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Robert Koopman
Director, Office of Operations

Karen Laney
Director, Office of Industries

This report was principally prepared by:

David Coffin, Office of Industries
david.coffin@usitc.gov

With supporting assistance from:

Brian Allen, Andrew David, Gerald Houck,
David Lundy, Monica Reed, and Wanda Tolson
Office of Industries

Shadara Peters and Sonya Wilson
Office of the Chief Information Officer

Peg Hausman
Office of Analysis and Research Services

Under the direction of:

Michael Anderson, *Chief*
Advanced Technology and Machinery Division

Address all communication to

Secretary to the Commission
United States International Trade Commission
Washington, DC 20436

www.usitc.gov

Preface

The United States International Trade Commission (USITC) initiated its current Industry and Trade Summary series of reports to provide information on the rapidly evolving trade and competitive situation of the thousands of products imported into and exported from the United States. International supply chains have become more global, and competition has increased.

Each Industry and Trade Summary addresses a different commodity/industry and contains information on trends in consumption, production, and trade, as well as an analysis of factors affecting industry trends and competitiveness in domestic and foreign markets. This report on the passenger vehicle industry primarily covers the period 2007 through 2011, with 2012 data where available.

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Acronyms

ACEA	European Automobile Manufacturers' Association
BAIC	Beijing Automotive Industry Holding Company
BMW	Bayerische Motoren Werke AG
BYD	Build Your Dreams
CAFE	Corporate Average Fuel Economy (mileage standard)
CARS	Consumer Assistance to Recycle and Save (Program)
CDT	cyclododecatriene
CUV	crossover utility vehicle
EC	European Commission
EU	European Union
FAW	First Automobile Works (China)
FCV	fuel-cell vehicle
FMVSS	Federal Motor Vehicle Safety Standards
FTA	free trade agreement
GDP	gross domestic product
GM	General Motors Company
GPS	global positioning system
GVWR	gross vehicle weight rating
HS	Harmonized Commodity Description and Coding System (Harmonized System) (international)
HTS	Harmonized Tariff System (of the United States)
ICE	internal combustion engine
JIT	just-in-time (manufacturing)
kWh	kilowatt-hours
LLC	limited liability company
Mercosur	Southern Cone Common Market
METI	Ministry of Economy, Trade and Industry (Japan)
mpg	miles per gallon
MSRP	manufacturer's suggested retail price

Acronyms—*Continued*

NAFTA	North American Free Trade Agreement
NAICS	North American Industry Classification System
NCAP	New Car Assessment Program
NHTSA	National Highway Traffic and Safety Administration
NUMMI	New United Motor Manufacturing Inc.
OEM	Original equipment manufacturer
OICA	International Organization of Motor Vehicle Manufacturers
PATAC	Pan-Asia Technical Automotive Center Company
PSA	Peugeot Société Anonyme
R&D	research and development
SAIC	Shanghai Automotive Industry Corporation
SOE	state-owned enterprise
SUV	sport utility vehicle
UAW	United Automobile Workers Union
ULSD	ultra-low sulfur diesel
USDOC	U.S. Department of Commerce
VDA	German Association of the Automotive Industry
VW	Volkswagen

Key Points

The United States is the second largest manufacturer of passenger vehicles, producing 10 million vehicles in 2012. The industry is recovering from the effects of the economic downturn. The recession led to a significant drop in demand for U.S. passenger vehicles, with cascading effects on sales, production, and employment; two major U.S. producers went through bankruptcy proceedings as a result. Improving economic conditions led to an increase in sales during 2010–12, and the reorganization of the U.S. industry allowed for higher production and employment.

Passenger vehicle production for the U.S. market is concentrated in North America, particularly around Michigan, the southeastern United States, and northern Mexico. In 2012, nearly 80 percent of vehicles sold in the United States were produced in North America. Most production by U.S.-headquartered manufacturers is near Michigan, on both sides of the U.S.-Canada border, or in Mexico, while most production by non-U.S.-headquartered manufacturers is in the southeastern United States or Mexico. The supply chain for vehicles is similarly localized in North America, with more than 50 percent of the content of 139 out of 145 domestically produced carlines coming from the United States and Canada.

The economic downturn combined with increased gasoline prices to change the quantity and composition of the U.S. passenger vehicle market. Annual U.S. passenger vehicle sales declined from over 16 million in 2007 to 10.4 million in 2009 before rebounding and reaching 14.5 million in 2012. Over the same period, the composition of passenger vehicle sales in the United States changed to include fewer sport-utility vehicles (SUVs) and pickup trucks, and more crossover utility vehicles (CUVs) and small cars.

The U.S. passenger vehicle trade deficit shrank during 2007–09. U.S. imports followed a similar pattern to sales and production, with a decline in 2008 and 2009 followed by increases during 2010–12. Canada passed Japan as the top supplier of passenger vehicles in terms of value, and Mexico passed Germany to become the third-largest single country supplier in terms of value (in unit terms it was the third-largest supplier throughout the five year period). Exports followed a similar pattern, but by 2012 had actually grown by nearly 23 percent over 2007 exports. This increase was primarily due to an increase in exports to developing countries such as China.

Manufacturers will need to continue to innovate to supply passenger vehicles to the U.S. and global markets. Increasing fuel efficiency requirements in the United States and globally will lead to changes in vehicle propulsion, composition and weight; fewer truck sales; and smaller, lighter, and more aerodynamic vehicles with less steel and more aluminum. Alternative propulsion technologies such as electric-, natural gas-, or hydrogen-powered vehicles will likely make up an increasing part of passenger vehicle sales in the medium to long-term.

