United States
International Trade Commission

USMCA Automotive Rules of Origin: Economic Impact and Operation, 2023 Report

Corrected July 2023
June 2023
Publication Number: 5443
Investigation Number: 332-592

United States International Trade Commission

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For the United States International Trade Commission *USMCA Automotive Rules of Origin: Economic Impact and Operation, 2023 Report*, Investigation No. 332-592, USITC Publication 5443, June 2023.

- In table ES.1, the estimated impact on imports of transmissions from non-USMCA countries was corrected to read "−55,195 transmissions" rather than "−55,295 transmissions," and the estimated impact on total U.S. vehicle production was corrected to read "1,464 vehicles" rather than "1,463 vehicles."

July 2023

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Abbreviations and Acronyms

Acronym	Term
AALA	American Automotive Labeling Act (1992)
The Act	The USMCA Implementation Act
AAPC	American Automotive Policy Council
ADAS	advanced driver assistance systems
AISI	American Iron and Steel Institute
AMIA	La Asociación Mexicana de La Industria Automotriz (Mexican Automotive Industry Association)
BLS	U.S. Bureau of Labor Statistics
CANACERO	Cámara Nacional de la Industria del Hierro y del Acero (National Iron and Steel Industry Association) (Mexico)
CAR	Center for Automotive Research
CBP	U.S. Customs and Border Patrol
CHIPS Act	Creating Helpful Incentives to Produce Semiconductors and Science Act of 2022
COMPAS	Cooperation Manufacturing Plant Aguascalientes (Mercedes-Benz Group and Nissan plant in Mexico)
COVID-19	coronavirus disease 2019
CUV	crossover utility vehicle
EDIS	Electronic Document Information System (USITC)
EV	electric vehicle
GDP	gross domestic product
GM	General Motors
GTA	S&P, Global Trade Atlas database
GWh	Gigawatt hours
HS	Harmonized Commodity Description and Coding System (Harmonized System)
HTS	Harmonized Tariff Schedule of the United States
ICE	internal combustion engine
ILO	International Labour Organization
IRA	Inflation Reduction Act of 2022
IT	information technology
LVC	labor value content
MCU	microcontroller unit
MEMA	Motor & Equipment Manufacturers Association
NAFTA	North American Free Trade Agreement
NAICS	North American Industry Classification System
OEM	original equipment manufacturers
PSRO	product-specific rule of origin
OICA	International Organization of Motor Vehicle Manufacturers
R&D	research and development
ROO	rule of origin
RVC	regional value content
SUV	sport utility vehicle
UAW	International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (also known as United Auto Workers)
Unifor	Canadian union formed by Canadian Auto Workers union (CAW) and the Communications, Energy and Paperworkers Union of Canada (CEP)
USITC	U.S. International Trade Commission
USITC DataWeb/Census	U.S. International Trade Commission Interactive Tariff and Trade DataWeb (USITC DataWeb)/U.S. Census Bureau (Census)

Acronym	Term
USMCA	United States–Mexico–Canada Agreement
USMCA Automotive Committee	USMCA Interagency Committee on Trade in Automotive Goods
USMCA Implementation Act	United States–Mexico–Canada Agreement Implementation Act
USTR	U.S. Trade Representative
VW	Volkswagen

Executive Summary

As required by section 202A(g)(2) of the United States-Mexico-Canada Agreement (USMCA) Implementation Act (the Act), this report is the first of five biennial reports submitted by the Commission on the USMCA automotive rules of origin (ROOs), their impact on the U.S. economy as a whole, and on the U.S. automotive industry and other pertinent industries.

The reports in this series are due in 2023, 2025, 2027, 2029, and 2031. This report covers the period from July 1, 2020, when the USMCA entered into force, to December 31, 2022, and addresses the following:

- The economic impact of the ROOs on U.S. gross domestic product (GDP); U.S. exports and imports; U.S. aggregate employment and employment opportunities; production, investment, use of productive facilities, and profit levels in the U.S. automotive industries and other pertinent industries; wages and employment of workers in the U.S. automotive sector; and the interests of U.S. consumers.
- The operation of the ROOs and their effects on the competitiveness of the United States with respect to production and trade in automotive goods, taking into account developments in technology, production processes, or other related matters.
- Whether the ROOs are relevant in light of technological changes in the United States.
- Other matters identified by the Commission as relevant to the economic impact of the ROOs, including prices, sales, inventories, patterns of demand, capital investment, obsolescence of equipment, and diversification of production in the United States.

This report includes quantitative and qualitative analyses of the impacts of the ROOs. The quantitative analyses employ a model to estimate the economic impacts of the ROOs on the automotive industry and the overall U.S. economy. This report uses qualitative analyses to describe and assess the impacts of the ROOs on the competitiveness of the automotive industry, including comparisons of descriptive statistics measuring automotive trade, production, investment, and employment. Finally, the report reviews technology changes in the United States that may affect the relevancy of the ROOs.

Highlights

The USMCA automotive ROOs are designed to replace the North American Free Trade Agreement (NAFTA) automotive ROOs and incentivize U.S. vehicle and parts production, increasing automotive investment and employment. The ROOs provide new content requirements and establish new requirements for vehicle producers' purchases of steel and aluminum for passenger vehicles, light and heavy trucks, and certain automotive parts to be eligible for preferential treatment under the USMCA.

The USMCA has only been in force since July 1, 2020. Many of the ROOs, therefore, have not been fully implemented because of staging—or phasing in—of requirements over a period of years. The full effect of the ROOs will likely not be apparent until the agreement is fully implemented in 2027, or later.

The Commission's economic modeling analysis indicates that during 2020–22 the U.S. automotive industry experienced reduced imports of engines and transmissions and increased employment, production, revenue, capital expenditures, and profits as a result of the ROOs. The Commission's model estimates that the ROOs increased the number of U.S. vehicles produced by 1,464 and the number of vehicles and automotive parts production workers by 3,912. The model also estimates that U.S. automotive sector wage payments increased by $2.7 million in vehicle production and by $239.1 million in parts production. The ROOs had a negligible impact on GDP and aggregate employment in the U.S. economy.

Production, trade, employment, and investment data trends examined for 2018 to 2022 show few signs of changes in competitiveness of the U.S. automotive industry after the USMCA's entry into force in 2020. Production shutdowns due to the COVID-19 pandemic and chip shortages were likely the main factors in declines in U.S. vehicle and parts production in 2020 and 2021.

Technological changes have affected the U.S. automotive industry during the period covered in this report. This report notes two instances in which such changes in the U.S. automotive industry have created divergences related to the Harmonized Commodity Description and Coding System (HS) tariff classification or tariff treatment of similar goods in the USMCA automotive ROOs. These changes involve the shift to production of electric and hybrid pickup trucks and a new automotive production process related to aluminum vehicle bodies.

Several factors unrelated to the ROOs have likely impacted automotive production, trade, and the supply chain since entry into force of the agreement. These factors likely had a greater impact on the U.S. automotive industry than the ROOs. The most significant of these were the onset of the COVID-19 pandemic and subsequent semiconductor shortage, which significantly depressed automotive production for multiple years. Other factors affecting the industry during 2020–22 include the industry-wide shift to electric and hybrid vehicles that is changing the quantity, value, and type of various automotive parts in a finished vehicle, which has implications for the ROOs.

Scope of the Report

This report analyzes the effects of the USMCA automotive ROOs on the U.S. automotive industry, including both U.S.- and foreign-headquartered vehicle manufacturers and vehicle parts producers operating in the United States. The report also examines the effects of the ROOs on other pertinent industries, including the steel and aluminum industries, which—although not exclusively automotive focused—are also impacted by the ROOs because they provide critical structural components that account for most of the weight of vehicles produced in USMCA countries. Furthermore, the report examines the competitiveness of the U.S. automotive industry vis-à-vis Canada, Mexico, and non-USMCA vehicle-producing countries; technological changes within the U.S. automotive industry that affect the relevancy of these ROOs; and external factors impacting the U.S. automotive industry.

This report discusses three categories of vehicles: passenger vehicles, light trucks, and heavy trucks. This report focuses primarily on passenger vehicles and light trucks ("light vehicles") because the agreement

applies the greatest number of rule changes and more stringent rules to light vehicles compared to heavy trucks and light vehicles represent the vast majority of the U.S. automotive market.[1]

Overview of the USMCA automotive ROOs

The USMCA automotive ROOs have three major components—regional value content (RVC), labor value content (LVC), and steel and aluminum purchasing requirements. These ROOs are designed to replace NAFTA automotive ROOs. The RVC rules require vehicle and vehicle parts manufacturers to use a certain amount of content originating in a USMCA country for those goods to receive preferential duty treatment. The level of RVC requirements varies from 75 percent (for light vehicles and their core parts) to 60 percent (for complementary parts for heavy trucks), which are increases as compared to the RVC requirements in NAFTA. The RVC rules also require that all core parts for light vehicles (comprising passenger vehicles and light trucks)—or the average of the value of all core parts for light vehicles summed together—meet the 75 percent RVC requirement.[2] The LVC rules, introduced for the first time in the USMCA, require all vehicle manufacturers to use a certain amount (40 percent for passenger vehicles and 45 percent for light and heavy trucks) of content produced with high-wage labor (average greater than $16 per hour) for goods to receive preferential duty treatment. The steel and aluminum purchasing requirements, also introduced for the first time in the USMCA, require all vehicle manufacturers to source at least 70 percent of their steel and 70 percent of their aluminum from USMCA countries to receive preferential duty treatment. The RVC requirements for light vehicles are being staged (phased in) over three years, with full implementation scheduled to occur on July 1, 2023. The RVC requirements for heavy trucks are being staged over seven years, with full implementation scheduled to occur on July 1, 2027. Although the steel and aluminum purchasing requirements for all vehicles and LVC requirements for trucks (light and heavy) went into effect immediately, the LVC requirements for passenger vehicles are being phased in over three years.[3]

Alternative Staging Regimes

Alternative staging extends the time that vehicle manufacturers have to meet the USMCA automotive ROOs for light vehicles from mid-2023 to at least mid-2025 (five years after entry into force). Vehicle manufacturers are limited to using alternative staging for 10 percent of their annual production in USMCA countries. If the parties agree that a manufacturer has demonstrated via a detailed and credible plan that it would have the ability to meet the ROOs by the alternative staging date, alternative staging could apply to more than 10 percent.

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[1] Light vehicles comprise the largest share of the vehicle market and, in 2022, made up 98 percent of U.S. vehicle sales, 96 percent of U.S. vehicle imports, and 96 percent of U.S. vehicle exports by quantity. Wards Intelligence, "U.S. Vehicle Sales by Vehicle Type and Source, 1931–2022," February 9, 2023. USITC DataWeb/Census, accessed September 27, 2022. HS subheadings for light vehicles and heavy trucks are provided in appendix F.

[2] A panel decision was issued in January 2023 related to the interpretation of flexibilities for this requirement. For more see "Core Parts Dispute" in chapter 1.

[3] The USMCA automotive ROOs also have a "melted and poured" requirement for steel, starting on July 1, 2027, that requires the steel to be melted and poured in USMCA countries for it to qualify under the steel purchasing requirement. 19 C.F.R. Appendix A to part 182 § 17(5); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 6, 4-B-1-25.

Commission analysis of alternative staging petitions reveals that only a minority of vehicles that manufacturers produced within USMCA countries are using alternative staging, most often to meet vehicle RVC, core parts RVC, and steel purchase requirements. In total, the 13 approved alternative staging petitions affect less than 15 percent of distinct vehicle models produced in USMCA countries. The affected models account for approximately 22 percent of North American production and a smaller percentage of U.S. sales. Almost all these petitions requested alternative staging for greater than 10 percent of their vehicle production in USMCA countries by providing a detailed and credible plan describing how they planned to meet the ROOs for the models requested. Nearly all alternative staging plans end by mid-2025.

Economic Impact of the USMCA Automotive ROOs

This report uses an economic simulation model and detailed data from the U.S., Mexican, and Canadian automotive industries to assess the likely impacts of the USMCA automotive ROOs on the U.S. economy and automotive industry. The model focuses on the impacts of the ROOs on the U.S. automotive industry after the USMCA entered into force in July 2020 through the end of 2022. The results are summarized below (table ES.1).

Table ES.1 Summary of estimated impacts of the USMCA automotive ROOs
In number of units, dollars, and number of workers.

Economic Outcome	Estimated Impact
Imports of engines from non-USMCA countries	-431,853 engines
Imports of transmissions from non-USMCA countries	-55,195 transmissions
Imports of light vehicles from other USMCA countries	-4,748 vehicles
Imports of light vehicles from non-USMCA countries	1,125 vehicles
Employment in U.S. parts production	3,877 workers
Employment in U.S. vehicle production	35 workers
Wages in U.S. parts production	$239.1 million
Wages in U.S. vehicle production	$2.7 million
Revenue from U.S. vehicle production	$81.3 million
Revenue from U.S. engine production	$1,525.4 million
Revenue from U.S. transmission production	$101.5 million
Average vehicle prices	$3
Total U.S. vehicle production	1,464 vehicles

Source: USITC estimates. See chapter 2 for more information.

Changes in GDP and aggregate employment in the United States attributed to the ROOs were less than 0.01 percent. Therefore, economy-wide effects were marginal in the first two and a half years after the USMCA entered into force, consistent with the estimated effects within the U.S. automotive industry and the size of the industry relative to the entire U.S. economy.

Effects of the USMCA Automotive ROOs on U.S. Competitiveness

This report analyzes the effects of the USMCA automotive ROOs on the competitiveness of the U.S. domestic automotive industry, which includes U.S.- and foreign-headquartered vehicle manufacturers and parts suppliers.[4] For purposes of this analysis, competitiveness is defined as the ability of U.S. producers to meet the demand for U.S.-produced vehicles and parts within USMCA countries and non-USMCA countries at a price that is accepted in the market. The USMCA automotive ROOs impact the automotive industry primarily through influencing producers' decisions about investment, input sourcing, and production locations. Such increased costs may harm U.S. vehicle manufacturers' competitiveness at least in the short run. Increased sourcing of domestic inputs may increase resilience to external supply chain disruptions and help retain domestic production.

The full extent of the effect of the ROOs on competitiveness will likely not be apparent until the agreement is fully implemented in 2027, or later. Even at this stage, vehicle manufacturers and suppliers report that the ROOs have increased costs at multiple stages of the supply chain (table ES.2), but they have also increased the U.S. share of USMCA vehicle and parts production.

Table ES.2 Effects of the USMCA automotive ROOs on U.S. automotive industry competitiveness

Provision	Requirement	Reported industry response to comply with the ROOs	Reported effect of industry response on competitiveness
Regional value content (increase from NAFTA)	75 percent (was 62.5 under NAFTA)	Increased sourcing of parts from USMCA countries	• Increased USMCA parts production • Increased input costs
Labor value content (new)	40 or 45 percent content produced at plants paying workers $16 per hour	Relocated parts production and vehicle assembly to (or retained in) the United States and Canada	• Increased U.S. (and Canadian) vehicle and parts production • Increased labor costs • Increased input costs
Steel and aluminum purchasing requirements (new)	70 percent purchased from USMCA countries	Increased sourcing of steel and aluminum from USMCA countries	• Increased steel and aluminum production • Increased input costs

Source: USITC created using interviews with industry experts and hearing testimony and data from alternative staging petitions.
Note: As noted in chapter 3, in at least two instances, parts suppliers reportedly chose to pay their workers in Mexico an average of $16 per hour to comply with the LVC requirement.

In contrast to the reported changes in costs and production driven by the ROOs outlined in table ES.2, public data on U.S. automotive production and trade show few signs of changes in competitiveness after the USMCA entered into force. It is unclear what effects, if any, were caused by the ROOs. In part because the COVID-19 pandemic and chip shortages drove declines and subsequent increases in U.S. automotive production and trade, changes in various metrics of U.S. automotive competitiveness since the USMCA's entry into force present a mixed picture. For example, during 2018 to 2022, domestic parts

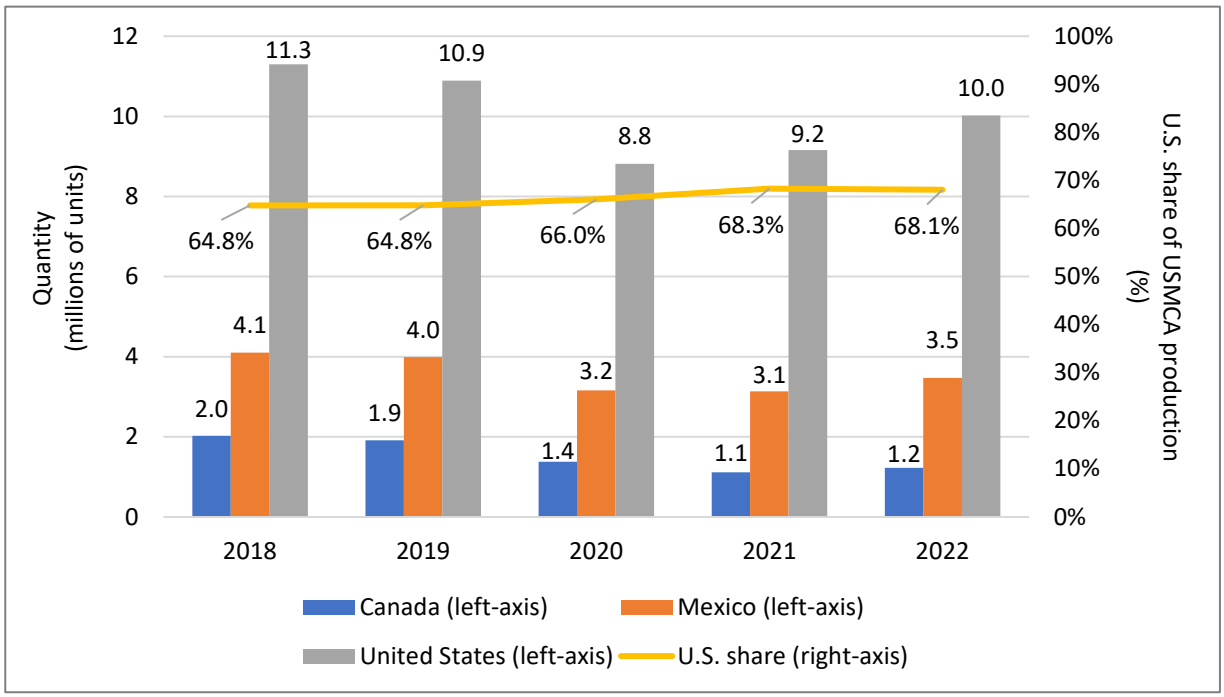
[4] Nonautomotive firms that supply inputs to the automotive industry (e.g., steel and aluminum manufacturers) are also discussed, though they are not necessarily part of the automotive industry.

production's share of U.S. parts consumption declined by 3.1 percentage points, possibly indicating a decrease in competitiveness of U.S. parts versus imported parts. Also, the share of U.S. automotive imports from Canada and Mexico not claiming the USMCA tariff preference increased significantly after entry into force of the agreement. This increase may indicate that an increasing share of vehicle manufacturers and parts suppliers are opting to pay tariffs on U.S. imports rather than meet the ROOs. It is unclear, however, whether either of these trends is permanent or caused by the ROOs.

Some changes that may indicate an increase in U.S. automotive competitiveness include the United States' share of USMCA light vehicle production, as well as light vehicle and parts exports as a share of global exports, all of which increased after entry into force in a way that may indicate small but positive increases in U.S. competitiveness. U.S. light vehicle production as a share of USMCA production increased from 64.8 percent in 2018 to 68.1 percent in 2022 (figure ES.1). U.S. light vehicle exports as a share of global light vehicle exports increased from 6.6 percent in 2018 to 7.7 percent in 2022. U.S. automotive parts exports as a share of global parts exports also increased from 8.1 percent of global exports in 2018 to 8.4 percent in 2022. These increases are small and it is unclear whether they are permanent or caused by the ROOs.

Figure ES.1 U.S. share of USMCA vehicle production, by country and year

In percentages. Underlying data for this figure can be found in appendix E, table E.8.



Source: Ward's Intelligence, "North American Vehicle Production by State and Plant," April 11, 2022; Ward's Intelligence, "North America Production, December 2022," January 19, 2023.
Note: See appendix G for production and trade by U.S. region, as well as the state composition of each region.

Employment and investment data also show some signs of changes in competitiveness, though the extent to which the changes can be attributed to the ROOs is unclear. U.S. vehicle manufacturers and parts suppliers' announced investments in Canada and the United States have increased sharply, with most of the new investments going into electric vehicles and electric vehicle batteries.

Technological Changes Impacting the Relevance of the USMCA Automotive ROOs

This report identifies two instances in which technological changes occurring in the U.S. automotive industry in recent years created divergences related to the HS tariff classification or tariff treatment of similar goods in the USMCA automotive ROOs. The first pertains to the USMCA's categorization of electric and hybrid pickups as heavy trucks, which are subject to a different set of product-specific rules of origin (PSROs) than their internal combustion engine counterparts. The second pertains to cast aluminum vehicle bodies, which are not granted a key flexibility related to qualifying the good as originating that is granted to stamped vehicle bodies.

The report describes industry views regarding the impact of the production shift toward electric vehicles (EVs) and hybrids on the relevance of the rest of the ROOs. Relatedly, it describes views on the relevance of, and potential need for changes to, the USMCA automotive parts lists in response to increased production of EVs and hybrid vehicles. Finally, this report describes two technological trends that may impact the continued relevance of the ROOs in the future: (1) the increased value of nontraditional automotive inputs (e.g., semiconductors and sensors) and how this may impact RVC calculations for vehicle components that use a growing share of nontraditional parts and (2) the lack of PSROs for recycled battery materials.

Other Factors Impacting the U.S. Automotive Industry

Several factors unrelated to the USMCA automotive ROOs likely impacted automotive production, trade, and the supply chain since entry into force of the agreement. These factors likely had a greater impact on the U.S. automotive industry than the ROOs. Most significant of these was the onset of the COVID-19 pandemic, which led to declines in automotive production, first as a result of production shutdowns and then due to prolonged shortages in the supply of inputs. The most significant of these supply chain shortages occurred in the semiconductor market. Vehicle manufacturers canceled chip orders at the onset of the pandemic, even though nonautomotive semiconductor demand was rising, because of factors like local lockdowns, remote work, and distance learning. To meet these shifts in demand, chip makers shifted their production away from automotive legacy chips toward higher profit margin chips used in consumer electronics. As a result, when vehicle demand rebounded, semiconductor manufacturers lacked the capacity to fulfill orders for automotive chips and vehicle manufacturers were faced with low inventories and long wait times on orders for new chips. Other factors affecting the industry during 2020–22 included the industry-wide shift to electric and hybrid vehicles; the ongoing USMCA core parts dispute; Russia's invasion of Ukraine; various U.S. laws, such as the 2022 Inflation Reduction Act; and other trade actions.

Chapter 1
Introduction

The U.S. International Trade Commission (Commission or USITC) prepared this report to meet the requirements of section 202A(g)(2) of the United States-Mexico-Canada Agreement (USMCA) Implementation Act (the Act) (19 U.S.C. § 4532(g)(2)).[5] The Act requires the Commission to prepare a series of five biennial reports on the economic impact of the USMCA automotive rules of origin (ROOs), their operation and effects on competitiveness, and whether they remain relevant; and to provide those reports to the President, the House Committee on Ways and Means, and the Senate Committee on Finance. This is the first report in the series; the subsequent four reports are due in 2025, 2027, 2029, and 2031.[6] The USMCA automotive ROOs are described in more detail below.[7]

Scope

Appendix A to this report sets out the full text of section 202A(g)(1)–(3) of the Act. Section 202A(g)(2), which applies to the Commission, requires that the Commission submit a report on:

- The economic impact of the USMCA automotive ROOs on: (1) the gross domestic product (GDP), trade, and employment in the overall U.S. economy; (2) production, investment, use of productive facilities, and profit levels in the U.S. automotive industry and other pertinent industries; (3) wages and employment in the U.S. automotive industry; (4) the interests of consumers in the United States; and (5) other relevant matters, including prices, sales, inventories, patterns of demand, capital investment, obsolescence of equipment, and diversification of production in the United States.[8]
- The operation of the ROOs and their effects on U.S. competitiveness with respect to production and trade in automotive goods, considering developments in technology, production processes, and related matters.[9]
- The relevancy of the ROOs in light of technological changes in the United States.[10]

[5] Pub. L. No. 116-113, § 202A(g)(2), 134 Stat. 42 (2020) (codified at 19 U.S.C. § 4532(g)(2)).
[6] The USITC's reports alternate with the years in which the USTR will provide USMCA automotive ROOs-related reports to the Committees. The first USTR report was submitted in July 2022. USTR, *Report to Congress on USMCA Trade in Automotive Goods*, July 1, 2022. https://ustr.gov/sites/default/files/2022%20USMCA%20Autos%20Report%20to%20Congress.pdf.
[7] Throughout the report "USMCA automotive rules of origin (ROOs)" and "ROOs" are, unless otherwise specified, used to refer to the provisions set forth in the automotive appendix to the USMCA. 19 U.S.C. § 4532(a)(5); USMCA, Chapter 4 Rules of Origin, Appendix to Annex 4-B, 4-B-1-1 through 4-B-1-47.
[8] 19 U.S.C. § 4532(g)(2)(A) and (D).
[9] 19 U.S.C. § 4532(g)(2)(B).
[10] 19 U.S.C. § 4532(g)(2)(C).

This report discusses the economic impact of the ROOs on the overall U.S. economy and the automotive industry; the competitiveness of the U.S. automotive industry vis-à-vis Canada, Mexico, and non-USMCA vehicle-producing countries; and technology changes within the U.S. automotive industry that affect the relevancy of these ROOs. These rules are set out in the appendix to Annex 4-B of the USMCA.[11] The ROOs cover light vehicles (passenger vehicles and light trucks), heavy trucks, automotive parts for those vehicles, and steel and aluminum purchasing requirements for vehicle manufacturers. The report primarily focuses on light vehicles, which comprise the largest part of the industry. Heavy trucks, particularly those that are similar to light vehicles (e.g., electric and hybrid pickup trucks), however, are also discussed.[12]

Industry Coverage

For the purpose of this report, the Commission defines the U.S. automotive industry to include both U.S.- and foreign-headquartered vehicle and vehicle parts manufacturers operating in the United States. In terms of vehicle parts manufacturing, the report's coverage includes parts suppliers and producers of nontraditional vehicle parts, including those that have become more prevalent in the global automotive industry because of the transition to electric vehicles (EVs) (e.g., suppliers of EV batteries) and those that produce an increasing number of parts requiring semiconductors. The steel and aluminum industries, although not exclusively automotive focused, are other pertinent industries that have also been impacted by the USMCA automotive ROOs because they provide critical structural components that account for the majority of the weight of vehicles. In particular, the USMCA introduced new requirements for vehicle manufacturers to purchase steel and aluminum from USMCA countries to qualify for preferential treatment.

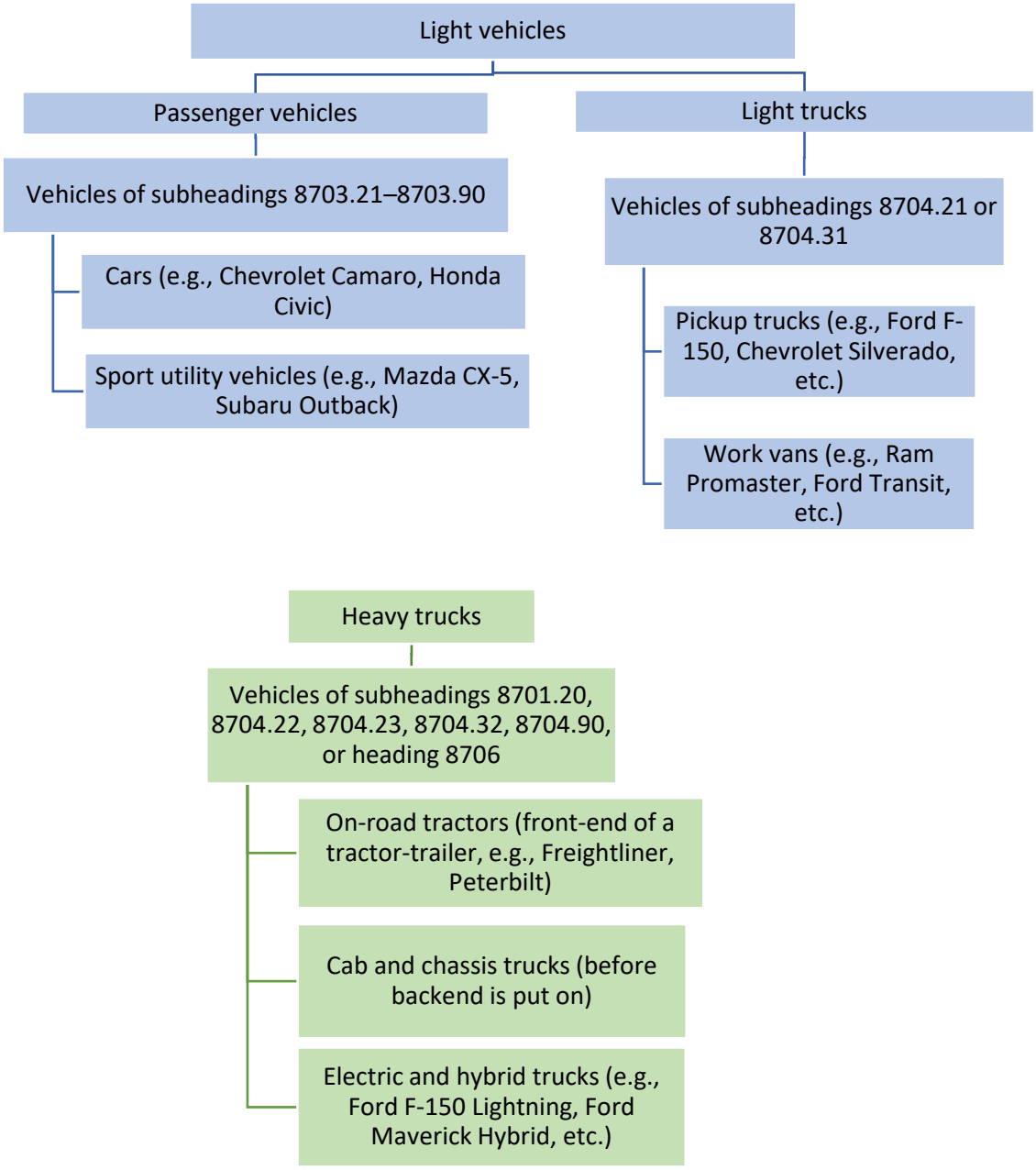
Product Coverage

This report discusses three categories of vehicles, as defined by USMCA: passenger vehicles, light trucks, and heavy trucks. These categories are presented in figure 1.1.

[11] 19 C.F.R. Appendix A to part 182; USMCA, Appendix to Annex 4-B, 4-B-1-1 through 4-B-1-47.
[12] For a discussion of the categorization of EV and hybrid pickup trucks under USMCA, see chapter 4.

Figure 1.1 Vehicle categories in the USMCA

Underlying data for this figure appear in appendix E, table E.1.



Source: 19 C.F.R. Appendix A to part 182 § 12; USMCA, Appendix to Annex 4-B, Provisions Related to the Product-specific Rules of Origin for Automotive Goods, Articles 1 and 10
Note: All Harmonized System (HS) subheadings listed here are based on HS 2012 nomenclature. For a discussion of changes to HS subheadings since then, see chapter 4. Passenger vehicles with compression-ignition engines (diesel) are excluded.

Passenger vehicles and light trucks can be grouped together as "light vehicles." These vehicles are typically manufactured by the same companies, using similar supply chains, and are subject to similar USMCA automotive ROOs. This report focuses primarily on the ROOs for light vehicles because the agreement applies the greatest number of rule changes and more stringent rules to light vehicles

compared to heavy trucks or other vehicles. Furthermore, light vehicles comprise the largest share of the vehicle market and, in 2022, made up 98 percent of U.S. vehicle sales, 96 percent of U.S. vehicle imports, and 96 percent of U.S. vehicle exports by quantity.[13]

The report also discusses automotive parts and other inputs such as semiconductors, steel, and aluminum. The USMCA provides ROOs for automotive parts for light vehicles, heavy trucks, and other vehicles.[14] The agreement separates automotive parts for light vehicles into three categories: core parts, principal parts, and complementary parts. Core parts in a vehicle include major systems such as the engine, the transmission, or an advanced battery.[15] Principal parts are significant parts not included in core parts and include such parts as air conditioners, seats, air bags, and major components of core parts (e.g., transmission shafts, electronic brake systems, and clutches).[16] Complementary parts are other automotive parts (e.g., small electric motors, headlights, and wiring sets) that are not core parts or principal parts.[17] Automotive parts for heavy trucks and other vehicles are separated into two categories: principal parts and complementary parts.[18]

Roadmap for Future Reports

This report is the first in a series of five biennial reports on the economic impact of the USMCA automotive ROOs. It discusses the ROOs and their economic impacts, competitiveness effects, and their continuing relevancy in light of technological changes in the United States that occurred between the USMCA's entry into force (July 1, 2020) and December 31, 2022. The next report, due in 2025, has the same reporting requirements but will present updated data and information about the industries through December 31, 2024. Each subsequent report will report on the same topics and two new years of data and information.

The Commission expects the impacts of the USMCA automotive ROOs on the automotive industry and the overall U.S. economy to increase over time and be more evident in subsequent reports. The realization of the impacts of the ROOs tends to be somewhat delayed for multiple reasons. Many of the requirements did not fully apply immediately on entry into force but rather are being phased in over a

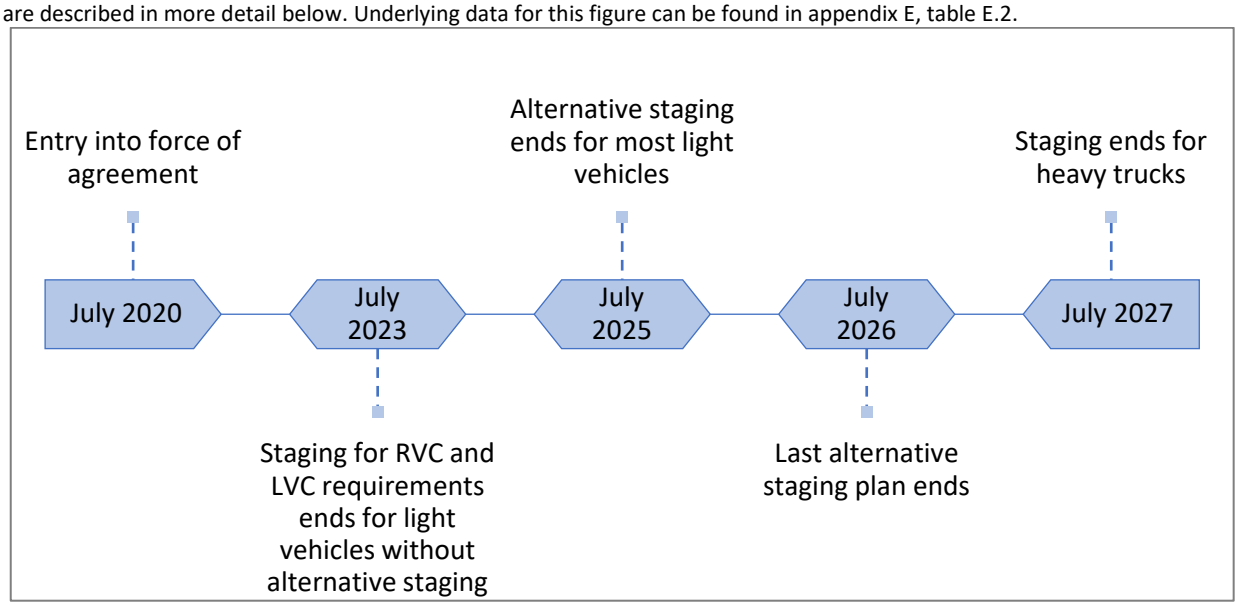
[13] Wards Intelligence, "U.S. Vehicle Sales by Vehicle Type and Source, 1931–2022," February 9, 2023. USITC DataWeb/Census (accessed September 27, 2022). HS subheadings for light vehicles and heavy trucks are provided in appendix F.
[14] HS subheadings for automotive parts are provided in appendix F of this report.
[15] 19 C.F.R. Appendix A to part 182 § 20 Table A.1; USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Table A.1, 4-B-1-34. According to the appendix's chapeau, the formatting and organization of 19 C.F.R., Appendix A to part 182 does not conform with ordinary such conventions in the code of federal regulations because it directly incorporates provisions of the USMCA without revision.
[16] 19 C.F.R. Appendix A to part 182 § 20 Table B; USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Table B, 4-B-1-36 through 4-B-1-37.
[17] 19 C.F.R. Appendix A to part 182 § 20 Table C; USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Table C, 4-B-1-38 through 4-B-1-39.
[18] The USMCA does not have a core parts list for heavy trucks, as it does for light vehicles. The core parts for light vehicles are included in the principal parts list for heavy trucks, except for lithium-ion batteries, which are classified as a complementary part for heavy trucks. For more information on these differences and their impacts, see chapter 4. 19 C.F.R. Appendix A to part 182 § 20 Tables D and E; USMCA, Appendix to Annex 4-B, Provisions Related to the Product-specific Rules of Origin for Automotive Goods, Tables D and E, 4-B-1-40 through 4-B-1-42.

staging period. The staging periods incrementally increase the RVC requirements (and LVC requirements for passenger vehicles) over a period of years.[19] For light vehicles, most staging is in four equal parts from entry into force until reaching the full agreement level in July 2023.[20] For heavy trucks, RVC requirements are staged in three equal parts through July 2027, and the LVC requirements went immediately into effect.[21] The requirement for manufacturers to purchase steel and aluminum produced in USMCA countries fully applied on entry into force, except for manufacturers with alternative staging plans that provide additional time to fully implement the RVC, LVC, and steel and aluminum purchasing requirements.

Alternative staging (discussed below) has allowed manufacturers to delay full implementation of the ROOs beyond the staging described below (see figure 1.2) until January 1, 2025, or later. The full extent of the effects of the USMCA will likely not be apparent until the agreement is fully implemented, which will be discussed in future iterations of the report.

Figure 1.2 Timeline of the USMCA automotive ROOs staging requirements, 2020–27

RVC = regional value content; LVC = labor value content. The RVC and LVC requirements and the alternative staging provisions are described in more detail below. Underlying data for this figure can be found in appendix E, table E.2.



Sources: Compiled by USITC from 19 C.F.R. Appendix A to part 182 §§ 13, 19(2); USMCA, Chapter 4 Rules of Origin, 2018, 4-B-1-19–23, 4-B-1-29–31.

Nonetheless, as described in the chapters covering economic impacts and competitiveness, vehicle manufacturers have begun sourcing additional parts and inputs from USMCA countries and will continue to increase the share sourced from USMCA partners through at least mid-2027, when the USMCA is fully

[19] LVC requirements for light and heavy trucks went into effect immediately on entry into force.
[20] 19 C.F.R. Appendix A to part 182 §§13(1)&18(1); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-specific Rules of Origin for Automotive Goods, Article 3 and Article 7, 4-B-1-19 and 4-B-1-26 through 4-B-1-27.
[21] 19 C.F.R. Appendix A to part 182 §§15(2)&18(2); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-specific Rules of Origin for Automotive Goods, Article 4 and Article 7, 4-B-1-22 through 4-B-1-23 and 4-B-1-26 through 4-B-1-27.

implemented (figure 1.2).[22] Furthermore, vehicle manufacturers and parts suppliers will make capital investments that gradually change where vehicles and parts are made. These production shifts (particularly vehicle assembly) will not occur all at once, because vehicle manufacturers have already invested billions of dollars in existing plants. The three major components of the ROOs described below—RVC, LVC, and steel and aluminum purchasing requirements—have reportedly contributed to these shifts. Because of a longer staging period, any discernable effects on heavy truck manufacturing will likely occur several years after light vehicle effects.[23]

Analytical Approach

This report includes quantitative and qualitative analyses of the impacts of the USMCA automotive ROOs. The quantitative analyses employ a model to estimate the economic impacts of the ROOs on the automotive industry and the overall U.S. economy. This report uses qualitative analyses to describe and assess the effects of the ROOs on the competitiveness of the automotive industry, including by providing comparison of descriptive statistics measuring automotive trade, production, employment, and investment. Finally, the report reviews technological changes that may affect the relevancy of the ROOs.

Information Sources

Official trade statistics for vehicles and vehicle parts were obtained from USITC DataWeb/Census and S&P's Global Trade Atlas, including data on the value of imports and exports, quantities, and destinations.[24] Data for automotive production and sales were obtained from Ward's Intelligence, the U.S. Census Bureau's Annual Survey of Manufactures, and Automotive World.[25] Investment data utilized to assess the competitiveness of the automotive industry were obtained from the Center for Automotive Research and Automotive Communities Partnership. Employment data for motor vehicles and parts were obtained from the U.S. Bureau of Labor Statistics.

Additional data information sources include U.S. government publications, industry interviews, public hearing testimony, and written submissions. Information on investments, spending, and the effects of the USMCA automotive ROOs were also drawn from individual firm petitions for alternative staging, submitted to the USMCA Interagency Committee on Trade in Automotive Goods (USMCA Automotive Committee) in December 2020.[26] The Commission interviewed more than 30 stakeholders, including vehicle and parts manufacturers, vehicle and supplier associations, government organizations, and academic experts. The Commission also held a public hearing on November 3, 2022, and received written submissions in connection with this investigation. The hearing had both in-person and virtual

[22] Alternative staging extended the time vehicle manufacturers had to fully meet the USMCA Automotive ROOs to at least mid-2025 (five years after entry into force), with a few vehicle manufacturers getting an additional six months to a year. Automotive Committee, information from alternative staging petitions submitted to the Automotive Committee July 2020 and aggregated by the USITC, February 15, 2023. 19 C.F.R. Appendix A to part 182 § 19(2).
[23] 19 C.F.R. Appendix A to part 182 § 19(2).
[24] U.S. trade statistics are U.S. Census Bureau data as stored by the USITC on USITC DataWeb/Census.
[25] For the purposes of this report, automotive production, vehicle production, and vehicle assembly are used interchangeably.
[26] The USITC aggregated information from individual petitions to preserve confidentiality. This use was authorized in the USMCA Implementation Act. 19 U.S.C. § 4532(b)(4)(B).

participation, including vehicle manufacturers; vehicle, parts, and other trade associations; and labor unions, and was transcribed by a court reporter. The transcript and all written submissions were made part of the Commission's public record in the investigation (with the exception of any confidential business information) and are available on the Commission's Electronic Document Information System (EDIS).[27]

Report Organization

Chapter 1 provides overviews of the USMCA automotive ROOs, the USMCA automotive industry, and non-ROOs-related factors affecting the U.S. automotive industry. Chapter 2 presents the results of the Commission's quantitative analysis that estimates the impact of the ROOs on the U.S. automotive industry and the U.S. economy. It focuses on the impact of the ROOs in the first two and a half years after the USMCA entered into force. Chapter 3 analyzes the effects of the ROOs on the competitiveness of the U.S. automotive industry, including by examining data on production, trade, investment, and employment in the U.S. automotive industry that might indicate a gain or loss in U.S. competitiveness. Chapter 4 describes current and potential future technological changes that may impact the relevancy of the ROOs. Appendix G of this report provides a more detailed description of the USMCA automotive industry than offered in chapter 1, including USMCA production and intra-regional trade. Appendix H reviews relevant literature the Commission considered in preparing this report. Appendix I adds detail on the quantitative methods used in chapter 2.

Modeling Approach

A detailed firm-level partial equilibrium model of the U.S. automotive industry is used to estimate the impacts on the U.S. economy. The partial equilibrium model estimates the impacts of the USMCA automotive ROOs on production, investment, capacity, profit, wages, employment, sales, inventories, and consumer interests (e.g., prices) in the U.S. automotive industry using changes in production costs and tariffs paid. In addition to the direct effects on the automotive industry, upstream industries (including steel and aluminum producers) and downstream industries (including retail automotive dealers) see indirect effects. In theory, as long as the ROOs lead to a shift in the sourcing of parts and other inputs to the United States and that shift results in increased production costs that are at least partially passed on into prices, the ROOs will likely have positive effects on parts production and other upstream industries and negative effects on vehicle production and other downstream industries. The rules would also lead to positive effects on aggregate U.S. employment and GDP as a result of the direct and indirect effects. In this case, however, the economic effects on aggregate U.S. employment and GDP are so small that they are practically zero.

The estimation of the economic impacts compares observed data to a simulation of the state of the industry and of the overall U.S. economy in 2022, absent adjustments that have been made because of the ROOs. Some of these adjustments come from vehicle manufacturers' pledged alternative staging petitions, which include investments attributable to the ROOs.[28] The model estimates impacts that can

[27] A list of witnesses appearing at the hearing is provided in appendix C, and summaries of written submissions are provided in appendix D.
[28] Alternative staging is discussed in more detail below.

be attributed to the ROOs. The impacts of non-ROOs-related factors like the semiconductor shortage, supply chain disruptions, and reduction in demand due to the COVID-19 pandemic are included in the baseline of the model.[29]

Competitiveness

The Commission analyzed the effects of the USMCA automotive ROOs on the competitiveness of the U.S. automotive industry, including U.S.- and foreign-headquartered vehicle manufacturers and parts suppliers. This report considers industry competitiveness as the ability of U.S. producers to meet the demand for U.S-produced vehicles and parts in both USMCA and non-USMCA countries at a price that is accepted in the market. The supply chains for vehicle manufacturers and parts suppliers are highly complex, spanning multiple countries within and outside of the USMCA region. Changes in the ROOs that encourage U.S. vehicle manufacturers to source a greater share of parts domestically may harm their competitiveness by increasing input costs, but the ROOs may benefit U.S. parts suppliers and other pertinent industries because of an increase in demand, and they may increase U.S. automotive employment and production.

