may therefore weaken domestic production even when nominal sales measures appear comparatively resilient.

Future research could extend this analysis using quantity-based demand measures, plant-level production data, and detailed information on sourcing and supplier relationships. Such data would allow for sharper identification of the mechanisms through which tariffs affect downstream manufacturing sectors and would help clarify the conditions under which trade policy might meaningfully alter domestic production patterns.

By focusing on the dynamic adjustment of a capital-intensive manufacturing sector, this paper adds to existing evidence documenting price pass-through and downstream costs associated with the Section 301 tariffs (Amiti et al. (2019), Fajgelbaum et al. (2020); Flaaen and Pierce (2019)). The results highlight how trade policy shocks propagate through supply chains over time and why downstream manufacturing responses may look quite different in real production data than in nominal sales outcomes.

Replication materials, including data construction scripts and processed datasets, are available upon request and will be released publicly.

11 Appendix A. Construction of Monthly Import-Weighted Tariff Exposure Indices

This appendix describes the construction of the monthly tariff exposure indices used in the empirical analysis. The objective is to summarize the intensity of U.S. Section 301 tariff exposure using a transparent aggregation of product-level tariffs weighted by pre-period import importance.

11.1 A.1 Product-Level Data and Notation

Let i index HS6 product categories and let t index months.

For each HS6 product i and month t, define the following variables:

- τ_{it}: the ad valorem Section 301 tariff rate applied to product i in month t, expressed in decimal form.
- s_i: the pre-period share of U.S. imports of product i sourced from China.
- w_i: the pre-period world import value of product i, used as an importance weight.

The weights w_i and China shares s_i are constructed using import data from a fixed pre-tariff baseline period and are therefore time invariant. This design ensures that variation in the exposure indices over time reflects changes in tariff policy rather than endogenous changes in import sourcing or trade volumes after tariff implementation.

All HS6 codes are harmonized across data sources and tariff implementation dates are aligned to a monthly frequency. Observations with missing or non-numeric tariff rates are assigned a value of zero, indicating the absence of Section 301 tariff coverage.

11.2 A.2 Product-Level Tariff Exposure

For each product i in month t, a product-level tariff exposure measure is defined as

$$e_{it} = \tau_{it} \cdot s_i$$

This measure captures the interaction between tariff intensity and baseline dependence on Chinese imports. A tariff applied to a product contributes more to aggregate exposure when that product historically relied more heavily on Chinese supply.

11.3 A.3 Monthly Import-Weighted Exposure Index

The primary exposure index aggregates product-level exposure to the monthly level using pre-period import values as weights:

$$E_t = \frac{\sum_i w_i e_{it}}{\sum_i w_i} = \frac{\sum_i w_i \tau_{it} s_i}{\sum_i w_i}$$

The resulting index increases when tariffs are applied to products that are both economically important (high w_i) and historically dependent on Chinese sourcing (high s_i).

Because the weights are fixed over time, changes in E_t reflect policy-driven variation in tariff coverage rather than contemporaneous changes in trade flows.

11.4 A.4 Auxiliary Weighted Indices

Two auxiliary indices are constructed to aid interpretation.

First, the weighted average tariff rate is defined as

$$T_t = \frac{\sum_i w_i \tau_{it}}{\sum_i w_i}$$

This index summarizes the overall intensity of tariffs across products, abstracting from differences in China dependence.

Second, the weighted average China import share is defined as

$$S_t = \frac{\sum_i w_i s_i}{\sum_i w_i}$$

Although the product-level China share s_i is time invariant, the weighted average S_t may vary across months because the set of tariffed products changes over time.

Importantly, the exposure index does not equal the product of these auxiliary indices:

$$\mathbb{E}_w[\tau_{it} s_i] \neq \mathbb{E}_w[\tau_{it}] \cdot \mathbb{E}_w[s_i]$$

unless tariff rates and China shares are uncorrelated in the weighted cross section.