Global passenger vehicle production is concentrated in the European Union, China, the United States, and Japan, which are also the four largest motor vehicle markets. This reflects the preference among motor vehicle manufacturers, which are global companies, to produce in close proximity to the market due to transportation costs, currency risks,

and trade barriers. Most of the value for passenger vehicles assembled in these countries comes from regional suppliers, as supply chains are mostly regional, rather than global.

Trends in the production and sales of passenger vehicles in developed and developing economies diverged during 2007–12. In developed economies, the general trend was a decline in sales, production, and trade in 2008 and 2009 due to the economic recession, then an increase in 2010 and 2011. Production in Germany and Korea in 2011 surpassed pre-recession levels, but in the United States, Japan, and most other countries it remains below 2007. In 2012, developed countries diverged, with production in Europe staying flat or declining, and production in other developed countries, including the United States and Japan, increasing.

In developing countries such as China, India, and Brazil, production and sales increased throughout the five year period due to demand from the growing middle class in developing countries, with consumers often purchasing their first personal passenger vehicle. China surpassed developed countries including the United States and Japan to become the largest single-country producer of passenger vehicles, with over 17 million produced in 2012. On the other hand, production in Mexico is increasing as European, Japanese and U.S. manufacturers locate new production in Mexico to take advantage of Mexico's network of trade agreements, proximity to the U.S. market, low labor costs, and pool of skilled workers. Japanese manufacturers located production in Mexico during this period due to the increasing value of the Japanese yen.

Introduction

The United States is a major global producer of passenger vehicles, an industry that is undergoing dramatic changes. From 2007 to 2012 the U.S. industry faced a sharp decline in demand, largely stemming from the economic downturn in 2008 and 2009, but the industry rebounded as the economy recovered during 2010–12. Concurrently, major changes in the global passenger vehicle industry and market also impacted the U.S. industry. Some production for the U.S. and Latin American markets shifted to Mexico from Canada, Europe, Japan, and the United States, while the Chinese passenger vehicle market grew rapidly to become the largest in the world. Furthermore, passenger vehicle manufacturers are significantly changing the design of the vehicles they will be producing in the future to meet increasingly stringent fuel efficiency regulations.

The passenger vehicle industry[1] is one of the most important manufacturing industries in the United States, and one of the largest of its kind in the world. It directly employed more than 160,000 workers and accounted for more than 4.2 percent of U.S. merchandise exports in 2012.[2] This industry produced more than 40 million passenger vehicles during 2007–12,[3] including cars, vans, minivans, crossover utility vehicles (CUVs),[4] sport-utility vehicles (SUVs), and pickup trucks for the U.S. market and for export.[5] Two of the world's 10 largest passenger vehicle manufacturers—Ford Motor Company (Ford) and General Motors Company (GM)—are headquartered in the United States.[6] Moreover, the United States was also the second-largest producer of passenger vehicles (in units) in 2012,[7] and the third-largest exporter by value.[8] The United States was also the second-largest single-country market (in units) that year. In fact, despite its substantial domestic production, the United States was the world's largest passenger vehicle importer by value each year during 2007–12.[9]

This industry summary surveys the global passenger vehicle industry, market, and trade. The next two sections describe global industry characteristics and trends. The subsequent two sections assess the U.S. industry and market**,** and the fifth section examines U.S.

[1] The U.S. passenger vehicle manufacturing industry includes passenger cars, minivans, sports utility vehicles (SUVs), crossover utility vehicles (CUVs), and pickup trucks, and is a part of the larger motor vehicle and equipment manufacturing industry (including not just passenger vehicles, but also heavy-duty trucks and buses).

[2] DOL, BLS, Current Employment Statistics, Automotive Industry: Employment, Earnings and Hours, (accessed May 16, 2012); USITC/USDOC, DataWeb (accessed April 24, 2012 and March 21, 2013).

[3] Binder, *Ward's Automotive Yearbook,* 2011, 200.

[4] A CUV is a vehicle with a height, look, and size similar to an SUV, but with a unibody frame and light-duty all-wheel drive system that is designed to maximize fuel efficiency instead of off-road use.

[5] Tariff classification systems group passenger vehicles somewhat differently than industry data. Relevant subheadings for passenger vehicles under the international Harmonized Commodity Description and Coding System (HS) include 8703.22, 8703.23, 8703.24, 8703.31, 8703.32, 8703.33, 8704.21, and 8704.31. HS subheading 8703.21 is not included in this list and because most trade under this classification is not of passenger vehicles. The Harmonized Tariff Schedule of the United States (HTSUS) divides motor vehicles by their primary function (transport of persons or transport of goods), engine type, and size of engine. On the other hand, industry publications separate vehicles based on the type of frame used. For descriptions of each HS subheading, see appendix A.

[6] OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–10 (accessed June 20, 2011).

[7] OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–11 (accessed August 15, 2012 and March 21, 2013).

[8] GTIS, Global Trade Atlas database (accessed November 28, 2012 and March 21, 2013).