Technological Changes Impacting the Relevancy of the ROOs

To analyze whether the USMCA automotive ROOs are relevant in light of technological changes in the United States, the Commission identified and evaluated key changes that have occurred (or are occurring) in the automotive industry. The two main changes that the Commission identified and evaluated are technological changes related to the tariff classification or tariff treatment of similar goods in the ROOs. The first involves the classification of electric and hybrid pickups as heavy trucks, and the second involves a new production process for aluminum vehicle bodies. The Commission also examined ongoing changes in the composition of existing vehicles and the increased prevalence of recycling in the automotive industry. These changes, as well as their potential to impact the relevancy of the ROOs, are discussed in more detail in chapter 4.

USMCA Automotive ROOs

Operation of the USMCA Automotive ROOs

The USMCA automotive ROOs define whether a vehicle qualifies for USMCA tariff preference.[30] These ROOs were designed to replace the North American Free Trade Agreement (NAFTA) automotive ROOs.

[29] See below for more examples of non-ROOs-related factors that impact the automotive industry alongside the ROOs.

[30] 19 C.F.R. Appendix A to part 182 provides the Uniform Regulations Regarding the Interpretation, Application, and Administration of Chapter 4 (Rules of Origin) of the Agreement between the United States of America, the United Mexican States, and Canada. This appendix provides further details on implementing the USMCA automotive ROOs as agreed by the parties, including allowing alternative staging for the steel and aluminum requirements and options to extend alternative staging beyond 2025. Appendix to Annex 4-B, Provisions Related to

This section primarily focuses on light vehicle ROOs for reasons stated in the product coverage section but also discusses areas where heavy truck ROOs differ. The USMCA automotive ROOs have three major components for the finished vehicle—RVC, LVC, and the steel and aluminum purchasing requirements (figure 1.3). The RVC rules require vehicle and vehicle parts manufacturers to use a certain amount of content originating (i.e., parts that qualify as originating) in a USMCA country for those goods to receive preferential duty treatment.[31] The ROOs provide product-specific rules of origin (PSROs) for various automotive parts to determine whether the part qualifies for duty-free treatment and group these parts into one of three categories (core parts, principal parts, and complementary parts).[32] Each of these categories has a different RVC requirement.[33] The LVC rules, first introduced in the USMCA, require vehicle manufacturers to use a certain amount of content produced with high-wage labor (average greater than $16 per hour) for the vehicle to receive preferential duty treatment.[34] The steel and aluminum purchasing requirements, also first introduced in the USMCA, require vehicle manufacturers to source at least 70 percent of their steel and 70 percent of their aluminum purchases from USMCA countries in order to receive preferential duty treatment.[35]

the Product-Specific Rules of Origin for Automotive Goods of the USMCA also provides information on the implementation of the ROOs.

[31] 19 C.F.R. Appendix A to part 182 § 13; USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Articles 3, 4, and 10.

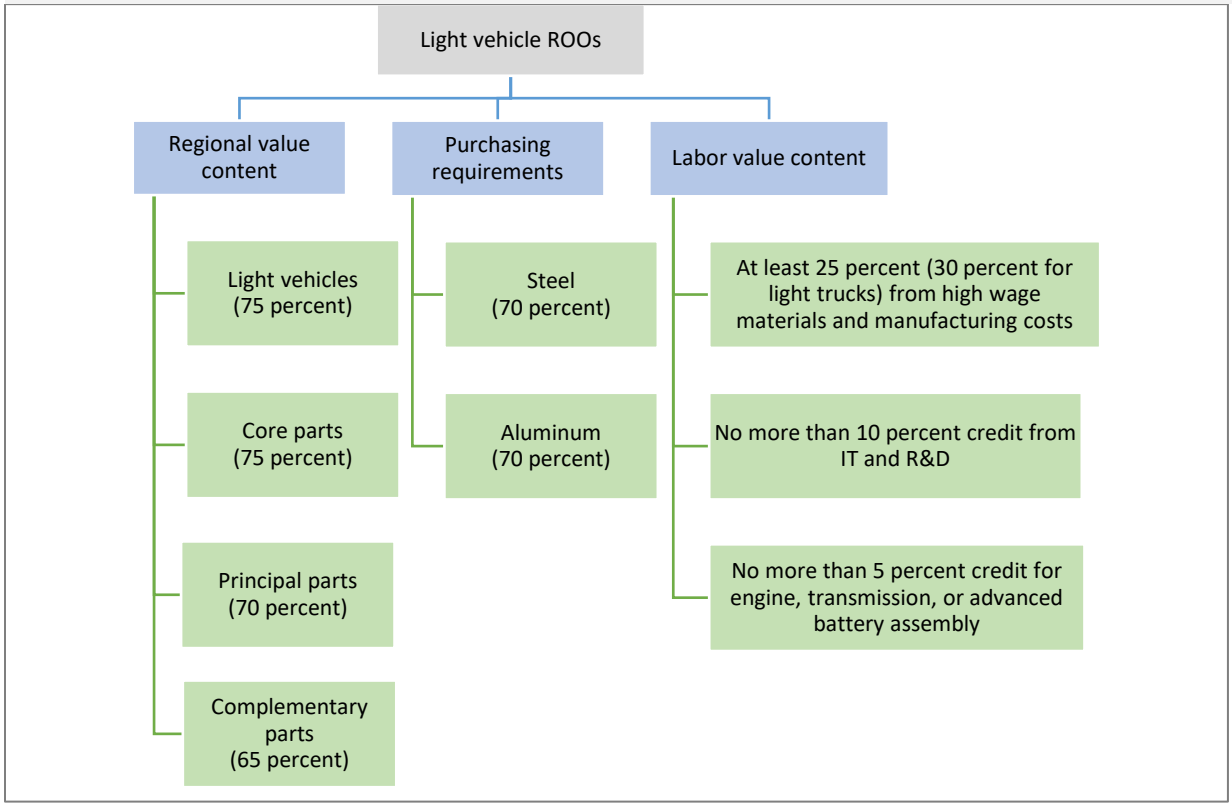
[32] Product-specific rules of origin are ROOs at the product-specific level, often categorized by HS heading or subheading level of aggregation. For a complete list of the USMCA PSROs, see 19 C.F.R. Appendix A to part 182 § 13 or USMCA Appendix to Annex 4-B: Article 2: Product-Specific Rules of Origin, 4-B-1-3 through 4-B-1-19.

[33] The Core, Principal, and Complementary Parts lists in the USMCA automotive ROOs outline the parts of a motor vehicle that are subject to the ROOs. 19 C.F.R. Appendix A to part 182 § 20 Tables A.1, A.2, B, C, D, and E; USMCA Appendix to Annex 4-B: Tables A.1, A.2, B, C, D, and E, 4-B-1-34 through 4-B-1-42.

[34] 19 C.F.R. Appendix A to part 182 § 12; USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 7, 4-B-1-26 through 4-B-1-27.

[35] 19 C.F.R. Appendix A to part 182 §17(1); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 6, 4-B-1-25 through 4-B-1-26.

Figure 1.3 The USMCA automotive ROOs for light vehicles



Source: Created by USITC from the USMCA automotive ROOs.
Note: The ROOs for heavy trucks differ from light vehicle ROOs in several ways, including lower vehicle RVC requirements (70 percent), higher LVC requirements (45 percent), and the lack of a core parts list. Some ROOs, however, are the same for light vehicles and heavy trucks, including the RVC requirements for principal and complementary parts and steel and aluminum purchasing requirements.

NAFTA automotive ROOs were generally less stringent, but in some ways more complicated, than those in the USMCA. For example, NAFTA had a light vehicle RVC of 62.5 percent.[36] For parts listed in Annex 403.1 of NAFTA, the importer had to include the value of non-originating material used to produce originating materials in its RVC calculations (i.e., if a spark plug was produced using non-originating materials, that non-originating value would be counted in the RVC calculation for the engine and for the vehicle).[37] This process was called "tracing." Parts not included on the tracing list were "deemed originating," meaning those parts could be included in the originating content in the RVC calculation, regardless of origin.[38]

[36] North American Free Trade Agreement Implementation Act, Pub. L. No. 103-182, § 202(c), 107 Stat. 2057, 2073–76 (1993).
[37] North American Free Trade Agreement Implementation Act, Pub. L. No. 103-182, § 202(c), 107 Stat. 2057, 2073–76 (1993); Schaeffler, Traced Value Instructions, accessed May 15, 2023.
[38] In the years since NAFTA entered into force, parts and components "deemed originating" became increasingly important, especially for components used in automotive goods that are not specifically for automotive goods. The share of value attributable to these "nontraditional automotive goods" has grown significantly in recent years and continues to grow. USTR, *Report to Congress on USMCA Trade in Automotive Goods*, July 1, 2022, 3. Products not included in the NAFTA tracing lists that compose significant shares of a vehicle included batteries, some parts of seats, chipsets, sensors, and various upstream steel and aluminum. For more information on the increased prevalence of these products, see chapter 4 of this report.

RVC Requirements

The USMCA RVC requirements require passenger vehicles, light trucks, heavy trucks, and vehicle parts producers to meet a threshold of content originating in USMCA countries to receive the duty-free benefits of the USMCA. The RVC requirements differ for light vehicles and heavy trucks and their respective parts both in terms of required levels and time to achieve those levels. Light vehicles (passenger vehicles and light trucks) face more stringent requirements than heavy trucks for content originating in a USMCA country (table 1.1). RVC requirements for other types of vehicles are the same as they were in NAFTA. Staging requirements for both passenger vehicles and light trucks end July 1, 2023; for heavy trucks, the staging requirements end on July 1, 2027. Light vehicle models included in alternative staging petitions may take longer than July 1, 2023, to meet the requirements, and heavy trucks may take longer than July 1, 2027, although nearly all petitions for alternative staging did not extend beyond July 1, 2025. For more on staging, see the "Alternative Staging" section of this chapter.

Table 1.1 USMCA automotive ROOs required percentages by vehicle type, staging end date, and rule
In percentages.

Vehicle type	Date of full implementation	RVC requirement	LVC requirement	Steel and aluminum purchasing requirement
Passenger vehicles	July 1, 2023	75	40	70
Light trucks	July 1, 2023	75	45	70
Heavy trucks	July 1, 2027	70	45	70

Source: 19 C.F.R. Appendix A to part 182 §§ 13, 17(1), 18(1–2); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 3, Article 4, and Article 10, 4-B-1-19 through 4-B-1-24, 4-B-1-31 through 4-B-1-34.

As mentioned above, the USMCA automotive ROOs separate light vehicle parts into three categories (core, principal, and complementary), each with a different RVC requirement (table 1.2). The USMCA introduced a "core parts requirement" that, in order for a light vehicle to receive duty-free treatment, all the core parts in the vehicle (or all the parts aggregated together, also referred to as "super-core") need to meet the core parts RVC requirement of 75 percent.[39] The USMCA also eliminated what is often referred to as parts being "deemed originating," discussed above. RVC requirements are generally measured at the model or part level, though vehicle manufacturers can average the RVC requirements across models produced at the same plant or within the same country.[40]

[39] The USMCA core parts are the parts included in Table A.2 of the agreement. 19 C.F.R. Appendix A to part 182 § 14(4–12); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 3, 4-B-1-21 through 4-B-1-22.
[40] 19 C.F.R. Appendix A to part 182 § 16; USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 5, 4-B-1-24.

Table 1.2 USMCA automotive parts RVC requirements, by parts category and vehicle type
In percentages. — (en dash) = not applicable.

Parts category	Light vehicle RVC	Heavy truck RVC
Core	75	—
Principal	70	70
Complementary	65	60

Source: 19 C.F.R. Appendix A to part 182 §§ 14(13), (15–16), 15(2–3); USMCA, Appendix to Annex 4-B, "Provisions Related to the Product-specific Rules of Origin for Automotive Goods," Article 3 and Article 4, 4-B-1-19 through 4-B-1-21 and 4-B-1-23.
Note: Heavy trucks do not have a core parts list or core parts requirement. The principal parts list for heavy trucks includes both the parts listed as "core parts" for light vehicles and the parts listed as "principal."

All products in the ROOs are classified using HS 2012 nomenclature. Even if a vehicle or part is now classified under a different subheading using current HS nomenclature (HS 2022) (either because its classification was altered or because a new subheading was created), for the purposes of the agreement, the product follows the PSROs for the appropriate subheading classification in HS 2012 nomenclature.

LVC Requirements

NAFTA did not include LVC requirements for motor vehicles and parts and this requirement was new under the USMCA. It requires that a minimum percentage of the content (by value) in passenger vehicles, light trucks, and heavy trucks be sourced from USMCA manufacturing facilities that compensate workers at $16 per hour or more.[41] To meet the LVC requirements, the labor cost must make up at least 30 percent of the total manufacturing cost for passenger vehicles on entry into force of the agreement, with incremental increases in four stages to 40 percent of the total manufacturing cost by July 1, 2023, and 45 percent for light and heavy trucks on entry into force (table 1.3).[42] As much as 10 percent of the LVC requirement, however, can be from a vehicle manufacturer's spending on wages for high-wage information technology (IT) or research and development (R&D) labor.[43] An additional 5 percent of the LVC requirement can be from a vehicle manufacturer having a high-wage engine, transmission, or battery plant (or having a long-term contract with such a plant) located in North America.[44] Vehicle manufacturers have the flexibility to average LVC across models produced at the same plant or within the same country to meet the requirement.[45]

[41] 19 C.F.R. Appendix A to part 182 § 18(1–2); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 7, 4-B-1-27 through 4-B-1-30.
[42] 19 C.F.R. Appendix A to part 182 § 18(15); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 7, 4-B-1-28.
[43] The percentage is wages in USMCA parties on R&D or IT spending divided by total annual vehicle producer expenditures on production wages in USMCA countries. 19 C.F.R. Appendix A to part 182 § 18(9); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 7, 4-B-1-27 through 4-B-1-28.
[44] For passenger vehicles and light trucks, the plant must have a capacity of at least 100,000 engines, 100,000 transmissions, or 25,000 advanced battery packs. For heavy trucks, the plant requirement is a capacity of at least 20,000 engines, 20,000 transmissions, or 20,000 advanced battery packs. 19 C.F.R. Appendix A to part 182 §§12,18(1, 12–14); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 7, 4-B-1-26 through 4-B-1-30.
[45] 19 C.F.R. Appendix A to part 182 § 18(15); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 7, 4-B-1-28.

Table 1.3 Staging of LVC requirements
By vehicle type, labor type, and period.

Vehicle type	Type of labor	July 1, 2020	July 1, 2021	July 1, 2022	July 1, 2023
Passenger vehicle	High-wage material and manufacturing	At least 15 percent	At least 18 percent	At least 21 percent	At least 25 percent
Passenger vehicle	High-wage technology	No more than 10 percent	No more than 10 percent	No more than 10 percent	No more than 10 percent
Passenger vehicle	High-wage engine or battery plant	No more than 5 percent	No more than 5 percent	No more than 5 percent	No more than 5 percent
Passenger vehicle	All high-wage labor	At least 30 percent	At least 33 percent	At least 36 percent	At least 40 percent
Light and heavy trucks	High-wage material and manufacturing	At least 30 percent	At least 30 percent	At least 30 percent	At least 30 percent
Light and heavy trucks	High-wage technology	No more than 10 percent	No more than 10 percent	No more than 10 percent	No more than 10 percent
Light and heavy trucks	High-wage engine or battery plant	No more than 5 percent	No more than 5 percent	No more than 5 percent	No more than 5 percent
Light and heavy trucks	All high-wage labor	At least 45 percent	At least 45 percent	At least 45 percent	At least 45 percent

Source: 19 C.F.R. Appendix A to part 182 § 18(1–2); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-specific Rules of Origin for Automotive Goods, Article 7, 4-B-1-26 through 4-B-1-27.

Steel and Aluminum Purchasing Requirements

The steel and aluminum purchasing requirements were not included in other free trade agreements involving the U.S. automotive industry. The USMCA automotive ROOs require that 70 percent of the vehicle manufacturers' steel purchases and 70 percent of their aluminum purchases, by value, must originate from USMCA countries.[46] These requirements applied upon entry into force of the agreement, unless subject to an alternative staging plan. These requirements are measured separately at the vehicle manufacturer level. Steel and aluminum goods are considered originating if imported semifinished steel or unwrought aluminum undergo a transformation resulting in certain tariff shifts in USMCA countries.[47] An additional requirement will become effective in 2027. Under this additional requirement, all steel manufacturing processes must occur within a USMCA country for the steel purchases to qualify as originating under the ROOs. This is known as the "melted and poured" requirement.[48] For example, until

[46] 19 C.F.R. Appendix A to part 182 § 17(1); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 6, 4-B-1-25 through 4-B-1-26.
[47] 19 C.F.R. Appendix A to part 182 § 17(5)(a); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 7, 4-B-1-25.
[48] 19 C.F.R. Appendix A to part 182 § 17(5)(b); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 7, 4-B-1-25.

the melted and poured requirement comes into effect in 2027, semifinished steel imported from a non-USMCA country and stamped in a USMCA country qualify as originating.[49]

Alternative Staging

Alternative staging extends the time vehicle manufacturers have to fully implement the USMCA automotive ROOs.[50] The ROOs generally limit vehicle manufacturers to using alternative staging for 10 percent of their annual production in USMCA countries and require any alternative staging for light vehicles be completed no later than July 1, 2025. If a vehicle manufacturer, however, demonstrated via a detailed and credible plan in its petition to the USMCA parties that it will have the ability to meet the full extent of the ROOs by the date proposed in its petition, then the parties allowed vehicle manufacturers to use alternative staging for a larger share of their vehicle production or for a longer period of time.[51] Vehicle manufacturers who are using alternative staging are also required to submit annual progress reports to USTR, outlining that their original petition remains true and accurate.[52]

Most light vehicle manufacturers with operations within USMCA countries are using alternative staging for at least some portion of their production. The 13 vehicle manufacturers listed below requested and received approval for their respective petitions.[53] Note that all 13 requests are for vehicle manufacturers that primarily produce light vehicles, even though heavy trucks were also eligible for alternative staging. Among established light vehicle manufacturers, BMW and General Motors did not participate in alternative staging. Startups, including Rivian and Lucid, also did not participate.

- Cooperation Manufacturing Plant Aguascalientes (COMPAS)[54]
- Ford Motor Company
- FCA North America Holding LLC
- Honda North America, Inc.
- Hyundai Motor America
- Kia Motors Manufacturing Georgia
- Kia Motors Mexico

[49] 19 C.F.R. Appendix A to part 182 § 17(5)(a);); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 7, 4-B-1-25; USITC, hearing transcript, November 3, 2022, 193–95 (testimony of Kaitlin Wojnar, U. S. Steel); and 186–87, 195 (testimony of Kevin Dempsey, AISI).
[50] C.F.R. Appendix A to part 182 § 19; USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 8, 4-B-1-29 through 4-B-1-31.
[51] 85 Fed. Reg. 22238 (April 21, 2020) (request for petitions and outlining requirements of petitions for alternative staging); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 8, 4-B-1-30. A few vehicle manufacturers were approved for an additional six months to a year to fully implement the USMCA ROOs and almost all petitioning vehicle manufacturers were approved for greater than 10 percent of their vehicle production. USMCA Automotive Committee, information from alternative staging petitions submitted to the Automotive Committee, July 2020, aggregated by the USITC, February 15, 2023. As noted above, the USMCA Implementation Act authorized the USITC to use aggregated information collected by the USMCA Automotive Committee that preserves confidentiality for this report. 19 U.S.C. § 4532(b)(4)(B).
[52] 85 Fed. Reg. 22238, 22243 (April 21, 2020) (indicating that USTR will monitor if producers satisfy alternative staging requirements in maintaining list of approved producers). The government of Mexico has argued that USMCA does not require progress reports after initial approval of an alternative staging petition. See, e.g., Government of Mexico, Initial Written Submission for USMCA Panel on Core Parts, 49, March 29, 2022.
[53] USTR, "Alternative Staging," accessed February 7, 2023.
[54] COMPAS is a manufacturing joint venture that is equally owned by Daimler and Nissan.

- Mazda North America
- Nissan North America, Inc.
- Tesla Inc.
- Toyota Motor North America Inc.
- Volkswagen Group of America, Inc.
- Volvo Car Corporation

A review of the alternative staging petitions filed in 2020 shows certain patterns with respect to the timing, coverage, and aspects of the ROOs most often included. In total, the 13 approved petitions affect less than 15 percent of the models produced in USMCA countries. The affected models account for approximately 22 percent of North American production and a smaller percentage of U.S. sales. Almost all petitioning manufacturers requested to use alternative staging for greater than 10 percent of their vehicle production and thus had to provide a detailed and credible plan describing how they planned to meet the ROOs. Half of vehicle models that were included in petitions are assembled in the United States rather than Canada or Mexico. Nearly all alternative staging plans end by mid-2025. Two extend farther with the latest ending in mid-2027. These plans provide some insight into how companies plan to eventually comply with the ROOs after the expiration of the alternative staging period.[55]

Vehicle manufacturers most often requested to use alternative staging for the RVC, core parts RVC, and steel purchase requirements. Almost all participating firms asked for additional time to meet vehicle RVC requirements. Nearly 75 percent of firms providing detailed plans asked for additional time to meet core parts requirements. More than half of firms that provided detailed plans asked for additional time to meet the steel requirements, but almost all planned to meet the steel requirements by 2023. Several firms asked for additional time to meet LVC requirements. Only one firm asked for additional time to meet the aluminum requirements, and only for two years.[56]

USMCA Automotive Industry

The U.S. automotive industry is the largest among USMCA countries, with higher levels of production, sales, and trade than Canada and Mexico (table 1.4). In the United States, vehicle manufacturers and their suppliers comprised the country's largest manufacturing sector, accounting for more than 11.0 percent of manufacturing output and 1.9 percent of total U.S. output in 2022.[57] The automotive industry also accounted for more U.S. jobs than any other manufacturing sector in 2022, employing more than 291,000 people in motor vehicle manufacturing, 553,000 people in parts production, and more than 169,000 people in motor vehicle body and trailer manufacturing.[58] That year the United States produced

[55] USMCA Automotive Committee, information from alternative staging petitions submitted to the Automotive Committee, July 2020, aggregated by the USITC, February 15, 2023.
[56] USMCA Automotive Committee, information from alternative staging petitions submitted to the Automotive Committee, July 2020, aggregated by the USITC, February 15, 2023.
[57] GDP by Industry, "BEA Interactive Data Application," accessed March 2, 2023.
[58] Automotive employment represented less than 1 percent of total U.S. employment, however, in 2022. For more information on the impacts of the USMCA on U.S. employment, see chapter 2.
BLS, "Automotive Industry: Employment, Earnings, and Hours," accessed February 13, 2023; U.S. Bureau of Labor Statistics, "NAICS 336100 - Motor Vehicle Manufacturing," May 2021. U.S. Bureau of Labor Statistics, "NAICS 336300 - Motor Vehicle Parts Manufacturing," May 2021; U.S. Bureau of Labor Statistics, "NAICS 336200 - Motor Vehicle Body and Trailer Manufacturing," accessed March 2, 2023.

10.0 million vehicles (68.1 percent of vehicle production by USMCA parties) and sold 14.2 million vehicles.[59]

Table 1.4 Production, sales, and trade of vehicles, by USMCA country, 2022
In millions of units.

Country	Production	Sales	Imports	Exports
United States	10.0	14.2	7.2	2.7
Canada	1.2	1.6	1.6	1.3
Mexico	3.5	1.1	1.0	3.3
All USMCA countries	14.7	16.9	9.8	7.3

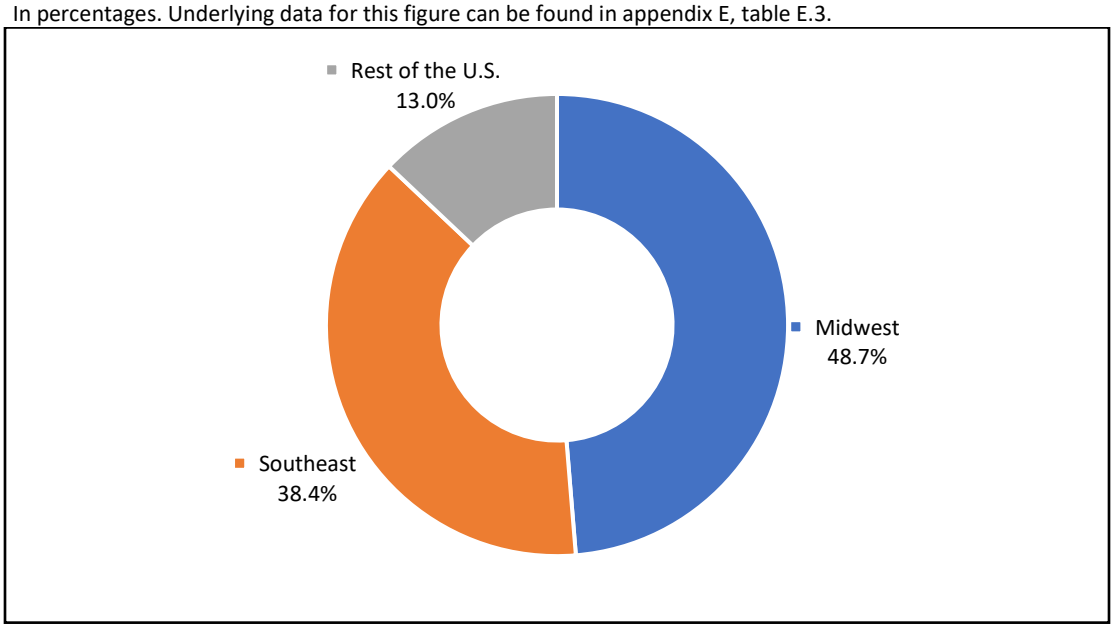
Sources: Ward's Intelligence, "North America Production, December 2022," January 19, 2023; Ward's Intelligence, "North America Vehicle Sales by Vehicle Type 2013–2022," February 13, 2023; S&P Global, GTAS, list of HS subheadings corresponding to all vehicles (both light vehicles and heavy trucks), accessed March 30, 2023. Additional information is available in appendix F of this report.
Notes: The data of all USMCA countries are the summation of the three individual countries and do not measure the UMSCA market as a single market (i.e., the data do not remove imports/exports between each other). Because of data availabilities, Mexican imports and exports are based on mirrored data.

Production of vehicles is primarily located in the midwestern and southeastern regions of the United States (figure 1.4).[60] The 11 automakers and over 35 assembly plants in the midwestern region (Illinois, Indiana, Kansas, Michigan, Missouri, and Ohio) produced the highest number of vehicles (4.9 million) in 2022.[61] In 2022, three states in the midwestern region (Michigan, Indiana, and Ohio) accounted for 77.5 percent of total vehicle production in the region. The southeastern region (Alabama, Georgia, Kentucky, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia) produced 3.8 million vehicles in 2022 and had 15 automakers with nearly 20 assembly plants.[62] Vehicle manufacturers in the rest of the United States (Arizona, California, Texas) produced 1.0 million vehicles in 2022 and had four automakers operating five plants.[63]

[59] Ward's Intelligence, "North America Production, December 2022," January 19, 2023," accessed April 19, 2023; ITA, "Mexico - Automotive Industry," September 23, 2022.
[60] A more detailed summary of the three U.S. regions can be found in appendix G.
[61] Wards Intelligence, "North America Vehicle Production by State and Plant, 2018-2022," March 21, 2023.
[62] Wards Intelligence, "North America Vehicle Production by State and Plant, 2018-2022," March 21, 2023.
[63] For more regional information about the U.S. automotive industry, see appendix G. Wards Intelligence, "North America Vehicle Production by State and Plant, 2018-2022," March 21, 2023.

Figure 1.4 Vehicle production breakdown, by U.S. regions, 2022

In percentages. Underlying data for this figure can be found in appendix E, table E.3.



Source: Ward's Intelligence, "North America Vehicle Production by State and Plant, 2017–2021," March 9, 2022.
Notes: Production in the midwestern region is located in Illinois, Indiana, Kansas, Michigan, Missouri, and Ohio. The Southeast includes Alabama, Georgia, Kentucky, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia. The rest of the United States has reported vehicle production in only three states: Arizona, California, and Texas. Additional regional analysis is available in appendix G.

While U.S.-headquartered vehicle manufacturers had the strongest presence in the midwestern region, the southeastern region had more foreign-headquartered manufacturers in 2022. Ford and General Motors (GM) along with Netherlands-based Stellantis (created by the merger of Fiat Chrysler Automobiles and Peugeot S.A. in 2021) were the three largest vehicle producers in the midwestern region, respectively, accounting for 74.6 percent of midwestern production in 2022.[64] In the southeastern region, Toyota, Ford, and Nissan were the leading vehicle producers. Foreign-headquartered vehicle manufacturers accounted for 79.9 percent of southeastern production in 2022.[65] Tesla (56.7 percent) and GM (30.9 percent) accounted for the majority (87.6 percent) of the production in the rest of the United States.[66] California and Texas made up most of the production in the rest of the United States, accounting for 99.4 percent of vehicle production in the rest of the United States. Tesla accounted for all of California's production and GM was the leading producer in Texas.[67]

[64] Stellantis is a multinational automotive manufacturing corporation formed by a 50-50 cross-border merger of France's Groupe PSA and Italian-American auto conglomerate Fiat Chrysler Automobiles. Wards Intelligence, "North America Vehicle Production by State and Plant, 2018-2022," April 18, 2023.
[65] Foreign-headquartered vehicle manufacturers in the southeastern region include Toyota, Nissan, BMW, Kia, Hyundai, Mercedes, Honda, Mazda, Volkswagen, Volvo, and Hino.
[66] The midwestern region is home to 69.9 percent of GM's U.S. production, with the rest of the United States accounting for 20.0 percent and the southeastern region making up the remaining 10.1 percent. Wards Intelligence, "North America Vehicle Production by State and Plant, 2018-2022," April 18, 2023.
[67] Wards Intelligence, "North America Vehicle Production by State and Plant, 2018-2022," April 18, 2023.

Trade in vehicle parts also contributes to the automotive supply chain in the USMCA region. In 2022, the United States exported vehicle parts worth $113.2 billion and imported nearly $245.3 billion in vehicle parts, making the United States the largest exporter and importer of vehicle parts in the USMCA region (table 1.5).[68] Mexico was the second-largest automotive trade partner in the USMCA region, with the values of vehicle parts exports and imports totaling $81.6 billion and $74.5 billion in 2022, respectively.

Table 1.5 Imports and exports of vehicle parts, by USMCA country, 2022
In billions of dollars.

Country	Imports	Exports
United States	245.3	113.2
Canada	44.8	25.6
Mexico	74.5	81.6
All USMCA countries	364.6	220.3

Source: S&P Global, GTAS, list of HS subheadings corresponding to automotive parts in table F.5 of appendix F, accessed April 18, 2023.
Note: Data from all USMCA countries are the summation of the three individual countries and do not measure the USMCA market as a single market (i.e., the data do not remove imports/exports between each other).

The USMCA and its predecessor, NAFTA, have played an important role in creating a highly integrated automotive market within USMCA countries.[69] Most light vehicles produced in Canada and Mexico are exported to the United States, suggesting that U.S. demand is critical to the automotive industry in all USMCA countries.[70] For example, the United States is the largest importer of automotive parts from Mexico, which is the fourth-largest producer of automotive parts worldwide.[71]

Other Factors Impacting the U.S. Automotive Industry

Several factors unrelated to the USMCA automotive ROOs also impacted automotive production, trade, and the supply chain in the period examined. These factors included global factors such as the COVID-19 pandemic, the semiconductor shortage (i.e., chip shortage), and the Russian invasion of Ukraine, as well as automotive-specific factors such as the USMCA core parts dispute and the transition to EV and hybrid vehicles, and recent trade actions and laws (section 232 tariffs, section 301 tariffs, the Inflation Reduction Act, and the Creating Helpful Incentives to Produce Semiconductors and Science Act of 2022 (CHIPS Act)).[72] Industry representatives noted that these factors, particularly the COVID-19 pandemic and subsequent parts shortages, have had such a significant effect on the automotive industry during recent years that it was difficult to distinguish between each of these effects and the impact of the

[68] This discussion of automotive trade between USMCA countries uses HS subheadings that include significant (or exclusively) parts specific to automotive goods. Elsewhere in this report where data being examined is exclusively U.S. automotive parts imports and exports, a narrower, more precise list is used, and thus data may not be directly comparable. For more information, see appendix F.
[69] USTR, *Report to Congress on USMCA Trade in Automotive Goods*, July 1, 2022, 2.
[70] USITC DataWeb/Census, list of HTS subheadings corresponding to light vehicles are in appendix F, accessed March 1, 2023. Wards Intelligence, "North America Vehicle Production by State and Plant, 2018–2022," March 21, 2023.
[71] USITC DataWeb/Census, list of HTS subheadings corresponding to automotive parts are in appendix F, accessed March 1, 2023; ITA, "Mexico - Automotive Industry," September 23, 2022; HTS codes used following the U.S. Department of Commerce-published automotive parts list.
[72] USITC, *Economic Impact of Section 232 and 301 Tariffs on U.S. Industries*, March 2023, 95–97.

ROOs.[73] This section provides an overview of these complex factors and their effect on the U.S. automotive industry.

Global Factors

COVID-19 Pandemic

Negative impacts of the COVID-19 pandemic led to declines in automotive production, reduced demand, and supply shortages. The automotive industry faced two COVID-19 pandemic-induced shocks related to initial temporary closures of production facilities and then prolonged disruptions in the automotive supply chain.[74] U.S. annual production of vehicles decreased by 19.0 percent in 2020 and 15.9 percent in 2021, as a result of these pandemic-related shocks.[75] U.S. automotive plants closed in March and April of 2020 and, when they reopened, operated at reduced production capacity for several months.[76] These events, in turn, drove a decline in both domestic production and international trade in vehicles and parts.[77]

By the third quarter of 2020, production had rebounded, and sales returned to pre-pandemic levels.[78] Consumer demand for vehicles continued to rise in the following months; however, the scarcity of certain inputs created a second shock that constrained production.[79] The most widely reported was a shortage of semiconductors, which is described in more detail below. In response to input scarcity, original equipment manufacturers prioritized producing higher-margin vehicle models and had overall reduced production capacity.[80]

Semiconductor Shortage

The COVID-19 pandemic severely disrupted the market for semiconductors (chips), an essential component in modern vehicles. At the onset of the pandemic, many vehicle manufacturers canceled chip orders in anticipation of a significant decline in vehicle demand.[81] During that time, nonautomotive semiconductor demand rose. Lockdowns, remote work, and distance learning increased demand for computers and other electronic devices, for which semiconductors are a critical input.[82] In order to meet this rising demand, chip makers shifted production away from the automotive industry and toward

[73] USITC, hearing transcript, November 3, 2022, 135–36 (testimony of Kevin Dempsey, AISI); USITC, hearing transcript, November 3, 2022, 80 (testimony of Rory Heslington, Autos Drive America).
[74] Coffin et al., "The Roadblocks of the COVID-19 Pandemic," June 2022; USITC, hearing transcript, November 3, 2022, 12 (Matt Blunt, AAPC), 30–31 (Bill Frymoyer, MEMA); and 38 (Anna Schneider, VW).
[75] The declines are based upon 2019 production figures. BTS, "Annual U.S. Motor Vehicle Production and Domestic Sales," accessed February 3, 2023.
[76] The initial reduced production capacity was due to health and safety restrictions in response to the COVID-19 pandemic; subsequent reductions were due in part to a lack of available components, such as semiconductors. Coffin et al., "The Roadblocks of the COVID-19 Pandemic," June 2022, 4–6.
[77] Coffin et al., "The Roadblocks of the COVID-19 Pandemic," June 2022, 13–16.
[78] Wayland, "Coronavirus Crippled U.S. Auto Sales in 2020," December 23, 2020.
[79] Coffin et al., "The Roadblocks of the COVID-19 Pandemic," June 2022, 8–11.
[80] Burkacky et al., "Semiconductor Shortage," June 2022, 2.
[81] Priddle, "What Happened With the Semiconductor Chip Shortage," December 27, 2021.
[82] World Semiconductor Trade Statistics, "WSTS Semiconductor Market Forecast Fall 2021," November 30, 2021; LaReau, "Everything You Need to Know About the Chip Shortage," June 15, 2021.

other industries such as those producing computers and consumer electronics.[83] This shift was further incentivized by the fact that the legacy chips[84] used in vehicles tended to cost less and have lower profit margins than the leading-edge chips used by other industries.[85] When vehicle demand rebounded more quickly than anticipated in late 2020, semiconductor manufacturers lacked the capacity to fulfill vehicle manufacturers' orders for automotive chips.[86] The shortage was further exacerbated by rising consumer demand for vehicles with advanced technological features, like infotainment systems and automated parking sensors, which increased the number of chips required per vehicle.[87] As a result, vehicle manufacturers were faced with low inventories and long wait times on orders for new chips.[88]

In response to the semiconductor shortage, many vehicle manufacturers were forced to temporarily stop or slow production.[89] The loss of output stemming from the shortage reportedly was equivalent to taking six U.S. automotive plants offline for a year.[90] One analysis estimates that, without the shortage, the United States would have produced 1.5 million more vehicles in 2021 and an additional 355,000 in 2022.[91] Despite the supply recovery of high-end chips in late 2022, access to legacy chips continues to be a challenge for the automotive industry in 2023.[92] The legacy chip shortage remains the largest supply chain constraint faced by automotive equipment manufacturers and is considered to be the largest constraint on automotive production as a whole.[93]

Russian Invasion of Ukraine

The 2022 Russian invasion of Ukraine disrupted the supply of both raw materials and upstream inputs used in vehicle production. Russia is a major producer of palladium and nickel, two key metals in automotive manufacturing.[94] Palladium is commonly used in catalytic converters to decrease pollution from engine exhaust.[95] Russia is historically the largest supplier of palladium to the United States, accounting for 34 percent of imports between 2018 and 2021.[96] It also supplies 40 percent of the palladium used in catalytic converters globally.[97] Similarly, Russia is the third-largest supplier of nickel, which is required in lithium-ion batteries used in EVs.[98] Disruption in the nickel supply could therefore

[83] Priddle, "What Happened With the Semiconductor Chip Shortage," December 27, 2021.
[84] "Legacy chips" are often defined as those with node sizes of 28 nanometers or larger. Shivakumar, Wessner, Howell, "The Strategic Importance of Legacy Chips," March 3, 2023.
[85] Burkacky, Lingemann, Pototzky, "Coping with the Auto-Semiconductor Shortage," May 27, 2021.
[86] Reuters, "Increased New-Car Demand during Pandemic Has U.S. Industry Optimistic about 2021," January 5, 2021; Burkacky, Lingemann, Pototzky, "Coping with the Auto-Semiconductor Shortage," May 27, 2021.
[87] AZO Materials, "How Are Semiconductors Used in Cars?," April 26, 2021.
[88] LaReau, "Everything You Need to Know About the Chip Shortage," June 15, 2021.
[89] LaReau, "Everything You Need to Know About the Chip Shortage," June 15, 2021.
[90] USITC, hearing transcript, November 3, 2022, 69 (testimony of Matt Blunt, AAPC).
[91] AAPC, written submission to the U.S. International Trade Commission in connection with Inv. No. 332-592, USMCA Automotive Rules of Origin: Economic Impact and Operation, 2023, December 3, 2022, 10.
[92] Tucker, "Microchip Shortage Still Limiting Car Production," February 17, 2023.
[93] USITC, hearing transcript, November 3, 2022, 71 (Bill Frymoyer, MEMA), and 192 (Kevin Dempsey, AISI).
[94] Eisenstein, "Ukraine Crisis Could Create More Woes," February 28, 2022.
[95] Because catalytic converters are used in the exhaust system for an internal combustion engine, they are not present in electric vehicles. DeCarlo and Goodman, "Russia, Palladium, and Semiconductors," Executive Briefings on Trade, May 2022, 1; Hawley, "What's a Catalytic Converter," October 6, 2022.
[96] U.S. Geological Survey, *Mineral Commodity Summaries 2023*, 2023, 134.
[97] Eisenstein, "Ukraine Crisis Could Create More Woes," February 28, 2022.
[98] Eisenstein, "Ukraine Crisis Could Create More Woes," February 28, 2022.

impede EV production and slow the transition from internal combustion engine vehicles. Market uncertainty surrounding palladium and nickel supplies from Russia initially led the spot price of both metals to spike in March 2022.[99] However, prices have since declined as fears over sanctions and logistics difficulties receded amidst stronger-than-expected Russian exports.[100] According to U.S. steel producers, the Russian invasion of Ukraine also led to increased steel prices, because both Russia and Ukraine are significant producers of steel inputs for U.S. purchasers.[101]

Automotive-Specific Factors

Core Parts Dispute between the United States, Canada, and Mexico

On January 6, 2022, Mexico requested the establishment of a USMCA dispute settlement panel (referred to as "the panel") after a period of consultations; Canada later stated its intention to join the dispute as a complaining party on January 13, 2022.[102] The dispute concerned the interpretation of the USMCA automotive ROOs and whether the U.S. methodologies for determining if vehicles qualify as originating were consistent with the agreement, in particular with respect to how core parts are used in vehicle qualification.[103] The panel finalized the report on December 14, 2022, and publicly released its final report on January 11, 2023.[104] The panel found that the United States was incorrectly interpreting the methodologies for ascertaining whether "core parts" qualified as originating in determining whether a passenger vehicle or light truck qualified for preferential treatment under the agreement.[105]

The overall effect this dispute had on vehicle producers is not clear. Uncertainty over the dispute may have delayed the sector's investments or other adjustments to the ROOs, contributing to the minimal effects from the ROOs seen so far. Alternatively, some vehicle manufacturers may have increased sourcing from USMCA countries, assuming a final decision resulting in the most strict interpretation of the dispute. This dispute has delayed finalization of detailed USMCA guidance from the U.S. Customs and Border Protection (CBP) to vehicle manufacturers on the ROOs, creating uncertainty for vehicle manufacturers and parts suppliers.[106] This uncertainty stems from both the disagreement itself, as some vehicle manufacturers may need time to adjust their supply chains, depending on the resolution of the

[99] Hobson, "Palladium Propelled to Record Highs by Russia Supply Concerns," March 7, 2022; Monex, "Palladium Prices Today: Live Spot Palladium Price per Ounce," accessed November 9, 2022; Insider, "Nickel Price Today," accessed November 14, 2022.
[100] Onstad, "EU, U.S. Step up Russian Aluminum, Nickel Imports," September 7, 2022; Dareen, "Palladium Dives about 17% as Russia Supply Fears Recede," March 14, 2022.
[101] USITC, *Economic Impact of Section 232 and 301 Tariffs on U.S. Industries*, 2023, p. 81.
[102] See the text of the panel report for further detail on the procedural history of the dispute. Arbitral Panel Report, "United States - Automotive Rules of Origin," December 14, 2022. paras. 10-21.
[103] This difference in interpretation does not impact the Commission's analysis in this report given the analytical approach used in chapters 2 and 3. See the text of the panel report for further detail on the dispute and the claims at issue. Arbitral Panel Report, "United States - Automotive Rules of Origin," December 14, 2022, paras. 2, 49-68.
[104] Arbitral Panel Report, "United States - Automotive Rules of Origin," December 14, 2022, para 1.
[105] Arbitral Panel Report, "United States - Automotive Rules of Origin," December 14, 2022, paras. 203–9.
[106] USTR, Report to Congress on USMCA Trade in Automotive Goods, July 1, 2022, 8; USITC, hearing transcript, November 3, 2022, 11–12 (testimony of Matt Blunt, AAPC), and 33 (testimony of Bill Frymoyer, MEMA).

disagreement, and the lack of official CBP guidance.[107] One industry representative stated that the panel's decision in favor of Canada and Mexico may lead some vehicle manufacturers to reconsider plans to not comply for some older internal combustion engine models, because compliance under Canada and Mexico's interpretation will be more achievable.[108]

Transition to Electric and Hybrid Vehicles

The most significant technological change in the automotive industry is the ongoing shift to EVs and hybrids.[109] This shift brings with it significant changes to the quantity and value of various parts in a finished vehicle, which has implications for the USMCA automotive ROOs. EVs have thousands of fewer parts, on average, than their internal combustion engine equivalents.[110] Additionally, EVs have different core parts: they possess an advanced battery but lack both an engine and a multispeed transmission.[111] The advanced battery also typically represents a larger share of the final vehicle's total cost than the internal combustion engine, so the origin of the battery is disproportionately more important to core parts calculations for both EVs and hybrids. Industry representatives view the shift to EVs as a long-term trend that will likely continue to impact the U.S. vehicle industry and is a topic that will be detailed in future reports.[112]

Vehicle manufacturers have made commitments to increase available EV models and EV quantities in recent years.[113] With the goal of building EV battery supply chains in USMCA countries, manufacturers across the United States are investing billions of dollars into new facilities and entering into supplier agreements to secure needed raw materials.[114] In 2021, companies announced $36 billion of investments related to the shift toward North American production of EVs and hybrids. In 2022, companies announced investments of $13 billion in domestic EV manufacturing, $24 billion in batteries, and more than $700 million to support EV charging infrastructure.[115] Looking ahead, vehicle manufacturers have announced plans to invest $330 billion in the shift to EVs and hybrids by 2025 and

[107] USITC, hearing transcript, November 3, 2022, 39 (testimony of Anna Schneider, VW); industry representatives, meetings with USITC staff, August 31, 2022, and September 29, 2022.
[108] Industry representative, interview with USITC staff, February 23, 2023.
[109] USITC, hearing transcript, November 3, 2022, 10 (testimony of Matt Blunt, AAPC). Throughout this report, an EV is defined as a vehicle that possesses a battery as its only source of power. Where applicable, hybrid vehicles (vehicles that are powered by both a battery and an engine) are also discussed.
[110] USITC, hearing transcript, November 3, 2022, 68, 91 (testimony of Bill Frymoyer, MEMA).
[111] For a better understanding of the USMCA core parts list, see RVC Requirements earlier in this chapter. For the full core parts list, see 19 C.F.R. Annex A to part 182 § 20 Tables A.1 and A.2. USMCA Uniform Regulations, "Uniform Regulations," June 3, 2020. Note that EVs still have single-speed transmissions that are often incorporated into a "drive-unit," but the drive-unit is classified under HTS statistical reporting number 8501.53.8040. This HTS statistical reporting number is not included in Table A.2 (the core parts list) of the USMCA Uniform Regulations. For more information, see CBP, "The Tariff Classification of Electrical Drive Units from Germany," October 29, 2021.
[112] USITC, hearing transcript, November 3, 2022, 10–11 (testimony of Matt Blunt, AAPC), and 26–27 (testimony of Rory Heslington (Autos Drive America).
[113] Bush, "Automakers Invest Billions in North American EV and Battery Manufacturing Facilities," July 21, 2022; White House Briefing, "FACT SHEET," September 14, 2022; Bartlett, "Automakers Are Adding Electric Vehicles to Lineups," March 10, 2023.
[114] Magill, "Automakers Race to Build EV Battery Supply Chains in North America," September 1, 2022.
[115] Bozer, "Automakers Invest Billions in North American EV and Battery Manufacturing Facilities," July 21, 2022; White House Briefing, "FACT SHEET," September 14, 2022.

predict the availability of 130 EV models in the United States by 2026.[116] These investments create new jobs, but at the same time may eliminate other jobs. The net impact of the transition to electric vehicles on jobs is uncertain. Multiple hearing participants noted that fewer total parts in an EV likely means fewer total workers in the EV supply chain.[117] For example, Ford announced plans to cut nearly 40 percent of its European product development team in early 2023 in response to shifting to its "smaller, more focused, and increasingly electric portfolio."[118] The transition is also expected to negatively affect workers who are employed in the engine production process.