11.5 A.5 Coverage and Diagnostics

Two diagnostic statistics are reported for each month:

- the total weight $\sum_i w_i$, capturing the economic mass of HS6 products included in the index,
- the number of unique HS6 products contributing to the index.

Products with missing or non-positive pre-period import values are excluded to ensure that weighted averages are well defined.

11.6 A.6 Interpretation

The exposure index E_t provides a parsimonious summary of tariff exposure that increases when tariffs target economically significant products with high historical reliance on Chinese imports. Because both the weights and China shares are fixed using pre-period data, the index isolates variation driven by tariff policy rather than endogenous adjustments in trade flows. This feature makes the index well suited for use in difference-in-differences and event-study frameworks that rely on policy-driven variation in exposure over time.

12 Appendix B: Additional Results

This appendix reports the full set of regression results corresponding to the specifications summarized in the main text. The tables provide sector-specific estimates for the difference-in-differences and event-study specifications for both commercial vehicles and light vehicles. They are included to provide the complete underlying estimates behind the combined tables and figures reported in the main results section.

12.1 B.1 Difference-in-Differences Estimates

The sector-specific difference-in-differences estimates largely reinforce the patterns discussed in the main text. Production results are more consistently negative, especially for commercial vehicles, while sales results are more sensitive to specification choice and to the treatment of the COVID period.

Table 8: Difference-in-Differences Estimates for Commercial Vehicle Production (Outcome 1). *Notes:* Dependent variable is log industrial production for commercial vehicles. All specifications include month-of-year fixed effects and macroeconomic controls. Standard errors in parentheses are Newey–West HAC with 12 lags. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Variable	(1) Baseline	(2) + COVID × Exposure	(3) Drop COVID Window
Post	-0.0618***	-0.0449***	-0.0035***
	(0.0015)	(0.0012)	(0.0003)
Exposure	-0.0377***	-0.0964***	-0.0079***
	(0.0037)	(0.0030)	(0.0011)
Post × Exposure	-0.0377***	-0.0964***	-0.0079***
	(0.0037)	(0.0030)	(0.0011)
Unemployment Rate	-0.0672***	-0.0717***	0.0369***
	(0.0012)	(0.0013)	(0.0012)
CPI Inflation (YoY)	-2.8501***	-2.5984***	-0.1488***
	(0.0581)	(0.0514)	(0.0211)
10-Year Treasury Yield	-0.0006	0.0142***	0.0324***

Variable	(1) Baseline	(2) + COVID × Exposure	(3) Drop COVID Window
	(0.0015)	(0.0011)	(0.0005)
Time Trend	-0.0027***	-0.0028***	0.0032***
	(0.0001)	(0.0001)	(0.0001)
Time Trend²	0.0000***	0.0000***	-0.0000***
	(0.0000)	(0.0000)	(0.0000)
Constant	4.9916***	4.9847***	4.3111***
	(0.0090)	(0.0083)	(0.0067)
Month-of-Year Fixed Effects	Yes	Yes	Yes
HAC Standard Errors (12 lags)	Yes	Yes	Yes

Table 8 reports the difference-in-differences estimates for commercial vehicle production.

Table 9: *Notes:* Dependent variable is log industrial production for light vehicles. All specifications include month-of-year fixed effects and macroeconomic controls. Standard errors in parentheses are Newey–West HAC with 12 lags. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.10.

Variable	(1) Baseline	(2) + COVID × Exposure	(3) Drop COVID Window
Post	-0.0831***	-0.0566***	0.0043***
	(0.0023)	(0.0017)	(0.0004)
Exposure	-0.0507***	-0.1313***	-0.0003
	(0.0057)	(0.0044)	(0.0017)
Post × Exposure	-0.0507***	-0.1313***	-0.0003
	(0.0057)	(0.0044)	(0.0017)
Unemployment Rate	-0.1036***	-0.1109***	0.0131***
	(0.0019)	(0.0021)	(0.0020)
CPI Inflation (YoY)	-4.8659***	-4.4553***	-0.5525***