[9] Ibid.

imports and exports. The final two sections analyze the major foreign industries and markets. This report primarily covers the six-year period from 2007 to 2012.[10]

Global Industry

Although the 2008–09 global economic downturn contributed to a decline in passenger vehicle production in most countries, global production during the six-year period increased from 69.4 million units in 2007 to 80.1 million units in 2012 (15.4 percent). This rise was largely due to increased Chinese production, which expanded from less than 8 million units in 2007 to more than 17 million units in 2012 (table 1). China became the number one passenger-vehicle-producing country in 2009, and accounted for almost 22 percent of global production in 2012, up nearly 9.5 percent from 2007 (figure 1).[11] The economic downturn depressed production in the EU and the United States,[12] while the downturn combined with the rising yen led Japanese producers to decrease production in Japan. Korea, Canada, and Mexico are also major producers[13] of passenger vehicles, particularly supplying the United States.[14] Manufacturers in the United States, Japan, and the EU moved some production for the North and South American markets to Mexico, leading to an increase in production there.[15] Canadian and Mexican production is by foreign-headquartered manufacturers.

TABLE 1 Global passenger vehicle production for select countries, 2007–12 (millions of units)

Location	2007	2008	2009	2010	2011	2012	Percent share, 2012
China	7.81	7.95	11.96	15.84	16.33	17.39	21.7
European Union	19.02	17.72	15.00	16.70	17.48	16.05	20.0
Germany	5.96	5.78	5.11	5.76	[a]6.31	5.65	7.1
France	2.29	2.49	2.02	2.19	2.24	1.97	2.5
Spain	2.79	2.47	2.14	2.35	2.30	1.93	2.4
United States	10.47	8.45	5.58	7.60	8.40	10.06	12.6
Japan	10.87	10.83	7.55	9.09	7.88	9.35	11.7
Korea	4.04	3.78	3.45	4.20	4.62	4.53	5.7
Mexico	2.01	2.08	1.50	2.25	2.54	2.86	3.6
Canada	2.54	2.05	1.48	2.07	2.13	2.45	3.1
Subtotal	56.76	52.86	46.52	57.47	59.37	62.69	78.3
Other	12.66	13.74	11.55	15.64	16.36	17.37	21.7
Global[b]	69.42	66.60	58.07	73.39	75.74	80.06	100.0

Source: OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–11 (accessed August 15, 2012 and March 21, 2013).

[a]2011 German production data includes all commercial vehicles, not just light commercial vehicles.
[b]May not sum due to rounding.

[10] While most Industry and Trade Summaries cover a 5-year period, 2007 data were included here to provide an indication of the level of production and trade prior to the recession. 2012 data were not available in all datasets.

[11] OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–11 (accessed August 15, 2012 and March 21, 2013).

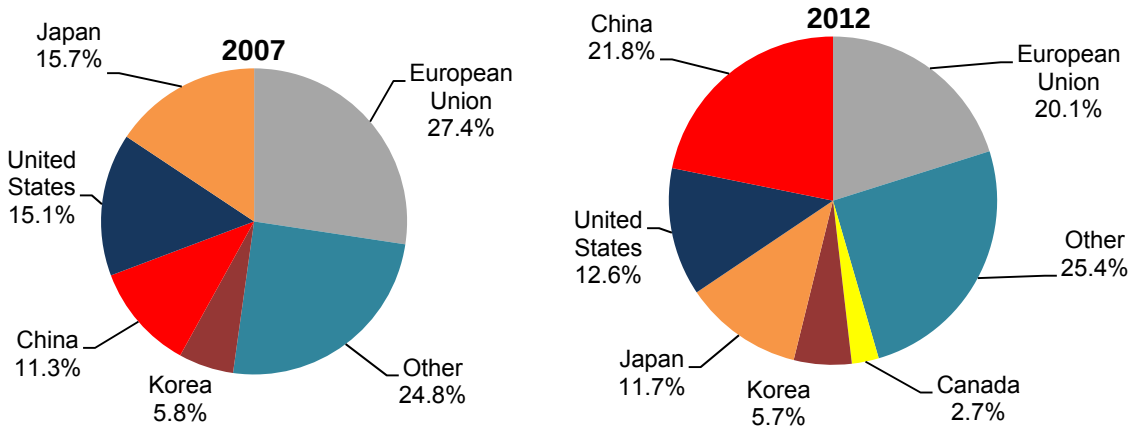
[12] The 27 EU members (with those listed in table 1 being highlighted in bold type) are Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, **France**, **Germany**, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, **Spain**, Sweden, and the United Kingdom.

[13] OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–11 (accessed August 15, 2012).

[14] GTIS, Global Trade Atlas database (accessed January 3, 2012).

[15] OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–11 (accessed August 15, 2012).

FIGURE 1 Share of global passenger vehicle production, by country, 2007 and 2012



Source: OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–11 (accessed August 15, 2012, and March 24, 2013).