As a result of these investments, EVs and hybrids make up an increasing share of the automotive industry each year. EVs and hybrids accounted for 12.2 percent (1.7 million vehicles) of total U.S. light vehicle sales in the first half of 2022, up from 11.9 percent in 2021.[119] One hearing participant predicted that this number will nearly quadruple to 6.4 million vehicles by 2030.[120] Vehicle manufacturers also announced various goals ranging from carbon neutrality to selling only EVs, with target dates ranging from 2025 to 2050.[121]

Recent Trade Actions and Laws

Several U.S. government trade actions that were put into effect prior to entry into force of the USMCA—such as additional tariffs imposed under the national security provision in section 232 of the Trade Expansion Act of 1962 and under section 301 of the Trade Act of 1974 on certain imports from China—may have affected the U.S. automotive industry's adjustment to the USMCA automotive ROOs. In addition, the Inflation Reduction Act and CHIPS Act may incentivize increased investment into critical minerals used in EVs, EV battery production, EV charging infrastructure, and domestic automotive semiconductor production and, therefore, may affect production and sourcing of certain auto parts in the future.

Section 232 Tariffs

In 2017, the U.S. Secretary of Commerce initiated investigations under section 232 of the Trade Expansion Act of 1962 to determine the effects on the national security of imports of steel and aluminum.[122] As a result of the investigations, the Department of Commerce imposed additional tariffs on imports of certain steel and aluminum products. A previous Commission model estimated that the section 232 tariffs led to an increase in domestic sourcing of steel and aluminum for the motor vehicle metal stamping and other motor vehicle parts subsectors of the automotive industry and an increase in

[116] Clean Fuels Ohio, "Automaker Electric Vehicle Production and Investment Announcements," February 2022; Brinley, "IHS Markit Forecasts EV Sales," May 28, 2019.
[117] USITC, hearing transcript, November 3, 2022, 68, 91 (testimony of Bill Frymoyer, MEMA); and 193 (testimony of Bill Reinsch, CSIS).
[118] Campbell, "Ford to Axe 3,800 European Jobs in Electric-Car Overhaul," February 14, 2023.
[119] Bozer, "Automakers Invest Billions in North American EV and Battery Manufacturing Facilities," July 21, 2022.
[120] USITC, hearing transcript, November 3, 2022, 10 (testimony of Matt Blunt, AAPC).
[121] Motavalli, "Every Automaker's EV Plans Through 2035 And Beyond," October 4, 2021.
[122] Notice Request for Public Comments and Public Hearing on Section 232 National Security Investigation of Imports of Steel, 82 Fed. Reg. 19205 (April 26, 2017); Notice of Request for Public Comments and Public Hearing on Section 232 National Security Investigation of Imports of Aluminum, 82 Fed. Reg. 21509 (May 9, 2017).

the price of steel and aluminum in the U.S. market.[123] According to U.S. vehicle manufacturers, these increases in domestic raw material prices reduced the competitiveness of U.S. vehicle manufacturing. For example, one hearing participant noted that their firm faces higher raw materials costs due in part to purchasing U.S.-made steel, which they must do to comply with the USMCA requirements for vehicle production in Mexico.[124]

Section 301 Tariffs

In 2017, the U.S. Trade Representative (Trade Representative) initiated an investigation under section 301 of the Trade Act of 1974 to determine whether acts, policies, and practices of the government of China related to technology transfers, intellectual property, and innovation were actionable under the law.[125] As a result of the investigation, the Trade Representative imposed additional duties on products made in China, as outlined in a series of lists.[126] China was the third-largest supplier of automotive parts to the United States in 2021, particularly electronics and inputs into larger parts, as well as replacement parts.[127] Higher tariffs on electronics and other automotive inputs have increased the cost of inputs from China and increased costs for vehicle manufacturers; a previous Commission model estimated increases in prices for semiconductors and other motor vehicle parts due to the tariffs.[128]

Inflation Reduction Act

The Inflation Reduction Act (IRA) of 2022 may have significant impacts on the automotive industry, especially in the coming years.[129] The IRA took effect on January 1, 2023, and includes a wide range of provisions pertaining to the environment, tax, manufacturing, and healthcare.[130] The tax provisions of

[123] In 2021, domestic sourcing of steel and aluminum was estimated to have increased by $93.3 million and $68.0 million, respectively, in the motor vehicle metal stamping subsector and by $54.4 million and $39.6 million in the other motor vehicle parts subsector. The estimated increase in prices of domestically sourced steel and aluminum in 2021 was 0.75 percent and 0.71 percent, respectively. The estimated increase in average U.S. prices of steel and aluminum in 2021 was 2.47 percent and 1.27 percent, respectively. USITC, *Economic Impact of Section 232 and 301 Tariffs on U.S. Industries*, 2023, 125–129.

[124] USITC, hearing transcript, November 3, 2022, 42–43 (testimony of Anna Schneider, VW). For more detailed information on the impacts of section 232 tariffs, refer to the USITC's report, *Economic Impact of Section 232 and 301 Tariffs on U.S. Industries* (Investigation No. 332-591).

[125] Section 301 refers to sections 301–10 of the Trade Act of 1974, as amended, which is codified at 19 U.S.C. §§ 2411–20. 82 Fed. Reg. 40213 (August 24, 2017).

[126] See USTR, "Section 301 FINAL," March 22, 2018, for findings of the investigation. See USITC, Year in Trade, 2021, 65–67 for further background on the investigation.

[127] The second largest HTS 10-digit statistical reporting number for imports from China was Other Automotive Parts (8708.99.8180), which is a basket covering some miscellaneous automotive parts not classified elsewhere in the HTS. Chinese imports under this category totaled $1.1 billion in 2021.

[128] The estimated impact of section 301 tariffs on domestic U.S. producer prices (difference between actual and counterfactual as percentage of counterfactual) in 2021 was 3.1 percent for semiconductors and other electronic components and 1.5 percent for other motor vehicle parts. The estimated impact on prices of imports from China in 2021 was 25.0 percent and 24.5 percent for semiconductors and other vehicle parts, respectively. USITC, *Economic Impact of Section 232 and 301 Tariffs on U.S. Industries*, 2023, 152–153, 158–160.

[129] The IRA was signed by the President and became law on August 16, 2022, which was late into this report's investigation period, which is from July 1, 2020, to December 31, 2023. Similar provisions were contained in the Build Back Better Act passed by the U.S. House of Representatives on November 19, 2021. H.R. 5376, 117th Congress § 136401 et seq. (2021) (popularly known as the "Build Back Better Act").

[130] Inflation Reduction Act of 2022, Pub. L. No. 117-169, 136 Stat. 1818 (2022).

the IRA modified certain existing provisions and established various taxes and tax credits (including new requirements for final assembly in North America and for battery materials to be sourced from the United States or countries with which it has a free trade agreement).[131] The IRA provides tax credits to firms that participate in the following activities: mining battery metals, processing battery materials, making battery cells, and assembling battery packs.[132] These credits will incentivize additional investment in these areas, potentially increasing domestic sourcing further up the EV supply chain in the United States.[133]

CHIPS Act

Similar to the IRA, the CHIPS Act likely did not have a significant impact on the U.S. automotive industry during the period of investigation but will likely increase the availability of domestic automotive semiconductors in the future. The act, signed into law on August 9, 2022, includes a number of research, science, and technology provisions.[134] It also introduced various incentives for the domestic production of semiconductors.[135] It allocated $2 billion for expanding capacity or building new semiconductor fabrication plants that make legacy semiconductors.[136] It may incentivize chipmakers in the United States to increase their production of legacy semiconductors that continue to be in short supply.[137] An increase in the domestic production of chips used in vehicles could make it easier for USMCA vehicle manufacturers to meet RVC requirements.[138]

[131] See, e.g., Pub. L. No. 117-169, §§ 13401, 13502, 136 Stat. 1818, 1954 (2022) (codified at 26 U.S.C. §§ 30D and 45X).
[132] 26 U.S.C. § 45X.
[133] Nakano, "IRA and the EV Tax Credits," September 15, 2022; Guido, Iyer, Lezak, "How the Inflation Reduction Act Will Spur," October 12, 2022.
[134] The CHIPS Act of 2022, Pub. L. No. 117-167, 136 Stat. 1366 (2022).
[135] The CHIPS Act of 2022, Pub. L. No. 117-167, §§ 102–3, 136 Stat. 1366 (2022).
[136] Pub. L. No. 117-167, § 102(a)(2)(A), 136 Stat. 1366, 1372 (appropriating for Pub. L. No. 116-283, § 9902, 134 Stat. 3388, 4846 (authorization codified as amended at 15 U.S. Code § 4652(e)(6))). The law specifically refers to mature technology nodes, which are non-leading-edge (legacy) chips commonly used in analog applications. 15 U.S.C. § 4652(e).
[137] USITC, hearing transcript, November 3, 11 (Matt Blunt, AAPC), 24 (Rory Heslington, Autos Drive America), and 30 (Bill Frymoyer, MEMA); Hufbauer, Hogan, "CHIPS Act Will Spur US Production," October 26, 2022.
[138] For more information on electronic systems, please see the section covering the increasing importance of nontraditional automotive goods in chapter 4 of this report.

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Chapter 2
Economic Impact of the USMCA Automotive ROOs

This chapter uses an economic simulation model and detailed data from the automotive industry in USMCA countries to estimate the economic impact of the USMCA automotive rules of origin (ROOs) on consumer prices, production, revenue, employment, wages, capital expenditures, profits, sales, inventories, patterns of consumption, diversification of production, use of production facilities, trade, and gross domestic product (GDP) in the United States.[139] These are the specific economic effects enumerated in the statutory request. The model focuses on the impact of the ROOs in the first two and a half years after the USMCA entered into force.

This is an especially challenging task because the ROOs address the sourcing of parts, labor, and materials, often at the level of individual passenger vehicles and light truck models. Quantifying the economic effects of the ROOs requires analysis of finely disaggregated data, which are often limited or unavailable. These and other limitations are described in this chapter.

Key Findings

The modeling analysis indicates that in the first two and a half years after the USMCA entered into force, the USMCA automotive ROOs:

- Reduced imports of engines and transmissions and increased employment, production, revenue, capital expenditures, and profits for U.S. producers of these parts.
- Reduced imports of light vehicles from Canada and Mexico and increased imports of light vehicles from the rest of the world. The ROOs slightly increased employment, production, revenue, capital expenditures, inventories, and profits for U.S. producers of light vehicles. They slightly increased the average price of light vehicles in the U.S. market.
- Had a negligible impact on GDP and aggregate employment in the U.S. economy.

Potential Economic Effects Associated with the USMCA Automotive ROOs

The supply chains for passenger vehicles and light trucks in USMCA countries vary across manufacturers, even across vehicle models within the same manufacturer. Some vehicle models are assembled in the United States, Mexico, or Canada; others are imported from Europe or Asia. Manufacturers also vary in where they source parts. Foreign-owned companies that build passenger vehicles and light trucks in

[139] Obsolescence of equipment and employment opportunities were additional factors listed in section 202A(g)(2)(A) of the Act (19 U.S.C. § 4532(g)(2)(A) but were not quantified in this analysis. Additionally, analysis of other pertinent industries, although mentioned in section 202A(g)(A) of the Act, is limited in this report.

USMCA countries are more likely to import their engines, transmissions, and other core parts from their home countries in Europe or Asia.[140]

Differences in supply chains across vehicle models and manufacturers would lead to different responses to the USMCA automotive ROOs. Manufacturers that already met the ROOs for their vehicle models would not need to adjust their supply chains to comply; thus, the ROOs would not prompt a change in sourcing and associated trade flows. Other manufacturers with vehicle models that do not already meet the ROOs would need to adjust their input sourcing to meet the ROOs. Some manufacturers may choose to make these adjustments and, if so, the ROOs would have the effect of shifting input sourcing to USMCA countries. Others may choose not to adjust; in which case, the ROOs would not have the effect of shifting import sourcing. Within the category of manufacturers that choose to adjust their sourcing to meet the ROOs, the timing of any shift in sourcing may vary depending on whether the manufacturer is subject to an alternative staging regime. Finally, for vehicle manufacturers that produce their vehicles outside the USMCA, the ROOs would not prompt changes in sourcing because their vehicles would not benefit from the USMCA tariff preferences, even if they shifted their sourcing of core parts.

To the extent that the ROOs lead to more costly sourcing of core parts or reduce the utilization of tariff preferences, these additional costs could be partly passed on to consumers and partly subtracted from the profits of vehicle manufacturers that export. Even manufacturers that have not experienced a direct increase in their costs could respond to any increase in prices by their competitors by raising their own prices.

The ROOs could have a positive effect on U.S. employment in the production of engines and transmissions by shifting sourcing to the United States. The effect of the ROOs on U.S. employment in vehicle production could be positive, negative, or zero, depending on the balance of two partly offsetting effects. On one hand, the demand for workers in U.S. vehicle production would increase if vehicles imported from Canada and Mexico fail to meet the ROOs and thus to qualify for USMCA tariff preferences because tariffs increase the cost of those imports, shifting demand to U.S. vehicle production. On the other hand, the demand for U.S. workers would decrease if U.S. production declines because of a shift in sourcing to the United States that increases a vehicle producer's cost of parts and materials.

Description of the Analytical Approach

The economic simulation model includes 331 individual light vehicle models produced by 21 vehicle manufacturers in North America and sold to consumers in North America. The 21 vehicle manufacturers are Audi, BWM, Daimler, Ford, General Motors, Honda, Hyundai, Jaguar Land Rover, Kia, Lucid, Mazda, Mitsubishi, Nissan, Porsche, Rivian, Stellantis, Subaru, Tesla, Toyota, Volkswagen, and Volvo. The model simulation estimates the impact that can be attributed to the USMCA automotive ROOs. Specifically, the analysis estimates the changes in automotive tariffs collected among USMCA countries as well as the impact of shifts in the sourcing of engines, transmission, steel, and aluminum on various outcomes for the automotive industry: trade, production, employment, wages, capital expenditures, revenue, profits, prices, and inventories. The impact of non-ROOs-related factors like the semiconductor shortage, supply

[140] NHTSA, "AALA Report for Model Year 2022," accessed December 1, 2022.

chain disruptions, and reduction in demand due to the COVID-19 pandemic are included in the baseline of the model.

The estimation of economic impact proceeded in three steps.[141] The first step analyzed two types of adjustments using observed data attributed to the USMCA automotive ROOs. The first type is changes in the tariffs collected on trade in vehicles between USMCA countries. This analysis is based on a review of confidential data on vehicle imports of individual manufacturers, including duties paid on these imports. It examines whether the U.S. imports of passenger vehicles and light trucks from Canada or Mexico utilized the USMCA tariff preferences in 2022.

The other type of adjustment is changes in sourcing due to the ROOs. This analysis examines whether the sourcing of engines, transmissions, steel, and aluminum for each specific vehicle model shifted to USMCA countries between 2018 and 2022.[142] This analysis only attributes to the ROOs observed shifts in sourcing of parts and materials to USMCA suppliers if the majority of the sales of the USMCA production of the specific vehicle model crossed national borders within USMCA countries and, therefore, could have benefited from the USMCA tariff preferences.[143] This analysis is based on shifts in sourcing of engines and transmissions recorded in the American Automotive Labeling Act reports at the level of 331 individual vehicle models. The analysis also utilizes confidential data regarding sourcing (e.g., of steel and aluminum) from vehicle manufacturers. Specifically, the analysis is based on 2022 data on sales, pricing, production, parts and materials sourcing, and patterns of trade of light vehicles produced and sold in USMCA countries.

The second step in the analysis uses an economic simulation model to translate the changes in tariffs paid on vehicle imports from other USMCA countries and sourcing of parts and materials that were estimated in the first step into changes in production costs and vehicle prices within eight industry segments of the light vehicle markets in the United States and Canada.[144] The industry-specific partial equilibrium model simulates the decisions of vehicle manufacturers about the pricing, production, sales, employment, wages, revenues, profits, and inventories for each of the vehicle models that they sold in the United States or Canada in 2022. The model takes into account that the industry has a small number of vehicle manufacturers, each of whom respond to the changes in the tariffs and costs that they face and react to price changes by their competitors. Model simulations estimate the magnitudes of price adjustments and accompanying changes in trade and production in the United States and Canada using several factors, including the manufacturers' market shares and sourcing of core parts. The model simulates what the 2022 market would have looked like, counterfactually, if the changes in tariffs and

[141] Appendix I provides a more technical description of the methodology.
[142] The analysis of changes in the sourcing of core parts is limited to engines and transmissions because of data availability.
[143] The majority of sales is a proxy for the importance of trade in USMCA sales of a particular vehicle model. As a sensitivity analysis of this specific assumption, Appendix I provides another complete set of model estimates based on an alternative, less restrictive assumption that attributes all observed shifts in sourcing to USMCA countries to the USMCA automotive ROOs, regardless of whether the specific vehicle models crossed national borders within USMCA countries. The signs of some of the estimated effects switch under this alternative assumption, though the industry-level effects are still small enough that no significant economy-wide effects occurred during the first two and a half years after entry into force.
[144] The model in this report is an updated and extended version of the industry-specific economic simulation model in USITC, "U.S.-Mexico-Canada Trade Agreement: Likely Impact on the U.S. Economy and on Specific Industry Sectors," 2019.

shifts in sourcing due to the ROOs had not occurred. The estimates of economic impact compare counterfactual values of prices, production, revenue, employment, wages, capital expenditures, inventories, profits, sales, and imports to the observed values of these economic variables in 2022. In this way, the model provides an estimate of the incremental effect of the ROOs, through the shifts in sourcing and changes in tariffs, holding other factors constant. These impacts are summed across the eight industry segments to provide estimates of the economic impact at the industry level.[145] Appendix I provides additional detail about the economic model.

The third and final step in the analysis of economic impact is to assess the impact on GDP and aggregate employment in the United States. The automotive industry saw direct effects, and upstream industries (e.g., steel and aluminum producers) and downstream industries (e.g., retail automotive dealers) saw indirect effects. In theory, the ROOs might have a positive effect on aggregate employment and average wages in the economy as a result of the direct and indirect effects. In this case, however, the economic effects on U.S. GDP and employment are so small that they are practically zero, as evidenced by the magnitude of the direct effects estimated in the second step. Based on the magnitude of the estimated effects within the automotive industry and the size of the industry relative to the entire U.S. economy, the impact on GDP and aggregate employment in the United States is estimated to be negligible and for this reason has been quantified without the use of a model for the purposes of this report.

Data Inputs

The analysis of individual passenger vehicle and light truck models in the first step uses the following combination of confidential, proprietary, and public data:

- Location and quantity of vehicle sales and production in 2022 from Ward's Intelligence[146]
- Sourcing of engines and transmission from American Automotive Labeling Act (AALA) reports for 2022[147]
- Sourcing of steel and aluminum from confidential alternative staging plans of vehicle manufacturers in USMCA countries[148]
- Manufacturer suggested retail prices for individual vehicle models from Edmunds[149]
- U.S. import trade data used to calculate the utilization of the USMCA tariff preferences on vehicle imports from USITC DataWeb/Census[150]

[145] The industry-specific economic simulation model does not quantify the effects on U.S. exports of vehicles to Mexico or the rest of the world, which account for only a small share of total shipments of U.S.-produced light vehicles.
[146] Ward's Intelligence, "North America Vehicle Production by State and Plant, 20172021," April 11, 2022; Ward's Intelligence, "North America Production, December 2022," January 19, 2023.
[147] NHTSA, "AALA Report for Model Year 2022," accessed December 1, 2022.
[148] USITC calculations based on public automotive production data and confidential data from alternative staging plans for steel and aluminum cost shares. Ward's Intelligence, "North America Production, December 2022," January 19, 2023.
[149] Edmunds, "Edmunds New Car Pricing by Make and Model," accessed February 27, 2023.
[150] USITC DataWeb/Census, accessed January 19, 2023.

The industry-specific simulation model in the second step uses the Commission estimates from the first step and the following proprietary and public data:

- Ownership by passenger vehicle or light truck model in 2022 from *Ward's Automotive Yearbook*[151]
- Capital expenditures, employment, and wages in vehicle and parts manufacturing in the United States in 2021 from the U.S. Census Bureau's Annual Survey of Manufactures[152]
- Demand elasticity econometrically estimated using data from USITC DataWeb/Census[153]
- International differences in the costs of producing engines and transmissions were calculated from USITC DataWeb/Census data[154]
- International differences in the costs of steel and aluminum came from the U.S. Census Bureau and various subscription services[155]
- Costs of the shares of core parts and materials in U.S. vehicle production were calculated by the Commission based on Ward's Intelligence data, confidential staging plans, and USITC DataWeb/Census[156]

The assessment of economy-wide effects in the third step of the analysis combines the industry-level estimates from the second step with the following additional macroeconomic data:

- Industry and aggregate employment from the U.S. Bureau of Labor Statistics (BLS) 2022 Current Employment Survey[157]
- U.S. GDP from the U.S. Bureau of Economic Analysis (BEA) 2022 GDP Report[158]

[151] Ward's Intelligence, "Canadian Car and Light Truck Sales," December 2022; Ward's Intelligence, "U.S. Light Vehicle Sales," December 2022.
[152] U.S. Census, "Annual Survey of Manufactures: Summary Statistics for Industry Groups and Industries in the U.S.: 2018–2021," accessed February 1, 2023; NAICS classifications 336111 and 336112.
[153] USITC DataWeb/Census, accessed February 27, 2023.
[154] The unit values of U.S. imports from Canada and Mexico were compared to the unit values of imports from all other sources, broken up by type of engine or transmission, and then concorded to different varieties of vehicles. USITC DataWeb/Census, accessed February 27, 2023. HTS statistical reporting numbers 8407.33.6080, 8407.34.1800, 8407.34.4800, 8408.20.2000, 8708.40.1110, and 8708.40.1150.
[155] Price differentials were estimated by comparing the average domestic price for the past two and a half years to the average import price during this period. For steel, the average price difference between domestic and imported steel was used. For domestic and imported aluminum ingot prices were used. Trade and price data compiled by the USITC from U.S. Census Bureau and subscription sources.
[156] Ward's Intelligence, "North America Production, December 2022," January 19, 2023; USITC DataWeb/Census, accessed January 19, 2023.
[157] BLS, "Employment, Hours and Earnings," accessed March 2, 2023.
[158] BEA, "GDP Tables," accessed March 2, 2023.

Estimated Economic Impact of the USMCA Automotive ROOs

The USMCA automotive ROOs shifted the sourcing of parts and materials for U.S. vehicles from the rest of the world to USMCA countries. This reduced U.S. imports of parts and increased U.S. revenues from parts production, as well as employment, wage payments, and capital expenditures on parts production, and also increased the cost of producing light vehicles in the United States.[159] The higher costs of U.S. vehicle production increased U.S. sales of imported light vehicle models from the rest of the world. Lower tariff preference utilization reduced U.S. imports of light vehicles from Canada and Mexico as well as U.S. employment, wage payments, and capital expenditure in vehicle production. These economic effects in the first two and a half years were concentrated in the automotive industry and had a negligible economy-wide impact.

The economic model estimates that the ROOs reduced U.S. imports of engines and transmissions from outside of USMCA countries in 2022, because sourcing these core parts from USMCA producers helps light vehicle manufacturers meet the ROOs (table 2.1).[160]

Table 2.1 Estimated impact on U.S. imports of engines and transmissions from non-USMCA countries, 2022

In number of engines and transmissions.

Economic outcome	Change
Engines	-431,853
Transmissions	-55,195

Source: USITC estimates.

The economic model estimates that the ROOs reduced U.S. imports of light vehicles from USMCA countries by 4,748 vehicles in 2022 (table 2.2). Some light vehicle models produced in Canada and Mexico faced higher production costs as a result of shifting their sourcing of parts from non-USMCA suppliers to USMCA suppliers, or faced non-preferential tariffs, which would make imports from Canada and Mexico relatively more expensive and less competitive. On the other hand, the model estimates that the ROOs increased U.S. imports of light vehicles from outside of USMCA countries by 1,125 vehicles. These imports faced no change in tariff treatment and did not have a ROO-based incentive to shift their sourcing of parts. Thus, the price of light vehicles imported from outside the USMCA declined relative to USMCA-produced vehicles, making them more competitive.

[159] The model only incorporates information on the sourcing patterns for specific vehicle models that adjusted their sourcing as a result of the ROOs, because this is the only information needed to calculate the impact of the ROOs on the different economic outcomes modeled. Calculating the baseline and level of the economic outcomes reported in the tables would require information on the sourcing patterns for all vehicle models competing in the market and was not done for this report.

[160] Estimated economic impacts on U.S. and Canadian imports of engines, transmissions, and light vehicles, as well as U.S. and Canadian vehicle production and U.S. and Canadian vehicle inventories for sale are included in appendix I.

Table 2.2 Estimated impact on U.S. imports of light vehicles, 2022
In number of vehicles.

Economic outcome	Change
U.S. imports from other USMCA countries	-4,748
U.S. imports from non-USMCA countries	1,125

Source: USITC estimates.

The economic model estimates that the ROOs increased employment in U.S. parts production by 3,877 workers and increased employment in U.S. vehicle production by 35 workers (table 2.3).

Table 2.3 Estimated impact on employment in the U.S. industry, 2022
In number of workers.

Economic outcome	Change
Parts: employment in U.S. production	3,877
Vehicles: employment in U.S. production	35

Source: USITC estimates.

The economic model estimates that effects on wages and capital expenditures in U.S. parts production were positive and effects on wages and capital expenditures in U.S. vehicle production were smaller but still positive in 2022 (table 2.4).

Table 2.4 Estimated impact on wages and capital expenditures in the United States, 2022
In millions of dollars.

Economic outcome	Change
Parts: wages in U.S. production	239.1
Parts: capital expenditures on U.S. production	60.2
Vehicles: wages in U.S. production	2.7
Vehicles: capital expenditures on U.S. production	1.2

Source: USITC estimates.

The economic model estimates that the ROOs increased the revenue from U.S. production of light vehicles by $81.3 million in 2022 (table 2.5). In addition, it estimates that the ROOs increased revenue from U.S. production of engines and transmissions by $1.6 billion in 2022, mostly from the production of engines, because the ROOs shifted parts production to the United States.

Table 2.5 Estimated impact on revenue from U.S. vehicle and parts production, 2022
In millions of dollars.

Economic outcome	Change
Revenue from U.S. vehicle production	81.3
Revenue from U.S. production of engines	1,525.4
Revenue from U.S. production of transmissions	101.5

Source: USITC estimates.

The economic model estimates that the ROOs had a negligible effect on average vehicle prices in the United States. Most vehicle models did not experience a direct cost increase. They already met the requirements of the ROOs without any adjustments to their sourcing or production was outside of USMCA countries and they had no incentive to adjust to try to meet the ROOs. The ROOs increased average prices of light vehicles in the United States by approximately $3 per vehicle (table 2.6). U.S. vehicle production for sale in the United States and Canada increased slightly.

Table 2.6 Estimated impact on the prices and production of light vehicles in the United States, 2022
In dollars or number of vehicles.

Economic outcome	Change
Average vehicle prices	3
Vehicle production	1,464

Source: USITC estimates.

The economic model estimates that the ROOs resulted in decreased total sales of light vehicles in the United States by 2,159 vehicles in 2022. This was a combination of an increase of 1,464 domestically produced vehicles (table 2.6) and a net decrease of 3,623 imported vehicles, reflecting that the decline in vehicle imports from other USMCA countries exceeded the increase in vehicle imports from non-USMCA countries (table 2.2).

The economic model estimates an increase in the profits of U.S. vehicle manufacturers in 2022, reflecting the increases in their prices and sales of domestically produced light vehicles (table 2.7).

Table 2.7 Estimated impact on profits of U.S. vehicle manufacturers, 2022
In millions of dollars.

Economic outcome	Change
Profits of U.S. vehicle manufacturers	25.0

Source: USITC estimates.

Finally, the economic model estimates that the ROOs reduced average vehicle inventories in the United States by 172 vehicles in 2022 to support the reduced volume of vehicles sold in the U.S. market estimated by the model (table 2.8).

Table 2.8 Estimated impact on average vehicle inventories for sales in the U.S. market, 2022
In number of vehicles.

Economic outcome	Change
Average vehicle inventories in the United States	-172

Source: USITC estimates.

The estimated industry-level effects indicate no significant changes in the diversification of production or the use of production facilities due to the ROOs. The ROOs increased parts production in the United States and slightly increased vehicle production. They also slightly reduced the supply of light vehicles from Canada and Mexico and increased the supply of light vehicles from U.S. production and from the rest of the world. The model does not consider the obsolescence of equipment because it does not appear to have been a relevant factor in the two and a half years after the USMCA entered into force, though this factor will likely become more relevant over time.

The estimated industry-level effects also indicate only a small adjustment in the pattern of demand in the United States due to the ROOs. The effect on the overall demand for light vehicles was very small, with a slight reduction in demand for mid-size and large cross-over vehicles and small cars, as they became more costly to supply to the U.S. market.

These estimated effects of the ROOs two and a half years after the USMCA entered into force were smaller than the longer-run effects reported in the Commission's prior modeling analysis of these

ROOs.[161] One important difference is that the earlier analysis assumed the completion of staging and full utilization of tariff preferences. In contrast, the model in this report focuses only on adjustments that have occurred in the two and a half years after the USMCA entered into force and recognizes that a portion of the trade between USMCA countries is currently not utilizing the USMCA tariff preferences. The economic impact of the ROOs will likely increase in future years as alternative staging ends and manufacturers further adjust their sourcing patterns.

Finally, as discussed above, the estimated effects on the automotive industry imply that the changes in GDP and aggregate employment in the United States due to the ROOs were less than 0.01 percent. These negligible economy-wide effects occurred in the first two and a half years after the USMCA entered into force, regardless of assumptions about the flexibility of adjustment in labor markets. The estimated effects within the automotive industry were very small relative to the size of the overall U.S. economy. For example, the estimated net increase in employment of 3,912 jobs in the U.S. automotive industry represents only 0.0027 percent of total nonfarm employment in the United States in 2022.[162] The estimated $1.71 billion increase in revenues from U.S. vehicle, engine, and transmission production represented only 0.0067 percent of U.S. GDP in 2022.[163] The increase in value added from U.S. vehicle, engine, and transmission production, which is the industry's estimated additional contribution to GDP, was even smaller than these increases in revenue.

Model Limitations

These model-based estimates of economic impact have several important limitations.

- Although the model incorporates many industry features and detailed industry data, beyond what is typical in partial equilibrium modeling of trade policy, the calculations are approximations based on a simulation model and limited data. The estimates do not capture many intricacies of the industry, such as the many vehicle parts that are not measured in the data on sourcing, which is limited to engines and transmissions.
- The economic simulation model assumes that the set of vehicle models sold in each national market does not change in response to the USMCA automotive ROOs, though the number of vehicles of each model that are sold changes. This is a reasonable simplification, because the ROOs only recently entered into force and alternative staging is in place.
- The industry-specific economic simulation model quantifies the effects of the ROOs on U.S. exports to Canada, but it does not quantify the effects on U.S. exports of vehicles to Mexico or the rest of the world, because these exports account for only a small share of total shipments of U.S.-produced light vehicles.
- The calculations of economic impact may attribute shifts in sourcing to the ROOs that would have occurred otherwise, and this would overstate the impact of the ROOs. To help mitigate this issue, the analysis in the first step focused on light vehicles that crossed national borders within

[161] USITC, "U.S.-Mexico-Canada Trade Agreement: Likely Impact on the U.S. Economy and on Specific Industry Sectors," 2019.
[162] BLS, "Employment, Hours and Earnings," accessed March 2, 2023.
[163] BEA, "GDP Tables," accessed March 2, 2023.

USMCA countries and would be more likely to adjust sourcing in response to the incentives created by the ROOs.

- The quantification of economic impacts is not comprehensive. It is limited to an estimate of additional U.S. jobs, wages, revenues, and profits in the production of vehicles and of two core parts—engines and transmissions, which are covered by North American Industry Classification System (NAICS) 6-digit industry codes 336111, 336112, 336310, and 336350. The Commission recognizes that ROOs probably have an economic impact on producers of other core parts, like steering systems (NAICS code 336330) and braking systems (NAICS code 336340). The economic simulation model, however, does not quantify these effects, because vehicle model-level data on the sourcing of core parts (other than engines and transmissions) are not currently available at the level of individual vehicle models.
- The industry-specific economic simulation model assumes that each manufacturer's marginal cost of production does not increase with its scale of vehicle production. Cost data for individual vehicle models were not available. The analysis does not explicitly use information on economies of scale, though economies of scale might be implicitly reflected in the data on price differentials. A shift to North American vehicle production will likely reduce economies of scale in foreign production and raise production costs to a small extent, with no practical way to measure that for the individual car and truck models included in the quantitative analysis.
- The demand system captures the differences in price elasticity due to segmentation and different market shares, though it does not fully capture the complex substitution patterns in the industry.
- The economic model focuses on the impact of observed shifts in sourcing to the USMCA parties since 2018 and does not include the effects of any curtailment of offshoring of production among Canada, Mexico, and the United States.

Limitations in the public data sources are partially addressed by incorporating confidential data from the alternative staging petitions. Alternative staging data provide limited information (e.g., steel and aluminum sourcing) and are only available for some vehicles produced by some companies. A precise and complete evaluation of the economic effects of the ROOs would require extensive confidential information from all manufacturers competing in the market.

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Chapter 3
Effects of the USMCA Automotive ROOs on U.S. Competitiveness

Introduction

This chapter analyzes the effects of the USMCA automotive ROOs on the competitiveness of the U.S. automotive industry. For purposes of this analysis, competitiveness is defined as the ability of U.S. producers to meet the demand for U.S.-produced vehicles and parts in USMCA countries and non-USMCA countries at a price that is accepted in the market. The U.S. automotive industry is defined as U.S.- and foreign-headquartered vehicle manufacturers and parts suppliers with production in the United States.[164] The supply chains for both vehicle manufacturers and parts suppliers are highly complex, spanning USMCA countries and non-USMCA countries.

This chapter is divided into two sections. The first section examines the impact of the ROOs on the overall U.S. automotive industry's competitiveness, using hearing testimony, industry interviews, data from alternative staging petitions, and open-source information. The second section examines publicly available U.S. production, trade, investment, and employment data for signs of change that may signal an increase or decrease in U.S. competitiveness and whether the ROOs could have contributed to this change.

Key Findings

According to hearing testimony and industry input, the ROOs appear to be impacting the U.S. automotive industry in three major ways (table 3.1). First, the higher regional value content (RVC) requirements are reportedly increasing the USMCA share of vehicle and parts production in USMCA countries. Second, industry representatives state that the labor value content (LVC) requirements encouraged vehicle production in the United States and Canada, where wages are higher, over production in Mexico, where wages are generally lower. Third, the higher RVC requirements and the steel and aluminum purchasing requirements encourage sourcing of inputs from USMCA countries, raising the cost of producing vehicles in the United States by increasing steel and aluminum costs, other input costs, labor costs, and supply chain management costs (i.e., the costs of tracking the flow of inputs needed to produce vehicles).

[164] Nonautomotive firms that supply inputs to the automotive industry (e.g., steel and aluminum manufacturers) are also discussed, though they are not necessarily part of the automotive industry.

Table 3.1 Effects of the USMCA light vehicle ROOs on U.S. automotive industry competitiveness

Provision	Requirement	Reported industry response to comply with the ROOs	Reported effect of industry response on competitiveness
Regional value content (increase from NAFTA)	75 percent content (was 62.5 under NAFTA)	Increased sourcing of parts from USMCA countries	• Increased USMCA parts production • Increased input costs
Labor value content (new)	40 or 45 percent content produced at plants paying workers $16 per hour	Relocated parts production and vehicle assembly to (or retained in) the United States and Canada	• Increased U.S. (and Canadian) vehicle and parts production • Increased labor costs • Increased input costs
Steel and aluminum purchasing requirement (new)	70 percent purchased from USMCA countries	Increased sourcing of steel and aluminum from USMCA countries	• Increased steel and aluminum production • Increased input costs

Source: USITC created based on interviews with industry experts and hearing testimony and data from alternative staging petitions.
Note: As noted below, in at least two instances, parts suppliers chose to pay their workers in Mexico an average of $16 an hour to comply with the LVC requirement.

From entry into force in July 2020 through the end of 2022, according to trends in production, trade, investment, and employment data, the U.S. automotive industry shows few signs of changes in competitiveness, and it is unclear if the changes that have occurred are due to the USMCA automotive ROOs. The agreement is in the early stages of implementation, and the full effect of the ROOs will likely not be apparent until the agreement is fully implemented in 2027, or later. Production, trade, investment, and employment data do not show a clear indication of increased or decreased competitiveness since entry into force in 2020. Production shutdowns in response to the COVID-19 pandemic and chip shortages were the main factors in declines in U.S. vehicle and parts production in 2020 and 2021.[165]

How Changes to the USMCA Automotive ROOs Affect Competitiveness

As described in chapter 1, the USMCA automotive ROOs have three major components:

1. **Increased RVC requirements:** Light vehicle[166] RVC requirements increased from 62.5 percent to 75 percent (heavy trucks increased to 70 percent) content originating in USMCA countries. RVC requirements for parts also increased. The USMCA also changed the way vehicle RVC is calculated, dropping "deemed originating" and "tracing" rules in favor of a simpler rule that requires vehicle manufacturers have origin information for all the content that counts toward the USMCA requirements. The "core parts requirement" states that all core parts (engine, transmission, steering, etc.) must meet the USMCA origination requirements individually or in the aggregate.

[165] See chapter 1 for more information on these and other non-ROOs-related factors affecting the U.S. automotive industry.
[166] Light vehicles include passenger vehicles (cars, SUVs, and minivans) and light trucks (pickup trucks and work vans).

2. **New LVC requirements:** The LVC requirements stipulate that 40 or 45 percent of vehicle content come from USMCA manufacturing facilities that compensate workers at least $16 an hour.[167] As much as 10 percent of the LVC requirement, however, can be from a vehicle manufacturer spending on wages for high-wage IT or R&D labor.[168] An additional 5 percent of the LVC requirement can be from a vehicle manufacturer having a high-wage engine, transmission, or battery plant (or having a long-term contract with such a plant) located in North America.[169]
3. **New steel and aluminum purchasing requirements:** To meet these requirements, vehicle manufacturers must purchase 70 percent of their steel and 70 percent of their aluminum by value from sources in USMCA partner countries to qualify as originating under the USMCA.

The competitiveness effects of these ROOs will be determined by the extent to which implementing the ROOs increases costs and whether the increased costs have a significant impact on demand and trade flows and, at the same time, the extent to which domestic production is stimulated. The ROOs encourage a higher share of the USMCA vehicle and parts production to occur in the United States and Canada, benefiting U.S. and Canadian parts suppliers and automotive workers.[170] The ROOs also encourage USMCA vehicle manufacturers to increase the share of parts they purchase from USMCA countries, which also benefits U.S. parts suppliers and automotive workers.[171] These investments could also increase resiliency to external supply chain disruptions and increase competitiveness.

The goal of the ROOs is to incentivize U.S. vehicle and parts production, resulting in increased automotive investment and employment.[172] This goal will be hindered, however, if increased input costs cause domestic vehicle manufactures to be less cost competitive relative to production in non-USMCA countries or if vehicle manufacturers decide to not comply with the rules because the costs of fulfilling the requirements are too high. If the ROOs are achieving their goals, then U.S. vehicle and parts production, investment, and employment should increase.

[167] USITC, hearing transcript, November 3, 2022, 75–76 (testimony of Anna Schneider, VW); and 77 (testimony of Bill Frymoyer, MEMA); Industry representative, meeting with USITC staff, November 15, 2022.
[168] The percentage is wages in USMCA parties on R&D or IT spending divided by total annual vehicle producer expenditures on production wages in USMCA countries. 19 C.F.R. Appendix A to part 182 § 18(9); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 7, 4-B-1-27 through 4-B-1-28.
[169] For passenger vehicles and light trucks, the plant must have a capacity of at least 100,000 engines, 100,000 transmissions, or 25,000 advanced battery packs. For heavy trucks, the plant requirement is a capacity of at least 20,000 engines, 20,000 transmissions, or 20,000 advanced battery packs. 19 C.F.R. Appendix A to part 182 §§12,18(1, 12–14); USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Article 7, 4-B-1-26 through 4-B-1-30.
[170] The RVC increase from 62.5 to 75 percent encourages a greater share of parts come from USMCA countries. The LVC encourages a greater share of those parts come from the United States and Canada.
[171] Other indirect impacts of the ROOs on competitiveness, such as their impact on innovation, are not discussed in this chapter but may be covered in future reports to the extent firms report such effects.
[172] USTR, *Report to Congress on the Operation of the United States-Mexico-Canada Agreement with Respect to Trade in Automotive Goods*, July 1, 2022.

Increase in U.S. Vehicle and Parts Production

The RVC requirements supplemented by the LVC requirements provide incentives to increase the production of vehicles and parts in the United States. The RVC requirements encourage increased demand for USMCA parts from USMCA vehicle manufacturers. To the extent that vehicle manufacturers need to make changes to meet the LVC requirements, those requirements incentivize U.S. vehicle manufacturers to purchase more parts and components from U.S. and Canadian suppliers instead of Mexican suppliers.[173] Most vehicle producers are unlikely to make significant changes in response to the LVC, but a few U.S. vehicle manufacturers have begun to change their purchasing patterns in response to the LVC requirements. Because most Mexican workers are paid significantly less than $16 per hour, vehicle and parts production in Mexico generally does not count toward the LVC requirements.[174] In the long term, some vehicle manufacturers also may choose to invest in U.S. or Canadian vehicle assembly instead of Mexico.