Variable	(1) Baseline	(2) + COVID × Exposure	(3) Drop COVID Window
	(0.0909)	(0.0799)	(0.0329)
10-Year Treasury Yield	-0.0299***	-0.0055***	0.0196***
	(0.0022)	(0.0016)	(0.0007)
Time Trend	-0.0065***	-0.0067***	-0.0001
	(0.0002)	(0.0002)	(0.0001)
Time Trend²	0.0001***	0.0001***	0.0000***
	(0.0000)	(0.0000)	(0.0000)
Constant	5.3214***	5.3096***	4.5244***
	(0.0141)	(0.0130)	(0.0118)
Month-of-Year Fixed Effects	Yes	Yes	Yes
HAC Standard Errors (12 lags)	Yes	Yes	Yes

Table 9 reports the difference-in-differences estimates for light vehicle production.

Table 10: *Notes:* Dependent variable is log nominal sales for commercial vehicles. All specifications include month-of-year fixed effects and macroeconomic controls. Standard errors in parentheses are Newey–West HAC with 12 lags. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Variable	(1) Baseline	(2) + COVID × Exposure	(3) Drop COVID Window
Post	-0.0014	-0.0019*	-0.0182***
	(0.0011)	(0.0012)	(0.0009)
Exposure	0.0233***	0.0701***	-0.0099**
	(0.0026)	(0.0045)	(0.0041)
Post × Exposure	0.0233***	0.0701***	-0.0099**
	(0.0026)	(0.0045)	(0.0041)
Unemployment Rate	-0.0441***	-0.0448***	-0.1592***

Variable	(1) Baseline	(2) + COVID × Exposure	(3) Drop COVID Window
	(0.0005)	(0.0006)	(0.0040)
CPI Inflation (YoY)	-7.8338***	-7.7853***	-9.3653***
	(0.0569)	(0.0599)	(0.0728)
10-Year Treasury Yield	0.1298***	0.1335***	0.1181***
	(0.0016)	(0.0013)	(0.0015)
Time Trend	-0.0011***	-0.0011***	-0.0069***
	(0.0001)	(0.0001)	(0.0002)
Time Trend²	0.0001***	0.0001***	0.0001***
	(0.0000)	(0.0000)	(0.0000)
Constant	3.5667***	3.5633***	4.2511***
	(0.0045)	(0.0044)	(0.0233)
Month-of-Year Fixed Effects	Yes	Yes	Yes
HAC Standard Errors (12 lags)	Yes	Yes	Yes

Table 10 reports the difference-in-differences estimates for nominal sales in the commercial vehicle sector.

Table 11: *Notes:* Dependent variable is log nominal sales for light vehicles. All specifications include month-of-year fixed effects and macroeconomic controls. Standard errors in parentheses are Newey–West HAC with 12 lags. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Variable	(1) Baseline	(2) + COVID × Exposure	(3) Drop COVID Window
Post	-0.0345***	-0.0246***	0.0063***
	(0.0010)	(0.0012)	(0.0003)
Exposure	0.0261***	0.0412***	0.0163***
	(0.0034)	(0.0029)	(0.0009)
Post × Exposure	0.0261***	0.0412***	0.0163***

Variable	(1) Baseline	(2) + COVID × Exposure	(3) Drop COVID Window
	(0.0034)	(0.0029)	(0.0009)
Unemployment Rate	-0.0401***	-0.0437***	-0.0297***
	(0.0008)	(0.0010)	(0.0017)
CPI Inflation (YoY)	-3.7047***	-3.4947***	-1.4590***
	(0.0637)	(0.0629)	(0.0352)
10-Year Treasury Yield	0.0206***	0.0339***	-0.0003
	(0.0018)	(0.0012)	(0.0005)
Time Trend	-0.0020***	-0.0021***	0.0006***
	(0.0001)	(0.0001)	(0.0001)
Time Trend²	0.0000***	0.0000***	-0.0000***
	(0.0000)	(0.0000)	(0.0000)
Constant	3.1022***	3.0943***	3.0413***
	(0.0068)	(0.0063)	(0.0102)
Month-of-Year Fixed Effects	Yes	Yes	Yes
HAC Standard Errors (12 lags)	Yes	Yes	Yes

Table 11 reports the difference-in-differences estimates for light-vehicle sales.