The three largest passenger vehicle manufacturers from 2007 to 2011 were Toyota, GM, and Volkswagen (table 2). Production by Toyota surpassed that of GM in 2008 and 2009, but GM regained its lead in 2010 and 2011. Volkswagen was the second-largest producer of passenger vehicles in 2011, achieving an early start on its goal of producing over 10 million passenger vehicles per year by 2018.[16]

TABLE 2 Global passenger vehicle production, top 10 manufacturers, 2007–11 (millions of units)

Group	Headquarters location	2007	2008	2009	2010	2011	Percent change
GM	United States	9.3	8.2	6.4	8.5	9.0	–3.3
Volkswagen	Germany	6.2	6.4	6.1	7.3	8.2	31.8
Toyota	Japan	8.3	8.9	7.1	8.3	7.9	–5.0
Hyundai	Korea	2.4	2.5	4.5	5.6	6.5	175.5
Ford	United States	6.2	5.3	4.6	4.9	5.3	–13.8
Nissan	Japan	3.3	3.3	2.7	3.9	4.7	42.4
PSA Peugeot Citroen	France	3.5	3.3	3.0	3.6	3.5	0.0
Honda	Japan	3.9	3.9	3.0	3.6	2.9	–25.6
Suzuki	Japan	2.6	2.6	2.4	2.9	2.7	3.9
Renault	France	2.7	2.4	2.3	2.7	2.7	0.0

Source: OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–11 (accessed February 1, 2012); Hirsch, "General Motors Recaptures Top Spot for Global Auto Sales," January 19, 2012; Honda Motor Co., "Honda Sets All-Time December Record," January 27, 2012; Nissan Motor Co., "Nissan Production, Sales and Export," January 27, 2012; Suzuki Motor Co., "Suzuki 2011 Car Production, Sales, and Export Figures," January 27, 2012; IHS Global Insight, "PSA Peugeot Citroën's Global Sales Dip in 2011", January 12, 2012; Nissan, "Renault-Nissan Alliance Posts Record Sales," February 1, 2012.

Each manufacturer produces and sells a significant percentage of its vehicles in its home country. However, among the top three manufacturers, Volkswagen produces the largest percentage within its home country and sells the least within that country (table 3). Volkswagen's low proportion of sales in Germany is likely due to the relatively small size of Germany's market. Germany's proximity to the rest of Europe, where Volkswagen sold 2.96 million (24.5 percent) of the vehicles it produced in 2011, is likely the reason Volkswagen continues to produce such a large share of its vehicles in Germany.[17] GM sells the largest percentage of its vehicles in its home market, likely

[16] Volkswagen AG, "Group Strategy 2018," 2011.
[17] Binder, *Ward's Automotive Yearbook*, 2012, 53.

because it is headquartered in the United States, the largest single-country market of the three leading manufacturers.

TABLE 3 Shares of 2011 sales and production in top three leading manufacturers' home countries (percent), 2011

Manufacturer	Share of sales in home country market	Share of production in home country headquarters location
Toyota	15.1	21.5
GM	27.8	21.1
Volkswagen	11.5	32.9

Source: Binder, *Ward's Automotive Yearbook*, 2012, 40, 43, 53, 58, 183, 206–07.

The global passenger vehicle industry is regionally focused, and the world's leading manufacturers produce vehicles in many countries around the world to supply different regional markets. Transportation costs, currency fluctuation risks, and trade barriers are among the major reasons many passenger vehicle manufacturers attempt to manufacture in the same region where they sell passenger vehicles. For example, transportation costs, while often high, are relatively predictable, involving both direct costs (a function of distance) and indirect ones (a function of time lost in transit). To minimize transportation costs, most manufacturers that sell significant quantities of passenger vehicles into the U.S. market produce their vehicles in North America, and encourage their suppliers to locate plants nearby to reduce suppliers' transportation costs as well.[18]

By contrast, currency fluctuation risks are less predictable and are country-specific. In countries with free-floating exchange rates, an unforeseen change in value of the currency can affect the profitability of producing vehicles for export in that country. Due to the rising value of the Japanese yen during most of the period, the relative cost of producing passenger vehicles in Japan increased.[19] Thus, Japanese producers have been reducing domestic export-oriented production and increasing production in other countries, including the United States and Mexico.[20] Currency valuation risk concerns were also an important factor in the decisions of BMW, Mercedes, and Volkswagen to open assembly plants in the United States.[21] Trade barriers in some countries, such as local-content requirements or prohibitive tariffs, may also be used to encourage domestic assembly of passenger vehicles.[22]

Some firms work with other manufacturers to acquire technology or production processes, divide research and development (R&D) costs, access a market, or even to achieve production scale at a plant. Technology licensing is another way that passenger vehicle manufacturers work together. For example, the Altima hybrid produced by Nissan Motor Co. (Nissan) through 2011 used hybrid technology developed by Toyota Motor Corporation (Toyota) and licensed to Nissan.[23] Production sharing is another approach to cost reduction. A well-known example was the New United Motor Manufacturing Inc. (NUMMI), a joint venture between GM and Toyota that closed in 2010.[24] In January 2012, Daimler AG and Nissan announced that Nissan would produce

[18] Walsh, "Automakers Push Suppliers to Consolidate, Move Closer," August 15, 2011, 23.

[19] USITC staff calculation based on U.S. Federal Reserve, Historical Rates for the Japanese Yen, January 17, 2012. Dawson and Takahashi, "Toyota Confronts Rising Yen," September 8, 2011; Greimel, "To Fix Yen; Japan Automakers Must Look to Selves," February 4, 2009.

[20] Dawson and Takahashi, "Toyota Confronts Rising Yen," September 8, 2011; Greimel, "To Fix Yen Japan Automakers Must Look to Selves," February 4, 2009.

[21] VDA, "German Manufacturers' U.S. Sales Exceed 1 Million Mark," January 9, 2012.

[22] Humphrey and Memedovic, "The Global Automotive Industry Value Chain," May 2003, 19.

[23] *Kelley Blue Book,* "Nissan Altima Hybrid Won't Be Back in 2012," June 15, 2011.