Vehicle manufacturers and parts suppliers have already responded to the ROO changes by adding new production lines and expanding existing plants to increase production capacity.[175] Vehicle manufacturers participating in alternative staging reported increased investments and sourcing from USMCA suppliers.[176] ROO changes also have played a role in increases in U.S. production of several core parts, including electric vehicle (EV) batteries. For example, Volkswagen (VW) reported relocating or planning to relocate production of axles, transmissions, and EV batteries from non-USMCA countries to the United States to meet the ROOs.[177] The ROOs contributed to vehicle manufacturers' decisions to partner with battery manufacturers to produce EV batteries in the United States, instead of importing the cells from Asia (box 3.1).[178]

[173] USITC, hearing transcript, November 3, 2022, 111 (testimony of Anna Schneider, VW).
[174] In reference to the LVC requirements, the DOL stated "In general, the Department believes the average annualized adjustment cost per firm will be small. The DOL believes most producers in the United States either already meet the LVC requirements or would be able to with minor adjustments. Additionally, these are predominately one-time costs. However, for firms not meeting the LVC requirements, these costs may be more substantial." 85 Fed. Reg. 39782, 39805 (July 1, 2020); USITC, hearing transcript, November 3, 2022, 42–43 (testimony of Anna Schneider, VW); USITC, hearing transcript, November 3, 2022, 77–78 (testimony of Mateo Diego-Fernández, AMIA); USITC, hearing transcript, November 3, 2022, 78 (testimony of Fausto Cuevas, AMIA); VW, written submission to the USITC, December 3, 2022, 8, 16; Industry representative, meeting with USITC staff, October 14, 2022.
[175] AAPC, written submission to the USITC, December 3, 2022, 12; USMCA Automotive Committee, information from alternative staging petitions submitted to the Automotive Committee, July 2020, aggregated by the USITC, February 15, 2023; USITC, hearing transcript, November 3, 2022, 43–44 (testimony of Bill Frymoyer, MEMA); Industry representative, meeting with USITC staff, October 14, 2022.
[176] For more on alternative staging see "Alternative Staging" in chapter 1. USMCA Automotive Committee, information from alternative staging petitions submitted to the Automotive Committee, July 2020, aggregated by the USITC, February 15, 2023.
[177] VW, posthearing submission, December 2, 2022, 8, 16; USITC, hearing transcript, November 3, 2022, 64–65 (testimony of Anna Schneider, VW).
[178] Horowitz, Coffin, and Taylor, "Supply Chain for EV Batteries: 2020 Trade and Value-Added Update," 2021, 28.

Box 3.1 The USMCA Automotive ROOs Have Helped Incentivize U.S. EV Battery Production

Since the United States-Mexico-Canada Agreement (USMCA) was announced in 2018, vehicle manufacturers' U.S. battery investments have increased, at least partially in response to the USMCA regional value content (RVC) requirements for light vehicles.[a] Electric vehicle (EV) batteries are included as a core part under the USMCA automotive rules of origin (ROOs). For EVs, the battery currently accounts for the majority of the total value of core parts and also makes up a significant share of the value of the vehicle. Given this cost structure, without a battery that meets the USMCA automotive ROOs, an EV cannot possibly meet the RVC requirements. When staging is completed, the ROOs will effectively require cells (which make up the majority of the cost of the battery) be produced in a USMCA country in order to qualify.[b] Since the USMCA's entry into force, at least three U.S.-produced EVs (Chevrolet Bolt, Tesla Model S, and Tesla Model X) have shifted from using U.S.-produced battery packs with Japanese or South Korean cells to battery packs with U.S.-produced cells. Some U.S.-produced EVs, such as the Ford Mustang Mach-E, however, continue to use imported cells, likely because of continued capacity constraints in U.S. battery cell production.[c]

When the USMCA was signed in 2018, Tesla produced most battery cells for EVs made in the United States in its Nevada battery plant. In 2018, total domestic capacity for EV battery cells was less than 40 gigawatt hours (GWh), but it increased to 55 GWh in 2021.[d] According to an April 2022 estimate, vehicle manufacturers and battery suppliers have subsequently invested $60 billion to date expanding expected U.S. cell capacity to 382 GWh by 2025, increasing projected EV battery cell capacity 10-fold.[e] According to the Center for Automotive Research's Book of Deals database, 86 separate EV-related investment announcements were made from 2018 to 2022 and more than a dozen companies have announced EV-related investments of greater than $1 billion. Ford Motor Company, General Motors, and Hyundai Motor Company are the largest investors and have each announced investments greater than $10 billion in EVs and EV batteries, from 2018 to 2022.[f] Vehicle manufacturers and battery manufacturers would have made significant U.S. investments in EV batteries absent the incentivizing effect of the ROOs because battery cells tend to be produced in proximity to vehicle assembly locations and because of incentives in the Inflation Reduction Act. Industry representatives, however, report that these ROOs have accelerated the process.[g]

[a] See chapter 1 for more detail on the transition to EVs and hybrid vehicles.
[b] To qualify for duty-free treatment under the USMCA, an EV battery must either: meet the 75 percent RVC requirement or undergo a change in subheading from any subheading except for the one that includes battery cells. Because cells are such a significant share of the cost of a battery, to qualify under either rule the cells need to originate in a USMCA member country. Vehicle manufacturers participating in alternative staging can use non-originating cells for the length of their alternative staging plan.
[c] Horowitz, Coffin, and Taylor, "Supply Chain for EV Batteries," January 2021, 18; Hebda, "LG Energy Solutions Solidifies Collaboration," July 22, 2022.
[d] AAPC, written submission to the USITC, December 3, 2022, 12; Horowitz, Coffin, and Taylor, "Supply Chain for EV Batteries," January 2021, 3; VTO, "Electric Vehicle Battery Manufacturing Capacity in North America," January 2, 2023.
[e] Yu and Marjolin, "Investment in Lithium-Ion Batteries Could Deliver 5.9 TWh Capacity by 2030," April 12, 2022.
[f] CAR, Automotive Communities Partnership, accessed August 30, 2022.
[g] Industry representative, meeting with USITC staff, August 29, 2022.

Increase in Demand for U.S. Steel and Aluminum

The steel and aluminum purchasing requirements appear to have benefited the U.S. steel and aluminum industry. Vehicle manufacturers reported plans to increase their purchases of USMCA steel and

aluminum by billions of dollars in their alternative staging plans.[179] Several vehicle manufacturers have replaced non-USMCA steel inputs with steel from the United States.[180] U. S. Steel reported that it has invested in additional capacity because of increased demand related to the USMCA automotive ROOs and that vehicle manufacturers have shown increased interest in its steel.[181] The USMCA's melted and poured requirements for steel, starting in 2027, discourage the use of imported semifinished steel for vehicle manufacturers seeking to comply with the USMCA automotive ROOs. This change will likely further increase investment in steel capacity in the United States.[182]

Increase in Production Costs

USMCA provisions that require automotive supply chains to source more content from the USMCA region will likely lead to increased production costs for vehicle manufacturers.[183] Input costs, steel and aluminum costs, labor costs, and compliance and data collection (i.e., supply chain management) costs are all likely to increase as a result of the USMCA automotive ROOs, as described below. These cost increases have not yet been significant but will likely increase as vehicle manufacturers continue to make changes to meet the ROOs.

Some U.S. vehicle manufacturers expressed concern about the costs of producing USMCA-compliant vehicles in the United States for their exports to Canada and Mexico. These firms reported that they are considering replacing some U.S.-made vehicle sales in Canada and Mexico with non-USMCA-produced vehicles, which would cost less than USMCA-compliant vehicles.[184] U.S. import data appear to indicate that vehicle manufacturers have also chosen to produce vehicles in USMCA countries that are not USMCA compliant.[185] The result is that these vehicles become subject to a 2.5 percent tariff rate, increasing their cost relative to competitors'.

[179] USMCA Automotive Committee, information from alternative staging petitions submitted to the Automotive Committee, July 2020, aggregated by the USITC, February 15, 2023.
[180] AISI, prehearing brief, November 3, 2022, 4; USITC, hearing transcript, November 3, 2022, 42–43 (testimony of Anna Schneider, VW); USITC, hearing transcript, November 3, 2022, 135 (Kevin Dempsey, AISI).
[181] USITC, hearing transcript, November 3, 2022, 152 (testimony of Kaitlin Wojnar, U. S. Steel); USITC, hearing transcript, November 3, 2022, 168 (testimony of Kevin Dempsey, AISI); U. S. Steel, posthearing submission to the USITC, November 11, 2022, 7, 9, 11.
[182] Melted and poured requirements prevent the use of imported semifinished steel that is only cast in the USMCA countries. For more, see "Operation of the Rules of Origin" in chapter 1. USITC, hearing transcript, November 3, 2022, 193–95 (testimony of Kaitlin Wojnar, U. S. Steel); USITC, hearing transcript, November 3, 2022, 186–87, 195 (testimony of Kevin Dempsey, AISI); AAM, written submission to the USITC, November 24, 2022, 3.
[183] USITC, hearing transcript, November 3, 2022, 43 (Anna Schneider, VW); USITC, hearing transcript, November 3, 2022, 44 (Mateo Diego-Fernández, AMIA).
[184] USITC, hearing transcript, November 3, 2022, 73, 117 (Rory Heslington, Autos Drive America); Industry representative, meeting with USITC staff, November 15, 2022; industry representatives, interview by USITC staff, January 24, 2023.
[185] U.S. imports of light vehicles from the USMCA partner countries that do not claim the USMCA tariff preferences have increased significantly since 2020. For more information, see the section below titled "External Factors Caused Fluctuations in U.S. Light Vehicle Trade." USITC DataWeb/Census, imports for consumption customs value, list of HS subheadings corresponding to light vehicles in appendix F, accessed February 23, 2023.

Input Costs

Inputs are all the parts and materials vehicle manufacturers use to make a vehicle. The higher RVC requirements encourage U.S. vehicle manufacturers to purchase more parts and components from suppliers in USMCA countries rather than from non-USMCA countries, which generally offer lower priced inputs.[186] The LVC requirements also may incentivize additional U.S. and Canadian inputs for some producers, as discussed earlier. Sourcing shifts to meet the ROOs (or slowing of sourcing shifts away from high-wage countries) and associated cost increases will likely rise through 2027 as vehicle manufacturers purchase more parts domestically or from USMCA partners to meet growing requirements.[187] Parts production is more labor intensive than vehicle production; therefore, shifting parts purchases to the United States (and Canada) increases the cost of individual parts more on a percentage basis than shifting vehicle assembly increases the overall vehicle cost.[188] The new steel and aluminum purchasing requirements encourage U.S. vehicle manufacturers to make purchases from USMCA countries, which generally have higher steel and aluminum prices. Industry representatives report that this led to an increase in their costs of production.[189]

Small increases in the prices of individual parts multiplied across hundreds of thousands or millions of vehicles can significantly increase costs. Manufacturers rely on an intricate supply chain with thousands of inputs from hundreds of suppliers for each vehicle. The cost of materials for U.S. vehicle manufacturers was 77 percent ($245 billion) of the value of U.S. motor vehicle shipments in 2021.[190] Among vehicle manufacturers that submitted a detailed plan for alternative staging, most spent tens of billions of dollars on parts for vehicle assembly in USMCA countries.[191]

[186] USITC, hearing transcript, November 3, 2022, 46 (testimony of Fausto Cuevas, AMIA) and 111 (testimony of Anna Schneider, VW); VW, written submission to the USITC, December 2, 2022, 20–21.
[187] RVC and LVC requirements reach their final level for most light vehicles in 2023, most vehicles in alternative staging by 2025, and all light and heavy vehicles by 2027. USMCA Automotive Committee, information from alternative staging petitions submitted to the Automotive Committee, July 2020, aggregated by the USITC, February 15, 2023; USITC, hearing transcript, November 3, 2022, 42–43, 64 (testimony of Anna Schneider, VW); and 136–37 (testimony of Kevin Dempsey, AISI).
[188] Payroll makes up 13 percent of vehicle parts shipments (compared to 5 percent for vehicle manufacturing). NAICS 3361 (motor vehicles) and 3363 (parts). U.S. Census, "Annual Survey of Manufactures: Summary Statistics for Industry Groups and Industries in the U.S.: 2018–2021," accessed February 1, 2023. Parts suppliers may mitigate the cost increase by using less labor-intensive techniques in their U.S. manufacturing. Industry representative, interview with USITC staff, October 14, 2022.
[189] USITC, hearing transcript, November 3, 2022, 42–43 (testimony of Anna Schneider, VW); 46 (testimony of Fausto Cuevas, AMIA); and 80 (Rory Heslington, Autos Drive America); VW, posthearing submission, December 2, 2022, 16–17.
[190] Cost of materials as a percentage of shipments was relatively stable from 2018 to 2021, never going lower than 76.7 percent, nor higher than 77.1 percent. NAICS 3361. U.S. Census, "Annual Survey of Manufactures: Summary Statistics for Industry Groups and Industries in the U.S.: 2018–2021," accessed February 1, 2023.
[191] USMCA Automotive Committee, information from alternative staging petitions submitted to the Automotive Committee, July 2020, aggregated by the USITC, February 15, 2023.

Labor and Labor Costs

For a few vehicle producers, the LVC requirements may incentivize a shift in production away from Mexico toward the United States and Canada or slow further shifts in production to Mexico.[192] Vehicle manufacturers reported encountering difficulties getting U.S. and Canadian parts suppliers to certify that they meet the LVC requirements. Because of this—as well as the generally held belief that U.S. and Canadian suppliers are above the high-wage threshold—some stakeholders believe that U.S. and Canadian parts suppliers should be exempt from needing to certify that they meet this requirement (see box 3.2 for more).[193]

Any increase in supplier employment in the United States means that total labor costs of vehicle producers would rise. USITC modeling estimates that the wages in U.S. production increased by $241.8 million in the U.S. automotive parts industry as a result of the ROOs.[194] The impact on automotive wages per worker, however, is less certain. The Motor and Equipment Manufacturers Association (MEMA) reported that U.S. automotive wages are up 15.2 percent since the USMCA entered into force; however, it noted that this wage increase was largely due to external factors such as supply chain and workforce shortages, rather than the LVC requirements.[195] Similarly, the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (UAW) stated that it had not yet seen any beneficial impact on U.S. automotive industry wages as a result of the USMCA.[196]

Even if the LVC requirements only minimally benefit U.S. automotive wages, multiple hearing participants stated that the requirements will have other positive effects for U.S. automotive workers. The LVC requirements stand to prevent future U.S. job relocation to lower-wage countries and will act as a floor for U.S. automotive wages. Industry experts generally expect Mexican production to continue to fall short of the $16 per hour threshold.[197] Industry representatives, however, reported a few instances of Mexican producers meeting the $16 per hour threshold by drastically increasing their wage rates since the USMCA entered into force.[198]

[192] The International Labour Organization (ILO) reports $376 a month for Mexican manufacturing workers, which would work out to less than $19 a day assuming 20 working days in a month. ILO, "Average Monthly Earnings of Employees by Sex and Economic Activity," February 4, 2023; USITC, hearing transcript, November 3, 2022, 77–78 (testimony of Mateo Diego-Fernández, AMIA); *Mexico News Daily*, "Only 269,000 Mexicans Earn More than US $16 per Hour, or 308 Pesos," accessed November 18, 2022. For the estimated impact on employment in the U.S. automotive industry, see chapter 2 of this report.
[193] USITC, hearing transcript, November 3, 2022, 77–78 (testimony of Mateo Diego-Fernández, AMIA); *Mexico News Daily*, "Only 269,000 Mexicans Earn More than US $16 per Hour, or 308 Pesos," accessed November 18, 2022.
[194] See table 2.4 for more information.
[195] USITC, hearing transcript, November 3, 2022, 77 (testimony of Bill Frymoyer, MEMA).
[196] USITC, hearing transcript, November 3, 2022, 139–40 (testimony of Josh Nassar, UAW).
[197] USITC, hearing transcript, November 3, 2022, 165 (testimony of Roy Houseman, USW), 172–73 (testimony of Kevin Dempsey, AISI); and 173–74 (testimony of Josh Nassar, UAW).
[198] Nakayma, Asayama, "Japan Auto Companies Triple Mexican Pay Rather than Move to U.S.," June 28, 2020; USITC, hearing transcript, November 3, 2022, 99 (testimony of Fausto Cuevas, AMIA).

Box 3.2 Exempting U.S. and Canadian Suppliers from the High-Wage LVC Certification

To promote increased U.S. automotive sector employment, the United States-Mexico-Canada Agreement (USMCA) requires vehicle manufacturers to certify that 40 or 45 percent of the value of the vehicle was produced in USMCA facilities where direct production workers are compensated at least $16 an hour. Some U.S. and Canadian parts suppliers, as well as vehicle manufacturers operating in Mexico, have expressed a desire to be exempt from the need to certify that they meet this high-wage labor value content (LVC) requirement.

La Asociación Mexicana de La Industria Automotriz [Mexican Automotive Industry Association] (AMIA) proposed that, for materials and parts sourced from the United States or Canada, the inputs be counted as high-wage materials without the need to certify as such.[a] AMIA, which represents 21 primarily U.S.-, European-, and Asian-headquartered light vehicle manufacturers with Mexican operations, stated that the certification requirements are disproportionately burdensome for vehicle manufacturers in Mexico that rely heavily on parts sourced from U.S. parts suppliers to meet the LVC requirements. Automotive producers in Mexico reportedly struggle to get their U.S. suppliers to provide the information and documentation needed for LVC certification.[b]

Other industry representatives also described the challenges of the LVC certification process. The Motor and Equipment Manufacturers Association (MEMA), which represents large and small producers that are parts suppliers for light and commercial vehicles, asserted that the certifications can be very time consuming, expensive, and burdensome, especially for upstream parts suppliers. Moreover, these suppliers are now receiving significantly more certification requests under the USMCA automotive rules of origin (ROOs) than they did under NAFTA automotive ROOs.[c]

U.S. automotive industry representatives provided a range of views on whether U.S. and Canadian wages were already above $16 per hour. Some industry representatives reiterated AMIA's belief that most (or all) U.S.-based suppliers already pay at least $16 per hour.[d] The International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (UAW), however, expressed some doubt that most U.S. suppliers pay workers at least $16 per hour, and some vehicle manufacturers similarly indicated some skepticism of this being true in all cases (but said that they believed it was true in most). For example, the UAW noted that wages for smaller parts suppliers, which tend to be less unionized, are likely to be lower than wages in their more unionized larger counterparts.[e]

[a] USITC, hearing transcript, November 3, 2022, 21–22 (testimony of José Zozaya, AMIA).
[b] USITC, hearing transcript, November 3, 2022, 77–78 (testimony of Mateo Diego-Fernández, AMIA).
[c] USITC, hearing transcript, November 3, 2022, 33–34 (testimony of Bill Frymoyer, MEMA); USITC, hearing transcript, November 3, 2022, 77–78 (testimony of Mateo Diego-Fernández, AMIA); industry representatives, meetings with USITC staff, August 31, 2022, October 14, 2022, and November 15, 2022.
[d] USITC, hearing transcript, November 3, 2022, 75–76 (testimony of Anna Schneider, VW); USITC, hearing transcript, November 3, 2022, 77 (testimony of Bill Frymoyer, MEMA); USITC, hearing transcript, November 3, 2022, 21 (Matt Blunt, AAPC); industry representative, meeting with USITC staff, November 15, 2022.
[e] USITC, hearing transcript, November 3, 2022, 140, 164, & 166–67 (testimony of Josh Nassar, UAW); industry representatives, meetings with USITC staff, October 14, 2022 and November 15, 2022.

Supply Chain Management Costs

The higher RVC requirements will likely increase the costs of managing already complex automotive supply chains. Vehicle manufacturers must collect and report more information under the USMCA

automotive ROOs than they did under NAFTA, adding to supply chain management complexity.[199] Vehicle manufacturers hired additional staff, created USMCA compliance teams, and built new data collection systems to ensure they meet the ROOs.[200] One vehicle manufacturer's additional USMCA supply chain management costs reportedly totaled millions of dollars.[201] Parts suppliers, who generally employ fewer people and have smaller budgets, also reported hiring additional staff or having supply chain management take up more staff time than previously.[202] These costs, however, are unlikely to increase further once vehicle manufacturers and parts suppliers have supply chain management systems in place to collect, analyze, and report sourcing information.

U.S. Automotive Data Show Few Signs of Changes in Competitiveness

Whereas the first section of the chapter focused on changes to costs and U.S. production as reported by industry, this section examines U.S. production, investment, trade, and employment data for changes that might indicate a gain or loss in competitiveness and whether the USMCA automotive ROOs could have contributed to this change. Changes in U.S. automotive industry competitiveness due to these ROOs were not the main driver of fluctuations in U.S. automotive production and trade during 2018–22.[203] Instead, the declines in 2020 and 2021 were primarily due to external shocks, especially the chip shortage and shutdowns related to the COVID-19 pandemic.[204]

U.S. Automotive Production from 2018 to 2022

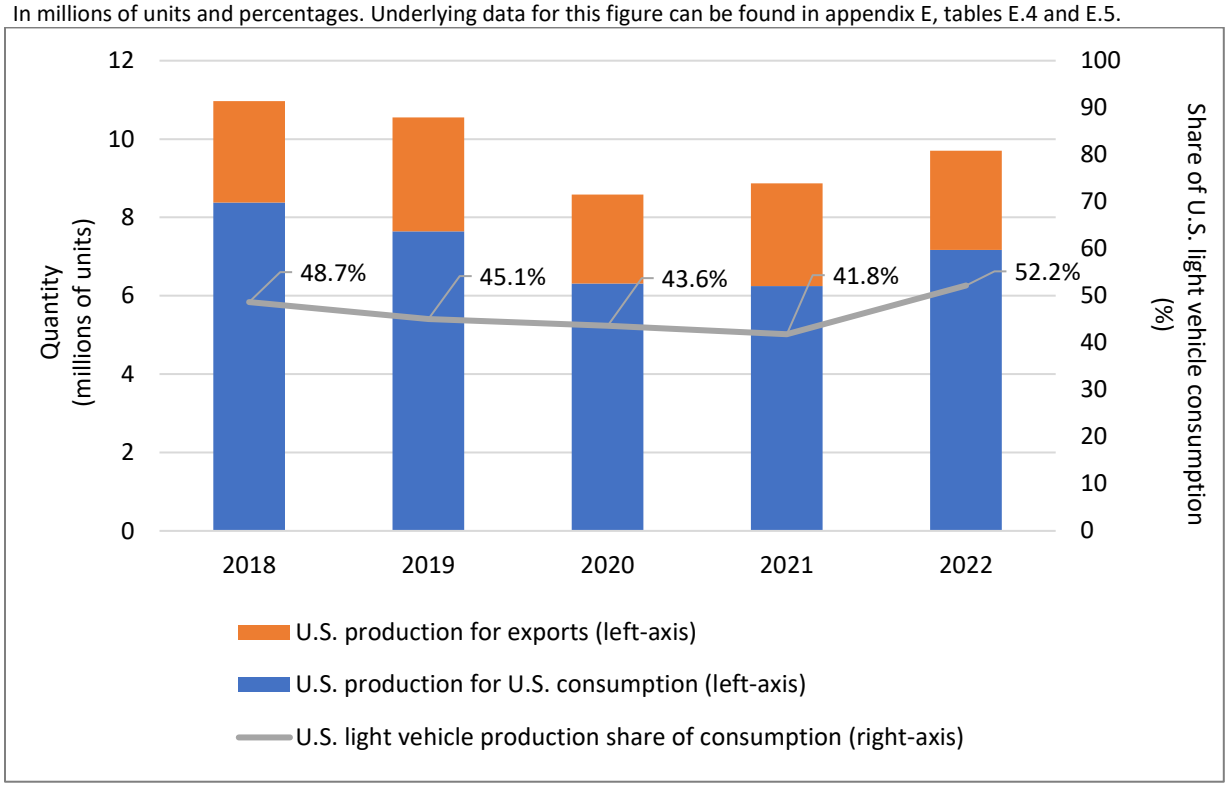
U.S. light vehicle production decreased from 11 million units in 2018 to a low of 8.6 million units in 2020, before partially rebounding to 9.8 million units in 2022 (figure 3.1).[205] The significant decrease in 2020 was mainly caused by stoppages in production and shortages of parts due to COVID-19 pandemic-related issues and chip shortage rather than USMCA requirements. In response to the onset of the COVID-19 pandemic, light vehicle manufacturers either shut down or scaled back production from mid-March to May 2020.[206] This loss of production time in the United States contributed to a USMCA-wide decline in vehicle production of 20 percent.[207] Notwithstanding the decrease in U.S. light vehicle

[199] Industry representatives, meetings with USITC staff, August 15, 2022, September 29, 2022, October 14, 2022, and October 18, 2022.
[200] Industry representatives, meetings with USITC staff, August 15, 2022, and September 29, 2022.
[201] Industry representative, meeting with USITC staff, November 15, 2022.
[202] Industry representatives, meetings with USITC staff, August 19, 2022, August 30, 2022, August 31, 2022, and September 19, 2022.
[203] The following sections of chapter 3 use data from 2018 to 2022 to show a full five-year panel including multiple years before entry into force of the agreement.
[204] For a more complete discussion of the COVID-19 pandemic's effect on the U.S. automotive industry, as well as other external factors impacting the automotive industry, see chapter 1 of this report.
[205] Ward's Intelligence, "North America Vehicle Production by State and Plant, 2017–2021," April 11, 2022; Ward's Intelligence, "North America Production, December 2022," January 19, 2023.
[206] For more discussion on the effects of the COVID-19 pandemic on automotive supply chains, see chapter 1 of this report. Brinley, "North American Auto Production Hit by COVID-19 Virus Outbreak," March 19, 2020.
[207] International Organization of Motor Vehicle Manufacturers (OICA), "Global Auto Production in 2020 Severely Hit by COVID-19 Crisis with a 16% Drop in World Auto Production," March 24, 2021.

production, U.S. producers' share of U.S. consumption of light vehicles increased over the period, from 48.7 percent in 2018 to 54.5 percent in 2022 (figure 3.1). This increase in the share of U.S. vehicle consumption that is fulfilled by U.S. production may indicate an improvement in the competitiveness of U.S. vehicle production compared to imported vehicles. The modeling estimates from chapter 2 show increases in U.S. vehicle production due to the ROOs.[208]

Figure 3.1 U.S. light vehicle production and share of U.S. light vehicle production for U.S. consumption in overall U.S. light vehicle consumption (sales), by year, 2018–22

In millions of units and percentages. Underlying data for this figure can be found in appendix E, tables E.4 and E.5.



Sources: Ward's Intelligence, "North America Vehicle Production by State and Plant, 2017–2021," April 11, 2022; Ward's Intelligence, "North America Production, December 2022," January 19, 2023; and USITC DataWeb/Census, domestic exports list of HS subheadings for light vehicles, accessed February 21, 2023, correspond to those in appendix F of this report.
Note: The presented share is based on U.S. production for U.S. consumption, which is derived by subtracting domestic exports from U.S. production. Light vehicle subheadings do not include electric or hybrid trucks because they are classified as heavy trucks in the USMCA. For more information, see chapter 4.

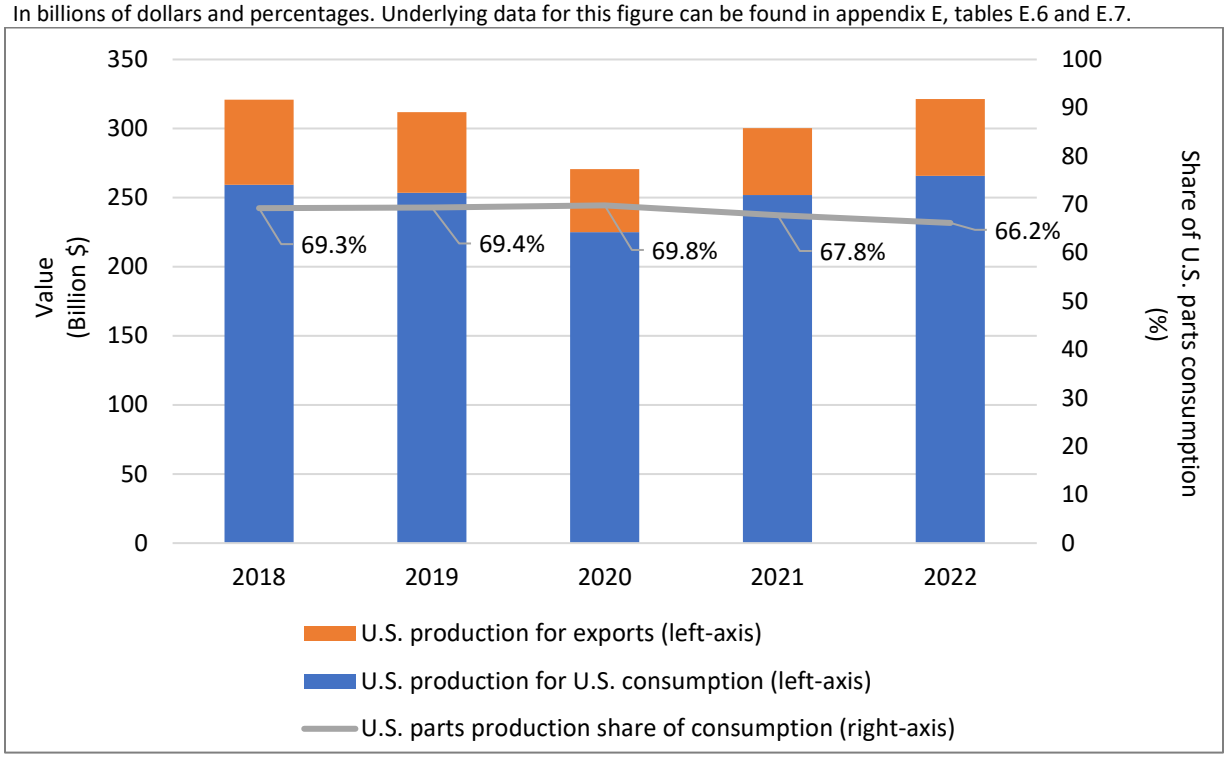
Despite the decline in total vehicle production, U.S. vehicle parts production remained largely unchanged from 2018 ($321.0 billion) to 2022 ($321.3 billion), aside from the decrease in 2020 ($277.7 billion) due to COVID-19 pandemic-related shutdowns and subsequent chip shortages (figure 3.2).[209] The increase in parts production after 2020 is in line with the upturn in vehicle production. Nevertheless, U.S. parts production as a share of U.S. consumption declined from 69.8 percent in 2020 to 66.2 percent in 2022, possibly indicating a slight decline in U.S. parts production competitiveness relative to imported

[208] See table 2.6 for more information.
[209] NAICS 3362 and 3363. USITC DataWeb/Census, accessed February 27, 2023; U.S. Census, "Annual Survey of Manufactures: Summary Statistics for Industry Groups and Industries in the U.S.: 2018–2021," accessed February 1, 2023.

parts since the USMCA entered into force. Modeling results, however, estimate an increase of $1.6 billion in U.S. engine and transmission revenue.[210]

Figure 3.2 U.S. parts production and share of U.S. parts production for U.S. consumption in overall U.S. parts consumption, by year, 2018–22

In billions of dollars and percentages. Underlying data for this figure can be found in appendix E, tables E.6 and E.7.



Sources: U.S. Census, "Annual Survey of Manufactures," 2017–2021; U.S. Census, Manufacturers' Shipments, Inventories, and Orders (M3) Survey, February 2, 2023; USITC DataWeb/Census, imports for consumption and domestic exports, NAICS 3362 and 3363, accessed February 21, 2023.
Note: U.S. parts production includes NAICS 3362 (Vehicle bodies) and 3363 (Vehicle parts). A different survey (M3) is used for U.S. parts production in 2022 and may be slightly different than the Annual Survey of Manufactures, which will not be released until after this report is published. The presented share is based on U.S. parts production for U.S. consumption, which is derived by subtracting domestic exports from U.S. production.

U.S. Production and Investment Gains Relative to USMCA Partners

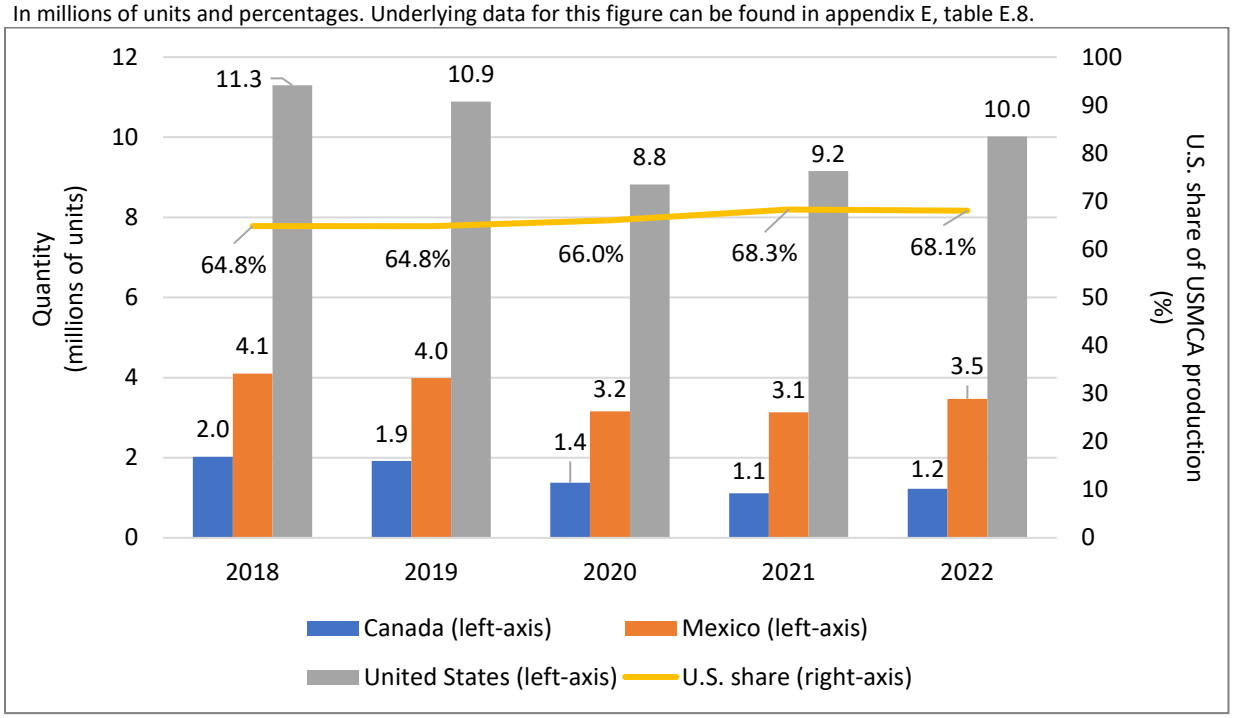
The new USMCA automotive ROOs may have contributed to increases in the U.S. share of USMCA vehicle and engine production, but external factors such as the response to the COVID-19 pandemic and chip shortage also played a role. As previously mentioned, total U.S. production declined by 1.2 million units from 2018 to 2022 but production in Canada (down 800,000 units) and Mexico (down 600,000 units) followed similar trends (figure 3.3). The U.S. share of total USMCA vehicle production, however,

[210] See table 2.5 for more information.

increased from 64.4 percent in 2018 to 68.1 percent in 2022 (figure 3.3).[211] Similarly, the U.S. share of USMCA engine production increased from 70.3 percent in 2018 to 73.5 percent in 2021.[212]

Figure 3.3 USMCA vehicle production and U.S. share of USMCA vehicle production, by country and year, 2018–22

In millions of units and percentages. Underlying data for this figure can be found in appendix E, table E.8.



Source: Ward's Intelligence, "North American Vehicle Production by State and Plant," April 11, 2022; Ward's Intelligence, "North America Production, December 2022," January 19, 2023.
Note: See appendix G for production and trade by U.S. region, as well as the state composition of each region.

According to the American Automotive Policy Council (AAPC), it is unclear the extent to which the United States' increased share of USMCA production is a trend that will continue or if the share will return to previous levels.[213] It is also unclear whether this increased share is caused by the ROOs. During the chip shortage, vehicle manufacturers have prioritized production of higher profit-margin vehicles, which tend to be made in the United States, over lower profit-margin vehicles, which are more likely to be made in Mexico.[214] Canadian production is also lower because a Canadian plant was offline and

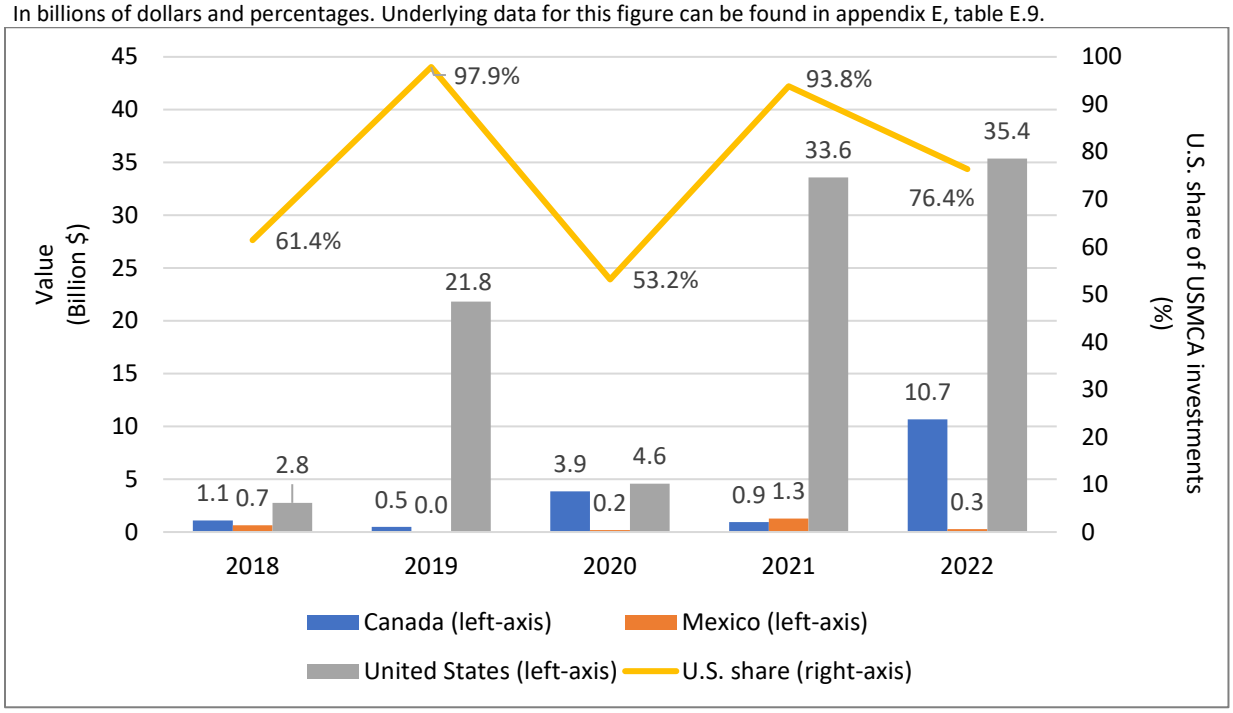
[211] Ward's Intelligence, "North America Vehicle Production by State and Plant, 2017–2021," April 11, 2022; Ward's Intelligence, "North America Production, December 2022," January 19, 2023.
[212] AW, "Global Vehicle Engine Plant Database – 2020 Edition," May 21, 2020; AW, "Global Vehicle Engine Plant Database – 2022 Edition," May 26, 2022.
[213] AAPC, posthearing submission, December 3, 2022, 10.
[214] Klayman, Carey, "GM's Barra Sees a More Profitable Future," May 5, 2021; Coffin et al., "The Roadblocks of the COVID-19 Pandemic," June 2022; 12–13.

appeared to be destined for closure during 2019–20 until it was brought back online as part of an agreement with the union representing Canadian autoworkers.[215]

The USMCA RVC and LVC requirements may have contributed to directing new USMCA automotive investments to the United States and Canada after the USMCA agreement was announced in 2018. Vehicle manufacturer investment in U.S. and Canadian destinations made up 84.8 percent of USMCA vehicle manufacturer investments in 2018. The U.S. and Canadian share increased to an average of 98.5 percent during 2019–22. Similarly, parts supplier investments in the United States and Canada increased from 93 percent of USMCA parts supplier investments in 2018 to an average of 98.1 percent during 2019–22. The United States was the leading USMCA destination for vehicle manufacturer investments from 2018 to 2022 (figure 3.4). These U.S. investment data trends are consistent with the investment activities reported above by industry representatives, and modeling results show increased U.S. capital investments of $60 million related to USMCA.[216]

Figure 3.4 U.S. vehicle manufacturer investments and U.S. share of vehicle manufacturer investments in all USMCA countries, by region and year, 2018–22

In billions of dollars and percentages. Underlying data for this figure can be found in appendix E, table E.9.



Source: CAR, Automotive Communities Partnership, accessed August 30, 2022.

U.S. Automotive Trade from 2018 to 2022

Changes in U.S. automotive trade data during 2018–22 do not indicate a clear gain or loss in competitiveness. U.S. vehicle and parts exports (as a share of global exports) rose during the period,

[215] Unifor is the union formed by the Canadian Auto Workers union and the Communications, Energy and Paperworkers Union of Canada. Noble, Hall, "GM's Decision to Build Trucks in Ontario Concerns UAW Workers," November 5, 2020.
[216] See table 2.4 for more information.

possibly signaling an increase in the competitiveness of U.S. vehicle and parts production in other markets. The share of imports from USMCA countries that did not claim the USMCA preference rose since entry into force, which may be a negative indicator of competitiveness because vehicle and parts producers in Mexico or Canada that do not meet the USMCA automotive ROOs have fewer incentives to use USMCA content.[217]

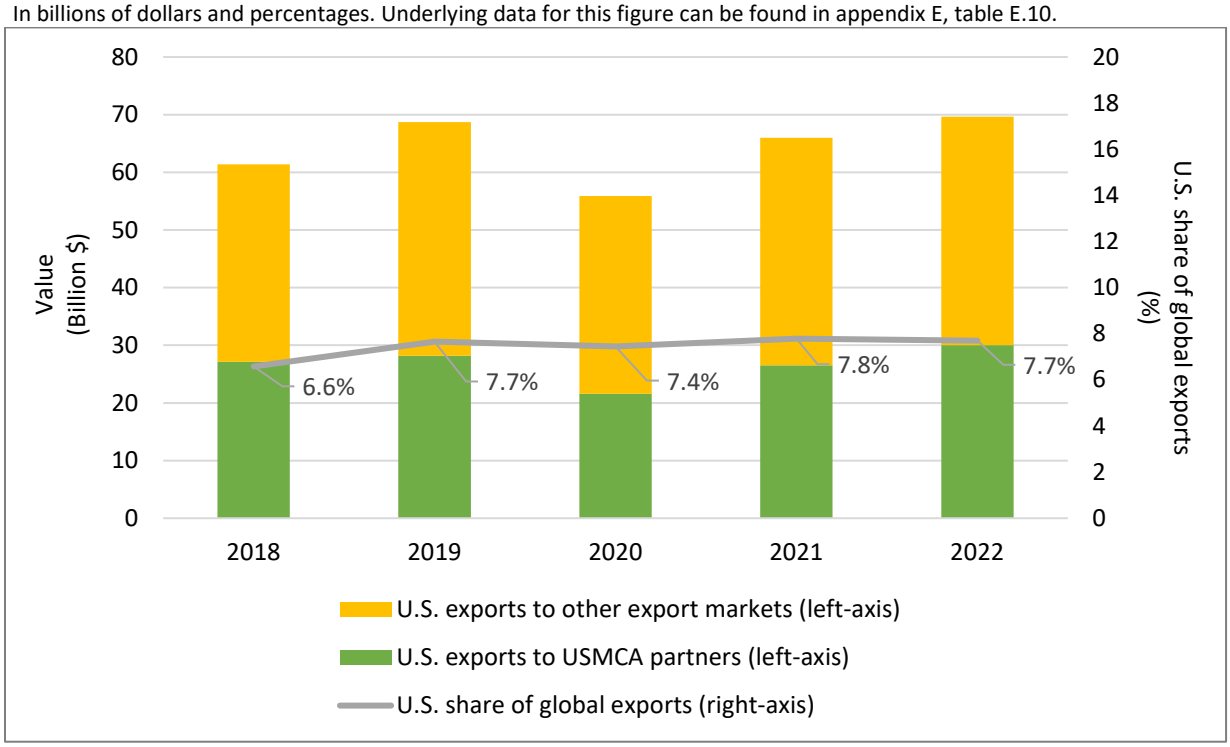
Overall, U.S. light vehicle exports increased from $61.4 billion in 2018 to $69.7 billion in 2022, recovering from a significant decrease to $55.9 billion in 2020 (figure 3.5).[218] Production shutdowns and parts shortages were the major causes of the significant decline in 2020.[219] U.S. light vehicle exports outside USMCA countries were more stable than exports to the USMCA partners and reached their highest level in 2022. Parts shortages and higher raw material costs drove up the cost of finished vehicles and, thus, increased the value of exports. If the unit price had continued at 2018 levels, then U.S. light vehicle exports in 2022 would have been $2.1 billion lower than in 2018.[220] The chip shortage and other material shortages negatively affected supply and increased raw material prices, leading to higher vehicle prices and vehicle manufacturers focusing on higher-end models, as noted above.[221]

The U.S. share of global exports of light vehicles increased (from 6.6 percent in 2018 to 7.7 percent in 2022) during the period; however, most of that increase occurred before entry into force of the USMCA. The smaller increase from 2020 to 2022 (0.3 percent) may point to an increase in U.S. light vehicle competitiveness but may also reflect minor fluctuations due to the various other external factors, such as COVID-related shutdowns and shortages, impacting the automotive industry during this time.[222]

[217] In general, proximity to the United States would still lead most vehicle manufacturers and parts suppliers to use a significant share of U.S. content, but not as much as meeting USMCA automotive ROOs.
[218] The trend was similar for heavy trucks, with exports increasing from $4.9 billion in 2018 to $5.2 billion in 2019, before declining to $3.4 billion in 2020. They then bounced back in 2022 to $5.4 billion. For a full list of HS subheadings for heavy trucks see appendix F. USITC DataWeb/Census, accessed February 27, 2023.
[219] AAPC, Posthearing submission to the USITC, December 3, 2022, 8.
[220] During this time the unit value of U.S. light vehicle exports increased by 17.5 percent, from $22,484 in 2017 to $26,420 in 2022. For a complete list of HS subheadings corresponding to light vehicles, see appendix F. USITC DataWeb/Census, accessed February 27, 2023.
[221] J. P. Morgan Research, "When Will Car Prices Drop?," November 14, 2022; Huetter, "New-Vehicle Prices Surge, but There's No Shortage of Buyers," June 17, 2022.
[222] For a more thorough discussion of the other factors impacting the automotive industry, see chapter 1 of this report.