12.2 B.2 Event-Study Estimates

The sector-specific event-study estimates also mirror the combined patterns discussed in the main text. Pre-treatment coefficients are generally small, while post-treatment responses are more pronounced for commercial vehicle outcomes than for light vehicle outcomes. The binned specifications improve precision at longer horizons and summarize medium-run adjustment more clearly.

Table 12: *Notes:* Dependent variable is log industrial production for commercial vehicles. Event-time bins correspond to months relative to tariff implementation. All specifications include month-of-year fixed effects and macroeconomic controls. Standard errors in parentheses are Newey–West HAC with 12 lags. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.10.

Variable	(1) Baseline	(2) + COVID × Exposure	(3) Drop COVID Window
Post (0–12)	-0.0295***	-0.0288***	-0.0009***
	(0.0007)	(0.0007)	(0.0003)
Post (13–24)	-0.0654***	-0.0628***	-0.0212***
	(0.0023)	(0.0022)	(0.0007)
Post (25–36)	-0.0230***	-0.0325***	-0.0307***
	(0.0028)	(0.0031)	(0.0053)
Exposure	-0.1409***	-0.2523***	-0.0078*
	(0.0055)	(0.0102)	(0.0040)
Post (0–12) × Exposure	-0.3212***	-0.1235***	-0.0131***
	(0.0118)	(0.0122)	(0.0043)
Post (13–24) × Exposure	0.0790***	0.0572***	-0.0026
	(0.0149)	(0.0113)	(0.0048)
Post (25–36) × Exposure	0.1013***	-0.1860***	0.0078
	(0.0071)	(0.0248)	(0.0117)
Unemployment Rate	-0.0657***	-0.0712***	0.0334***
	(0.0012)	(0.0014)	(0.0011)
CPI Inflation (YoY)	-2.4939***	-2.3823***	0.0769**
	(0.0500)	(0.0476)	(0.0346)
10-Year Treasury Yield	-0.0018	0.0133***	0.0278***
	(0.0015)	(0.0010)	(0.0005)
Time Trend	-0.0012***	-0.0018***	0.0027***
	(0.0001)	(0.0001)	(0.0001)
Time Trend²	0.0000***	0.0000***	-0.0000***

Variable	(1) Baseline	(2) + COVID × Exposure	(3) Drop COVID Window
	(0.0000)	(0.0000)	(0.0000)
Constant	4.9667***	4.9702***	4.3403***
	(0.0087)	(0.0086)	(0.0064)
Month-of-Year Fixed Effects	Yes	Yes	Yes
HAC Standard Errors (12 lags)	Yes	Yes	Yes

Table 12 reports the binned event-study estimates for commercial vehicle production.

Table 13: *Notes:* Dependent variable is log industrial production for light vehicles. Event-time bins correspond to months relative to tariff implementation. All specifications include month-of-year fixed effects and macroeconomic controls. Standard errors in parentheses are Newey–West HAC with 12 lags. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Variable	(1) Baseline	(2) + COVID × Exposure	(3) Drop COVID Window
Post (0–12)	-0.0351***	-0.0340***	0.0072***
	(0.0011)	(0.0010)	(0.0004)
Post (13–24)	-0.0775***	-0.0748***	-0.0183***
	(0.0036)	(0.0034)	(0.0010)
Post (25–36)	-0.0256***	-0.0439***	-0.2656***
	(0.0044)	(0.0048)	(0.0058)
Exposure	-0.1947***	-0.3419***	-0.0061**
	(0.0086)	(0.0155)	(0.0030)
Post (0–12) × Exposure	-0.4794***	-0.1840***	-0.0073*
	(0.0182)	(0.0187)	(0.0039)
Post (13–24) × Exposure	0.1345***	0.1172***	-0.0050
	(0.0229)	(0.0174)	(0.0052)
Post (25–36) × Exposure	0.1503***	-0.2751***	0.0061