[24] Gonzales, "NUMMI Plant Closure," April 1, 2010.

four-cylinder engines for Mercedes-Benz passenger cars in the United States beginning in 2014.[25] In February 2012, GM and Peugeot-Citroen (PSA) announced an agreement that could include shared production and R&D.[26]

U.S. Industry

The 2008–09 economic downturn was a serious blow to the U.S. passenger vehicle industry,[27] but the industry has continued to recover each year since then. From 2007 to 2009, manufacturers shuttered or idled at least 15 passenger vehicle assembly plants,[28] reducing production capacity by 3.5 million units,[29] and in 2009 both Chrysler and GM entered bankruptcy. As the U.S. economy recovered, U.S. passenger vehicle production increased. In 2011, Toyota and Volkswagen opened new plants and GM announced that it would restart production at its plant in Spring Hill, TN.[30] Despite the economic downturn, the number of firms with assembly plants in the United States increased to 13 in 2012 from 12 in 2007, with two producers entering and one exiting.[31]

The U.S. passenger vehicle industry consists of 13 major manufacturers that are supported by a large and varied supplier base.[32] Three are U.S.-headquartered firms—Chrysler, Ford, and GM, collectively "The Big Three"—and the other 10 are "transplant"[33] manufacturers (table 4). Ford and GM were two of the world's five largest passenger vehicle producers in 2012.

[25] Nissan, "Nissan and Daimler to Produce Engines Together," January 8, 2012.

[26] General Motors, "GM and PSA Peugeot Citroen Create Global Alliance," February 29, 2012.

[27] This industry encompasses all U.S. production of passenger vehicles, regardless of the headquarters location of the producer.

[28] Chrysler LLC, "Chrysler LLC Clarifies," October 23, 2008; Volkmann, "Chrysler to Close Fenton Truck Plant," May 6, 2009; Ford Motor Company, "Norfolk Assembly Plant Ends Production," June 28, 2007; Ford Motor Company, "Production Ends at Wixom Assembly Plant," May 31, 2007; Hunt, "New Life for Old GM Plant," March 31, 2010; Spangler and Bomey, "The Facts about Janesville GM Plant's Closure," August 31, 2012; Kavanagh, "GM Plant's Closing Like a Death Knell," December 1, 2008; Aguilar, "Michigan Feels the Brunt of GM's Bankruptcy," June 2, 2009; Milford, "GM Closing Boxwood Road," July 13, 2009; Gonzales, "NUMMI Plant Closure," April 1, 2010; Bunkley, "Ex-Saturn Plant to Reopen," November 21, 2011.

[29] Binder, *Ward's Automotive Yearbook* 2008, 234 and 241; Binder, *Ward's Automotive Yearbook* 2010, 198–99; Binder, *Ward's Automotive Yearbook* 2012, 182–83; Sousanis, "Manufacturing's New Necessity," June 2011.

[30] Bunkley, "Ex-Saturn Plant to Reopen," November 21, 2011.

[31] Kia Motors (Kia) began producing vehicles at a plant in West Point, GA, on November 16, 2009, and Volkswagen began producing vehicles at its new plant in Chattanooga, TN on April 18, 2011, while Mazda Motor Corporation (Mazda) announced in 2011 that it would stop producing vehicles at the Flat Rock plant in Michigan that it shares with Ford. Trop, "Mazda Winds Down," May 24, 2012; Kia Motors Manufacturing Georgia, Inc., "About KMMG" (accessed September 26, 2012); Volkswagen Group of America, "Volkswagen Chattanooga Builds First Customer Car," April 18, 2011.

[32] Thormahlen, "Car and Automobile Manufacturing in the U.S.," June 2011, 21.

[33] A manufacturing plant that produces vehicles exclusively for a firm headquartered overseas.

TABLE 4 Passenger vehicle manufacturers in the United States, 2011

Manufacturer	Headquarters location	Types of vehicles produced	U.S. production (units)	Number of U.S. assembly plants
BMW	Germany	SUV	276,065	1
Chrysler	United States	Passenger car, SUV, and light truck	1,162,553	6
Ford	United States	Passenger car, SUV, and light truck	1,837,027	10 (11 including AutoAlliance with Mazda)
GM	United States	Passenger car, SUV, and light truck	1,882,854	11
Honda	Japan	Passenger car, SUV, and light truck	823,650	4
Hyundai	Korea	Passenger car and SUV	338,127	1
Kia	Korea	SUV	272,304	1
Mercedes-Benz	Germany	SUV, van	[a]145,841	2
Mitsubishi	Japan	Passenger car and SUV	37,150	1
Nissan	Japan	Passenger car and SUV	563,215	2
Subaru	Japan	Passenger car	240,886	1
Toyota	Japan	Passenger car, SUV, and light truck	714,041	4
Volkswagen	Germany	Passenger car	[b]45,857	1

Source: Binder, *Ward's Automotive Yearbook,* 2012, 13 and 186.

[a]Estimate by *Ward's Automotive Yearbook*, 2012, for October–December 2011.
[b]Estimate by *Ward's Automotive Yearbook*, 2012.