Figure 3.5 U.S. light vehicle exports and share of global exports, by export market and year, 2018–22

In billions of dollars and percentages. Underlying data for this figure can be found in appendix E, table E.10.



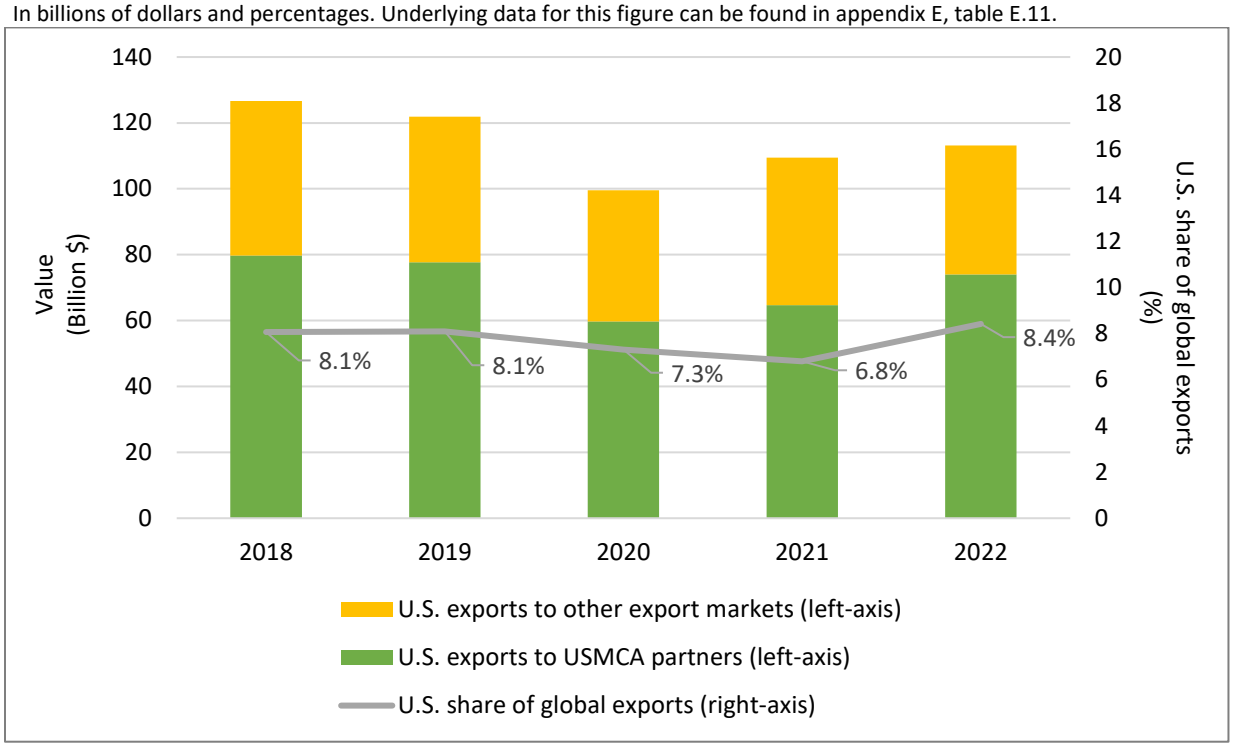
Source: S&P Global, GTAS, list of HS subheadings for light vehicles, accessed February 21, 2023, correspond to those in appendix F of this report.
Note: Global data on light vehicle exports in terms of quantity are not available. For information on U.S. vehicle exports in units see appendix G.

U.S. parts exports declined during 2018–22, but it is unclear if this decline was due to a decrease in competitiveness. U.S. parts exports as a share of global exports increased slightly from 8.1 percent in 2018 to 8.4 percent in 2022 (figure 3.6).[223] During this same time period, the share of U.S. parts exports to non-USMCA countries decreased from 38 percent to 33.3 percent of U.S. parts exports.[224] The absolute decline in total exports is likely not an indicator of reduced competitiveness of U.S. parts production, as the U.S. share of global exports increased.[225]

[223] This analysis uses a different definition of vehicle parts because NAICS codes are only available for U.S. trade. S&P Global, "Global Trade Atlas Database," accessed January 20, 2023. For full list of subheadings see appendix F "Harmonized HS-6 subheadings that are entirely or primarily vehicle parts."
[224] S&P Global, "Global Trade Atlas Database," accessed January 20, 2023. For a full list of subheadings, see appendix F, "Harmonized HS-6 subheadings that are entirely or primarily vehicle parts."
[225] Steinhauser, Ruženková, and Kittová, "Export Performance as a Measurement of Competitiveness," March 30, 2020, 145–60.

Figure 3.6 U.S. vehicle parts exports and share of global exports, by export market and year

In billions of dollars and percentages. Underlying data for this figure can be found in appendix E, table E.11.



Source: S&P Global, GTAS, list of HS subheadings for global vehicle parts, accessed February 21, 2023, correspond to those in appendix F of this report.
Note: Global vehicle parts list includes HS subheadings that are not solely automotive and is thus broader than the NAICS-based automotive trade data used in figures 3.2 and 3.7.

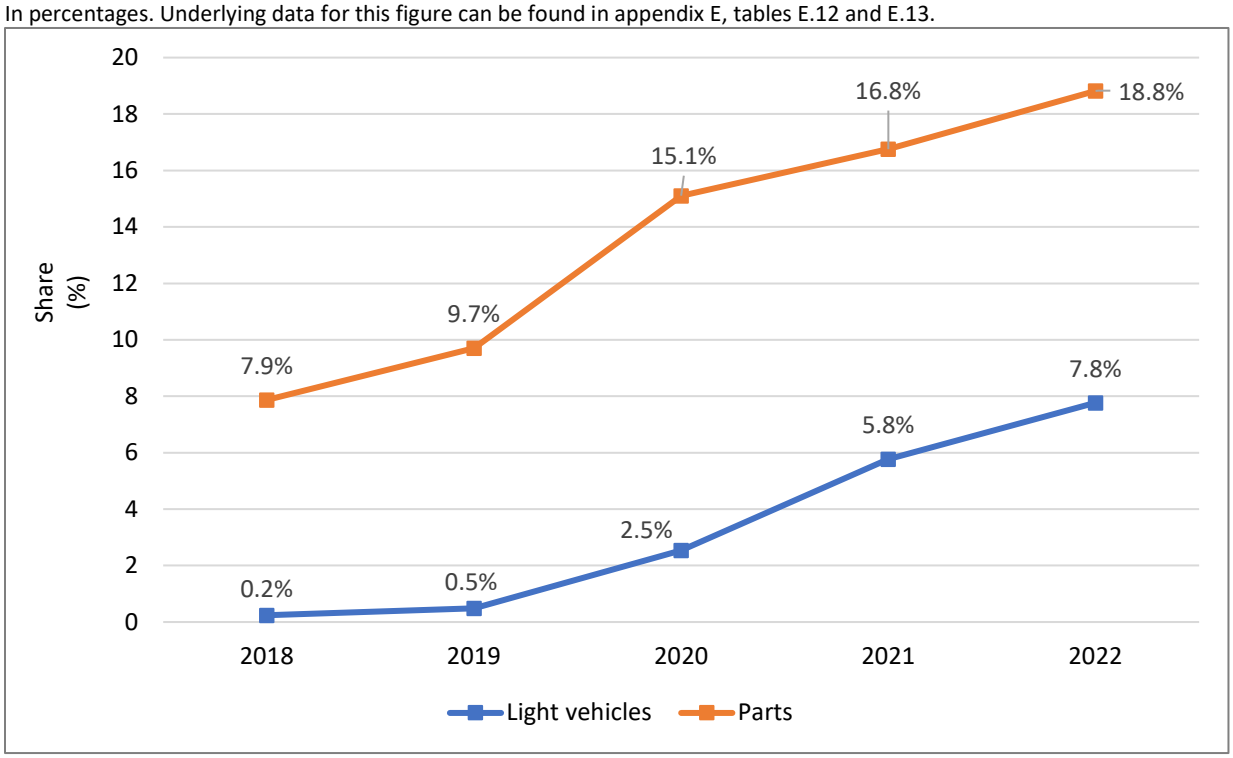
U.S. automotive imports from Canada and Mexico for which importers did not claim the USMCA (or NAFTA before) preference increased sharply after the USMCA entered into force in 2020. U.S. light vehicle imports from Canada and Mexico subject to tariffs increased from 0.2 percent in 2018 to 7.8 percent in 2022 (figure 3.7).[226] Some increase in this percentage is not surprising. Used vehicles produced before the USMCA entered into force are unlikely to qualify for duty-free treatment under the USMCA because they were not being produced with these ROOs in mind.[227] Used vehicle imports, however, only make up a little less than one-quarter of the vehicles subject to duties. New vehicles made up at least 77 percent of the increase in light vehicle imports from Canada and Mexico that were subject to duties in 2022.[228] Therefore, it is likely that this increase also reflects some vehicle

[226] For a complete list of HS subheadings corresponding to light vehicles, see appendix F. USITC DataWeb/Census, accessed February 27, 2023.
[227] CBP has interpreted USMCA as having no specific allowances to allow used vehicles to qualify for duty-free treatment under different ROOs, so a used vehicle only qualifies if it happens to have been produced in a way that it meets USMCA ROOs. In its submission to the Commission, NADA argues that USMCA automotive ROOs should be interpreted as applying to a vehicle's date of production rather than date of entry, which it argues would allow for used vehicles to qualify for duty-free treatment under USMCA if they satisfy NAFTA ROOs. CBP, "Used Vehicles," October 2021; NADA, written submission to the USITC, November 22, 2022.
[228] The exact share of imported vehicles that are new is unknown, as many light vehicles are imported under HTS10 statistical reporting numbers that do not differentiate between new and used vehicles. Seventy-five percent of light vehicle imports subject to duties were imported under statistical reporting numbers that are exclusive to new

manufacturer and parts supplier decisions to not meet the ROOs for some vehicle models and parts.[229] Vehicle parts imported from Canada and Mexico subject to duties also increased, from 7.9 percent in 2018 to 18.8 percent in 2022.[230] It is possible that these import changes are only the result of short-run decisions made by vehicle manufacturers and parts suppliers as they adjust to the USMCA amid external shocks.

Figure 3.7 Share of light vehicles and parts imported from Canada and Mexico paying duties, by year, 2018–22

In percentages. Underlying data for this figure can be found in appendix E, tables E.12 and E.13.



Source: USITC DataWeb/Census, imports for consumption customs value, list of HS for light vehicles in appendix F, accessed February 23, 2023, correspond to those in appendix F of this report; USITC DataWeb/Census, imports for consumption customs value, NAICS 3362 (Motor Vehicle Body and Trailer Manufacturing) and 3363 (Motor Vehicle Parts Manufacturing), accessed February 23, 2023.

vehicles. For a complete list of HS subheadings corresponding to light vehicles, see appendix F. USITC DataWeb/Census, accessed May 25, 2023.

[229] Without knowing which specific models and parts are affected it is hard to know for sure, but some of the vehicles not meeting USMCA may be from model lines where production will soon end, or that are globally sourced as part of a vehicle manufacturers plan to produce the same model in multiple locations using many of the same suppliers.

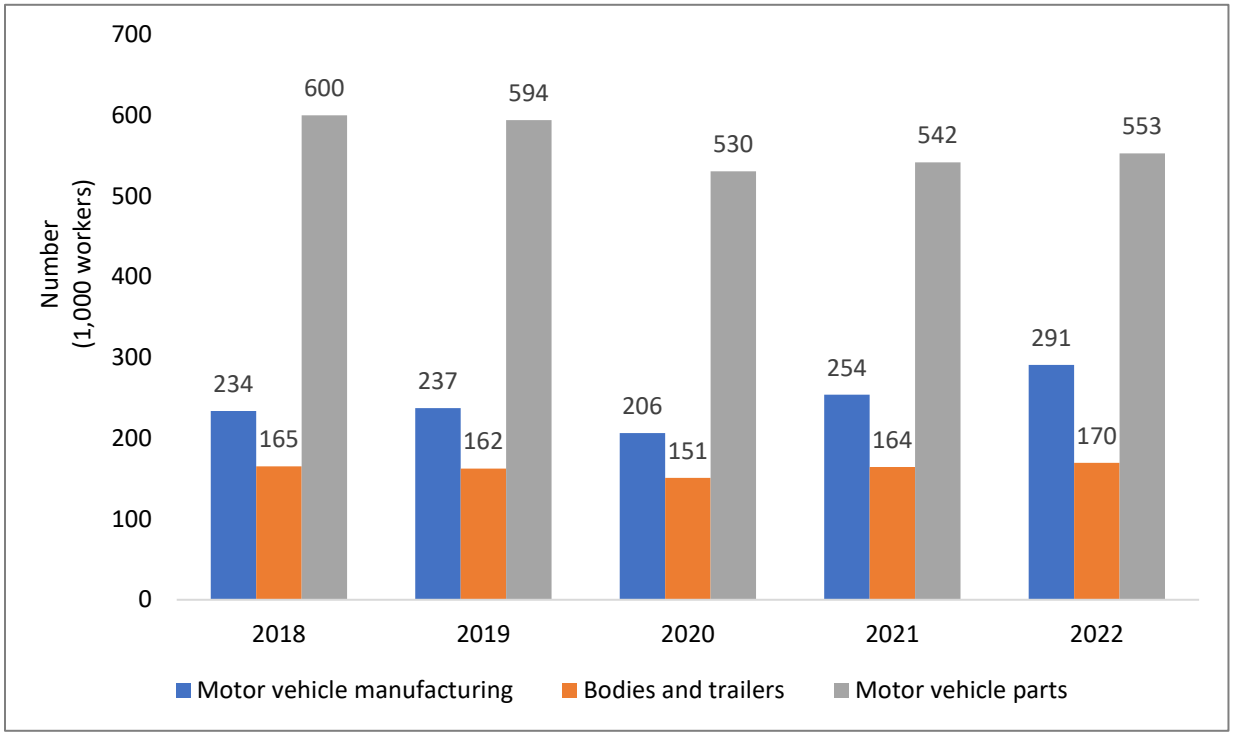
[230] For a complete list of HS subheadings corresponding to light vehicles, see appendix F. USITC DataWeb/Census, accessed February 27, 2023.

U.S. Automotive Employment and Wages Increased from 2018 to 2022

Employment and wages in the U.S. automotive industry do not indicate a gain or loss in competitiveness.[231] The automotive industry in the United States employs more than a million people, with over two-thirds working for suppliers and one-third working for vehicle manufacturers (figure 3.8). Automotive employment declined in 2020 for the same reasons as trade and production, but it returned to higher levels in 2022. Employment in 2022 was slightly higher than 2018. Modeling results estimate an addition of nearly 4,000 workers due to the ROOs.[232]

Figure 3.8 Number of automotive workers in the United States, by product type manufactured and year

In thousands of workers. Underlying data for this figure can be found in appendix E, table E.14.



Source: BLS, "Employment, Hours, and Earnings from the Current Employment Statistics survey (National)," accessed April 21, 2023.
Note: Motor vehicle manufacturing data are under NAICS 3361, motor vehicle body and trailer manufacturing data are under NAICS 3362, and motor vehicle parts manufacturing are under NAICS 3363.

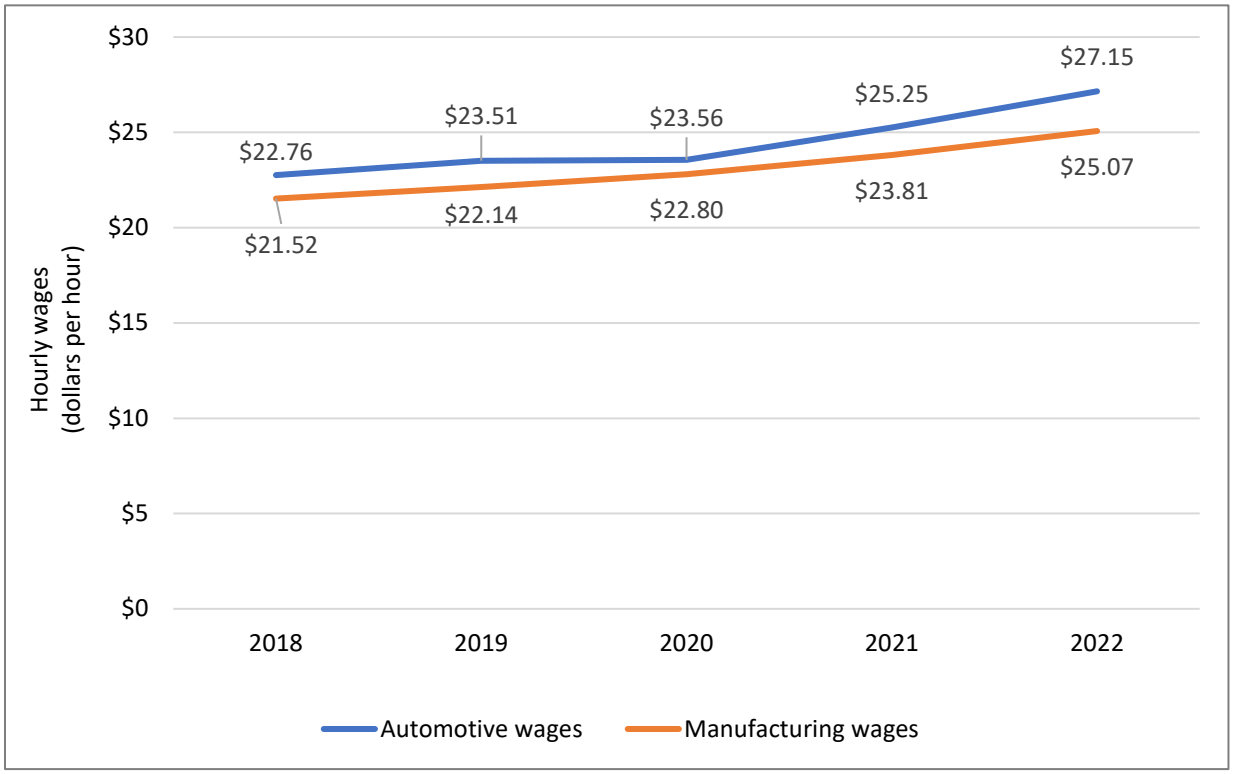
U.S. automotive wages increased significantly from 2018 to 2022, but most attribute this increase to factors other than the implementation and usage of the ROOs. Industry representatives report that wage increases were due to worker shortages and not directly caused by the ROOs.[233] Since entry into force, U.S. automotive wages increased from an average of $23.56 per hour in 2020 to $27.15 per hour in 2022, a 15.2 percent increase, outpacing the 7.1 percent increase seen among U.S. manufacturing

[231] AAPC, written submission to the USITC, December 3, 2022, 8–9.
[232] See table 2.3 for more information.
[233] Industry representative, meeting with USITC staff, August 15, 2022, September 29, 2022, October 14, 2022, and October 18, 2022; USITC, hearing transcript, November 3, 2022, 77 (testimony of Bill Frymoyer, MEMA).

workers in general (figure 3.9).[234] The wages of incumbent workers at U.S. vehicle and parts plants averaged more than the $16 per hour mandated to qualify for LVC.

Figure 3.9 United States annual averages of automotive workers' hourly wages, by year

In dollars per hour. Underlying data for this figure can be found in appendix E, table E.15.



Source: BLS, Current Employment Statistics, accessed April 21, 2023.
Note: Automotive includes motor vehicle manufacturing (NAICS 3361), motor vehicle body and trailer manufacturing (3362), and motor vehicle parts manufacturing (3363).

[234] U.S. automotive employment included NAICS 3361 (motor vehicle manufacturing), 3362 (motor vehicle body manufacturing), and 3363 (motor vehicle parts manufacturing). U.S. Bureau of Labor Statistics (BLS), "Current Employment Statistics," accessed March 15, 2021.

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Chapter 4
Technological Changes Impacting the Relevancy of the USMCA Automotive ROOs

Introduction

This chapter describes technological changes occurring in the U.S. automotive industry since entry into force of the United States-Mexico-Canada Agreement (USMCA) and examines the impact of those changes on the relevancy of the USMCA automotive rules of origin (ROOs).[235] The technological changes examined include both the adoption of new technologies and the adoption of new production processes. The agreement is in the early years of its implementation, so technological changes in the automotive industry since the negotiation of the USMCA are limited. Therefore, the overall impact of any technological changes is thus far limited but may be more significant in future years. Future reports will continue to examine technological changes and their impacts on the ROOs.

This chapter has three main sections. The first describes instances in which technological changes have created divergences in tariff classification or treatment of similar products in the ROOs. The second section discusses proposals, made by various stakeholders, related to other potential changes to the ROOs. The third section discusses other ongoing technological changes that may impact the relevance of the ROOs in future reports.

Key Findings

For the 2020–22 period covered by this report, this chapter identifies two instances where technological changes have created a divergence related to the tariff classification or tariff treatment of similar goods in the USMCA automotive ROOs. These technological changes involve the increased production of electric and hybrid pickup trucks and a new production process related to aluminum vehicle bodies.

The chapter also describes an aspect of the ROOs on which industry perspectives vary: the relevance of, and potential need for changes to, the USMCA automotive parts list in light of increased production of

[235] Section 202A(g)(2)(C) of the Act (19 U.S.C. § 4532(g)(2)(C)) directs the Commission in its report to examine "whether the automotive rules of origin are relevant in light of technological changes in the United States." However, the Act does not define "relevant." For this report, the Commission identified technological changes in the U.S. automotive industry that have occurred since the negotiation of the USMCA, or are in the process of occurring, and evaluated the extent to which these technological changes affect the application of the ROOs in the U.S. automotive industry. In this report, the divergences that the Commission identified include new HS subheadings created for new vehicle technologies since HS 2012 (the nomenclature that the USMCA was written in) and a new production technology that is not reflected in the ROOs. The Commission also examined changes in vehicle compositions that may invite a reevaluation of the automotive parts lists in the ROOs.

electric vehicles (EVs) and hybrid vehicles.[236] Finally, the chapter includes a discussion of two technologies that may impact the continued relevancy of the ROOs in the future. The first is the increased value of nontraditional automotive inputs relative to the value of the final vehicle, and how this increased value might impact the RVC calculations for the vehicle components that use a growing share of nontraditional parts. The second describes the lack of recycling-specific provisions for recycled battery materials.

Technological Changes and the USMCA Automotive ROOs

This section examines two instances in which technological changes in the U.S. automotive industry have created divergences between the tariff classification or tariff treatment of similar goods in the USMCA automotive ROOs.[237] In each instance, the divergence is described and the technology causing the divergence is discussed. The impact of the divergence on the industry is then explained and analyzed to the extent possible.

EV and Hybrid Light Trucks

The USMCA automotive ROOs do not categorize EV and hybrid pickup trucks as light trucks, which is how the ROOs categorize other pickup trucks. Under the HS 2012 nomenclature, which is the nomenclature used for the USMCA automotive ROOs, EV and hybrid pickup trucks are classified in subheading 8704.90, a residual subheading that provides for all trucks not classified elsewhere in heading 8704. A vehicle in that subheading is categorized as a "heavy truck" in the ROOs.[238] This tariff classification means that EV and hybrid trucks follow a different set of USMCA product-specific rules of origin (PSROs) than their internal combustion engine (ICE) counterparts.[239] At the time HS 2012 was adopted, however, sales of hybrid trucks were small and sales of EV trucks were nonexistent. It is only with the increasing prevalence of EV and hybrid trucks in recent years that the divergence between the treatment of these vehicles and their ICE counterparts has practical implications.

The HS and the Harmonized Tariff Schedule of the United States (HTS) were both updated in 2022 for reasons unrelated to the USMCA and now include new subheadings and statistical reporting numbers

[236] In this chapter, EVs are defined as vehicles that have a battery as a sole source of power. Where applicable, hybrid vehicles (vehicles that are powered by both a battery and an engine) are also discussed.
[237] The USMCA automotive ROOs are set forth in terms of the HS 2012 nomenclature. It is not uncommon for ROOs to use prior versions of the HS nomenclature, given the length of negotiations and the negotiators' need to choose a fixed time period for trade data. Additionally, any update to the ROOs would require agreement from USMCA countries, as well as adoption of the latest HS nomenclature.
[238] "Heavy trucks" are defined in the USMCA as "a vehicle of subheading 8701.20, 8704.22, 8704.23, 8704.32, 8704.90, or 87.06, except for a vehicle that is solely or principally for off-road use." Before HS 2022, subheading 8704.90 provided for "motor vehicles for transport of goods, other than with compression ignition or spark ignition reciprocating piston engine, not elsewhere specified or included." For more information, see Appendix 4-B of the USMCA, and USITC, Harmonized Tariff Schedule of the United States (2022) Revision 2, February 2022.
[239] Product-specific ROOs are often categorized by HS heading or subheading level of aggregation. For a complete list of the USMCA PSROs, see USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods.

for EV and hybrid trucks. These updates were due to the increasing amount of trade in EV and hybrid trucks and the need for better trade statistics for both light and heavy varieties of these vehicles. As a result, the scope of residual subheading 8704.90 shrank as certain EV and hybrid trucks were given their own specific subheadings (table 4.1).

Table 4.1 Changes to HS subheadings for electric and hybrid trucks
PSRO = product-specific rules of origin

2022 HS subheading	2022 HS description	Industry classification	2012 HS subheading	2012 HS description	USMCA PSRO implication
8704.41	Trucks with both a compression-ignition engine and an electric motor with weight not more than 5 metric tons.	Light hybrid truck	8704.90	All other trucks not classified in HS 8704	Covered under PSRO for 8704.90, which is classified as a heavy truck
8704.42	Trucks with both a compression-ignition engine and an electric motor with weight between 5 and 20 metric tons.	Heavy hybrid truck	8704.90	All other trucks not classified in HS 8704	Covered under PSRO for 8704.90, which is classified as a heavy truck
8704.43	Trucks with both a compression-ignition engine and an electric motor with weight greater than 20 metric tons.	Heavy hybrid truck	8704.90	All other trucks not classified in HS 8704	Covered under PSRO for 8704.90, which is classified as a heavy truck
8704.51	Trucks with both a spark-ignition engine and an electric motor with weight not more than 5 metric tons.	Light hybrid truck	8704.90	All other trucks not classified in HS 8704	Covered under PSRO for 8704.90, which is classified as a heavy truck
8704.52	Trucks with both a spark-ignition engine and an electric motor with weight greater than 5 metric tons.	Heavy hybrid truck	8704.90	All other trucks not classified in HS 8704	Covered under PSRO for 8704.90, which is classified as a heavy truck
8704.60	Trucks with only an electric motor	Both light and heavy electric trucks	8704.90	All other trucks not classified in HS 8704	Covered under PSRO for 8704.90, which is classified as a heavy truck

Source: USITC, Harmonized Tariff Schedule of the United States (2022) Revision 2, February 2022.
Note: The HS is maintained by the World Customs Organization and is amended every five years (e.g., HS 2012 was followed by HS 2017). Also, because 8704.60 (electric trucks) is not separated by the weight of the truck like the other new HS subheadings, this subheading still includes both light and heavy trucks.

These new subheadings, however, are not enumerated in the ROOs, which retain the HS 2012 nomenclature. CBP has indicated that, for any products currently classified in a tariff line that has no PSRO, any tariff treatment decisions are based on where the product would have been classified in HS 2012 nomenclature and any PSROs for that HS 2012 classification are applied.[240] Therefore, EV or hybrid pickup trucks such as the Ford Maverick hybrid, Ford F-150 hybrid and F-150 Lightning, Toyota Tundra hybrid, Tesla Cybertruck, Chevrolet Silverado hybrid, Rivian R1T, and GMC Hummer EV are are defined as "heavy trucks" under the USMCA. This means that EV or hybrid pickup trucks are currently subject to

[240] For more information, see "What do I do if my import does not have a product-specific rule of origin under the USMCA?," CBP, "USMCA Frequently Asked Questions," accessed January 23, 2023.

a different set of ROOs than their ICE equivalents (e.g., the Ford F-150 vs. the F-150 Lightning or the F-150 hybrid), despite having the same primary functionality. Moreover, the number of EV and hybrid trucks impacted by this classification (as well as total sales of these vehicles) is expected to rise in future years as more models from Chevrolet, Toyota, Honda, Mitsubishi, Nissan, and Jeep enter the market.[241]

The extent of the impacts of this divergence on the U.S. automotive industry is unclear because using the HS 2012 nomenclature in the USMCA has several effects. Producers receive some benefits from the current HS 2012 classification of these vehicles for three reasons. First, heavy trucks have a longer staging period. Second, heavy trucks have no core parts requirements (the products in the light truck core parts list are all included in the heavy trucks principal parts list, aside from lithium-ion batteries, which are listed in complimentary parts). Third, they have a lower regional value content (RVC) requirement than light trucks.[242] One vehicle producer indicated, however, that heavy trucks have fewer flexibilities than light trucks with regard to tariff shift allowances for some parts.[243] Additionally, light and heavy trucks have different principal and complimentary parts lists. Therefore, the classification divergence does not make it universally easier to qualify heavy trucks as originating. Finally, despite these differences in PSRO, vehicle manufacturers have indicated that this divergence has had no discernable impact on their sourcing, investment, or other decisions.[244]

As noted previously, the HS 2022 created new HS subheadings for EV and hybrid trucks, meaning the classification of these vehicles in the HS 2022 diverges from the classification of these vehicles in the HS 2012. This, however, is not the only classification divergence between the ROOs and the current HS. Other tariff classification divergences are summarized in box 4.1. None of these divergences are also associated with the type of divergence in applicable ROOs that exists for EV and hybrid trucks and their ICE counterparts (i.e., similar products being subject to different ROOs in light of technological changes).

[241] Bradley, "Guzzling Gas Is In The Past," January 3, 2023. Sales of EV and hybrid trucks are projected to increase from 118,000 vehicles in 2020 to more than 2.6 million by 2030. See IEA Global Data Explorer, accessed April 18, 2023. This projection includes both the IEA's "truck" and "van" category because of differences in how they define the vehicle types compared to this report.

[242] Light trucks follow the lists provided in Tables B and C of Chapter 4 of the USMCA; heavy trucks follow the lists provided in Tables D and E. Regarding tariff shift rules, Rules 4 and 5 of Article 3 of Annex 4-B include tariff shift flexibilities for principal and complimentary parts for light vehicles, but rules 2 and 3 of article 4 of Annex 4-B (the corresponding rules for heavy trucks) do not have the same tariff shift flexibilities.

[243] Industry representative, meetings with USITC staff, February 10, 2023.

[244] USITC, hearing transcript, November 3, 2022, 124 (testimony of Anna Schneider, VW); and 124–25 (Rory Heslington, Autos Drive America).

Box 4.1 Additional Instances of Divergence between the USMCA Automotive ROOs and Current Tariff Classification

Several other instances of classification divergence in which automotive subheadings established in Harmonized System (HS) 2017 and HS 2022 are not explicitly enumerated in the United States-Mexico-Canada Agreement (USMCA) automotive rules of origin (ROOs). Unlike the electric vehicle (EV) and hybrid truck classification divergence described above, these divergences do not result in different tariff treatment for similar goods in question but are highlighted simply to show additional areas where the HS classifications have changed since the USMCA entered into force.

Amendments in the nomenclature for HS 2017 created new subheadings for EVs and hybrids, including passenger vehicles provided for in subheadings 8703.40, 8703.50, 8703.60, 8703.70, and 8703.80.[a] Before that, these vehicles were provided for in HS subheading 8703.90, a residual subheading for vehicles not classified elsewhere in heading 8703. The product-specific rules of origin (PSROs) for passenger vehicles, however, covers "motor vehicles of subheading 8703.21 through 8703.90," removing any ambiguity or inconsistency about their PSROs because these new subheadings are already classified as passenger vehicles under the USMCA ROOs.[b]

Amendments in the nomenclature for HS 2022 established a new subheading, 8708.22, which covers windshields, rear windows, and certain other windows. As with EVs and hybrid vehicles and subheading 8703.90, subheading 8708.22 was established from a residual subheading, 8708.29, which contains a wide variety of automotive parts.[c] Because this newly established subheading has no PRSOs, importers using 8708.22 to enter goods must continue to follow the ROOs set forth for 8708.29, which is where these products would have been classified in HS 2012.[d]

Amendments in the nomenclature for HS 2022 established subheading 8421.32, which covers catalytic converters, in an effort to take into account technological changes and the need to monitor efforts in environmental protection. Before HS 2022, catalytic converters had been provided for in residual subheading 8421.39 with other filtering and purifying machinery and apparatus. As with the previous examples, importers using 8421.32 to enter goods must continue to follow the ROOs set forth for 8421.39, which is included in the USMCA complementary parts list.[e]

[a] USITC, Harmonized Tariff Schedule of the United States (2017) February 2018.
[b] Vehicles classified to the new HS subheadings would have all previously been classified under 8703.90, so adopting HS 2022 would have no discernable impact on the PSROs for these vehicles. For more information on tariff classifications for passenger vehicles, see 19 C.F.R. Appendix A to part 182 § 12, and appendix F of this report.
[c] USITC, *Recommended Modifications to the HTS, 2021*, April 2021, 188.
[d] 19 C.F.R. Appendix A to part 182 § 20, Tables B and D; USITC, *Recommended Modifications to the HTS, 2021*, April 2021, 188. For more information, see "What do I do if my import does not have a product-specific rule of origin under the USMCA?," CBP, "USMCA Frequently Asked Questions," accessed January 23, 2023.
[e] 19 C.F.R. Appendix A to part 182 § 20, Tables C and E.

Stamped and Cast Aluminum Parts

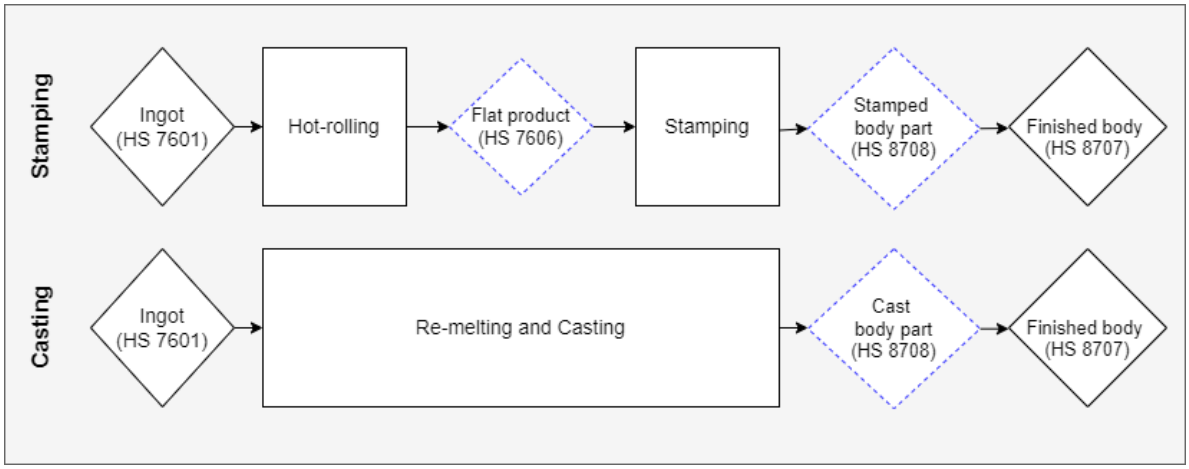
The USMCA automotive ROOs do not currently allow for cast aluminum bodies to qualify as originating via the same PSROs as stamped aluminum bodies.[245] Conventionally, automotive body parts were assembled by welding many individually stamped aluminum (or steel) parts. In contrast, cast aluminum body parts are made by pressing molten aluminum into a mold to shape the cooling aluminum into the

[245] Industry representatives, meeting with USITC staff, August 16, 2022; industry representative, email communications with USITC staff, September 13, 2022.

desired body part.[246] While only one vehicle manufacturer is currently using this technology in vehicle production, other manufacturers have indicated that they are exploring casting for future vehicle production. [247]

The difference in treatment between stamped and cast aluminum body parts is the result of the ROOs tariff shift rules for aluminum components (figure 4.1). The USMCA aluminum purchasing requirements allow for non-USMCA-originating aluminum to be considered as originating if the aluminum is subjected to a manufacturing process (in a USMCA country) that results in certain tariff shifts.[248] According to the ROOs, an applicable tariff shift occurs when an aluminum product (such as an aluminum ingot) is transformed into another intermediate aluminum product (a product of Chapter 76 that is classified under a different HS heading from the original product) before being further manufactured (figure 4.1).[249] The process of casting aluminum products does not produce an intermediate aluminum product comparable to the shift in the stamping process, making it much easier for stamped body parts to qualify as originating.

Figure 4.1 A comparison of stamping and casting automotive body manufacturing processes



Source: USITC-generated graphic.
Note: The figure shows the difference in automotive body production processes and when tariff code shifts occur. Diamonds represent various aluminum goods. Diamonds with solid boundaries represent the initial and final goods. Diamonds with dashed boundaries represent intermediate goods, which are consumed to produce the final goods. The blue coloration indicates where the tariff shift occurs. Squares and rectangles represent production processes. The figure's takeaway is that aluminum inputs subject to stamping experience a tariff shift, but aluminum inputs for casting do not qualify for a tariff shift.

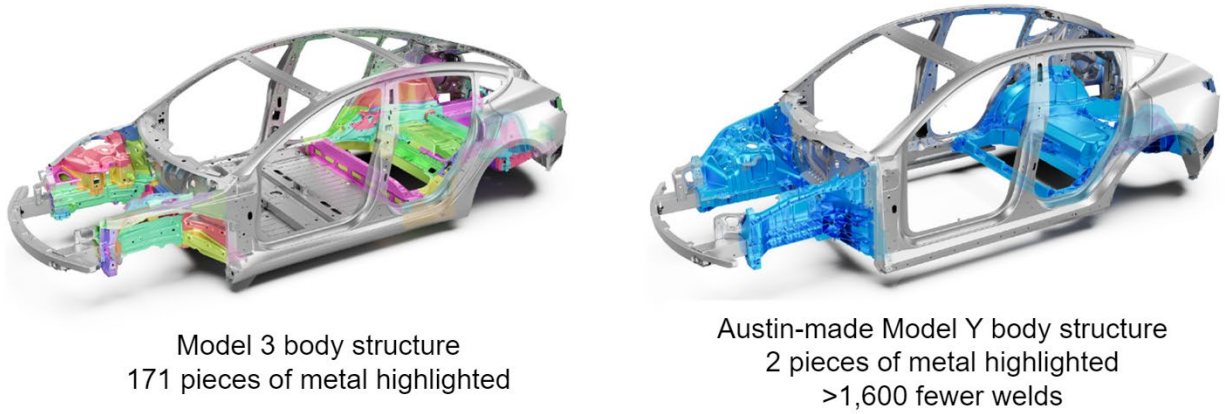
[246] North American Die Casting Association, "Die Casting vs Stamping," accessed April 17, 2023.
[247] Industry representatives, meetings with USITC staff, November 15, 2022, November 17, 2022, and February 10, 2023; Lambert, "Drone Flyover of Tesla's Massive New Casting Machine," September 9, 2020.
[248] Aluminum ingots are unwrought aluminum products intended for re-melting or further working though hot or cold finishing processes. For more information on aluminum PSROs, see 4-B-80 of Chapter 4 of the USMCA. 19 C.F.R. Appendix A to part 182 § 17(1); USMCA, appendix to Annex 4-B, "Provisions Related to the Product-Specific Rules of Origin for Automotive Goods," Article 6, 4-B-1-25–26; industry representative, meeting with USITC staff, August 16, 2022; Industry representative, email communications with USITC staff, September 13, 2022.
[249] 19 C.F.R. Appendix A to part 182 § 17(1); USMCA. See also 4-B-80 of Chapter 4 of the USMCA.
USMCA, Annex 4-B, "Provisions Related to the Product-Specific Rules of Origin for Automotive Goods," 4-B-80.

For example, a non-USMCA-originating aluminum ingot qualifies as originating when rolled into a flat product in USMCA countries, which is required for the stamping process. Specifically, stamped aluminum components are considered originating if a non-originating aluminum ingot (HS heading 7601) is hot-rolled into a flat aluminum product (HS heading 7606). Flat aluminum products are then subject to further transformations to make stamped goods (HS heading 8708) or the finished automotive body structure (HS heading 8707).

By contrast, non-USMCA-originating aluminum ingots that are remelted to cast aluminum body parts do not qualify as originating because the process does not result in an intermediate aluminum good that has an associated tariff shift (i.e., the molten aluminum is still classified in HS heading 7601).[250] The molten aluminum is then cast directly into a body part (such as the front or rear underbody shown in figure 4.2), and these body parts are classified in HS heading 8708 like the comparable stamped body part. Consequently, the USMCA's PSROs as currently written may impede firms from adopting casting processes.

The use of casting to produce aluminum automotive body parts is of growing interest to manufacturers. Cast automotive body parts have several advantages, including fewer structural components, fewer total welds, lower labor costs, and greater recyclability.[251] Figure 4.2 illustrates the difference between a body made of stamped components in a Tesla Model 3 versus a body made of cast components in the Model Y. The cast body structure replaces 171 different metal pieces (and more than 1,600 additional welds) with 2 larger pieces of cast metal. The inability to qualify cast aluminum products as originating by tariff shift make the ROOs more stringent for vehicle manufacturers that use the casting process.

Figure 4.2 A comparison of stamped and cast aluminum automotive bodies



Source: Adapted from Tesla, Inc., Quarterly Disclosure—Q1 2022 Update, April 20, 2022, 19.

[250] Industry representatives, meetings with USITC staff, August 16, 2022, and January 24, 2023; Industry representative, email communications with USITC staff, September 13, 2022.
[251] Idra S.r.l., "Gigapress," accessed September 16, 2022.

Stakeholder Views on the Relevance of the USMCA Automotive ROOs

In addition to the tariff classifications of certain automotive goods discussed above, the Commission received varying input on the impact of the production shift toward EVs and hybrids on the relevancy of the rest of the ROOs and varying industry views regarding whether this shift merits any changes to the ROOs. This section examines those views in more detail.

Relevance of the Current USMCA Automotive ROOs Parts Lists

Some stakeholders believe that the industry-wide shift to EVs and hybrid vehicles merits changes to, or the continued monitoring of, the USMCA automotive ROOs to ensure that they remain relevant. As mentioned in chapter 1, EVs have significantly fewer parts and one fewer core part than their ICE equivalents (they lack an ICE and a multispeed transmission but include a battery). As a result, many parts currently identified in the ROOs core, principal, and complementary parts lists will become less important to the final value of the vehicle as the conversion to EV production continues.[252] Moreover, the relative importance of the remaining parts may also shift over time. For example, any principal or complementary parts associated with engines and multispeed transmissions could become less relevant over time as EVs make up a greater share of vehicle sales. However, this transition is ongoing as previously mentioned, which makes it difficult to isolate the effects that the shift to EVs and hybrids will have on the ROOs remaining relevant with respect to specific automotive parts. This ongoing transition will be discussed more in subsequent reports.

Industry Views on Potential Additions to the USMCA Automotive ROOs Parts Lists

Some automotive industry stakeholders have proposed additions to the ROOs parts lists that they believe would better account for the increasing share of EVs in the U.S. market. The International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (UAW) has proposed adding EV components and EV battery components to the core parts list of the USMCA automotive ROOs in multiple venues. More specifically, the list proposed by the UAW includes automotive-grade semiconductors, electric motors and electric drivetrains, non-lithium-ion batteries, charge ports and charging stations, various battery components (cathodes, anodes, separators, casings), and various critical minerals (cobalt, nickel, manganese, graphite, silicone).[253] Many of these components are not

[252] The Core, Principal, and Complementary Parts lists in the USMCA automotive ROOs outline the parts of a motor vehicle that are subject to the ROOs. For a complete list, see Tables A.1, A.2, B, and C (for passenger vehicles and light trucks) or Tables D and E (for heavy trucks) of the USMCA Uniform Regulations. USMCA Uniform Regulations, "Uniform Regulations," June 3, 2020. 19 C.F.R. Appendix A to part 182 § 20, Tables A.1, A.2, B, C, D, and E.
[253] USITC, hearing transcript, November 3, 2022, 141, 214 (testimony of Josh Nassar, UAW); UAW, Comments to USTR, "Request for Comments Concerning the Operation of the USMCA With Respect to Trade in Automotive Goods," March 25, 2022. Some of these components may already be covered by the ROOs. For example, the core

referenced in the ROOs but may become increasingly applicable to EVs and hybrids, increasing their relevancy to the automotive industry.