Variable	(1) Baseline	(2) + COVID × Exposure	(3) Drop COVID Window
	(0.0112)	(0.0377)	(0.0075)
Unemployment Rate	-0.1017***	-0.1108***	0.0419***
	(0.0019)	(0.0022)	(0.0018)
CPI Inflation (YoY)	-4.3543***	-4.1620***	1.2317***
	(0.0790)	(0.0751)	(0.0517)
10-Year Treasury Yield	-0.0307***	-0.0053***	0.0188***
	(0.0023)	(0.0015)	(0.0006)
Time Trend	-0.0048***	-0.0057***	-0.0029***
	(0.0001)	(0.0001)	(0.0001)
Time Trend²	0.0001***	0.0001***	0.0001***
	(0.0000)	(0.0000)	(0.0000)
Constant	5.2902***	5.2951***	4.3977***
	(0.0136)	(0.0134)	(0.0105)
Month-of-Year Fixed Effects	Yes	Yes	Yes
HAC Standard Errors (12 lags)	Yes	Yes	Yes

Table 13 reports the binned event-study estimates for light-vehicle production.

Table 14: *Notes:* Dependent variable is log nominal sales for commercial vehicles. Event-time bins correspond to months relative to tariff implementation. All specifications include month-of-year fixed effects and macroeconomic controls. Standard errors in parentheses are Newey–West HAC with 12 lags. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Variable	(1) Baseline	(2) + COVID × Exposure	(3) Drop COVID Window
Post (0–12)	0.0486***	0.0488***	0.0323***
	(0.0011)	(0.0011)	(0.0009)
Post (13–24)	-0.0016	-0.0024	-0.0564***

Variable	(1) Baseline	(2) + COVID × Exposure	(3) Drop COVID Window
	(0.0019)	(0.0018)	(0.0021)
Post (25–36)	0.0205***	0.0166***	0.2312***
	(0.0023)	(0.0023)	(0.0163)
Exposure	0.0640***	0.0739***	0.0061
	(0.0035)	(0.0074)	(0.0086)
Post (0–12) × Exposure	0.2282***	0.2389***	0.0705***
	(0.0078)	(0.0091)	(0.0101)
Post (13–24) × Exposure	-0.1827***	-0.1712***	-0.0584***
	(0.0077)	(0.0070)	(0.0100)
Post (25–36) × Exposure	0.0186***	0.0061	-0.0061
	(0.0062)	(0.0137)	(0.0247)
Unemployment Rate	-0.0426***	-0.0436***	-0.2116***
	(0.0005)	(0.0006)	(0.0040)
CPI Inflation (YoY)	-7.2401***	-7.2126***	-9.9101***
	(0.0514)	(0.0526)	(0.1112)
10-Year Treasury Yield	0.1079***	0.1111***	0.0801***
	(0.0015)	(0.0013)	(0.0013)
Time Trend	-0.0027***	-0.0028***	-0.0067***
	(0.0001)	(0.0001)	(0.0003)
Time Trend²	0.0001***	0.0001***	0.0001***
	(0.0000)	(0.0000)	(0.0000)
Constant	3.6209***	3.6209***	4.5942***
	(0.0047)	(0.0048)	(0.0223)
Month-of-Year Fixed Effects	Yes	Yes	Yes

HAC Standard Errors (12 lags)	Yes	Yes	Yes

Table 14 reports the binned event-study estimates for nominal sales in the commercial vehicle sector.

Table 15: *Notes:* Dependent variable is log nominal sales for light vehicles. Event-time bins correspond to months relative to tariff implementation. All specifications include month-of-year fixed effects and macroeconomic controls. Standard errors in parentheses are Newey–West HAC with 12 lags. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.10.