As is the case for most markets worldwide, passenger vehicle manufacturing in the United States focuses on the vehicles preferred in the U.S. market. Vehicle types that sell in lower volumes in the United States tend to be imported. Thus larger passenger cars, SUVs, and light trucks tend to be produced in the United States rather than imported. For example, both Mercedes-Benz and BMW use their U.S. plants to produce all of their SUVs to meet global demand.[34]

Two major trends in passenger vehicle manufacturing are the ongoing drives to (1) cut costs and (2) reduce emissions and improve fuel efficiency in passenger vehicles. Manufacturers are striving to further cut costs by moving production to less expensive locations, negotiating with unions to lower wages for new workers and modify work rules, shrinking inventory, and decreasing the physical distance between suppliers and manufacturers. They are also increasing investments in R&D to raise the fuel efficiency of vehicles.[35]

A number of factors affect the quality and quantity of passenger vehicles a manufacturer can supply, as well as where they locate assembly plants. To research new technologies and develop new passenger vehicles, manufacturers require specialized engineers and designers, as well as specialized facilities to simulate a variety of weather patterns and road conditions. Different factors affect a manufacturer's production capability. The quality, skills, and cost of available labor are leading factors, as passenger vehicle manufacturers have specific labor needs.[36] The availability, cost, and type of electricity are also important, because assembly plants have large power needs, and some manufacturers may want to select an area with abundant renewable energy to reduce their

[34] Binder, *Ward's Automotive Yearbook,* 2011, 9–13.
[35] Jaruzelski and Dehoff, "Global Innovation 1000," Winter 2010, 10.
[36] Sher, "Chattanooga: VW Incentives Largest in State," July 24, 2008.

carbon footprint. Other major factors include the extent and quality of the local infrastructure, proximity to key suppliers, and the cost and availability of credit.[37]

Bankruptcy and Recovery of Chrysler and GM

In 2008 and 2009 the economic downturn undermined consumer demand, reducing Big Three profitability and sales, leading Chrysler and GM to seek bankruptcy protection. Demand for new passenger vehicles plunged during the downturn. In addition, the Big Three had relatively high fixed costs due to their labor contracts, R&D costs, and legacy (retiree benefits) costs.[38] Moreover, tighter credit restrictions, resulting from the economic downturn, hindered both these firms' ability to negotiate loans from banks to help survive this period of lower demand, and their customers' ability to qualify for loans to purchase passenger vehicles.[39] Finally, demand for SUVs and light trucks declined faster than for other vehicles due to rising gasoline prices.[40] SUVs and light trucks tend to be the most profitable vehicles sold by passenger vehicle manufacturers, and the Big Three were especially dependent upon them to maintain profitability.[41] When demand declined, Chrysler and GM were forced to reduce the price of vehicles to clear inventory, thus reducing profit margins on vehicles sold (which were below 2007 levels).[42] Ford, which originally requested government aid along with Chrysler and GM, used a $10 billion credit line it had secured before the crisis, and was able to continue operating without government loans.[43]

Chrysler and GM received loans totaling $62 billion from the U.S. Department of the Treasury (Treasury) through the Automotive Industry Financing Program (AIFP) under the Troubled Asset Relief Program (TARP) in December 2008 and July 2009.[44] AIFP loan commitments were contingent on the loan applicants' producing viable restructuring plans.[45] On March 30, 2009, the U.S. government's automotive task force approved the framework of Chrysler's plan to partner with Italian passenger vehicle manufacturer Fiat SpA (Fiat).[46] However, Chrysler failed to reach an agreement with its debt holders and had to file for bankruptcy on April 30, 2009.[47] Thirty-one days later, Chrysler's reorganization plan was approved and on June 10, 2009, the Chrysler-Fiat plan became official.[48] Both the U.S. and Canadian governments also took ownership positions in Chrysler.[49] Fiat contributed intellectual property to Chrysler in exchange for 20 percent equity in Chrysler; Fiat's share grew to 58.5 percent after Chrysler achieved specific performance metrics, including adopting advanced manufacturing techniques and producing a small car in the United States.[50]

[37] Venable, "BMW Drives into South Carolina," August 1992, 1; Sher, "Chattanooga: VW Incentives Largest in State," July 24, 2008; Mansfield, "TVA's Megasite Program a Megahit with Manufacturers," July 21, 2008.
[38] Webster, "GM in Crisis," November 18, 2008.
[39] Ibid.
[40] USDOC, ITA, "The Road Ahead," April 2009, 30.
[41] Stenquist, "Big Trucks Returned Big Profits for Detroit," November 22, 2011.
[42] U.S. GAO, "TARP: Treasury's Exit from GM and Chrysler," May 2011, 10–11.
[43] Vlasic, "Ford Reports a Record $14.6 Billion Loss for 2008," January 29, 2009.
[44] U.S. GAO, "TARP: Treasury's Exit from GM and Chrysler," May 2011, 1.
[45] Ibid., 4.
[46] USDOC, ITA, "The Road Ahead," 2010, 7.
[47] Ibid.
[48] USDOC, ITA, "The Road Ahead," 2010, 8.
[49] Ibid.
[50] Bennett, "Fiat to Increase Stake in Chrysler," June 28, 2012, A-17.