Other hearing participants shared similar views. Cámara Nacional de la Industria del Hierro y el Acero (the Mexican National Iron and Steel Industry Association, known by the Spanish acronym CANACERO) also indicated in its written submission that it sees the shift to EVs as an opportunity to review the USMCA ROOs with respect to EV components. These components include electric motors or electrical/silicon steel.[254] Other participants stated that the rules of trade agreements should be continuously monitored (and updated) as a general matter.[255] One hearing witness stated that neither the USMCA negotiators nor external parties anticipated the rapid shift to EVs at the time of negotiation. As a result, the hearing witness stated that they believe the ROOs were largely written for ICE vehicles.[256]

Other stakeholders, including vehicle manufacturers, stated that EV technologies are already captured by the ROOs and that any changes to the ROOs are not yet needed. They indicated that they believe that the shift to EVs and hybrids was anticipated by negotiators.[257] They also noted that not only is the technology still evolving, but industry investments and changes are ongoing and will take multiple years to be fully operational. Therefore, they find that any reassessment is premature, even if eventually needed.[258] Specifically, the American Automotive Policy Council (AAPC), an industry group, responded to the UAW's proposal in its posthearing submission to the Commission. First, the AAPC noted that EVs do not contain fundamentally new technology that negotiators were unaware of at the time of negotiation. Second, the AAPC also stated that many of the parts mentioned are already included in the ROOs under the principal parts list. Third, the AAPC stated that the inclusion of many of the other parts mentioned (such as semiconductors, critical minerals, or autonomous vehicle technologies) is not currently possible or practical. Finally, the AAPC stated that a higher percentage of the total value of an average EV—as opposed to its ICE counterpart—is captured by the ROOs.[259] Vehicle manufacturers also consistently stated at the USITC's public hearing that any changes to the ROOs should only be considered with significant industry consultation, because adding additional complexities may have unintended negative consequences on USMCA compliance, investment in the region, sourcing decisions, and consumer prices.[260] They went on to state that, if compliance were to become too burdensome, it could

part "advanced batteries" seems to include both lithium-ion batteries (HS subheading 8507.60) as well as other storage batteries (HS subheading 8507.80) if they are used in an EV, according to Table A.2 of the USMCA.

[254] Salinas, CANACERO, written submission to the USITC, 7–8, November 24, 2022.

[255] USITC, hearing transcript, November 3, 2022, 214–15 (testimony of Roy Houseman, USW); and 215–16 (testimony of Kevin Dempsey, AISI).

[256] USITC, hearing transcript, November 3, 2022, 157, 182 (testimony of William Reinsch, CSIS).

[257] USITC, hearing transcript, November 3, 2022, 124–25 (testimony of Rory Heslington, Autos Drive America), 125 (testimony of Bill Frymoyer, MEMA), and 124 (testimony of Anna Schneider, VW).

[258] USITC, hearing transcript, November 3, 2022, 10, 13–14 (testimony of Matt Blunt, AAPC); 24, 28, 124–25 (testimony of Rory Heslington, Autos Drive America); 39 (testimony of Anna Schneider, VW); and 125 (testimony of Bill Frymoyer, MEMA); Murphy, U.S. Chamber of Commerce, written submission to the USITC, 2–3, November 21, 2022; Schneider, VW, posthearing brief to the USITC, 21–22, December 2, 2022; Industry representative, meeting with USITC staff, December 15, 2022.

[259] AAPC, written submission to the USITC, 2–3, December 8, 2022.

[260] USITC, hearing transcript, November 3, 2022, 8, 14, 45, 63 (testimony of Matt Blunt, AAPC); 17–19 (testimony of José Zozaya, AMIA); 24, 28, 45, 49–50 (Rory Heslington, Autos Drive America); and 38 (Anna Schneider, VW).

discourage them from seeking to qualify for duty-free treatment or decrease overall competitiveness, especially as it pertains to new vehicle models.[261]

The Potential Impact of Other Technological Changes on the Relevancy of the USMCA Automotive ROOs

This section examines two ongoing technological changes in the U.S. automotive industry that may impact the relevancy of USMCA automotive ROOs in the future. The first section discusses the increased value of nontraditional automotive inputs relative to the value of the final vehicle and how this might impact the RVC calculations for the larger vehicle components that use a growing share of nontraditional parts. The second section discusses the lack of PSROs for recycled battery materials.

Increasing Importance of Nontraditional Automotive Inputs

The value of nontraditional automotive inputs is rising, and their share is rising relative to traditional automotive inputs.[262] This trend is driven by an increase in the number and cost of electronic components. This section describes component trends, such as factors driving the shift to EVs and hybrids, how electronic components are changing, and innovations in communication and information systems. It then examines technologies used for vehicle safety and communication—semiautonomous and autonomous navigation and onboard entertainment and communication—that are composed of advanced semiconductors, sensors, cameras, and touch screens. Finally, it analyzes how the increased value of electronic components may affect the applicability of these components as they relate to the USMCA automotive RVC calculations.

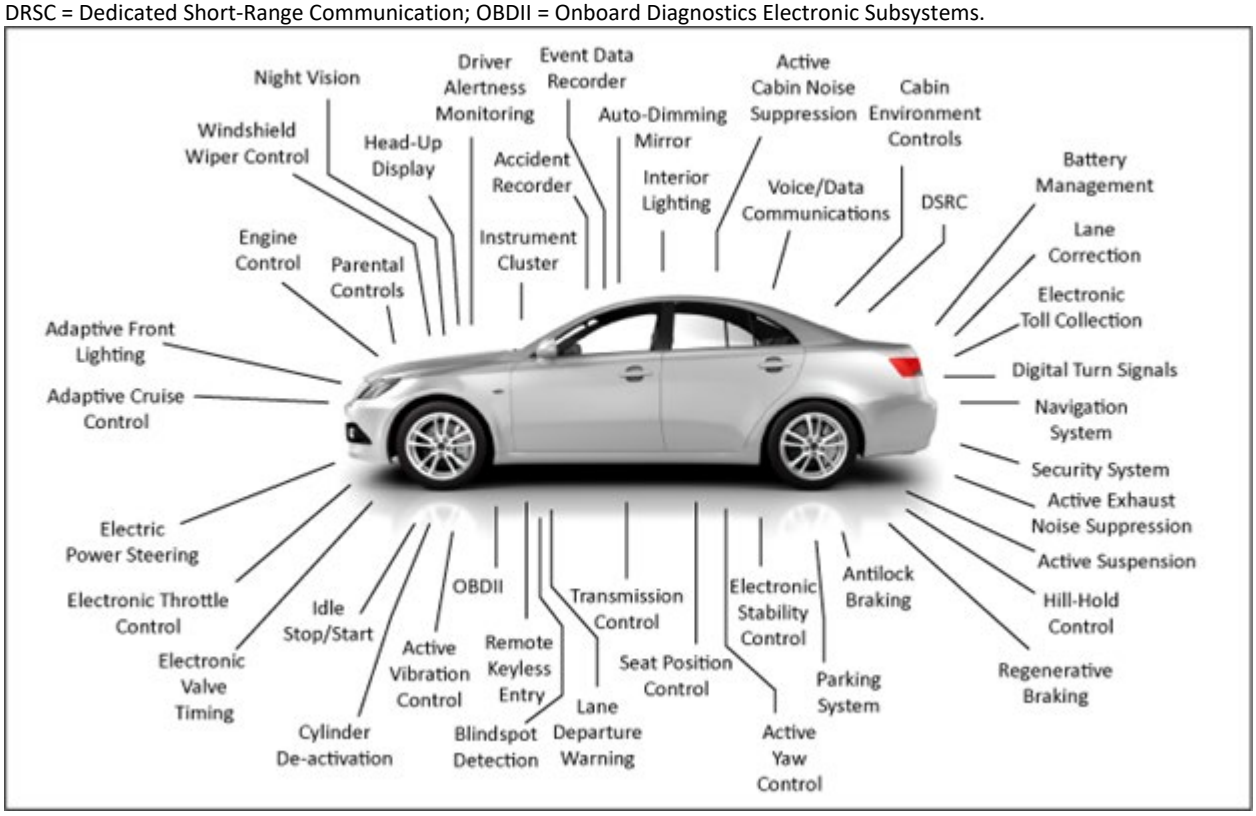
The content value of electronic components in vehicles has been rising in recent years and is expected to continue increasing in the future. This is because electronic components are ubiquitous and essential inputs for newer vehicles (figure 4.3).[263] The growth of electronic components stems from the switch from mechanical to electronic systems, greater use of sensors to monitor vehicle performance, and consumer demand for more connected cars.[264] The share of automotive electronics in a vehicle's total cost increased from 27 percent in 2010 to 40 percent in 2020 and will increase further in the future.[265] Industry representatives similarly forecast that the overall value share of electronic components may

[261] USITC, hearing transcript, November 3, 2022, 17, 21 (testimony of José Zozaya, AMIA); 25, 73 (Rory Heslington, Autos Drive America); and 39, 46 (Anna Schneider, VW). The significant increase in U.S. imports of vehicles and parts from Canada and Mexico not claiming a trade agreement-related duty preference since the USMCA entered into force may be evidence of this. See chapter 3 for more details.
[262] USITC staff define nontraditional automotive inputs as inputs that are traditionally not associated with vehicles uniquely, such as electronic components or electrical inputs.
[263] Lawrence and VerWey, *The Automotive Semiconductor Market*, May 2019.
[264] Kumar, "Semiconductor Devices for Automobiles," September 17, 2021.
[265] Deloitte, "Semiconductors—the Next Wave," April 2019.

grow further as vehicles integrate more advanced safety features that require more costly electronic components.[266]

Figure 4.3 Automotive electronic systems

DRSC = Dedicated Short-Range Communication; OBDII = Onboard Diagnostics Electronic Subsystems.



Source: Adapted from the Clemson University Vehicular Electronics Laboratory, "Automotive Electronic Systems," February 20, 2022.

These automotive electronic components require greater logic and memory capabilities that raise costs. Higher costs in turn make it more difficult for automotive parts that incorporate these components to qualify for PSROs because these high-value electronic components tend to be imported. Most automotive electronic systems rely on microcontroller units (MCUs) that perform a set of functions.[267] Because these MCUs (and other electronic components) are inputs into automotive parts that are subject to PSROs, changes to the supply chain of that part may impact whether the part qualifies as originating under the USMCA. Box 4.2 explores uses of MCUs in automotive electronics in more detail.

[266] Pat Gelsinger, Intel's CEO, projected that the cost share of semiconductors per premium vehicle may increase from 4 percent in 2019 to 20 percent in 2030. IAA Mobility, "How Digitization Is Affecting the Automotive Industry," February 20, 2022.

[267] MCUs are integrated circuits that function as standalone computers and contain a central processing unit and memory and interact with input/output peripherals. Infineon Technologies AG, "Microcontroller," accessed February 9, 2023.

Box 4.2 MCUs and their uses in automotive electronics

Automotive microcontroller units (MCUs) have become more computationally powerful in recent years to improve vehicle performance; meet connectivity, safety, and security requirements; and improve the overall driving experience.[a] For example, automakers are incorporating infotainment systems as a standard feature in all of their product lines.[b] Infotainment systems provide users with a single interface to convey information from the vehicle's other electronic systems, such as video from a backup camera.[c] Infotainment systems use MCUs powered by modern electronic components, which are more expensive per unit than older components.[d] Industry representatives noted that consumers are demanding certain features that require advanced electronics and the electrification of previously nondigitized systems, such as the transition from stereos to infotainment systems.[e] Infotainment systems accounted for approximately 26.7 percent of revenue for all U.S. automotive electronics manufacturing in 2022.[f]

Another example is advanced driver assistance systems (ADAS), which may further increase the percentage of costs of electronic components. ADAS are a suite of electronic systems designed to provide drivers with warnings or video footage to minimize risk when driving or parking a vehicle.[g] ADAS use MCUs to process signals coming from external-facing sensors to support vehicle safety. ADAS may raise the cost share of electronic systems if the technologies become an industry standard.[h] Government researchers estimated that ADAS costs in 2020 varied greatly according to the functionality.[i] Most vehicle manufacturers offer a variety of ADAS options with additional fees when purchasing a vehicle.[j] Industry researchers predict that the global market for ADAS will rise from about $30 billion in 2020 to $55 billion in 2025.[k] These trends might be more pronounced if autonomous driving technologies are successful and adopted.[l]

This increased demand for more sophisticated technology means MCUs are becoming more expensive, as the functionality required becomes more complex. Most automotive chipmakers contract some of their manufacturing to certain chipmakers.[m] For instance, industry experts estimated that Taiwan Semiconductor Manufacturing Company, Ltd. fabricated about 70 percent of global MCUs in 2021.[n] As previously discussed, rising MCU prices may affect firms' ability to comply with the USMCA RVC requirements because most electronic components are fabricated outside of the USMCA.

[a] Increased computational power is driving MCU prices upward. For instance, modern MCUs cost tens of dollars per unit, whereas legacy MCUs cost less than $10 per unit. Utmel, "MCUs Will Continue to Rise in Price," March 30, 2022; Meissner, *Computer on Wheels*, January 16, 2020, 13.
[b] Vehicle manufacturers are adopting hands-free communications technologies to encourage safer driving. Kumar, "Semiconductor Devices for Automobiles," September 17, 2021.
[c] For example, a premium vehicle may have a liquid-crystal display where users interact with the car's global positioning satellites (GPS), backup camera, or other electronic systems.
[d] Meissner, *Computer on Wheels*, January 16, 2020, 13.
[e] Subject matter expert, meetings with USITC staff, August 29, 2022.
[f] The revenues of automobile electronics manufactured in the U.S. are expected to rise from $21.6 billion in 2022 to $23.4 billion in 2025. Seiler, "Automobile Electronics Manufacturing in the US," 2022, 23.
[g] ADAS includes systems such as automatic emergency braking and lane departure warning.
[h] ADAS are a suite of electronics-enabled safety features. Several examples of ADAS are blind spot detection sensors, adaptive cruise control, and lane centering. NHTSA, "Driver Assistance Technologies," accessed December 20, 2022.
[i] The price of nonautonomous ADASs were estimated to range from $77 to about $1,545 in 2020. Kockelman et al., *An Assessment of Autonomous Vehicles*, March 1, 2017, 41.
[j] Certain automakers provide ADAS through a monthly subscription model. Jin, "Tesla Launches Subscription Service for Advanced Driver Assistance Software," July 17, 2021; Rivers, "Ford Expects To Make A Lot," June 12, 2022.
[k] Global Market Intelligence, "Global Automotive Sensors Market Size," September 2021.
[l] Government researchers estimated the price of these to be between $11,600 and $31,000, depending upon the level of autonomy. Kockelman et al., *An Assessment of Autonomous Vehicles*, March 1, 2017, 41; Deichmann et al., "Autonomous Driving's Future," January 6, 2023, 10–11.
[m] Amsrud et al., *Managing the 2021 Automotive Chip Famine*, February 2, 2021, 6.
[n] Most automotive MCU chipmakers contract fabrication to TSMC. The resulting semiconductor chips are typically assembled, tested, and packaged by third-party firms located in East Asia before incorporation into automobiles. Amsrud et al., *Managing the 2021 Automotive Chip Famine*, February 2, 2021.

The growing importance of nontraditional automotive inputs may have future impacts on the relevancy of the USMCA automotive ROOs. Multiple industry representatives noted that the rising value of nontraditional automotive inputs may merit changes to the ROOs because electronic components generally originate from Asia.[268] To address this trend, the UAW proposed including certain electronic components, such as automotive-grade semiconductors and sensors, in the USMCA automotive core parts list to incentivize USMCA-originating electronic supply chains.[269] Industry observers point out that the architectures of vehicle electronic systems, however, are rapidly evolving.[270] For example, electronic chip manufacturer NVIDIA has developed new automotive chip architecture that may lower the total number of electronic components in a vehicle.[271] Furthermore, the types of electronic components required for future autonomous driving systems remain uncertain.[272]

Lack of Recycling-Specific USMCA Automotive ROOs

The ongoing shift to EVs and the need to ensure an adequate supply of materials heighten the importance of recycling and reduction in the use of critical minerals to meet future demand. The current treatment of recycled battery materials under the USMCA automotive ROOs may pose challenges to emerging supply chains because of a lack of recycling-specific provisions in the ROOs. Volkswagen stated during the Commission's public hearing that the USMCA does not provide guidance on the recycling of battery metals.[273] For example, metal alloys partially composed of recycled materials do not qualify for the purpose of calculating origination requirements simply by being recycled.[274] This means that, absent any ROOs specific to the recycling of materials, the determination of whether the battery made using recycled materials qualifies as originating under the USMCA comes down to the same ROOs as the original battery, i.e., whether the recycled cells were created within the USMCA region.[275] One vehicle manufacturer, however, noted that, if the recycling is done within the USMCA region (i.e., the recycled cells are created within the region), it would be difficult to imagine a situation where the final recycled battery would not qualify as originating under the USMCA.[276] Volkswagen also stated that battery metal/material recycling and the environmental impacts should be addressed in future discussions on the USMCA.[277]

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[268] Industry representative, meetings with USITC staff, August 9, 2022, August 19, 2022, and August 29, 2022.
[269] UAW, Comments to USTR, "Request for Comments Concerning the Operation of the USMCA With Respect to Trade in Automotive Goods," March 25, 2022, 8.
[270] Industry observers note that the industry's model may shift if electronics manufacturers pivot to supply electric vehicles. Mournier and Boulay, *Automotive Semiconductor Trends 2021*, September 21, 2021, 1.
[271] NVIDIA's approach consolidates various computing operations into one or two electronic components. Kani, "DRIVE Thor Unites AV and Cockpit on a Single SoC," September 20, 2022.
[272] Coffin, Oliver, and VerWey, "Building Vehicle Autonomy," 2019, 3.
[273] USITC, hearing transcript, November 3, 2022, 113–14 (Testimony of Anna Schneider, VW).
[274] Industry representatives, meeting with USITC staff, August 16, 2022; industry representative, email communications with USITC staff, September 13, 2022.
[275] This scenario may mean that the battery materials from a non-originating EV or hybrid battery could be recycled into an originating battery, if that new battery is made up of cells created within the USMCA region.
[276] Industry representative, meetings with USITC staff, January 24, 2023.
[277] USITC, hearing transcript, November 3, 2022, 113–14 (Testimony of Anna Schneider, VW).

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Appendix A
USMCA Implementation Act

(B) NO ACCELERATED DISPOSITION.—An importer may not request the accelerated disposition under section 515(b) of the Tariff Act of 1930 (19 U.S.C. 1515(b)) of a protest against a decision of the Commissioner described in subparagraph (A).

(f) ADMINISTRATION BY DEPARTMENT OF LABOR.—The Secretary of Labor is authorized to establish or designate an office within the Department of Labor to carry out the provisions of this section for which the Department is responsible.

(g) REVIEW AND REPORTS.—

(1) PERIODIC REVIEW ON AUTOMOTIVE RULES OF ORIGIN.—

Consultation.

(A) IN GENERAL.—The Trade Representative, in consultation with the interagency committee, shall conduct a biennial review of the operation of the USMCA with respect to trade in automotive goods, including—

Summary.

(i) to the extent practicable, a summary of actions taken by producers to demonstrate compliance with the automotive rules of origin, use of the alternative staging regime, enforcement of such rules of origin, and other relevant matters; and

(ii) whether the automotive rules of origin are effective and relevant in light of new technology and changes in the content, production processes, and character of automotive goods.

(B) REPORT.—

(i) IN GENERAL.—The Trade Representative shall submit to the appropriate congressional committees a report on each review conducted under subparagraph (A).

(ii) INITIAL REPORT.—The first report required under clause (i) shall be submitted not later than 2 years after the date on which the USMCA enters into force.

(iii) TERMINATION OF REPORTING REQUIREMENT.—The requirement to submit reports under clause (i) shall terminate on the date that is 10 years after the date on which the USMCA enters into force.

Termination date.

(2) REPORT BY INTERNATIONAL TRADE COMMISSION.—Not later than 1 year after the submission of the first report required by paragraph (1)(B), and every 2 years thereafter until the date that is 12 years after the date on which the USMCA enters into force, the International Trade Commission shall submit to the appropriate congressional committees and the President a report on—

(A) the economic impact of the automotive rules of origin on—

(i) the gross domestic product of the United States;

(ii) exports from and imports into the United States;

(iii) aggregate employment and employment opportunities in the United States;

(iv) production, investment, use of productive facilities, and profit levels in the automotive industries and other pertinent industries in the United States affected by the automotive rules of origin;

(v) wages and employment of workers in the automotive sector in the United States; and

(vi) the interests of consumers in the United States;

(B) the operation of the automotive rules of origin and their effects on the competitiveness of the United States with respect to production and trade in automotive goods, taking into account developments in technology, production processes, or other related matters;

(C) whether the automotive rules of origin are relevant in light of technological changes in the United States; and

(D) such other matters as the International Trade Commission considers relevant to the economic impact of the automotive rules of origin, including prices, sales, inventories, patterns of demand, capital investment, obsolescence of equipment, and diversification of production in the United States.

(3) REPORT BY COMPTROLLER GENERAL.—Not later than 4 years after the date on which the USMCA enters into force, the Comptroller General of the United States shall submit to the Committee on Appropriations and the Committee on Ways and Means of the House of Representatives and the Committee on Appropriations and the Committee on Finance of the Senate a report assessing the effectiveness of United States Government interagency coordination on implementation, enforcement, and verification of the automotive rules of origin and the customs procedures of the USMCA with respect to automotive goods.

(4) PUBLIC PARTICIPATION.—Before submitting a report under paragraph (1)(B) or (2), the agency responsible for the report shall—

(A) solicit information relating to matters that will be addressed in the report from producers of automotive goods, labor organizations, and other interested parties;

(B) provide for an opportunity for the submission of comments, orally or in writing, from members of the public relating to such matters; and

(C) after submitting the report, post a version of the report appropriate for public viewing on a publicly available internet website for the agency.

Public information. Web posting.

(h) EFFECTIVE DATE.—This section shall—

(1) take effect on the date of the enactment of this Act; and

(2) apply with respect to goods entered, or withdrawn from warehouse for consumption, on or after the date on which the USMCA enters into force.

SEC. 203. MERCHANDISE PROCESSING FEE.

(a) IN GENERAL.—Section 13031(b)(10) of the Consolidated Omnibus Budget Reconciliation Act of 1985 (19 U.S.C. 58c(b)(10)) is amended by striking subparagraph (B) and inserting the following:

"(B) No fee may be charged under paragraph (9) or (10) of subsection (a) with respect to goods that qualify as originating goods under section 202 of the United States-Mexico-Canada Agreement Implementation Act or qualify for duty-free treatment under Annex 6–A of the USMCA (as defined in section 3 of that Act). Any service for which an exemption from such fee is provided

Appendix B
Federal Register Notice

Netherlands; NXP USA, Inc. of Austin, Texas; Avnet, Inc. of Phoenix, Arizona; Arrow Electronics, Inc. of Centennial, Colorado; Mouser Electronics, Inc. of Mansfield, Texas; Continental AG and Continental Automotive GmbH, both of Hanover, Germany; Continental Automotive Systems, Inc. of Auburn Hills, Michigan; Robert Bosch GmbH of Gerlingen-Schillerhöhe, Germany; and Robert Bosch LLC of Farmington Hills, Michigan (collectively, ''Respondents''). The Office of Unfair Import Investigations (''OUII'') is participating in the investigation.

The Commission previously terminated the investigation as to certain claims of the '928 patent, the '474 patent, the '017 patent, and the '228 patent. *See* Order No. 16 (Feb. 9, 2022), *unreviewed by* Notice (Mar. 2, 2022); Order No. 21, *unreviewed by* Notice (May 16, 2022).

On July 12, 2022, MediaTek and Respondents filed a joint motion to terminate the investigation in its entirety based on a settlement agreement (''Agreement''). On July 14, 2022, OUII filed a statement in support of termination but expressed concerns regarding the redactions to the public version of the Agreement. On July 21, 2022, MediaTek and Respondents filed a revised public version of the Agreement.

On July 25, 2022, the presiding ALJ issued the subject ID (Order No. 24), granting the joint motion to terminate the investigation based on settlement. The ID finds that the motion for termination satisfies Commission Rule 210.21(b) (19 CFR 210.21(b)) and that no extraordinary circumstances exist that would prevent the requested termination. No petitions for review were filed.

The Commission has determined not to review the subject ID. The investigation is terminated in its entirety.

The Commission vote for this determination took place on August 4, 2022.

The authority for the Commission's determination is contained in section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. 1337, and in Part 210 of the Commission's Rules of Practice and Procedure, 19 CFR part 210.

By order of the Commission.

Issued: August 4, 2022.

Katherine M. Hiner,

Acting Secretary to the Commission.

[FR Doc. 2022–17068 Filed 8–8–22; 8:45 am]

BILLING CODE 7020–02–P

INTERNATIONAL TRADE COMMISSION

[Investigation No. 332–592]

USMCA Automotive Rules of Origin: Economic Impact and Operations, 2023 Report

ACTION: Notice of investigation and scheduling of a public hearing.

SUMMARY: In accordance with the United States-Mexico-Canada Agreement Implementation Act (''USMCA Implementation Act'') the U.S. International Trade Commission (Commission) instituted Investigation No. 332–592, *USMCA Automotive Rules of Origin: Economic Impact and Operations, 2023 Report.*

DATES:

September 30, 2022: Deadline for filing requests to appear at the public hearing.

October 13, 2022: Deadline for filing prehearing briefs and statements.

October 27, 2022: Deadline for filing electronic copies of oral hearing statements.

November 3, 2022: Public hearing.

November 11, 2022: Deadline for filing post-hearing briefs and statements.

November 24, 2022: Deadline for filing all other written submissions.

June 30, 2023: Transmittal of Commission report to Congress and USTR.

ADDRESSES: All Commission offices are in the U.S. International Trade Commission Building, 500 E Street SW, Washington, DC. Due to the COVID 19 pandemic, the Commission's building is currently closed to the public. Once the building reopens, persons with mobility impairments who will need special assistance in gaining access to the Commission should contact the Office of the Secretary at 202–205–2000. The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at *https://edis.usitc.gov*.

FOR FURTHER INFORMATION CONTACT: Project Leader Mitch Semanik (*mitchell.semanik@usitc.gov* or 202–205–2034), or Deputy Project Leader Sharon Ford (202–204–3084 or *sharon.ford@usitc.gov*) for information specific to these investigations. For information on the legal aspects of this investigation, contact William Gearhart of the Commission's Office of the General Counsel (202–205–3091 or *william.gearhart@usitc.gov*). The media should contact Jennifer Andberg, Office of External Relations (202–205–3404 or *jennifer.andberg@usitc.gov*). Hearing-impaired individuals may obtain information on this matter by contacting the Commission's TDD terminal at 202–205–1810. General information concerning the Commission may also be obtained by accessing its website (*https://www.usitc.gov*). Persons with mobility impairments who will need special assistance in gaining access to the Commission should contact the Office of the Secretary at 202–205–2000.

SUPPLEMENTARY INFORMATION:

Background: As required by the USMCA Implementation Act, the Commission in its report will focus on USMCA automotive rules of origin (ROO) and their effects on the U.S. economy, impacts to U.S. competitiveness, and relevancy considering recent technology changes. In particular, the USMCA Implementation Act requires that the Commission report on:

(1) the economic impact of USMCA automotive ROO on U.S. gross domestic product, trade, employment, and consumers, as well as economic impact on production, investment, capacity, revenues, wages, and employment in U.S. automotive industries;

(2) the operation of USMCA automotive ROO and their effects on the competitiveness of U.S. automotive production and trade;

(3) the relevancy of USMCA automotive ROO in light of recent technology changes in the United States; and

(4) other matters the Commission considers relevant to the economic impact of the USMCA automotive ROO.

The USMCA Implementation Act requires that the Commission transmit its report on July 1, 2023, one year following submission of a USMCA automotive ROO report by USTR, also required by the USMCA Implementation Act. Because July 1, 2023, is a Saturday, the Commission expects to submit the report on Friday, June 30, 2023. The Commission is directed to submit reports on USMCA automotive ROO every two years thereafter until 2031.

Public Hearing: A public hearing in connection with this investigation will be held beginning at 9:30 a.m. on November 3, 2022. More detailed information about the hearing, including how to participate, will be posted on the Commission's website at (*https://usitc.gov/research_and_analysis/what_we_are_working_on.htm*). Once on that web page, scroll down to Investigation No. 332–592, *USMCA Automotive Rules of Origin: Economic Impact and Operations 2023 Report,* and click on the link to

''Hearing Information.'' Interested parties should check the Commission's website periodically for updates.

Requests to appear at the public hearing should be filed with the Secretary no later than 5:15 p.m., September 30, 2022, in accordance with the requirements in the ''Written Submissions'' section below. All prehearing briefs and statements should be filed not later than 5:15 p.m., October 13, 2022. To facilitate the hearing, including the preparation of an accurate written transcript of the hearing, oral testimony to be presented at the hearing must be submitted to the Commission electronically no later than noon, October 27, 2022. All post-hearing briefs and statements should be filed no later than 5:15 p.m., November 11, 2022. Post-hearing briefs and statements should address matters raised at the hearing. For a description of the different types of written briefs and statements, see the ''Definitions'' section below.

In the event that, as of the close of business on September 30, 2022, no witnesses are scheduled to appear at the hearing, the hearing will be canceled. Any person interested in attending the hearing as an observer or nonparticipant should check the Commission website in the preceding paragraph for information concerning whether the hearing will be held.

Written Submissions: In lieu of or in addition to participating in the hearing, interested parties are invited to file written submissions concerning this investigation. All written submissions should be addressed to the Secretary and should be received not later than the dates provided for in this notice. All written submissions must conform to the provisions of section 201.8 of the Commission's Rules of Practice and Procedure (19 CFR 201.8), as temporarily amended by 85 FR 15798 (March 19, 2020). Under that rule waiver, the Office of the Secretary will accept only electronic filings at this time. Filings must be made through the Commission's Electronic Document Information System (EDIS, *https://edis.usitc.gov*). No in-person paper-based filings or paper copies of any electronic filings will be accepted until further notice. Persons with questions regarding electronic filing should contact the Office of the Secretary, Docket Services Division (202–205–1802), or consult the Commission's Handbook on Filing Procedures.

Definitions of Types of Documents That May Be Filed; Requirements: In addition to requests to appear at the hearing, this notice provides for the possible filing of four types of documents: prehearing briefs, oral hearing statements, post-hearing briefs, and other written submissions.

(1) *Prehearing briefs* refers to written materials relevant to the investigation and submitted in advance of the hearing and includes written views on matters that are the subject of the investigation, supporting materials, and any other written materials that you consider will help the Commission in understanding your views. You should file a prehearing brief particularly if you plan to testify at the hearing on behalf of an industry group, company, or other organization, and wish to provide detailed views or information that will support or supplement your testimony.

(2) *Oral hearing statements (testimony)* refers to the actual oral statement that you intend to present at the public hearing. *Do not* include any confidential business information in that statement. If you plan to testify, you must file a copy of your oral statement by the date specified in this notice. This statement will allow Commissioners to understand your position in advance of the hearing and will also assist the court reporter in preparing an accurate transcript of the hearing (*e.g.,* names spelled correctly).

(3) *Post-hearing briefs* refers to submissions filed after the hearing by persons who appeared at the hearing. Such briefs: (a) should be limited to matters that arose during the hearing, (b) should respond to any Commissioner and staff questions addressed to you at the hearing, (c) should clarify, amplify, or correct any statements you made at the hearing, and (d) may, at your option, address or rebut statements made by other participants in the hearing.

(4) *Other written submissions* refer to any other written submissions that interested persons wish to make, regardless of whether they appeared at the hearing, and may include new information or updates of information previously provided.

There is no standard format that briefs or other written submissions must follow. However, each such document must identify on its cover (1) the type of document filed (*i.e.,* prehearing brief, oral statement of (name), post-hearing brief, or written submission), (2) the name of the person or organization filing it, and (3) whether it contains confidential business information (CBI). If it contains CBI, it must comply with the marking and other requirements set out below in this notice relating to CBI. Submitters of written documents (other than oral hearing statements) are encouraged to include a short summary of their position or interest at the beginning of the document, and a table of contents when the document addresses multiple issues.

Confidential Business Information: Any submissions that contain confidential business information must also conform to the requirements of section 201.6 of the Commission's Rules of Practice and Procedure (19 CFR 201.6). Section 201.6 of the rules requires that the cover of the document and the individual pages be clearly marked as to whether they are the ''confidential'' or ''non-confidential'' version, and that the confidential business information is clearly identified by means of brackets. All written submissions, except for confidential business information, will be made available for inspection by interested parties.

As requested by the USTR, the Commission will not include any confidential business information in its report. However, all information, including confidential business information, submitted in this investigation may be disclosed to and used: (i) by the Commission, its employees and Offices, and contract personnel (a) for developing or maintaining the records of this or a related proceeding, or (b) in internal investigations, audits, reviews, and evaluations relating to the programs, personnel, and operations of the Commission including under 5 U.S.C. Appendix 3; or (ii) by U.S. government employees and contract personnel for cybersecurity purposes. The Commission will not otherwise disclose any confidential business information in a way that would reveal the operations of the firm supplying the information.

Summaries of Written Submissions: Persons wishing to have a summary of their position included in the report that the Commission sends to the USTR should include a summary with their written submission and should mark the summary as having been provided for that purpose. The summary should be clearly marked as ''summary for inclusion in the report'' at the top of the page. The summary may not exceed 500 words, should be in MS Word format or a format that can be easily converted to MS Word, and should not include any confidential business information. The summary will be published as provided if it meets these requirements and is germane to the subject matter of the investigation. The Commission will list the name of the organization furnishing the summary and will include a link to the Commission's Electronic Document Information System (EDIS) where the full written submission can be found.

By order of the Commission.

Issued: August 4, 2022.

Katherine Hiner,

Acting Secretary to the Commission.

[FR Doc. 2022–17064 Filed 8–8–22; 8:45 am]

BILLING CODE 7020–02–P

DEPARTMENT OF JUSTICE

Drug Enforcement Administration

[Docket No. DEA-1060]

Bulk Manufacturer of Controlled Substances Application: Chemtos, LLC

AGENCY: Drug Enforcement Administration, Justice.

ACTION: Notice of application.

SUMMARY: Chemtos, LLC has applied to be registered as a bulk manufacturer of basic class(es) of controlled substance(s). Refer to **SUPPLEMENTARY INFORMATION** listed below for further drug information.

DATES: Registered bulk manufacturers of the affected basic class(es), and applicants therefore, may submit electronic comments on or objections to the issuance of the proposed registration on or before October 11, 2022. Such persons may also file a written request for a hearing on the application on or before October 11, 2022.

ADDRESSES: The Drug Enforcement Administration requires that all comments be submitted electronically through the Federal eRulemaking Portal, which provides the ability to type short comments directly into the comment field on the web page or attach a file for lengthier comments. Please go to *https://www.regulations.gov* and follow the online instructions at that site for submitting comments. Upon submission of your comment, you will receive a Comment Tracking Number. Please be aware that submitted comments are not instantaneously available for public view on *https://www.regulations.gov.* If you have received a Comment Tracking Number, your comment has been successfully submitted and there is no need to resubmit the same comment.

SUPPLEMENTARY INFORMATION: In accordance with 21 CFR 1301.33(a), this is notice that on July 11, 2022, Chemtos, LLC, 16713 Picadilly Court, Round Rock, Texas 78664–8544, applied to be registered as a bulk manufacturer of the following basic class(es) of controlled substance(s):

Controlled substance	Drug code	Schedule
3-Fluoro-N-methylcathinone (3-FMC)	1233	I
Cathinone	1235	I
Methcathinone	1237	I
4-Fluoro-N-methylcathinone (4-FMC)	1238	I
Para-Methoxymethamphetamine (PMMA), 1-(4-methoxyphenyl)-N-methylpropan-2-amine	1245	I
Pentedrone (α-methylaminovalerophenone)	1246	I
Mephedrone (4-Methyl-N-methylcathinone)	1248	I
4-Methyl-N-ethylcathinone (4-MEC)	1249	I
Naphyrone	1258	I
N-Ethylamphetamine	1475	I
N,N-Dimethylamphetamine	1480	I
Fenethylline	1503	I
Aminorex	1585	I
4-Methylaminorex (cis isomer)	1590	I
4,4′-Dimethylaminorex (4,4′-DMAR; 4,5-dihydro-4methyl-5-(4-methylphenyl)-2-oxazolamine; 4-methyl-5-(4-methylphenyl)-4,5-dihydro-1,3-oxazol-2-amine).	1595	I
Gamma Hydroxybutyric Acid	2010	I
Methaqualone	2565	I
Mecloqualone	2572	I
JWH-250 (1-Pentyl-3-(2-methoxyphenylacetyl) indole)	6250	I
SR-18 (Also known as RCS-8) (1-Cyclohexylethyl-3-(2-methoxyphenylacetyl) indole)	7008	I
ADB-FUBINACA (N-(1-amino-3,3-dimethyl-1-oxobutan-2-yl)-1-(4-fluorobenzyl)-1H-indazole-3-carboxamide)	7010	I
5-Fluoro-UR-144 and XLR11 [1-(5-Fluoro-pentyl)1H-indol-3-yl](2,2,3,3-tetramethylcyclopropyl)methanone	7011	I
AB-FUBINACA (N-(1-amino-3-methyl-1-oxobutan-2-yl)-1-(4-fluorobenzyl)-1H-indazole-3-carboxamide)	7012	I
FUB-144 (1-(4-fluorobenzyl)-1H-indol-3-yl)(2,2,3,3-tetramethylcyclopropyl)methanone)	7014	I
JWH-019 (1-Hexyl-3-(1-naphthoyl)indole)	7019	I
MDMB-FUBINACA (Methyl 2-(1-(4-fluorobenzyl)-1H-indazole-3-carboxamido)-3,3-dimethylbutanoate)	7020	I
FUB-AMB, MMB-FUBINACA, AMB-FUBINACA (2-(1-(4-fluorobenzyl)-1Hindazole-3-carboxamido)-3-methylbutanoate)	7021	I
AB-PINACA (N-(1-amino-3-methyl-1-oxobutan-2-yl)-1-pentyl-1H-indazole-3-carboxamide)	7023	I
THJ-2201 [1-(5-fluoropentyl)-1H-indazol-3-yl](naphthalen-1-yl)methanone	7024	I
5F-AB-PINACA (N-(1-amino-3-methyl-1-oxobutan-2-yl)-1-(5-fluropentyl)-1H-indazole-3-carboximide)	7025	I
AB-CHMINACA (N-(1-amino-3-methyl-1-oxobutan-2-yl)-1-(cyclohexylmethyl)-1H-indazole-3-carboxamide	7031	I
MAB-CHMINACA (N-(1-amino-3,3dimethyl-1-oxobutan-2-yl)-1-(cyclohexylmethyl)-1H-indazole-3-carboxamide)	7032	I
5F-AMB (Methyl 2-(1-(5-fluoropentyl)-1H-indazole-3-carboxamido)-3-methylbutanoate)	7033	I
5F-ADB; 5F-MDMB-PINACA (Methyl 2-(1-(5-fluoropentyl)-1H-indazole-3-carboxamido)-3,3-dimethylbutanoate)	7034	I
ADB-PINACA (N-(1-amino-3,3-dimethyl-1-oxobutan-2-yl)-1-pentyl-1H-indazole-3-carboxamide)	7035	I
5F-EDMB-PINACA (ethyl 2-(1-(5-fluoropentyl)-1H-indazole-3-carboxamido)-3,3-dimethylbutanoate)	7036	I
5F-MDMB-PICA (methyl 2-(1-(5-fluoropentyl)-1H-indole-3-carboxamido)-3,3-dimethylbutanoate)	7041	I
MDMB-CHMICA, MMB-CHMINACA (Methyl 2-(1-(cyclohexylmethyl)-1H-indole-3-carboxamido)-3,3-dimethylbutanoate)	7042	I
4F-MDMB-BINACA (4F-MDMB-BUTINACA or methyl 2-(1-(4-fluorobutyl)-1H-indazole-3-carboxamido)-3,3-dimethylbutanoate)	7043	I
MMB-CHMICA, AMB-CHMICA (methyl 2-(1-(cyclohexylmethyl)-1*H*-indole-3-carboxamido)-3-methylbutanoate)	7044	I
FUB-AKB48, FUB-APINACA, AKB48 N-(4-FLUOROBENZYL) (N-(adamantan-1-yl)-1-(4-fluorobenzyl)-1H-indazole-3-carboximide).	7047	I
APINACA and AKB48 N-(1-Adamantyl)-1-pentyl-1H-indazole-3-carboxamide	7048	I
5F-APINACA, 5F-AKB48 (N-(adamantan-1-yl)-1-(5-fluoropentyl)-1H-indazole-3-carboxamide)	7049	I
JWH-081 (1-Pentyl-3-(1-(4-methoxynaphthoyl) indole)	7081	I
5F-CUMYL-PINACA, 5GT-25 (1-(5-fluoropentyl)-*N*-(2-phenylpropan-2-yl)-1*H*-indazole-3-carboxamide)	7083	I
5F-CUMYL-P7AICA (1-(5-fluoropentyl)-*N*-(2-phenylpropan-2-yl)-1*H*-pyrrolo[2,3-b]pyridine-3-carboxamide)	7085	I

Appendix C
Calendar of Hearing Witnesses

CALENDAR OF PUBLIC HEARING

Those listed below appeared in the United States International Trade Commission's hearing:

Subject: USMCA Automotive Rules of Origin: Economic Impact and Operation, 2023 Report

Inv. No.: 332-592

Date and Time: November 3, 2022 - 9:30 a.m.

PANEL 1:

ORGANIZATION AND WITNESSES:

American Automotive Policy Council
Washington, DC

Governor Matt Blunt (remote witness), President

Asociación Mexicana de la Industria Automotriz, A. C. (AMIA)
Mexico City, CDMX, Mexico

José Zozaya, Executive President

Mateo Diego-Fernández, Advisor for Mr. Zozaya

Fausto Cuevas, Advisor for Mr. Zozaya

Autos Drive America
Washington, DC

Rory Heslington, Vice President, Government Affairs

Motor & Equipment Manufacturers Association (MEMA)
Washington, DC

Bill Frymoyer, Vice President, Public Policy

Volkswagen Group of America, Inc.
Washington, DC

Anna Schneider, Senior Vice President, Industry and Government Relations

PANEL 2:

ORGANIZATION AND WITNESSES:

American Iron and Steel Institute
Washington, DC

Kevin M. Dempsey, President, and Chief Executive Officer

International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (UAW)
Washington, DC

Josh Nassar, Legislative Director

United Steelworkers (USW)
Washington, DC

Roy Houseman Jr. (remote witness), Legislative Director

United States Steel Corporation (U.S. Steel)
Washington, DC

Kaitlin McHugh Wojnar, Counsel, International Trade and Public Policy

Center for Strategic and International Studies
Washington, DC

William A. Reinsch, Scholl Chair and Senior Adviser

Appendix D
Summary of Views of Interested Parties

Interested parties had the opportunity to file written submissions to the Commission in the course of this investigation and to provide summaries of the positions expressed in the submissions for inclusion in this report. This appendix contains these written summaries, provided that they meet certain requirements set out in the notice of investigation (see appendix B). The Commission has not edited these summaries. This appendix also contains the names of other interested parties who filed written submissions during this investigation but did not provide written summaries. A copy of each written submission is available in the Commission's Electronic Document Information System (EDIS), https://www.edis.usitc.gov, by searching for submissions related to Investigation No. 332-592. In addition, the Commission held a public virtual hearing in connection with this investigation on November 3, 2022. The full text of the transcript of the Commission's hearing is also available on EDIS.

Written Submissions

Motor and Equipment Manufacturers Association

Motor vehicle parts suppliers strongly supported the USMCA, including its innovative auto ROO provisions. Motor & Equipment Manufacturer Association (MEMA) were pleased by the strong bipartisan vote for the USMCA in Congress at a time of real challenge to American trade policy. A consistent and viable U.S. and North American manufacturing platform was and remains vital. That point was reinforced by the entry into force of the new USMCA on July 1, 2020.

However, motor vehicle suppliers are uniquely impacted by the challenges brought about by the auto ROO provisions. No industry faces a greater level of additional burden resulting from the new USMCA than the motor vehicle parts sector. Complex new processes and rapidly implemented ROO rules greatly increased our members' administrative and compliance commitments. In addition to these challenges, our OE customers have different requirements and interpretations of the rules, impacting MEMA members.

MEMA represents over 900 vehicle suppliers that develop innovative technologies and manufacture original equipment (OE) and aftermarket components and systems for use in passenger cars and commercial trucks.[278] Vehicle suppliers operate in all 50 states employ 907,000 Americans and represent the largest sector of manufacturing jobs in the United States. Today the vehicle industry is at an inflection point as it moves toward a net carbon neutral future.

Since, the global COVID-19 pandemic started in 2020, the motor vehicle parts sector has faced a myriad of U.S. and global supply chain challenges. Every MEMA member is coping with ports, and shipping disruptions, raw material shortages, and manufactured input cost increases. The shortages of legacy semiconductor chips continue to undermine motor vehicle and parts production in the 4th quarter of 2022. These accumulating challenges are problematic for all MEMA members but are compounded for small and medium tier three and tier two manufacturers.

[278] MEMA represents its member companies through its four divisions: Automotive Aftermarket Suppliers Association (AASA); Heavy Duty Manufacturers Association (HDMA); MERA - The Association for Sustainable Manufacturing; and Original Equipment Suppliers Association (OESA).

In addition, going into a rapid mid-year 2020 implementation of USMCA, the entire auto sector faced a totally new legal terrain with much broader ROO commitments. Much would be required of both customers and suppliers. Whether the issue is new alternative staging, or new certification requirements from our customers, higher regional value content (RVC) percentages, or new labor value content (LVC) provision, or North American steel and aluminum requirements, the USMCA challenges compounded over the past couple of years for suppliers. Even the certainty that suppliers thought they would have on the roll up issue has not materialized as the U.S. and Canada/Mexico have differing views that have been put to a dispute resolution test.