Variable	(1) Baseline	(2) + COVID × Exposure	(3) Drop COVID Window
Post (0–12)	-0.0016**	-0.0013	0.0261***
	(0.0008)	(0.0008)	(0.0004)
Post (13–24)	0.0223***	0.0160***	0.0135***
	(0.0019)	(0.0018)	(0.0007)
Post (25–36)	0.0824***	0.0669***	-0.1655***
	(0.0024)	(0.0028)	(0.0056)
Exposure	-0.0239***	0.0957***	0.0128***
	(0.0047)	(0.0095)	(0.0038)
Post (0–12) × Exposure	0.0080	-0.0523***	0.0499***
	(0.0097)	(0.0101)	(0.0041)
Post (13–24) × Exposure	-0.2049***	-0.1296***	-0.0244***
	(0.0124)	(0.0096)	(0.0041)
Post (25–36) × Exposure	0.1730***	0.2776***	-0.0128
	(0.0093)	(0.0230)	(0.0112)
Unemployment Rate	-0.0377***	-0.0399***	-0.0039**
	(0.0008)	(0.0011)	(0.0016)
CPI Inflation (YoY)	-3.3249***	-3.2442***	0.0646
	(0.0576)	(0.0578)	(0.0469)

Variable	(1) Baseline	(2) + COVID × Exposure	(3) Drop COVID Window
10-Year Treasury Yield	0.0228***	0.0310***	-0.0043***
	(0.0018)	(0.0012)	(0.0005)
Time Trend	-0.0003***	-0.0006***	-0.0018***
	(0.0001)	(0.0001)	(0.0001)
Time Trend²	-0.0000***	-0.0000***	0.0000***
	(0.0000)	(0.0000)	(0.0000)
Constant	3.0647***	3.0628***	2.9363***
	(0.0069)	(0.0070)	(0.0094)
Month-of-Year Fixed Effects	Yes	Yes	Yes
HAC Standard Errors (12 lags)	Yes	Yes	Yes

Table 15 reports the binned event-study estimates for light-vehicle sales.

References

Amiti, Mary, Stephen Redding, and David Weinstein. 2019. "The Impact of the 2018 Trade War on u.s. Prices and Welfare." *Journal of Economic Perspectives* 33 (4): 187–210. https://doi.org/10.1257/jep.33.4.187.

Autor, David, David Dorn, and Gordon Hanson. 2013. "The China Syndrome: Local Labor Market Effects of Import Competition in the United States." *American Economic Review* 103 (6): 2121–68. https://doi.org/10.1257/aer.103.6.2121.

Callaway, Brantly, and Pedro H. C. Sant'Anna. 2021. "Difference-in-Differences with Multiple Time Periods." *Journal of Econometrics* 225 (2): 200–230. https://doi.org/10.1016/j.jeconom.2020.12.001.

Fajgelbaum, Pablo, Pinelopi Goldberg, Patrick Kennedy, and Amit Khandelwal. 2020. "The Return to Protectionism." *Quarterly Journal of Economics* 135 (1): 1–55. https://doi.org/10.1093/qje/qjz036.

Flaaen, Aaron, and Justin Pierce. 2019. *Disentangling the Effects of the 2018–2019 Tariffs on a Globally Connected u.s. Manufacturing Sector*. Finance and Economics Discussion Series Nos. 2019-086. Board of Governors of the Federal Reserve System. https://www.federalreserve.gov/econres/feds/files/2019086pap.pdf.

Goldberg, Pinelopi, and Nina Pavcnik. 2007. "Distributional Effects of Globalization in Developing Countries." *Journal of Economic Literature* 45 (1): 39–82. https://doi.org/10.1257/jel.45.1.39.

Sun, Liyang, and Sarah Abraham. 2021. "Estimating Dynamic Treatment Effects in Event Studies with Heterogeneous Treatment Effects." *Journal of Econometrics* 225 (2): 175–99. https://doi.org/10.1016/j.jeconom.2020.09.006.

U.S. International Trade Commission. 2024. *USITC DataWeb*. Online database. https://dataweb.usitc.gov.