Meanwhile, the task force deemed GM's restructuring plan to be inadequate on March 30, 2009, but it provided GM with 60 days of capital to develop a new plan with the help of Treasury officials and outside advisors.[51] After producing a new plan in April and reaching agreements with its unions and bondholders, GM entered Chapter 11 bankruptcy to restructure the company.[52] As part of its restructuring, much of GM's corporate and government debt was converted into ownership shares, and GM permanently or temporarily closed at least five manufacturing plants.[53] Both Chrysler and GM renegotiated their contracts with the United Automobile Workers (UAW) labor union for lower pay and fewer benefits for new employees.[54]

Eliminating debt, closing plants, and reducing the number of dealers as part of the bankruptcy process reduced fixed costs for Chrysler and GM and enabled them to align their production plans more closely with market demand.[55] With fewer operating plants and lower debt obligations resulting from their restructuring, both companies have gained the flexibility to idle or slow production when demand declines for either a particular vehicle or all vehicles. Changes to the union wage structure, with new employees being hired at a lower wage than specified in previous union contracts, reduced the labor cost per vehicle.[56] This reduction allowed Chrysler and GM to produce vehicles that were previously unprofitable to produce in the United States, particularly small cars, which tend to have smaller profit margins due to their lower price to the consumer.[57]

While the economic downturn negatively affected all passenger vehicle manufacturers, it weighed less on many transplant manufacturers in the United States due to their lower fixed costs and their higher sales of passenger cars rather than light trucks.[58] In 2007, 65.5 percent of the 8.3 million passenger vehicles sold by the Big Three in the United States were light trucks.[59] In comparison, only 43.1 percent of transplant sales were of light trucks. In 2009, U.S.-headquartered manufacturers produced 44.7 percent fewer passenger vehicles than in 2007, but transplant production only declined by 17.8 percent.[60] Furthermore, although at least 15 assembly plants shut down in the United States during the economic downturn, the only one with transplant production to close was the NUMMI facility in California, which closed in 2010 after GM pulled out of its joint-venture partnership with Toyota in 2009.[61] In fact, as noted earlier, Kia, Toyota, and Volkswagen all opened new passenger vehicle plants during the six-year period.[62]

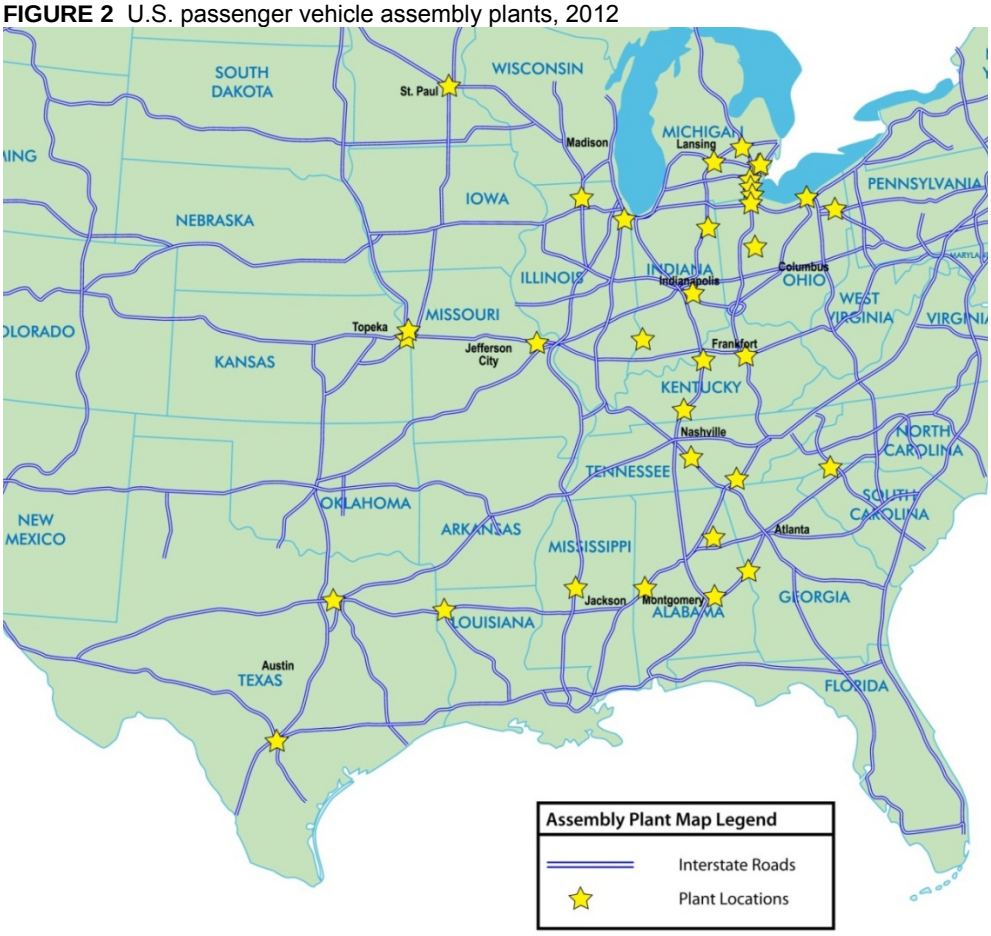
[51] USDOC, ITA, "The Road Ahead," 2010, 4.
[52] Ibid., 5.
[53] Ibid., 5.
[54] Cooney, et. al., *U.S. Motor Vehicle Industry,* January 30, 2009, 18.
[55] U.S. GAO, "TARP: Treasury's Exit from GM and Chrysler," May 2011, 11.
[56] See the Employment and Wages section for more on the reduction of labor costs.
[57] Payne, "Will Small Be Beautiful for GM?" July 18, 2009.
[58] For more on shifts in demand see the U.S. Market section. Binder, *Ward's Automotive Yearbook,* 2009*,* 258–67; Binder, *Ward's Automotive Yearbook* 2010*,* 229–38; Binder, *Ward's Automotive Yearbook,* 2011*,* 220–29; Binder, *Ward's Automotive Yearbook* 2012*,* 206–15.
[59] USITC staff calculation based on data from Binder, *Ward's Automotive Yearbook,* 2008, 258–67; Binder, *Ward's Automotive Yearbook,* 2010, 229–36.
[60] Binder, *Ward's Automotive Yearbook,* 2012, 186.
[61] Gonzales, "NUMMI Plant Closure Ends Toyota-GM Joint Venture," April 1, 2010.
[62] Hyundai Motor Manufacturing Alabama, "About HMMA" (accessed September 26, 2012); Kia Motors Manufacturing Georgia, Inc., "About KMMG" (accessed September 26, 2012); Volkswagen Group of America, "Volkswagen Chattanooga Builds First Customer Car," April 18, 2011.