The motor vehicle parts sector committed to working with the Biden Administration, and the U.S. Congress to make the USMCA even better. While the USMCA ROO provisions significantly complicate our sector's competitiveness challenges, MEMA is optimistic that dialogue with the federal government can alleviate our members' administrative and compliance concerns.

United States Steel Corporation

The U.S.-Mexico-Canada Agreement ("USMCA") establishes stricter rules of origin ("ROOs") for qualifying automotive products, including:

• Heightened regional value content ("RVC") requirements,

• Phased-in labor value content ("LVC") requirements, and

• Steel-specific 70 percent North American origin—eventually North American "melted-and-poured" origin—purchasing thresholds.

These requirements are designed to, inter alia, support and incentivize use of North American-made steel in North American-made vehicles. In this regard, USMCA's automotive ROOs are succeeding in shifting automotive supply chains to and within North America. As a result, the U.S. steel industry is already starting to experience positive commercial impacts and, in turn, is responding with significant ongoing investments in new and upgraded production capabilities. For instance, U.S. Steel has announced $4 billion worth of investments in new technology, facilities, and skilled workers since July 2020, including ongoing construction of a non-grain oriented electrical steel line that will serve the growing North American market for all-electric vehicles. These investments will further U.S. Steel's more sustainable steelmaking initiatives and efforts to achieve net-zero carbon emissions by 2050.

In the United States, Canada, and Mexico, most-favored nation ("MFN") duty rates for imported vehicles are as high as 25 percent, whereas MFN duty rates for steel products are generally zero percent. Moreover, standard (i.e., not automotive) USMCA ROOs continue to confer preferential origin to certain steel products (e.g., non-alloy, hot-rolled steel) made from steel melted and poured overseas that undergoes minimal processing in North America. Without the USMCA automotive ROOs, there is no tariff-reduction incentive for North American manufacturers to prioritize steel inputs melted and poured in North America. As such, compliance with USMCA's requirements for qualifying automotive products must be regularly verified and strongly enforced to prevent steel melted and poured overseas from improperly claiming preferential treatment.

USMCA creates a straightforward and flexible certification framework, in terms of certifying party, format, and blanket period. Steel producers work closely with automotive customers and original equipment manufacturers throughout North America to prepare all requisite USMCA-related documentation for compliance and traceability. The administrative burden of generating these certifications is minor relative to USMCA's benefits. Notably, U. S. Steel has been able to significantly increase shipments to existing automotive customers operating in Mexico since USMCA went into effect. At the same time, U.S. Steel has been approached—and qualified—by multiple new automotive customers. U. S. Steel has available capacity to increase supply of its high-performing and increasingly sustainable automotive-grade steels as it strengthens partnerships with existing customers and fosters long-term relationships with new customers. Indeed, the U.S. steel industry has sufficient collective capacity to supply the entire North American automotive market as USMCA's RVC, LVC, and melted-and-poured requirements are fully phased in. Diligent enforcement of USMCA's automotive ROOs is critical for U.S.-based, high-wage manufacturers like U. S. Steel to effectively compete for major automotive customer accounts throughout the North American market and, furthermore, will maximize USMCA-related economic, operational, and employment benefits at all levels of the North American automotive supply chain.

Written Submissions Without Summaries

The following parties filed written submissions without summaries. Please see EDIS for full submission.

Alliance for American Manufacturing

Aluminum Association

Aluminum Extruders Council

American Automotive Policy Council

American Iron and Steel Institute

La Asociación Mexicana de La Industria Automotriz (AMIA) Canadian Vehicle Manufacturers' Association

Cámara Nacional de la Industria del Hierro y el Acero (CANACERO) National Automobile Dealers Association

Toyota Motor North America, Inc.

Truck and Engine Manufacturers Association

U.S. Chamber of Commerce

Volkswagen Group of America, Inc.

Appendix E
Data Tables for Figures and Supplemental Data Tables

Data Tables for Figures

Table E.1 Vehicle categories in the USMCA

This table corresponds to figure 1.1.

Vehicle category	HS subheading details
Passenger vehicles	Vehicles of subheadings 8703.21–8703.90, cars, and sport-utility vehicles.
Light trucks	Vehicles of subheadings 8704.21 or 8704.31, pickup trucks, and work vans.
Heavy trucks	Vehicles of subheadings 8701.20, 8704.22, 8704.23, 8704.32, 8704.90, 8706, tractor trailers, and cab and chassis trucks.

Source: 19 C.F.R. Appendix A to part 182 § 12; USMCA, Appendix to Annex 4-B, Provisions Related to the Product-Specific Rules of Origin for Automotive Goods, Articles 1 and 10

Notes: All Harmonized Commodity Description and Coding System (HS) subheadings listed here are based on HS 2012 nomenclature. For a discussion of changes to HS subheadings since then, see chapter 4.

Table E.2 Timeline of the USMCA automotive ROOs staging requirements

RVC = regional value content; LVC = labor value content. This table corresponds to figure 1.2.

Month and year	Event
July 2020	Entry into force of agreement
July 2023	Staging for RVC and LVC requirements ends for light vehicles without alternative staging
July 2025	Alternative staging ends for most light vehicles
July 2026	Last alternative staging plan ends
July 2027	Staging ends for heavy trucks

Sources: 19 C.F.R. Appendix A to part 182 §§ 13, 19(2); USMCA, Chapter 4 Rules of Origin, 2018, 4-B-1-19-23, 4-B-1-29-31.

Table E.3 U.S. vehicle production by region, 2022

In percentages. This table corresponds to figure 1.4.

Region	Share
Midwest	48.7
Southeast	38.4
Rest of the United States	13.0

Source: Ward's Intelligence, "North America Vehicle Production by State and Plant," April 11, 2022; Ward's Intelligence, "North America Production, December 2022," January 19, 2023.

Notes: Production in the midwestern region is located in Illinois, Indiana, Kansas, Michigan, Missouri, and Ohio. The Southeast includes Alabama, Georgia, Kentucky, Maryland, Mississippi, North Carolina, Tennessee, Virginia, and West Virginia. The rest of the United States has production in three states: Arizona, California, and Texas. Additional regional analysis is available in appendix G.

Table E.4 U.S. light vehicle production, exports and production for U.S. consumption, by year, 2018–22

In millions of units. This table corresponds to figure 3.1.

Item	2018	2019	2020	2021	2022
U.S. production (million units)	11.0	10.5	8.6	8.9	9.7
Domestic exports (million units)	2.6	2.9	2.3	2.6	2.5
U.S. production for U.S. consumption (million units)	8.4	7.6	6.3	6.3	7.2

Sources: Ward's Intelligence, "North America Vehicle Production by State and Plant, 2017-2021," April 11, 2022; Ward's Intelligence, "North America Production, December 2022," January 19, 2023; USITC DataWeb/Census, domestic exports, list of HS subheadings corresponding to light vehicles in appendix F, accessed February 21, 2023.

Note: U.S. production for U.S. consumption is derived by subtracting domestic exports from U.S. production.

Table E.5 U.S. light vehicle consumption, by item and year, 2018–22

In millions of units and percentages. This table corresponds to figure 3.1.

Item	2018	2019	2020	2021	2022
U.S. production for U.S. consumption (million units)	8.4	7.6	6.3	6.3	7.2
Estimated imports (million units)	8.8	9.3	8.2	8.7	6.6
U.S. sales (million units)	17.2	17.0	14.5	14.9	13.7
U.S. production for U.S. consumption (%)	48.7	45.1	43.6	41.8	52.2
Estimated imports (%)	51.3	54.9	56.4	58.2	47.8
U.S. sales (%)	100.0	100.0	100.0	100.0	100.0

Sources: Ward's Intelligence, "North America Vehicle Production by State and Plant, 2017–2021," April 11, 2022; Ward's Intelligence, "North America Production, December 2022," January 19, 2023; USITC DataWeb/Census, domestic exports, list of HS subheadings corresponding to light vehicles in appendix F, accessed February 21, 2023.

Notes: U.S. production for U.S. consumption is derived by subtracting domestic exports from U.S. production as seen in table E.4. Estimated imports are derived by subtracting U.S. production for U.S. consumption from U.S. sales. Light vehicle subheadings do not include electric or hybrid trucks because they are classified as heavy trucks in the USMCA. For more information, see chapter 4.

Table E.6 U.S. parts production, exports and production for U.S. consumption, by year, 2018–22

In billions of dollars. This table corresponds to figure 3.2.

Item	2018	2019	2020	2021	2022
U.S. production (billion $)	321.0	311.8	270.7	300.3	321.4
Domestic exports (billion $)	61.6	58.2	45.7	48.5	55.5
U.S. production for U.S. consumption (billion $)	259.4	253.6	225.0	251.9	265.8

Sources: U.S. Department of Census, "Annual Survey of Manufactures," 2017–21; U.S. Department of Census, Manufacturers' Shipments, Inventories, and Orders (M3) Survey, February 2, 2023; USITC DataWeb/Census, imports for consumption and domestic exports, NAICS 3362 and 3363, accessed February 21, 2023.

Notes: U.S. parts production and trade data include NAICS 3362 (Automotive Bodies) and 3363 (Automotive Parts). U.S. parts production for U.S. consumption is derived by subtracting domestic exports from U.S. parts production.

Table E.7 U.S. parts consumption, by item and year, 2018–22

In billions of dollars and percentages. This table corresponds to figure 3.2.

Item	2018	2019	2020	2021	2022
U.S. production for U.S. consumption (billion $)	259.4	253.6	225.0	251.9	265.8
Imports (billion $)	115.2	111.9	97.2	119.4	135.7
Overall U.S. parts consumption (billion $)	374.5	365.4	322.2	371.3	401.6
U.S. parts production for U.S. consumption (%)	69.3	69.4	69.8	67.8	66.2
Imports (%)	30.7	30.6	30.2	32.2	33.8
Overall U.S. parts consumption (%)	100.0	100.0	100.0	100.0	100.0

Sources: U.S. Department of Census, "Annual Survey of Manufactures," 2017–2021; U.S. Department of Census, Manufacturers' Shipments, Inventories, and Orders (M3) Survey, February 2, 2023; USITC DataWeb/Census, imports for consumption and domestic exports, NAICS 3362 and 3363, accessed February 21, 2023.

Notes: U.S. parts production and trade data include NAICS 3362 (Automotive Bodies) and 3363 (Automotive Parts). U.S. parts production for U.S. consumption is derived by subtracting domestic exports from U.S. parts production as seen in table E.5. Imports are adjusted to remove re-exports. Overall U.S. parts consumption is derived by summing the U.S. parts production for U.S. consumption and imports. Light vehicle subheadings do not include electric or hybrid trucks because they are classified as heavy trucks in the USMCA. For more information, see chapter 4.

Table E.8 USMCA vehicle production, by country and year, 2018–22

In millions of units and percentages. This table corresponds to figures ES.1 and 3.3.

Country	2018	2019	2020	2021	2022
Canada (million units)	2.0	1.9	1.4	1.1	1.2
Mexico (million units)	4.1	4.0	3.2	3.1	3.5
United States (million units)	11.3	10.9	8.8	9.2	10.0
All USMCA production (million units)	17.4	16.8	13.4	13.4	14.7
Canada (%)	11.6	11.4	10.3	8.3	8.3
Mexico (%)	23.5	23.8	23.7	23.4	23.6
United States (%)	64.8	64.8	66.0	68.3	68.1
All USMCA production (%)	100.0	100.0	100.0	100.0	100.0

Sources: Ward's Intelligence, "North American Vehicle Production by State and Plant," April 11, 2022, and Ward's Intelligence, "North America Production, December 2022," January 19, 2023.

Note: See appendix G for production and trade by U.S. region, as well as the state composition of each region.

Table E.9 USMCA vehicle manufacturer investments, by region and year, 2018–22

In billions of dollars and percentages. This table corresponds to figure 3.4.

Region	2018	2019	2020	2021	2022
Canada (billion $)	1.1	0.5	3.9	0.9	10.7
Mexico (billion $)	0.7	0.0	0.2	1.3	0.3
U.S. Midwest (billion $)	1.6	15.9	1.4	3.4	19.2
U.S. Southeast (billion $)	0.0	2.9	1.2	7.7	0.2
U.S. Other (billion $)	1.1	3.0	1.9	22.5	16.0
All U.S. (billion $)	2.8	21.8	4.6	33.6	35.4
All USMCA production (billion $)	4.5	22.3	8.6	35.8	46.3
Canada (%)	24.0	2.1	44.9	2.6	23.1
Mexico (%)	14.5	0.0	2.0	3.6	0.6
U.S. Midwest (%)	36.4	71.2	16.7	9.6	41.4
U.S. Southeast (%)	0.1	13.0	13.9	21.5	0.4
U.S. Other (%)	25.0	13.6	22.6	62.7	34.5
All U.S. (%)	61.4	97.9	53.2	93.8	76.4
All USMCA production (%)	100.0	100.0	100.0	100.0	100.0

Source: CAR, Automotive Communities Partnership, accessed August 30, 2022.

Table E.10 Light vehicle exports, by source, export market and year, 2018–22
In billions of dollars and percentages. This table corresponds to figure 3.5.

Source and export market	2018	2019	2020	2021	2022
U.S. exports to Canada (billion $)	23.6	24.7	19.3	23.3	26.0
U.S. exports to Mexico (billion $)	3.5	3.5	2.3	3.2	4.0
U.S. exports to all USMCA partners (billion $)	27.2	28.2	21.6	26.5	30.0
U.S. exports to all other markets (billion $)	34.2	40.5	34.3	39.4	39.7
U.S. exports to all markets (billion $)	61.4	68.7	55.9	66.0	69.7
All other exporters exports to all markets (billion $)	871.5	829.6	694.8	781.1	834.2
Total global exports (billion $)	932.8	898.3	750.7	847.0	903.9
U.S. exports to Canada (%)	2.5	2.7	2.6	2.8	2.9
U.S. exports to Mexico (%)	0.4	0.4	0.3	0.4	0.4
U.S. exports to all USMCA partners (%)	2.9	3.1	2.9	3.1	3.3
U.S. exports to all other markets (%)	3.7	4.5	4.6	4.7	4.4
U.S. exports to all markets (%)	6.6	7.7	7.4	7.8	7.7
All other exporters exports to all markets (%)	93.4	92.3	92.6	92.2	92.3
Total global exports (%)	100.0	100.0	100.0	100.0	100.0

Source: S&P Global, GTAS, list of HS subheadings corresponding to light vehicles in appendix F, accessed March 30, 2023.
Notes: Global data on light vehicle exports in terms of quantity have inconsistent units of measure and therefore are unavailable. For information on U.S. only vehicle exports in units, see appendix G.

Table E.11 Vehicle parts exports, by source, export market and year, 2018–22
In billions of dollars and percentages. This table corresponds to figure 3.6.

Source and export market	2018	2019	2020	2021	2022
U.S. exports to Canada (billion $)	38.2	36.6	28.3	28.7	31.8
U.S. exports to Mexico (billion $)	41.6	41.1	31.4	36.0	42.3
U.S. exports to all USMCA partners (billion $)	79.8	77.7	59.7	64.7	74.0
U.S. exports to all other markets (billion $)	46.9	44.2	39.8	44.8	39.1
U.S. exports to all markets (billion $)	126.7	121.9	99.5	109.5	113.2
All other exporters exports to all markets (billion $)	1,442.5	1,382.1	1,260.9	1,499.1	1,229.9
Total global exports (billion $)	1,569.1	1,504.0	1,360.4	1,608.6	1,343.1
U.S. exports to Canada (%)	2.4	2.4	2.1	1.8	2.4
U.S. exports to Mexico (%)	2.6	2.7	2.3	2.2	3.1
U.S. exports to all USMCA partners (%)	5.1	5.2	4.4	4.0	5.5
U.S. exports to all other markets (%)	3.0	2.9	2.9	2.8	2.9
U.S. exports to all markets (%)	8.1	8.1	7.3	6.8	8.4
All other exporters exports to all markets (%)	91.9	91.9	92.7	93.2	91.6
Total global exports (%)	100.0	100.0	100.0	100.0	100.0

Source: S&P Global, GTAS, list of HS subheadings corresponding to parts in appendix F, accessed March 30, 2023.
Note: Global automotive parts list includes HS subheadings that are not solely automotive and is thus broader than the NAICS-based automotive trade data used in figures 3.2 and 3.7.

Table E.12 U.S. light vehicle imports from Canada and Mexico, by duty status and year, 2018–22
In billions of dollars and percentages. This table corresponds to figure 3.7.

Duty status	2018	2019	2020	2021	2022
Dutiable (billion $)	0.2	0.5	2.0	4.5	6.8
Duty-free (billion $)	92.7	98.3	76.2	74.0	80.3
All imports from Canada and Mexico (billion $)	92.9	98.8	78.2	78.5	87.1
Dutiable (%)	0.2	0.5	2.5	5.8	7.8
Duty-free (%)	99.8	99.5	97.5	94.2	92.2
All imports from Canada and Mexico (%)	100.0	100.0	100.0	100.0	100.0

Source: USITC DataWeb/Census, imports for consumption customs value, list of HS subheadings corresponding to light vehicles in appendix F, accessed February 23, 2023.

Table E.13 U.S. parts imports from Canada and Mexico, by duty status and year, 2018–22
In billions of dollars and percentages. This table corresponds to figure 3.7.

Duty status	2018	2019	2020	2021	2022
Dutiable (billion $)	5.2	6.4	8.5	11.0	14.6
Duty-free (billion $)	60.4	59.3	47.5	54.7	62.9
All imports from Canada and Mexico (billion $)	65.6	65.6	55.9	65.7	77.5
Dutiable (%)	7.9	9.7	15.1	16.8	18.8
Duty-free (%)	92.1	90.3	84.9	83.2	81.2
All imports from Canada and Mexico (%)	100.0	100.0	100.0	100.0	100.0

Source: USITC DataWeb/Census, imports for consumption customs value, NAICS 3362 and 3363, accessed February 21, 2023.

Table E.14 Number of automotive workers in the United States, by product type manufactured and year, 2018–22
In thousands of workers and percentages. This table corresponds to figure 3.8.

Product type	2018	2019	2020	2021	2022
Motor vehicles (1,000 workers)	233.7	237.2	206.3	253.8	290.9
Bodies and trailers (1,000 workers)	165.1	162.3	150.9	164.5	169.6
Parts (1,000 workers)	599.8	594.1	530.3	541.8	552.8
All product types (1,000 workers)	998.5	993.5	887.5	960.0	1013.4
Motor vehicles (%)	23.4	23.9	23.2	26.4	28.7
Bodies and trailers (%)	16.5	16.3	17.0	17.1	16.7
Parts (%)	60.1	59.8	59.8	56.4	54.6
All product types (%)	100.0	100.0	100.0	100.0	100.0

Source: BLS, "Employment, Hours, and Earnings from the Current Employment Statistics survey (National)," accessed April 21, 2023.
Note: Motor vehicle manufacturing data are NAICS 3361, motor vehicle body and trailer manufacturing data are NAICS 3362, and motor vehicle parts manufacturing data are NAICS 3363.

Table E.15 United States automotive workers' and overall U.S. manufacturing annual average hourly wages, by year, 2018–22

In dollars per hour. This table corresponds to figure 3.9.

Category	2018	2019	2020	2021	2022
Automotive workers' wages	22.76	23.51	23.56	25.25	27.15
Manufacturing wages	21.52	22.14	22.80	23.81	25.07

Source: BLS, "Employment, Hours, and Earnings from the Current Employment Statistics survey (National)," accessed April 21, 2023.

Appendix F
Relevant Automotive HTS Subheadings and Statistical Reporting Numbers

Unless otherwise stated, this report uses the following HS subheadings (imports and exports), HTS statistical reporting numbers (U.S. imports), and Schedule B statistical reporting numbers (U.S. exports) whenever discussing one of the following terms or categories of motor vehicles or automotive parts.

Table F.1 HS subheadings for light vehicles

HS subheading	Vehicle category	HS description
8703.21	Passenger vehicle	Vehicles for the transport of persons with only a spark-ignition internal combustion piston engine of a cylinder capacity not exceeding 1,000 cc
8703.22	Passenger vehicle	Vehicles for the transport of persons with only a spark-ignition internal combustion piston engine of a cylinder capacity exceeding 1,000 cc but not exceeding 1,500 cc
8703.23	Passenger vehicle	Vehicles for the transport of persons with only a spark-ignition internal combustion piston engine of a cylinder capacity exceeding 1,500 cc but not exceeding 3,000 cc
8703.24	Passenger vehicle	Vehicles for the transport of persons with only a spark-ignition internal combustion piston engine of a cylinder capacity exceeding 3,000 cc
8703.31	Passenger vehicle	Vehicles for the transport of persons with only a compression-ignition internal combustion piston engine of a cylinder capacity not exceeding 1,500 cc
8703.32	Passenger vehicle	Vehicles for the transport of persons with only a compression-ignition internal combustion piston engine of a cylinder capacity exceeding 1,500 cc but not exceeding 2,500 cc
8703.33	Passenger vehicle	Vehicles for the transport of persons with only a compression-ignition internal combustion piston engine of a cylinder capacity exceeding 2,500 cc
8703.40	Passenger vehicle	Vehicles for the transport of persons with both spark-ignition internal combustion piston engine and electric motor as motors for propulsion, other than those capable of being charged by plugging to external source of electric power
8703.50	Passenger vehicle	Vehicles for the transport of persons with both compression-ignition internal combustion piston engine and electric motor as motors for propulsion, other than those capable of being charged by plugging to external source of electric power
8703.60	Passenger vehicle	Vehicles for the transport of persons with both spark-ignition internal combustion piston engine and electric motor as motors for propulsion, capable of being charged by plugging to external source of electric power
8703.70	Passenger vehicle	Vehicles for the transport of persons with both compression-ignition internal combustion piston engine and electric motor as motors for propulsion, capable of being charged by plugging to external source of electric power
8703.80	Passenger vehicle	Vehicles for the transport of persons with only electric motors for propulsion
8703.90	Passenger vehicle	Other vehicles designed for the transport of persons (other than those of heading 8702)
8704.21	Light truck	Vehicles for the transport of goods with only a compression-ignition internal combustion engine not exceeding 5 metric tons
8704.31	Light truck	Vehicles for the transport of goods with only a spark-ignition internal combustion engine not exceeding 5 metric tons

Source: USITC, Harmonized Tariff Schedule of the United States (2022), February 2022.

Table F.2 HS subheadings for heavy trucks

HS subheading	HS description
8701.21	Road tractor with only a compression-ignition internal combustion engine
8701.22	Road tractor with both a compression-ignition internal combustion engine and electric motor as motors for propulsion
8701.23	Road tractor with both a spark-ignition internal combustion engine and electric motor as motors for propulsion
8701.24	Road tractor with only electric motor as motors for propulsion
8701.29	Other road tractors
8704.22	Vehicles for the transport of goods with only a compression-ignition internal combustion engine exceeding 5 metric tons but not exceeding 20 metric tons
8704.23	Vehicles for the transport of goods with only a compression-ignition internal combustion engine exceeding 20 metric tons
8704.32	Vehicles for the transport of goods with only a spark-ignition internal combustion engine exceeding 5 metric tons but not exceeding 5 metric tons
8704.41	Vehicles for the transport of goods with both compression-ignition internal combustion and electric motor as motors for propulsion not exceeding 5 metric tons
8704.42	Vehicles for the transport of goods with both compression-ignition internal combustion and electric motor as motors for propulsion exceeding 5 metric tons but not exceeding 20 metric tons
8704.43	Vehicles for the transport of goods with both compression-ignition internal combustion and electric motor as motors for propulsion exceeding 20 metric tons
8704.51	Vehicles for the transport of goods with both spark-ignition internal combustion and electric motor as motors for propulsion not exceeding 5 metric tons
8704.52	Vehicles for the transport of goods with both spark-ignition internal combustion and electric motor as motors for propulsion exceeding 5 metric tons
8704.60	Vehicles for the transport of goods with only electric motor for propulsion
8704.90	Other vehicles for the transport of goods

Source: USITC, Harmonized Tariff Schedule of the United States (2022) Revision 2, February 2022.
Notes: The heavy truck category in the USMCA also includes any chassis fitted with an engine of heading 87.06 that is for use in a vehicle of subheading 8701.21, 8704.22, 8704.23, 8704.32 or 8704.90, except for a vehicle that is solely or principally for off-road use. Additionally, some of these subheadings (8701.21, 8701.22, 8701.23, 8701.24, 8701.298704.41, 8704.42, 8704.43, 8704.51, 8704.52, and 8704.60), which cover electric vehicles (EVs) and hybrid trucks, do not appear in the USMCA ROOs or the USMCA Uniform Regulations, because they were new subheadings in HS 2022 and the USMCA is written in HS 2012 nomenclature. Vehicles of these subheadings would have previously been classified in 8701.20 or 8704.90 in HS 2012, and both of those subheadings are classified under heavy trucks in the USMCA. For more information on these new EV and hybrid truck subheadings, see chapter 4.

Table F.3 U.S. HTS statistical reporting numbers for vehicle parts
— (em dash) = not applicable.

HTS statistical reporting number	HTS statistical reporting number	HTS statistical reporting number	HTS statistical reporting number	HTS statistical reporting number	HTS statistical reporting number
3819.00.0000	4016.93.1090	8414.59.8040	8525.20.1500	8708.39.5020	8708.99.3000
3819.00.0010	4016.99.3000	8414.59.6540	8525.20.6020	8708.39.5030	8708.99.5005
3819.00.0090	4016.99.5010	8414.80.0500	8525.20.9020	8708.39.5050	8708.99.5010
3820.00.0000	4016.99.5500	8415.20.0000	8525.60.1010	8708.40.1000	8708.99.5020
4009.12.0020	4016.99.6010	8415.83.0040	8527.21.1005	8708.40.1110	8708.99.5030
4009.22.0020	6813.10.0050	8415.90.0040	8527.21.1010	8708.40.1150	8708.99.5045
4009.32.0020	6813.20.0015	8415.90.8040	8527.21.1015	8708.40.2000	8708.99.5060
4009.42.0020	6813.20.0025	8415.90.8045	8527.21.1020	8708.40.5000	8708.99.5070
4009.50.0020	6813.81.0050	8421.23.0000	8527.21.1025	8708.40.7000	8708.99.5080
4010.10.1020	6813.89.0050	8421.31.0000	8527.21.1030	8708.40.7500	8708.99.5085
4011.10.0010	6813.90.0050	8421.32.0000	8527.21.4000	8708.40.7570	8708.99.5090
4011.10.0050	7007.11.0000	8421.39.4000	8527.21.4040	8708.40.7580	8708.99.5200
4011.10.1000	7007.11.0010	8425.49.0000	8527.21.4080	8708.50.3000	8708.99.5025
4011.10.1010	7007.21.1000	8426.91.0000	8527.21.1500	8708.50.5000	8708.99.5300
4011.10.1020	7007.21.1010	8431.10.0090	8527.21.2510	8708.50.5110	8708.99.5500
4011.10.1030	7007.21.1110	8482.10.1000	8527.21.2525	8708.50.5150	8708.99.5800
4011.10.1040	7007.21.5000	8482.10.1040	8527.29.0020	8708.50.6100	8708.99.6100
4011.10.1050	7007.21.5100	8482.10.1080	8527.29.0040	8708.50.6500	8708.99.6400
4011.10.1060	7009.10.0000	8482.10.5044	8527.29.0060	8708.50.7900	8708.99.6700
4011.10.1070	7315.11.0005	8482.10.5048	8527.29.4000	8708.50.8000	8708.99.6710
4011.10.5000	7318.16.0010	8482.20.0010	8527.29.8000	8708.50.8100	8708.99.6720
4011.20.0005	7318.16.0015	8482.20.0020	8527.29.8020	8708.50.8500	8708.99.6790
4011.20.0010	7318.16.0030	8482.20.0030	8527.29.8060	8708.50.8900	8708.99.6805
4011.20.0015	7318.16.0045	8482.20.0040	8531.80.0038	8708.50.9110	8708.99.6810
4011.20.0020	7320.10.0015	8482.20.0050	8531.80.8038	8708.50.9150	8708.99.6820
4011.20.0025	7320.10.3000	8482.20.0060	8531.80.9031	8708.50.9300	8708.99.6890
4011.20.0030	7320.10.6015	8482.20.0070	8531.80.9038	8708.50.9500	8708.99.7030
4011.20.0035	7320.10.6060	8482.20.0080	8536.41.0005	8708.50.9900	8708.99.7060
4011.20.0050	7320.20.1000	8482.40.0000	8536.90.6000	8708.60.5000	8708.99.7330
4011.20.1005	8301.20.0000	8482.50.0000	8539.10.0010	8708.60.8010	8708.99.7360
4011.20.1015	8301.20.0030	8483.10.1030	8539.10.0020	8708.60.8050	8708.99.8005
4011.20.1025	8301.20.0060	8483.10.3010	8539.10.0040	8708.70.4530	8708.99.8015
4011.20.1035	8302.10.3000	8501.32.4500	8539.10.0050	8708.70.4545	8708.99.8045
4011.20.5010	8302.30.3000	8507.10.0060	8539.21.2040	8708.70.4560	8708.99.8060
4011.20.5020	8302.30.3010	8507.30.4000	8544.30.0000	8708.70.6030	8708.99.8080
4011.20.5030	8302.30.3060	8507.40.4000	8707.10.0020	8708.70.6045	8708.99.8105
4011.20.5050	8302.30.6000	8507.60.0010	8707.10.0040	8708.70.6060	8708.99.8115
4012.10.4005	8407.34.1400	8507.80.4100	8707.90.5020	8708.70.8010	8708.99.8160
4012.10.4015	8407.34.1540	8507.90.4000	8707.90.5040	8708.70.8015	8708.99.8180
4012.10.4025	8407.34.1580	8507.90.8000	8707.90.5060	8708.70.8025	8716.90.5010
4012.10.4035	8407.34.1800	8511.10.0000	8707.90.5080	8708.70.8030	8716.90.5030
4012.10.5005	8407.34.2040	8511.20.0000	8708.10.0010	8708.70.8035	8716.90.5035
4012.10.5009	8407.34.2080	8511.30.0040	8708.10.0050	8708.70.8045	8716.90.5050
4012.10.5015	8407.34.4400	8511.30.0080	8708.10.3010	8708.70.8050	8716.90.5045
4012.10.5019	8407.34.4540	8511.40.0000	8708.10.3050	8708.70.8060	8716.90.5055
4012.10.5025	8407.34.4580	8511.50.0000	8708.10.6010	8708.70.8075	8716.90.5056
4012.10.5029	8407.34.4800	8511.80.2000	8708.10.6050	8708.80.1300	8716.90.5059

HTS statistical reporting number	HTS statistical reporting number	HTS statistical reporting number	HTS statistical reporting number	HTS statistical reporting number	HTS statistical reporting number
4012.10.5035	8408.20.2000	8511.80.6000	8708.21.0000	8708.80.1600	8716.90.5060
4012.10.5050	8409.91.1040	8511.90.2000	8708.22.0000	8708.80.3000	9029.10.4000
4012.10.8009	8409.91.3000	8511.90.6020	8708.29.0010	8708.80.4500	9029.10.8000
4012.10.8019	8409.91.5010	8511.90.6040	8708.29.0025	8708.80.5000	9029.20.4080
4012.10.8029	8409.91.5080	8512.20.2000	8708.29.0050	8708.80.6000	9029.90.2000
4012.10.8050	8409.91.5081	8512.20.2040	8708.29.0060	8708.80.6510	9029.90.8040
4012.11.4000	8409.91.5085	8512.20.4000	8708.29.1000	8708.80.6590	9029.90.8080
4012.11.8000	8409.91.9110	8512.20.4040	8708.29.1500	8708.91.5000	9104.00.2510
4012.12.4015	8409.91.9190	8512.30.0020	8708.29.2000	8708.91.7000	9104.00.4000
4012.12.4025	8409.91.9910	8512.30.0030	8708.29.2500	8708.91.7510	9104.00.4510
4012.12.4035	8409.99.1040	8512.30.0040	8708.29.5010	8708.91.7550	9401.20.0000
4012.12.8019	8409.99.9110	8512.40.2000	8708.29.5025	8708.92.5000	9401.20.0010
4012.12.8029	8409.99.9190	8512.40.4000	8708.29.5060	8708.92.7000	9401.20.0090
4012.12.8050	8413.30.1000	8512.90.2000	8708.29.5125	8708.92.7500	9401.90.1000
4012.19.4000	8413.30.9000	8512.90.6000	8708.29.5160	8708.93.5000	9401.90.1010
4012.19.8000	8413.30.9030	8512.90.7000	8708.30.1090	8708.93.6000	9401.90.1020
4012.20.5000	8413.30.9060	8512.90.9000	8708.30.5020	8708.93.7500	9401.90.1080
4012.20.6000	8413.30.9090	8517.12.0020	8708.30.5030	8708.94.5000	9401.90.1085
4013.10.0010	8413.91.1000	8517.14.0020	8708.30.5040	8708.94.7000	9401.91.1500
4013.10.0020	8413.91.9010	8519.81.2000	8708.30.5090	8708.94.7510	9401.99.1010
4016.93.1010	8414.30.8030	8519.91.0020	8708.31.5000	8708.94.7550	9401.99.1020
4016.93.1020	8414.59.3000	8519.91.1000	8708.39.1090	8708.95.0500	9401.99.1085
4016.93.1050	8414.59.6040	8519.93.4000	8708.39.5010	8708.95.2000	—

Source: U.S. Department of Commerce, "Automotive Parts Product Codes," accessed April 7, 2023.

Table F.4 U.S. Schedule B statistical reporting numbers for vehicle parts

— (em dash) = not applicable.

Schedule B statistical reporting number	Schedule B statistical reporting number	Schedule B statistical reporting number	Schedule B statistical reporting number	Schedule B statistical reporting number	Schedule B statistical reporting number
3819.00.0000	4013.90.0000	8421.23.0000	8511.90.6020	8708.10.0010	8708.91.8000
3820.00.0000	4016.99.5010	8421.31.0000	8511.90.8000	8708.10.0050	8708.92.5000
4009.12.0020	6813.10.0000	8421.32.0000	8512.20.2000	8708.21.0000	8708.92.8000
4009.22.0020	6813.20.0000	8421.39.4000	8512.20.4000	8708.22.0000	8708.93.5000
4009.32.0020	6813.81.0000	8425.49.0000	8512.30.0000	8708.29.0010	8708.94.5000
4009.42.0020	6813.89.0000	8426.91.0000	8512.30.0030	8708.29.0025	8708.94.8000
4009.50.0020	6813.90.0000	8431.10.0090	8512.30.0050	8708.29.0050	8708.95.0000
4011.10.0010	7007.11.0000	8482.10.1000	8512.40.2000	8708.29.0060	8708.99.0045
4011.10.0050	7007.21.1000	8482.10.5044	8512.40.4000	8708.29.0110	8708.99.0050
4011.10.1000	7007.21.1100	8482.10.5048	8512.90.2000	8708.29.0125	8708.99.0070
4011.10.5000	7007.21.5000	8482.20.0020	8512.90.5000	8708.29.0160	8708.99.0090
4011.20.0005	7007.21.5100	8482.20.0030	8512.90.8000	8708.29.5025	8708.99.0095
4011.20.0010	7009.10.0000	8482.20.0040	8517.12.0020	8708.29.5070	8708.99.5800
4011.20.0015	7320.10.0000	8482.20.0060	8517.14.0020	8708.29.5170	8708.99.6100
4011.20.0020	7320.20.1000	8482.20.0070	8519.81.2000	8708.30.0010	8708.99.8015
4011.20.0025	8301.20.0000	8482.20.0080	8525.20.1000	8708.30.0050	8708.99.8030
4011.20.0030	8302.10.3000	8482.40.0000	8525.20.6000	8708.31.0000	8708.99.8075
4011.20.0035	8302.30.0000	8482.50.0000	8525.20.9020	8708.39.0000	8708.99.8115
4011.20.0050	8407.34.2000	8483.10.1020	8525.20.9050	8708.40.1000	8708.99.8130
4011.20.1005	8407.34.2030	8483.10.3010	8525.60.1010	8708.40.1110	8708.99.8175
4011.20.1015	8407.34.2090	8507.10.0050	8527.19.0000	8708.40.1150	8716.90.0000
4011.20.1025	8408.20.2000	8507.10.0060	8527.21.0000	8708.40.2000	8716.90.5000
4011.20.1035	8409.91.4000	8507.40.0000	8527.29.0000	8708.40.3500	9029.10.0000
4011.20.5010	8409.99.4000	8507.80.0100	8531.80.0038	8708.40.6000	9029.20.5000
4011.20.5020	8413.30.1000	8507.90.4000	8531.80.9038	8708.40.8000	9029.90.0000
4011.20.5030	8413.30.9000	8507.90.4050	8536.41.0005	8708.50.0050	9104.00.0000
4011.20.5050	8413.91.1000	8507.90.8000	8539.10.0020	8708.50.4110	9401.20.0000
4012.10.5020	8413.91.9010	8511.10.0000	8539.10.0040	8708.50.4150	9401.90.1000
4012.10.6000	8414.30.8030	8511.20.0000	8544.30.0000	8708.50.7200	9401.90.1010
4012.11.0000	8414.59.3000	8511.30.0040	8707.10.0020	8708.60.0050	9401.90.1080
4012.12.0000	8414.59.6040	8511.30.0080	8707.10.0040	8708.70.0050	9401.91.1500
4012.19.0000	8414.59.8040	8511.40.0000	8707.90.5020	8708.80.0050	9401.99.1010
4012.20.0000	8414.80.0500	8511.50.0000	8707.90.5040	8708.80.5000	9401.99.1080
4013.10.0010	8415.20.0000	8511.80.2000	8707.90.5060	8708.80.7000	—
4013.10.0020	8415.83.0040	8511.80.6000	8707.90.5080	8708.91.5000	—

Source: U.S. Department of Commerce, "Automotive Parts Product Codes," accessed April 7, 2023.

Table F.5 HS 6-digit subheadings that are exclusively or primarily vehicle parts

— (em dash) = not applicable.

HS subheading	HS subheading	HS subheading	HS subheading	HS subheading	HS subheading
3819.00	6813.81	8414.59	8507.40	8525.20	8708.50
3820.00	6813.89	8414.80	8507.60	8525.60	8708.60
4009.12	6813.90	8415.20	8507.80	8527.21	8708.70
4009.22	7007.11	8415.83	8507.90	8527.29	8708.80
4009.32	7007.21	8415.90	8511.10	8531.80	8708.91
4009.42	7009.10	8421.23	8511.20	8536.41	8708.92
4009.50	7315.11	8421.31	8511.30	8536.90	8708.93
4010.10	7318.16	8421.32	8511.40	8539.10	8708.94
4011.10	7320.10	8421.39	8511.50	8539.21	8708.95
4011.20	7320.20	8425.49	8511.80	8544.30	8708.99
4012.10	8301.20	8426.91	8511.90	8707.10	8716.90
4012.11	8302.10	8431.10	8512.20	8707.90	9029.10
4012.12	8302.30	8482.10	8512.30	8708.10	9029.20
4012.19	8407.34	8482.20	8512.40	8708.21	9029.90
4012.20	8408.20	8482.40	8512.90	8708.22	9104.00
4013.10	8409.91	8482.50	8517.12	8708.29	9401.20
4016.93	8409.99	8483.10	8517.14	8708.30	9401.90
4016.99	8413.30	8501.32	8519.81	8708.31	9401.91
6813.10	8413.91	8507.10	8519.91	8708.39	9401.99
6813.20	8414.30	8507.30	8519.93	8708.40	—

Source: USITC staff calculations based on U.S. Department of Commerce, "Automotive Parts Product Codes," accessed April 7, 2023.

Appendix G
Regional Analysis of Vehicle Manufacturers

Introduction

The North American automotive industry consists of vehicle and vehicle parts production in the United States, Mexico, and Canada. All three countries ranked among the top vehicle-producing countries in the world, with significant production of a wide array of vehicles. The North American region was negatively impacted by a variety of factors in recent years, including plant shutdowns associated with the onset of the COVID-19 pandemic, supply chain constraints such as the global semiconductor shortage, and a shortage of specialized labor. These interrelated factors (as well as others) resulted in production declines in all three countries during the period covered in this report, with most of these declines occurring in 2020.

United States

The U.S. automotive industry can be broken up into three distinct regions: the midwestern region, the southeastern region, and the rest of the United States. In 2022, U.S. automotive production accounted for 66.5 percent of production in North America and 11.4 percent globally. The industry employed more than 250,000 people in vehicle manufacturing, more than half a million people in parts production as well as sales and repairs, and more than 162,000 people in motor vehicle body and trailer manufacturing in 2021.[279] For the midwestern and southeastern regions, the decline between 2018 and 2022 is mostly accounted for in 2020; however, production has been slowly increasing since then. Production in the rest of the United States increased 39 percent from 2018 to 2022 in large part because of increases in electric vehicle demand. As discussed in chapter 1, the onset of the COVID-19 pandemic saw plant closures in the United States, with more than 40 percent of the automotive workforce furloughed or let go in March and April 2020.[280] Furthermore, even after plants reopened, the U.S. automotive industry dealt with various supply chain issues. The global semiconductor shortage led to automakers either shutting down production a second time or slowing down to fewer shifts or producing fewer vehicles per shift.[281] Additionally, labor shortages resulted in some plants scaling back production and being unable to reach capacity.[282]

Midwest

The midwestern region produced the most vehicles in the United States at nearly 4.9 million vehicles in 2022 (table G.1). Production declined by 21.2 percent (1.3 million) between 2018 and 2022 in the region. Production fell by 18.7 percent (1.1 million vehicles) between 2019 and 2020 because of declines in demand and plant closures related to the COVID-19 pandemic. In the midwestern region, light vehicles made up the bulk of production at 99.3 percent, with heavy trucks accounting for the remaining

[279] BLS, "NAICS 336100 - Motor Vehicle Manufacturing," May 2021; BLS, "NAICS 336300 - Motor Vehicle Parts Manufacturing," May 2021; BLS, "NAICS 336200 - Motor Vehicle Body and Trailer Manufacturing," May 2021; BLS, "49-3023 Automotive Service Technicians and Mechanics," May 2021; Cooper, Hill, and Menk, "Contribution of the Automotive Industry to the Economies of All Fifty State and the United States," accessed November 8, 2022.
[280] Coffin et al., "The Roadblocks of the COVID-19 Pandemic," June 2022.
[281] Coffin et al., "The Roadblocks of the COVID-19 Pandemic," June 2022; Boudette, "Chip Shortage Makes Big Dent in Automakers' U.S. Sales," October 1, 2021.
[282] Industry representative, meeting with USITC staff, November 15, 2022.

0.7 percent in 2021; the share of production of light vehicles and heavy trucks remained steady from 2017 to 2021. Ford, General Motors (GM), and Stellantis were the largest producers in the midwestern region, making up 74.5 percent of production in 2022 (table G.2).

Table G.1 Vehicle production in the U.S. Midwest, by state and year
In units.

State	2018	2019	2020	2021	2022
Michigan	2,088,033	1,999,421	1,562,366	1,803,405	1,872,958
Indiana	1,312,535	1,272,988	1,086,535	1,175,154	1,062,857
Ohio	1,215,548	1,105,080	892,686	854,890	843,393
Missouri	760,852	745,405	566,295	457,602	586,700
Illinois	647,588	438,739	406,068	309,324	363,210
Kansas	166,527	158,296	138,689	34,933	150,253
All Midwest U.S. production	6,191,083	5,719,929	4,652,639	4,635,308	4,879,371

Sources: Ward's Intelligence, "North America Vehicle Production by State and Plant, 2017–2021," April 11, 2022, and Ward's Intelligence, "North America Production, December 2022," January 19, 2023.
Note: States are listed in descending order of 2022 production.

Table G.2 Vehicle production in the U.S. Midwest, by manufacturer and year
In units.

Manufacturer	2018	2019	2020	2021	2022
Ford	1,566,538	1,450,879	1,130,427	1,153,700	1,317,213
Stellantis	1,450,782	1,418,981	1,061,424	1,171,025	1,169,830
GM	1,459,804	1,214,936	1,114,549	997,368	1,150,313
Honda	880,671	853,170	690,361	573,140	561,802
Toyota	422,394	362,222	301,874	427,185	351,072
Subaru	359,399	368,516	314,458	269,646	286,405
Rivian	0	0	0	1,015	24,440
Spartan	13,797	13,681	12,241	17,992	17,353
Workhorse	0	0	0	160	943
International	37,698	37,544	27,305	24,077	0
All Midwest U.S. production	6,191,083	5,719,929	4,652,639	4,635,308	4,879,371

Sources: Ward's Intelligence, "North America Vehicle Production by State and Plant, 2017–2021," April 11, 2022, and Ward's Intelligence, "North America Production, December 2022," January 19, 2023.
Note: Manufacturers are listed in descending order of 2022 production.

Southeast

The southeastern region of the United States was the second-largest vehicle producer in the county, with more than 3.8 million vehicles produced in 2022 (table G.3). Production declined by 7.9 percent between 2018 and 2022. Production declined slightly from 2018 to 2019 and fell by 20.3 percent (853,000 vehicles) between 2019 and 2020 as a result of declines in demand and plant closures related to the COVID-19 pandemic.

Table G.3 Vehicle production in the Southeast United States, by state and year
In units.

State	2018	2019	2020	2021	2022
Kentucky	1,263,263	1,225,206	1,035,711	1,033,756	1,088,322
Alabama	919,480	899,992	757,036	839,824	998,599
Tennessee	863,196	797,744	538,314	487,099	549,150
South Carolina	363,006	490,493	422,081	498,546	487,834
Mississippi	395,125	388,643	306,580	327,832	378,764
Georgia	237,000	274,000	222,274	255,100	340,000
Maryland	23,664	27,432	15,492	22,765	0
North Carolina	65,092	64,103	41,691	53,979	0
Virginia	31,686	34,993	16,593	24,912	0
West Virginia	10,479	10,470	4,012	695	0
All southeast U.S. production	4,171,991	4,213,076	3,359,784	3,544,508	3,842,669

Sources: Ward's Intelligence, "North America Vehicle Production by State and Plant, 2017–2021," April 11, 2022, and Ward's Intelligence, "North America Production, December 2022," January 19, 2023.
Note: States are listed in descending order of 2022 production.

Table G.4 Vehicle production in the Southeast United States, by manufacturer and year
In units.

Manufacturer	2018	2019	2020	2021	2022
Ford	811,902	766,221	623,277	559,544	604,853
Toyota	566,332	601,823	531,944	566,499	577,820
Nissan	835,321	763,036	431,069	451,788	538,750
BMW	356,749	411,620	361,361	433,748	416,301
Kia	237,000	274,000	222,274	255,100	340,000
Hyundai	322,500	336,000	268,635	291,406	332,832
Mercedes	235,508	247,724	243,014	294,789	316,993
Honda	361,472	351,874	276,087	283,184	270,106
GM	181,009	172,819	166,469	131,425	166,260
Toyota/Mazda	0	0	0	12,303	133,915
Volkswagen	127,020	107,694	127,846	139,431	128,553
Volvo	6,257	43,267	30,020	22,940	16,286
Freightliner	65,092	64,103	41,691	53,979	0
Hino	10,479	10,470	4,012	695	0
Mack	23,664	27,432	15,492	22,765	0
Volvo Truck	31,686	34,993	16,593	24,912	0
All southeast U.S. production	4,171,991	4,213,076	3,359,784	3,544,508	3,842,669

Sources: Ward's Intelligence, "North America Vehicle Production by State and Plant, 2017–2021," April 11, 2022, and Ward's Intelligence, "North America Production, December 2022," January 19, 2023.
Note: Manufacturers are listed in descending order of 2022 production.

Rest of the United States

The largest vehicle manufacturers in the rest of the United States were GM, Toyota, and Tesla. In the rest of the United States, production increased by nearly 14.3 percent between 2018 and 2022. Tesla's electric vehicle production in California increased rapidly between 2017 and 2019 at 260.7 percent (263,000 vehicles). Production shutdowns at Tesla's plant in Fremont, California, related to the COVID-19 pandemic led to a slight decline in production in 2020 (table G.5).[283] Tesla was able to recover,

[283] O'Kane, "Tesla Kept Global Sales and Production Up," April 2, 2020.

however, with production increasing by 69.7 percent (248,675 vehicles) between 2020 and 2022 at plants in California and Texas. Tesla's increased production was due, in part, to rising demand for electric vehicles in China, Europe, and the United States.[284] During the same time period, GM increased production in the region by 47.2 percent and Toyota decreased production at its Texas plant by 25.8 percent (table G.6).

Table G.5 Vehicle production in the rest of the United States, by state and year
In units.

State	2018	2019	2020	2021	2022
Texas	637,013	549,993	420,571	502,732	546,921
California	254,532	364,397	356,780	439,433	514,174
Other (state not listed)	0	0	0	0	230,615
Arizona	0	0	0	630	6,041
Washington	42,178	45,469	28,713	34,594	0
All rest of the U.S. production	933,723	959,859	806,064	977,389	1,297,751

Sources: Ward's Intelligence, "North America Vehicle Production by State and Plant, 2017–2021," April 11, 2022, and Ward's Intelligence, "North America Production, December 2022," January 19, 2023.
Note: States are listed in descending order of 2022 production.

Table G.6 Vehicle production in the rest of the United States, by manufacturer and year
In units.

Manufacturer	2018	2019	2020	2021	2022
Tesla	254,532	364,397	356,780	441,156	605,455
GM	345,402	275,423	223,870	330,112	329,451
Other (manufacturer not listed)	0	0	0	0	230,615
Toyota	252,889	230,916	170,109	137,185	126,189
Lucid	0	0	0	630	6,041
Kenworth	42,178	45,469	28,713	34,594	0
Peterbilt	38,722	43,654	26,592	33,712	0
All rest of the U.S. production	933,723	959,859	806,064	977,389	1,297,751

Sources: Ward's Intelligence, "North America Vehicle Production by State and Plant, 2017–2021," April 11, 2022, and Ward's Intelligence, "North America Production, December 2022," January 19, 2023.
Note: Manufacturers are listed in descending order of 2022 production.

Mexico

Mexico was the seventh-largest global producer of passenger vehicles in 2022.[285] The automotive industry in Mexico comprised 3.5 percent of the country's GDP and 20 percent of the manufacturing GDP and employed more than 1 million people. Major vehicle producers in Mexico included BMW, Ford, GM, Honda, Kia, Nissan, Mazda, Stellantis, Toyota, and Volkswagen. Vehicle production in Mexico saw steady decreases between 2018 and 2022. Toyota, however, moved U.S. production of one of its light trucks—the Tacoma—to Guanajuato, Mexico, resulting in the slight uptick of Mexican production in 2022.[286]

Between 2018 and 2022, total vehicle production in Mexico fell by 19.7 percent (808,000 vehicles), with a 20.8 percent (830,000 vehicles) decline between 2019 and 2020 (table G.7). Nissan realized the largest

[284] Boudette, "Tesla Reports 87% Increase in 2021 Deliveries - The New York Times," January 2, 2022.
[285] International Trade Administration, "Mexico - Automotive Industry," September 23, 2022.
[286] Wayland, "Toyota Shifts Tacoma Pickup Production from Texas to Mexico," January 17, 2020.

decline by value and percentage change at 386,000 vehicles (52.7 percent) from 2018 to 2022, followed by Stellantis at 224,000 vehicles (35.1 percent). Production in the Mexican automotive industry declined due to production shutdowns related to the onset of the COVID-19 pandemic and has not recovered to pre-pandemic numbers. Additionally, the global semiconductor shortage prompted Mexican automotive producers to shut down production at key plants in 2021, causing further production declines.

Vehicle production in Mexico primarily consisted of light vehicles, with 3.3 million vehicles produced in 2022 (table G.7).[287] Mexico also produced nearly 210,000 heavy trucks in 2022.[288] Declines in exports and domestic demand led to decreases in passenger vehicles production in Mexico.[289] From 2018 to 2022, Mexico increased heavy truck production by 7.6 percent (14,751 vehicles).

Table G.7 Vehicle production in Mexico, by manufacturer and year

In units.

Manufacturer	2018	2019	2020	2021	2022
GM	835,212	864,104	728,768	518,175	743,246
Volkswagen	608,471	600,075	422,927	431,908	479,865
Stellantis	639,022	560,141	442,107	406,973	414,952
Nissan	733,932	624,494	479,716	495,071	347,116
Ford	280,508	249,624	135,571	223,603	303,481
Toyota	190,010	192,952	169,305	221,942	267,785
Kia	295,900	286,600	206,800	219,700	264,500
Other (manufacturer not listed)	8,005	7,760	4,520	6,820	187,215
Mazda	149,589	91,830	138,855	127,293	148,098
Honda	147,521	204,415	128,557	152,291	126,306
COMPAS	40,887	90,408	113,015	100,204	108,619
BMW	0	24,755	55,832	68,919	63,465
JAC	2,954	4,747	3,782	3,126	17,074
Freightliner	99,216	107,851	76,940	99,142	0
International	53,842	64,053	40,900	46,846	0
Kenworth	15,701	18,674	11,253	13,008	0
All Mexico production	4,100,770	3,992,483	3,158,848	3,135,021	3,472,222

Sources: Ward's Intelligence, "North America Vehicle Production by State and Plant, 2017–2021," April 11, 2022, and Ward's Intelligence, "North America Production, December 2022," January 19, 2023.

Notes: Manufacturers are listed in descending order of 2022 production. Heavy truck producers include the "other (manufacturer not listed)" category in addition to Freightliner, International, Kenworth, and a small share of Stellantis' production. In 2022, Stellantis produced 21,600 heavy truck vehicles. All other production in this table is light vehicles.

Canada

Canada was one of the top 12 global producers of light vehicles in 2022. Global original equipment manufacturers Ford, GM, Honda, Stellantis, and Toyota, along with Hino, Multimatic, and Kenworth, assembled more than 1.2 million vehicles at their Canadian plants in 2022. The automotive industry was one of Canada's largest manufacturing industries, contributing $12.5 billion to GDP in 2020.[290] The

[287] Ward's Intelligence, "North America Vehicle Production, December 2022," January 19, 2023

[288] Heavy truck production in table G.7 is included in the "other (manufacturer not listed)" category in addition to Freightliner, International, Kenworth, and a small share of Stellantis' production. In 2022, Stellantis produced 21,600 heavy truck vehicles.

[289] Garduno, "Mexican Light Vehicle Production Increases," March 4, 2022.

[290] Government of Canada, "Canadian Automotive Industry," accessed November 7, 2022.

Canadian automotive industry employed 117,200 people in 2020, with an additional 371,400 people in aftermarket services and dealership networks.[291] Automotive production in Canada decreased between 2018 and 2022, with Stellantis seeing the largest decline at 220,000 vehicles (44.2 percent), followed by GM at 202,000 (59.9 percent) (table G.8).

With more than 80 percent of Canada's automotive exports going to the United States, the Canadian automotive industry relied on U.S. demand to fuel auto sales.[292] Coming off the 2008 financial crisis, demand for vehicles increased in the United States, resulting in growth of the Canadian industry, but sales began to slow in 2017 as demand was satisfied.[293]

Canada's vehicle production consisted primarily of light vehicles, with 1.2 million vehicles produced in 2022 along with a small number of heavy trucks. Production for all vehicles decreased between 2018 and 2022, at 39.3 percent (808,000 vehicles). During the same period, heavy trucks decreased by 46.6 percent (9,800 vehicles) and light vehicles decreased by 39.8 percent (798,000 vehicles).

Table G.8 Vehicle production in Canada, by manufacturer and year
In units.

Manufacturer	2018	2019	2020	2021	2022
Toyota	497,354	468,002	427,321	427,058	432,984
Stellantis	499,152	444,559	305,041	242,186	278,749
Honda	432,771	407,764	355,513	292,189	240,536
GM	337,853	318,999	128,497	36,869	135,371
Ford	237,446	253,699	145,322	103,944	129,969
Other (manufacturer not listed)	0	0	0	0	11,203
Nissan	0	0	0	0	228
Hino	3,465	3,499	861	41	0
Kenworth	17,501	19,812	13,362	12,463	0
Multimatic	252	251	210	252	0
All Canada production	2,025,794	1,916,585	1,376,127	1,115,002	1,229,040

Source: Ward's Intelligence, "North America Vehicle Production by State and Plant, 2017–2021," April 11, 2022, and Ward's Intelligence, "North America Production, December 2022," January 19, 2023.
Note: Manufacturers are listed in descending order of 2022 production. Heavy truck producers include the "other (manufacturer not listed)" category in addition to Hino and Kenworth. All other production in this table is light vehicles.

Trade in U.S. Vehicles and Vehicle Parts

U.S. Vehicle Imports

The value of U.S. light vehicle imports declined in 2020 but rebounded in 2021 and 2022 (table G.9).[294] However, the imported quantity of vehicles still lagged behind 2018–19 levels, despite a small increase

[291] Government of Canada, "Canadian Automotive Industry," accessed November 7, 2022.
[292] Layson, "Canada's Auto Production Faces Decreasing U.S. Demand," January 10, 2018.
[293] Layson, "Canada's Auto Production Faces Decreasing U.S. Demand," January 10, 2018.
[294] USITC DataWeb/Census, HTS Statistical reporting number 8703.21, 8703.22, 8703.23, 8703.24, 8703.31, 8703.32, 8703.33, 8703.40, 8703.50, 8703.60, 8703.70, 8703.80, 8703.90, 8704.21, 8704.31, accessed March 1, 2023.

in 2022 to 6.9 million vehicles (table G.10).[295] The top five sources of U.S. imports by value were Mexico, Japan, Canada, South Korea, and Germany.

Table G.9 Value of U.S. imports of light vehicles, by source and year
In billions of dollars.

Source	2018	2019	2020	2021	2022
Mexico	53.6	59.4	48.7	52.9	58.3
Japan	40.4	39.1	32.3	32.7	32.8
Canada	39.6	39.6	29.2	25.1	28.5
South Korea	13.8	15.9	16.2	17.4	21.8
Germany	18.6	17.8	12.4	15.2	19.5
All other sources	29.4	28.4	23.5	25.5	28.9
Total imports	195.4	200.2	162.3	168.9	189.9

Source: USITC DataWeb/Census, general imports, list of HS subheadings corresponding to light vehicles in appendix F, accessed March 21, 2023.
Note: Source countries are listed in descending order of 2022 value.

Mexico was the top source of light vehicles imports into the United States, followed by Japan and Canada, between 2018 and 2022 (table G.10). Mexico and Canada—which both neighbor the United States and are members of the USMCA—contributed 45.7 percent of total imports in 2022. Between 2018 and 2022, imports from Mexico increased by $4.7 billion (8.8 percent) to $58.3 billion, although they are still below 2019 levels. Imports from Canada experienced a decline between 2018 and 2022, decreasing by $11.1 billion (28.0 percent).

Table G.10 Quantity of U.S. imports of light vehicles, by source and year
In units.

Source	2018	2019	2020	2021	2022
Mexico	2,772,796	2,907,716	2,309,831	2,299,616	2,386,526
Japan	1,731,649	1,737,987	1,409,530	1,355,131	1,312,698
Canada	1,708,489	1,646,582	1,198,404	958,924	1,047,159
South Korea	831,209	916,613	874,236	826,500	939,715
Germany	459,983	414,447	287,294	299,885	338,308
All other sources	1,163,771	1,004,401	1,006,990	1,020,254	900,446
Total imports	8,667,897	8,627,746	7,086,285	6,760,310	6,924,852

Source: USITC DataWeb/Census, general imports, list of HS subheadings corresponding to light vehicles in appendix F, accessed March 21, 2023.
Note: Source countries are listed in descending order of 2022 value.

U.S. Vehicle Parts Imports

U.S. automotive parts imports declined in 2020 but have increased by $53.9 billion (41.3 percent) from 2020 to 2022 to $184.4 billion (table G.11). The increase in imports of automotive parts was largely due to a strong performance in the vehicle repair and maintenance industry. Supply chain disruptions, such

[295] For context, sales of motor vehicles decreased from 17.5 million vehicles in 2019 to 14.2 million vehicles in 2022; domestic production increased from 9.2 million vehicles in 2021 to 10.1 million vehicles in 2022. USITC DataWeb/Census, HTS statistical reporting numbers 8703.21, 8703.22, 8703.23, 8703.24, 8703.31, 8703.32, 8703.33, 8703.40, 8703.50, 8703.60, 8703.70, 8703.80, 8703.90, 8704.21, 8704.31, 8704.51, accessed March 1, 2023; OICA, "Sales of New Vehicles," accessed October 11, 2022; OICA, "World Motor Vehicle Production," accessed October 10, 2022.

as the semiconductor shortage, resulted in higher vehicle prices and longer ownership of existing vehicles, which led to greater demand for repair services. This repair-focused demand drove the increase in imports of vehicle parts.[296]

Table G.11 Value of U.S. imports of vehicle parts, by source and year
In billions of dollars.

Source	2018	2019	2020	2021	2022
Mexico	58.8	60.3	51.2	60.1	69.7
Canada	20.0	15.4	11.3	15.1	18.5
China	17.2	16.8	14.0	16.4	18.4
Japan	16.1	14.8	12.0	14.9	16.3
South Korea	8.8	9.4	8.1	10.2	13.6
All other sources	36.5	37.8	33.9	42.4	47.8
Total imports	157.3	154.6	130.5	159.1	184.4

Source: USITC DataWeb/Census, general imports, list of HTS statistical reporting numbers corresponding to vehicle parts in appendix F, accessed March 21, 2023.
Note: Source countries are listed in descending order of 2022 value.

U.S. Vehicle Exports

U.S. vehicle exports declined in 2020 but increased by $13.8 billion (24.7 percent) from 2020 to 2022 to $69.7 billion (table G.12), surpassing pre-pandemic levels. Part of the increase in the value of exports, however, was explained by the rise in unit values for motor vehicles in recent years. The increase in the quantity of vehicles exported over the last few years was smaller, increasing by just under 280,000 vehicles (11.8 percent) from 2020 to 2022 (table G.13). In fact, the quantity of vehicles exported in 2022 was still lower than pre-pandemic levels. Meanwhile, the unit value of vehicles exported from United States increased by over $2,700 per vehicle from 2020 to 2022. As indicated in the previous section, supply chain disruptions, notably a shortage of imported semiconductors, impacted vehicle production levels during a time of rising demand worldwide subsequent to the onset of the COVID-19 pandemic, and these shortages also led to higher costs.[297]

[296] USITC, "Transportation Equipment," *Trade Shifts 2020*. For a more complete discussion of the semiconductor shortage's effect on the U.S. automotive industry, as well as other external factors impacting the automotive industry, see chapter 1 of this report.
[297] USITC, "Transportation Equipment," *Trade Shifts 2020*. For a more complete discussion of the COVID-19 pandemic and semiconductor shortage's effect on the U.S. automotive industry, as well as other external factors impacting the automotive industry, see chapter 1 of this report.

Table G.12 Value of U.S. exports of light vehicles, by destination and year
In billions of dollars.

Destination market	2018	2019	2020	2021	2022
Canada	23.6	24.7	19.3	23.3	26.0
Germany	5.9	7.1	6.8	7.7	7.6
China	6.8	7.4	6.2	6.6	5.6
Mexico	3.5	3.5	2.3	3.2	4.0
South Korea	1.7	1.9	2.6	3.2	3.9
All other destination markets	19.9	24.1	18.8	21.9	22.5
Total exports	61.4	68.7	55.9	66.0	69.7

Source: USITC DataWeb/Census, total exports, list of HS subheadings corresponding to light vehicles in appendix F, accessed March 21, 2023.
Note: Source countries are listed in descending order of 2022 value.

Table G.13 Quantity of U.S. exports of light vehicles, by destination and year
In units.

Destination market	2018	2019	2020	2021	2022
Canada	916,053	933,513	684,935	752,114	793,897
United Arab Emirates	174,665	191,291	129,911	144,379	226,275
Mexico	197,101	193,932	129,833	170,863	195,920
Germany	184,152	197,921	170,201	192,095	183,712
China	171,773	198,781	144,707	159,292	121,960
All other destination markets	1,086,321	1,340,628	1,097,747	1,292,414	1,114,614
Total exports	2,730,065	3,056,066	2,357,334	2,711,157	2,636,378

Source: USITC DataWeb/Census, total exports, list of HS subheadings corresponding to light vehicles in appendix F, accessed March 21, 2023.
Note: Source countries are listed in descending order of 2022 value.

U.S. Vehicle Parts Exports

U.S. vehicle parts exports decreased in 2020, but exports increased by $13.1 billion (19.6 percent) from 2020 to 2022 (table G.14). Despite this increase, the 2022 total ($79.9 billion) still lagged behind pre-pandemic levels. Nearly 40 percent of U.S. automotive part exports went to Mexico in 2022, accounting for 55.6 percent of the annual increase of the total value of U.S. exports of automotive parts.[298]

Table G.14 Value of U.S. exports of vehicle parts, by destination and year
In billions of dollars.

Destination market	2018	2019	2020	2021	2022
Mexico	32.5	33.1	24.7	28.0	33.0
Canada	30.6	29.3	21.7	21.2	24.5
China	3.6	2.5	3.2	3.0	2.6
Germany	2.5	2.2	1.7	1.9	2.1
Brazil	1.8	1.4	1.1	1.3	1.4
All other destination markets	17.8	17.1	14.4	15.4	16.2
Total exports	88.8	85.6	66.8	70.9	79.9

Source: USITC DataWeb/Census, total exports, list of Schedule B statistical reporting numbers corresponding to vehicle parts in appendix F, accessed March 21, 2023.
Note: Source countries are listed in descending order of 2022 value.

[298] USITC DataWeb/Census, HTS codes used from the U.S. Department of Commerce-published automotive parts list.

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Appendix H
Recent Literature on the Economic Impacts of the USMCA Automotive ROOs

Introduction

Since 2019, researchers and policy analysts have published numerous studies and articles that examine the United States-Mexico-Canada Agreement (USMCA) automotive rules of origin (ROOs) and their likely economic impacts. This appendix provides a critical review of this literature and is broken up into three parts: reports required by the USMCA Implementation Act (the Act), other qualitative analyses, and other quantitative estimates. Much of the literature reviewed in this appendix is based on analysis conducted in 2019 and 2020 and describes the potential for changes to the U.S. automotive industry and automotive imports as U.S., Mexican, and Canadian producers worked to comply with the new requirements. Researchers estimate the effects and describe implications for the automotive supply chain, prices, consumption, and firm competitiveness.

Reports Required by the Act

Two reports that were mandated as part of the Act have been released to date. The Congressional Budget Office (CBO) issued a cost estimate of implementing legislation for the USMCA (H.R. 5430) in 2019.[299] It projected that total U.S. government revenue would be $3 billion higher during the next decade and attributed this primarily to an expected increase in tariff revenues on motor vehicles and parts. The CBO estimated that the more stringent USMCA automotive ROOs and new LVC requirements would lead to a decline of duty-free imports of vehicles and parts, with increases in both domestic production and imports subject to duties.[300]

In 2022, the Office of the U.S. Trade Representative (USTR) submitted its first biennial report to Congress on vehicle trade under the Act.[301] USTR drew on input from vehicle producers, labor organizations, associations, other stakeholders, and in consultation with the Interagency Committee on Trade in Automotive Goods. USTR reported that the USMCA is in the early stages of implementation and, thus, detailed information about the operation of the ROOs and their effects is limited.[302] USTR reported that U.S. vehicle manufacturers and some parts manufacturers made significant investments to comply with the ROOs during the two and a half years after the USMCA entered into force, despite significant costs and administrative burdens. Some parts suppliers, however, viewed the additional costs and administrative burden as too high and opted out of certifying their goods as originating, even if the goods might technically qualify.[303] The report stated that these investments are evidence of the relevancy and effectiveness of the ROOs.[304]

[299] CBO, "CBO Estimate for H.R. 5430," December 16, 2019.
[300] Note that the estimated change in revenue also includes a small reduction in tariff revenues collected on agricultural imports from Canada, so the automotive specific impact is likely larger than the $3 billion total. CBO, "CBO Estimate for H.R. 5430," December 16, 2019.
[301] USTR is required to submit a biennial report to Congress on vehicle trade under the USMCA (19 U.S.C. § 4532(g)(1)); USTR, *Report to Congress on USMCA Trade in Automotive Goods*, July 1, 2022.
[302] USTR, *Report to Congress on USMCA Trade in Automotive Goods*, July 1, 2022, 1.
[303] USTR, *Report to Congress on USMCA Trade in Automotive Goods*, July 1, 2022, 9–10.
[304] USTR, *Report to Congress on USMCA Trade in Automotive Goods*, July 1, 2022, 12.

Qualitative Analyses

Several qualitative analyses by the U.S. government and academic sources examine the expected impact of the USMCA on investment, employment, production, sales, and trade in the automotive industry. A USTR white paper (2019) provided the most positive assessment of the agreement, using aggregated information provided by North American vehicle manufacturers. That paper stated that the USMCA automotive ROOs would lead to new capital investments of $34 billion over five years, an increase in U.S. vehicle parts purchases of $23 billion per year, and the creation of 76,000 full-time equivalent jobs.[305] USTR also reported that vehicle and parts manufacturers expected the ROOs would not affect U.S. vehicle prices or global competitiveness of the U.S. vehicle industry, as long as vehicle manufacturers qualify for alternative staging.[306]

Reinsch, Caporal, Waddoups, and Tekarli (2019) conducted a qualitative assessment analyzing the probable impacts of the ROOs on supply chains and the resulting implications for the U.S. vehicle and parts industry.[307] The authors found that the more stringent ROOs would lead to producers shifting toward less efficient supply chains to comply with the USMCA, which would have mixed economic impacts.[308] They also expected additional investments in production capacity; expanded opportunities in research and development, assembly, and other areas of the U.S. vehicle industry; and benefits for the steel and aluminum industries in the United States.[309] They reported that the ROOs, however, would increase production costs and reduce funds for research and development at a pivotal time when vehicle manufacturers need to invest in electric vehicle (EV) technology to keep up with foreign producers.[310] The authors further stated that vehicle manufacturers need greater flexibility to meet the more stringent ROOs, especially for components that are not yet domestically produced in sufficient quantities and must be largely imported. They concluded that the more stringent ROOs will likely increase North American content in North American vehicle production but dampen the global competitiveness of the U.S. and North American vehicle industries.[311]

Lovely and Schott (2019) found that the new regulatory mandates, specifically in the automotive industry, will restrict trade and negatively impact the U.S. industry. Specifically, they concluded that the heightened ROOs would raise production costs, resulting in higher consumer prices, reduced U.S. demand, lower automotive exports, and a more rapid shift toward automation.[312]

An article by Schott, Hufbauer, and Robinson (2021) noted that the more stringent ROOs likely will be detrimental to the competitiveness of the U.S. vehicle industry. Like Reinsch, the authors expected supply chains to become more managed and less efficient. They also reported that the resulting higher

[305] USTR, *Estimated Impact of the USMCA on the U.S. Automotive Sector*, April 18, 2019, 2.
[306] USTR, *Estimated Impact of the USMCA on the U.S. Automotive Sector*, April 18, 2019, 2.
[307] Bill Reinsch also attended the USITC's hearing for this report.
[308] Reinsch et al., *The Impact of Rules of Origin on Supply Chains*, April 4, 2019, 27.
[309] Reinsch et al., *The Impact of Rules of Origin on Supply Chains*, April 4, 2019, 29.
[310] Reinsch et al., *The Impact of Rules of Origin on Supply Chains*, April 4, 2019, 38–39.
[311] Reinsch et al., *The Impact of Rules of Origin on Supply Chains*, April 4, 2019, 36.
[312] Lovely, Schott, "The USMCA: New, Modestly Improved, but Still Costly," December 17, 2019.

production costs will prompt some Mexican truck manufacturers to operate in the United States and will lead some vehicle manufacturers to produce outside North America.[313]

A forward-looking report by Dollar (2022) on the USMCA and North America contained some analysis of the ROOs in its chapters. In the supply chain chapter, Dollar stated that the main changes to the agreement were an increase in RVC requirements. He also stated that LVC requirements limit Mexico's share of automotive value added.[314] In the competition chapter, Luis F. de la Calle stated that the ROOs might be too strict with regard to EVs.[315]

A 2021 paper by the Congressional Research Service (CRS) discussed the USMCA agreement in detail, as well as the negotiation and implementation processes. In discussing the implementation of the USMCA, it identified "key issues," two of which were (1) whether the ROOs are being implemented as planned and (2) how the North American automotive industry is being affected by the more stringent ROOs.[316] These concerns were primarily related to the core parts dispute, which had been recently announced at the time.[317] Other articles by the CRS in 2021 and 2022 are similarly descriptive; they presented background information and details about the agreement and the ROOs, discussed outstanding issues (the core parts dispute, alternative staging, EV tax credits), and referenced the findings and opinions of economists and industry experts.[318]

Quantitative Estimates

Literature analyzing the economic impacts of the USMCA automotive ROOs is limited. Approaches vary to estimating the effects of the ROOs and competing assumptions about the share of vehicle and parts manufacturers that would prioritize compliance with the new requirements and therefore shift production to the United States (or North America) as a result. At the same time, the literature consistently finds that the ROOs would affect the supply chains, consumption, and competitiveness of the U.S. and North American vehicle and parts industries. Several academics and government agencies used models to generate quantitative estimates of the effects of the ROOs.

Ciuriak, Dadkhah, and Xiao (2020) used a computable general equilibrium (CGE) model to assess the probable impacts of (1) the USMCA on North American trade and (2) the ROOs on production, imports, exports, and domestic shipments in Canada, Mexico, and the United States.[319] The model projected a rise in prices and costs as well as a decline in production in the United States, with an overall negative impact on the U.S. economy of 0.1 percent.[320] Impacts on the U.S. vehicle industry included a decline in total imports of $3.5 billion (2.9 percent) and increases in total exports of $1.9 billion (2.2 percent),

[313] Schott et al., "The Future of North American Economic Integration," Implement. USMCA Test N. Am., January 2021.
[314] Dollar, "Mexico's Evolving Role in Global Supply Chains," February 28, 2022.
[315] de la Calle, "A Truly Competitive North America," February 28, 2022.
[316] Villarreal, *The United States-Mexico-Canada Agreement* (*USMCA*), December 28, 2021.
[317] For more information on the core parts dispute, see chapter 1.
[318] Villarreal, Canis, and Wong, "USMCA: Motor Vehicle Provisions and Issues," October 14, 2021; Wong and Villarreal, "USMCA: Motor Vehicle Rules of Origin," April 21, 2022.
[319] The CGE model is based on a dynamic specification of the Global Trade Analysis Project v10 dataset with a base year of 2014. The impact of the USMCA is assessed against a baseline that reflects an in-force NAFTA.
[320] Ciuriak, Dadkhah, and Xiao, "Quantifying the USMCA," February 21, 2020, 7, 14, 26, 27.

domestic shipments of $16.6 billion (46.4 percent), and total shipments of $18.5 billion (14.9 percent), annually.[321] The authors found that, although the ROOs would increase industry activity in the United States, the ROOs would adversely affect U.S. economic welfare and efficiency.[322]

A study by Hsu and Li (2022) examined the effectiveness of RVC requirements in persuading domestic firms to reshore or nearshore sourcing and manufacturing activities. The study, which focused on the impact of the ROOs, identified ROOs-related changes in supply chains of goods commonly imported by vehicle and parts manufacturers. The authors reported that, after implementation of the agreement, U.S. vehicle and parts manufacturers shifted supply chains at both the country level and the firm level.[323] They found evidence of nearshoring and, to a lesser extent, reshoring. U.S. manufacturers (1) reduced total imports of relevant goods, suggesting a reshoring of some supply chains to comply with the stricter ROOs and (2) increased the proportion of imports of relevant goods from Mexico and Canada.[324] The authors also found that supply chain fragmentation increased among Mexican and Canadian suppliers to U.S. manufacturers, but not for suppliers from other countries.[325]

According to Powers and Ubee (2020), recent U.S. trade agreements tend to use change in tariff classification ROOs for most goods.[326] For motor vehicles, however, RVC requirements are more common.[327] Powers and Ubee also compared different estimates of the effect of the ROOs, with the USITC and the Center for Automotive Research using model-level analysis to predict increased prices. Burfisher et al. used the Global Trade Analysis Project and a series of assumptions that predicted a greater decline in production.[328]

[321] Ciuriak, Dadkhah, and Xiao, "Quantifying the USMCA," February 21, 2020, 40.
[322] Ciuriak, Dadkhah, and Xiao, "Quantifying the USMCA," February 21, 2020, 1.
[323] Hsu, Wu, Jing, and Li, Zhi, "Keeping Your Friends," November 19, 2022, 3–4.
[324] Hsu, Wu, Jing, and Li, Zhi, "Keeping Your Friends," November 19, 2022, 15–18.
[325] Hsu, Wu, Jing, and Li, Zhi, "Keeping Your Friends," November 19, 2022, 19.
[326] Powers and Ubee, "A Comprehensive Comparison of Rules of Origin in U.S. Trade Agreements," May 2020, 9.
[327] Powers and Ubee, "A Comprehensive Comparison of Rules of Origin in U.S. Trade Agreements," May 2020, 13.
[328] Powers and Ubee, "A Comprehensive Comparison of Rules of Origin in U.S. Trade Agreements," May 2020, 15–16.

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Appendix I
Economic Modeling

Introduction

This appendix provides a technical description of the economic simulation model used to estimate the impact of the USMCA automotive ROOs, the results for which are presented in chapter 2. It also includes an analysis of the sensitivity of model estimates to underlying modeling assumptions and a discussion of additional limitations of the model.

Econometric Estimation of the Elasticity of Substitution

The elasticity of substitution is a model parameter that describes how consumers shift sourcing between vehicles produced in the United States and imported vehicles after a change in relative prices. A higher value means that the products are more substitutable, or less differentiated. It is an important parameter in trade policy models because the magnitude can significantly impact estimated effects.

The substitution elasticity used in the model was estimated using the trade cost method described in Riker (2020).[329] The method uses variation in international trade costs, such as freight costs and tariffs, to identify the elasticity of substitution across sources of light vehicles within each market segment. Annual panel import data from 2021 were obtained from USITC DataWeb/Census and were disaggregated by product, source country, customs district of import entry, and year. The measure for international trade costs is the ratio between the landed duty-paid value of imports and the customs value and includes international freight costs, tariffs, and other import charges. The estimation uses country-year and district-year fixed effects to control for variation in prices and other factors, including the price index, producer prices, and total expenditures. The estimated elasticity of substitution for light vehicles is 7.58.[330]

Description of the Economic Model

The first step of the estimation analyzed two types of adjustment based on observed data attributed to the USMCA automotive ROOs. The first type is changes in the tariffs collected on trade in vehicles among USMCA countries. This analysis is based on a review of confidential data on vehicle imports of individual manufacturers, including duties paid on these imports. It examines whether the U.S. imports of passenger vehicles and light trucks from Canada or Mexico utilized the USMCA tariff preferences in 2022. For example, if confidential data indicate that a specific vehicle manufacturer imported vehicles into the United States and duties were collected, and data on the sourcing of its vehicle models indicate that one of the vehicle models sourced its engines and transmissions from Japan, then the model assumes that tariffs were paid on U.S. imports of that vehicle model.

[329] Riker, "A Trade Cost Approach to Estimating the Elasticity of Substitution," Off. Econ. Work. Pap. 2022-07-D, July 2020.
[330] The standard error for the 7.58 elasticity of substitution for light vehicles is 2.15 and the 95 percent confidence intervals is 3.35 to 11.80.

The second type of adjustment is changes in sourcing due to the ROOs. This analysis examines whether sourcing of engines, transmissions, steel, and aluminum for each specific vehicle shifted to USMCA countries between 2018 and 2022.[331] The analysis only attributes to the ROOs observed shifts in sourcing of parts and materials to USMCA suppliers if the majority of the sales of the USMCA production of the specific vehicle model crossed national borders within USMCA countries and, therefore, could have benefited from the USMCA tariff preferences.[332] This analysis is based on shifts in sourcing of engines and transmissions recorded in the American Automotive Labeling Act reports at the level of 331 individual vehicle models. The analysis also uses confidential data regarding sourcing (e.g., of steel and aluminum) from vehicle manufacturers. Specifically, the analysis is based on 2022 data on sales, pricing, production, parts and materials sourcing, and patterns of trade of light vehicles produced and sold in USMCA countries, including detailed confidential data on sourcing by individual vehicle manufacturers. The analysis examines whether the sourcing of engines, transmissions, steel, and aluminum for each specific vehicle model shifted to USMCA countries between 2018 and 2022.

For example, if American Automotive Labeling Act reports indicate that a specific vehicle model produced in Canada shifted the sourcing of its engines and transmission from Japan to the United States between 2018 and 2022 and more than half of the sales of the specific vehicle model were exported from Canada to the United States, then the model assumes that the shift in sourcing, and the resulting change in cost of production for that specific vehicle model, is attributable to the ROOs.

The second step of the analysis uses an economic simulation model with multiproduct firms.[333] The model builds on the first step described in chapter 2. Each vehicle manufacturer sets the prices of its car or truck models on the basis of changes in the tariffs its faces, its costs of production, and the price responses of its competitors within the same industry segment.[334]

The economic simulation model assumes that the market for passenger vehicles and light trucks in the United States-Mexico-Canada Agreement (USMCA) countries is segmented by country and by vehicle class. Two national markets are included in the industry-specific economic simulation models: the United States and Canada.

[331] The analysis of changes in the sourcing of core parts is limited to engines and transmissions because of data availability.

[332] Majority of sales is a proxy for the importance of trade in USMCA sales of a particular vehicle model. As a sensitivity analysis of this specific assumption, Appendix I provides another complete set of model estimates based on an alternative, less restrictive assumption that attributes all observed shifts in sourcing to USMCA countries to the USMCA automotive ROOs, regardless of whether the specific vehicle models crossed national borders within USMCA countries. The signs of some of the estimated effects switch under this alternative assumption, though the industry-level effects are still small enough that no significant economy-wide effects occurred during the first two and a half years after entry into force.

[333] The model is an extension of the model in USITC, "U.S.-Mexico-Canada Trade Agreement: Likely Impact on the U.S. Economy and on Specific Industry Sectors," 2019.

[334] The equations of the model used in this report are similar to equations underlying the ROOs model in "U.S.-Mexico-Canada Trade Agreement: Likely Impact on the U.S. Economy and on Specific Industry Sectors," 2019 and also to the equations in the Bertrand-Nash oligopolistic competition model in Montgomery and Riker, "Modeling Tariff Policy in Concentrated Markets with Cross Border Ownership," Off. Econ. Work. Pap. 2020-01-A, January 2020. In these models, each company sells multiple products, in this case vehicle models, and faces CES demand and Bertrand price competition. The companies choose their prices to jointly maximize profits from the revenue streams associated with the different brands.

The demands for the differentiated vehicle models are represented by linear demand curves, with price coefficients calibrated to the econometric estimate of the elasticity of substitution. The economic simulation model assumes separability of demand across the eight industry segments to reduce computational complexity. Within each industry segment, Bertrand-Nash oligopolistic competition exists among the vehicle manufacturers, so each firm chooses its own prices (for its multiple vehicle models) to maximize its profits across all its vehicle models, taking the prices of its competitors as given.[335] Vehicle manufacturers choose prices for multiple vehicle models to maximize joint profits across their vehicle models, taking the prices of competitors as given. The economic simulation model assumes a fixed number of products competing in each industry segment and that pricing decisions are separable across the industry segments and national markets. This helps reduce computational complexity.

The marginal cost of producing each vehicle model is assumed to be constant and is calibrated to prices and market shares in 2022, using the first-order conditions from the manufacturers' profit-maximizing pricing, because these marginal costs are not directly measured in available data.[336] Some manufacturers respond to the USMCA automotive ROOs by adjusting their sourcing of core parts, specifically engines and transmissions.[337] A shift to sourcing from the USMCA parties increases their costs of vehicle production. The simulated changes in equilibrium prices imply changes to vehicle sales, international trade, production, wage payments, sales, employment, capital expenditures, profits, and inventories.[338]

For steel and aluminum, price differentials are based on a comparison of the average domestic price for the past two and a half years to the average import price during the same time period. For engine and transmission price differentials (North American compared to non-North American), the model compares the unit value of U.S. imports from Canada and Mexico to imports from all other sources, by type of engine or transmission, and then concords those to different types of vehicles.

This report has several improvements over the industry segment-specific economic simulation model in the Commission's prior modeling analysis of the ROOs in its 2019 report.[339] The economic simulation model in this report divides the light vehicle industry into eight product segments instead of four.[340] It adds shifts in the sourcing of steel and aluminum due to the ROOs. It includes tariffs on vehicle imports from Mexico and Canada that do not utilize the USMCA preferential rates, rather than assuming all imports meet the ROOs and fully utilize the preferences. Finally, it also estimates changes in revenue,

[335] The modeling approach follows the academic literature on estimating demand and simulating the effects of trade policy, including Berry, Levinsohn, and Pakes, "Automobile Prices," 1995; Berry, Levinsohn, and Pakes, "Voluntary Export Restraints," 1999; Berry, Levinsohn, and Pakes, "Differentiated Products," 2004; and Goldberg, "Product Differentiation," 1995.
[336] This step of calibrating marginal costs from the first-order conditions from the manufacturers' profit-maximizing pricing follows the academic literature including Berry, Levinsohn, and Pakes, "Automobile Prices," 1995.
[337] An important limitation of the model is that it looks only at changes in the sourcing of engines and transmission, not other core parts like electric vehicle batteries.
[338] Estimated employment effects assume constant marginal labor requirements and a separate set of workers involved in parts production and vehicle assembly.
[339] USITC, "U.S.-Mexico-Canada Trade Agreement: Likely Impact on the U.S. Economy and on Specific Industry Sectors," 2019.
[340] The eight vehicle classes of passenger vehicles and light trucks are small cars, mid to large cars, luxury cars, small crossover utility vehicles (CUVs), mid to large CUVs, sport utility vehicles (SUVs), vans, and pickup trucks.

wages, profits, sales, and inventories, in addition to the effects on prices, production, international trade, employment, and capital expenditure estimated in the 2019 report.

Sensitivity of the Model Estimates

As a sensitivity analysis of the economic simulation model estimates reported in chapter 2, tables I.1–I.8 provide alternative estimates. These alternatives attribute all observed shifts to sourcing of parts to the USMCA automotive ROOs, regardless of whether the specific vehicle model crossed national borders within USMCA countries and would benefit from the USMCA tariff preference. This assumption is less restrictive than the assumption underlying the estimates reported in chapter 2. The estimated net employment effect in table I.3 is larger than the corresponding estimate in chapter 2, but the effects in table I.3 are still small, even under this alternative method that attributes more of the adjustments between 2018 and 2022 to the ROOs. They are still consistent with the conclusion in chapter 2 that the industry-level effects resulted in less than a 0.01 percent change in aggregate employment and GDP.

In some cases, the signs of the estimated effects switch from the signs of the effects reported in chapter 2. The alternative, less restrictive assumption shows a small decline, rather than a small increase, in U.S. vehicle production, revenue, wages, capital expenditures, employment, and profits.

Table I.1 Estimated impact on U.S. imports of engines and transmissions from non-USMCA countries, 2022
In number of engines or vehicles.

Economic outcome	Change with alternative assumption	Change reported in chapter 2
Engines	-803,222	-431,853
Transmissions	-426,038	-55,195

Source: USITC estimates.

Table I.2 Estimated impact on U.S. imports of light vehicles, 2022
In number of vehicles.

Economic outcome	Change with alternative assumption	Change reported in chapter 2
U.S. imports from USMCA countries	-3,004	-4,748
U.S. imports from non-USMCA countries	3,075	1,125

Source: USITC estimates.

Table I.3 Estimated impact on employment in the U.S. industry, 2022
In number of workers.

Economic outcome	Change with alternative assumption	Change reported in chapter 2
Parts: employment in U.S. production	10,493	3,877
Vehicles: employment in U.S. production	-145	35

Source: USITC estimates.

Table I.4 Estimated impact on wages and capital expenditures in the United States, 2022
In millions of dollars.

Economic outcome	Change with alternative assumption	Change reported in chapter 2
Parts: Wages in U.S. production	647.1	239.1
Parts: Capital expenditures on U.S. production	173.4	60.2
Vehicles: Wages in U.S. production	-11.3	2.7
Vehicles: Capital expenditures on U.S. production	-4.7	1.2

Source: USITC estimates.

Table I.5 Estimated impact on revenue from vehicle and parts production, 2022
In millions of dollars.

Economic outcome	Change with alternative assumption	Change reported in chapter 2
Revenue from U.S. vehicle production	-71.9	81.3
Revenue from U.S. production of engines	2,750.7	1,525.4
Revenue from U.S. production of transmissions	784.2	101.5

Source: USITC estimates.

Table I.6 Estimated impact on the prices and production of light vehicles in the United States, 2022
In dollars or number of vehicles.

Economic outcome	Change with alternative assumption	Change reported in chapter 2
Average vehicle prices ($)	12	3
Vehicle production (number of vehicles)	-6,081	1,464

Source: USITC estimates.

Table I.7 Estimated impact on profits of U.S. vehicle manufacturers, 2022
In millions of dollars.

Economic outcome	Change with alternative assumption	Change reported in chapter 2
Profits of U.S. vehicle manufacturers	-48.1	25.0

Source: USITC estimates.

Table I.8 Estimated impact on average vehicle inventories in the U.S. market, 2022
In number of vehicles.

Economic outcome	Change with alternative assumption	Change reported in chapter 2
Average vehicle inventories in the United States	-476	-172

Source: USITC estimates.

Other Model Estimates

The model estimates in chapter 2 report the impacts of the USMCA automotive ROOs on U.S. imports of engines, transmissions, and light vehicles, as well as U.S. vehicle production and inventories. Table I.9 shows the differences between the estimates in chapter 2 and estimates that include U.S. and Canadian imports of engines, transmissions, and light vehicles, as well as U.S. and Canadian vehicle production and inventories.

Table I.9 Estimated impact on average imports of engines, transmissions, vehicles; vehicle production; and vehicle inventories, 2022
In number of engines, transmissions, and vehicles.

Economic outcome	Change with U.S. and Canadian markets	Change reported in chapter 2
Imports of engines from non-USMCA countries	-491,113	-431,853
Imports of transmission from non USMCAS countries	-58,858	-55,195
Imports of light vehicles from USMCA countries	-5,275	-4,748
Imports of light vehicles from non-USMCA countries	1,270	1,125
Vehicle production	1,567	1,464
Average vehicle inventories	-194	-172

Source: USITC estimates.

Model Limitations

Modeling limitations are listed in chapter 2.

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