Geographic Distribution

Where U.S. Manufacturing Sites are Concentrated

Historically, U.S. passenger vehicle manufacturing has been clustered near Detroit in Michigan, Ohio, and Indiana, but in pursuit of lower costs, many passenger vehicle manufacturers have built new plants in the southeastern United States. Most Big Three production plants are located in Michigan and Ohio, although some pickup truck and SUV production is in Kansas, Louisiana, Missouri, and Texas (figure 2).

FIGURE 2 U.S. passenger vehicle assembly plants, 2012



Sources: Binder, *Ward's Automotive Yearbook,* 2011, 12–13; Toyota Motor Company website, http://www.toyota.com/about/our_business/engineering_and_manufacturing/tmmms/ (accessed February 16, 2012); Volkswagen AG website, http://www.volkswagengroupamerica.com/chattanooga/ (accessed February 16, 2012).

Some transplant assembly operations are in the Midwestern United States as well. Several are located in Indiana and Ohio,[63] dating from the 1980s, when Japan agreed to limit the number of vehicles it exported to the United States.[64] However, many transplant producers have established assembly plants in the southeastern United States to take advantage of lower labor costs and reduced union presence in the 1990s and 2000s.[65]

Government Incentives and the Siting of Assembly Plants

While supply factors such as availability of labor, electricity, infrastructure, and suppliers are important in deciding where to locate assembly plants, tax and financial incentives offered to passenger vehicle manufacturers by state and local governments also carry considerable weight. Whenever a passenger vehicle manufacturer announces its interest in opening a new assembly plant in the United States, state and local governments compete to submit the most attractive proposal for locating the plant in their area because of the anticipated economic benefits. Proposals list tax abatements, including both existing and company-specific breaks that would be available if a passenger vehicle manufacturer chose a specific location.[66] They may also offer discounted or even free land that has been prepared as a manufacturing site.

A notable example is South Carolina's offer to BMW of both a $115 million incentive package and a $1,500 per-job state income-tax credit.[67] Even then, South Carolina only narrowly edged out Nebraska and 248 other competing locations worldwide for BMW's investment in 1995.[68] The Spartanburg, SC, assembly plant has since expanded and now employs more than 7,000 workers, while BMW suppliers located in South Carolina employ an additional 10,000 workers.[69] Since then, likely due to the benefits seen from the opening of previous passenger vehicle assembly plants, states have increased the value of the incentives they offer to passenger vehicle manufacturers, with $419.4 million offered to Kia to assemble vehicles in Georgia, and nearly $500 million from the state of Tennessee to convince Volkswagen to assemble passenger vehicles in Chattanooga.[70] The Chattanooga site was also a part of the Tennessee Valley Authority's Megasite program, which has consultants certify that specific locations meet criteria that are important to most passenger vehicle manufacturers.[71]

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[63] Binder, *Ward's Automotive Yearbook*, 2011, 10–11.

[64] Holweg, "The Genealogy of Lean Production," 2007, 424; Feenstra, "Voluntary Export Restraint in U.S. Autos, 1980–81," 1984, 35.

[65] Binder, *Ward's Automotive Yearbook*, 2010, 10–11; *Economist*, "Nothing Could Be Finer," November 19, 1994.

[66] Venable, "BMW Drives into South Carolina," August 1992, 1; Sher, "Chattanooga: VW Incentives Largest in State," July 24, 2008.

[67] Venable, "BMW Drives into South Carolina," August 1992, 1.

[68] Ibid.

[69] BMW Factory website, www.bmwusfactory.com (accessed July 7, 2011).

[70] Sher, "Chattanooga: VW Incentives Largest in State," July 24, 2008.

[71] The criteria include having at least 700 acres of developable land, immediate availability, completed environmental and geotechnical testing, sufficient labor available, and close proximity to interstate highways, railways, and automotive suppliers. From 2005 to 2008 the program successfully drew two passenger vehicle manufacturers (Volkswagen in Chattanooga, TN, and Toyota in Blue Springs, MS) and two other manufacturers to large sites in the southeastern United States. Mansfield, "TVA's Megasite Program a Megahit with Manufacturers," July 21, 2008.

Shipments and Production

Although shipments and production of passenger vehicles in the United States rebounded from downturn-related declines in 2008 and 2009, they remained below 2007 levels in each of the years from 2010 to 2012. By 2011, U.S. shipments had grown to $204 billion—a 53.8 percent increase over the 2009 level of $133 billion, but still 14.8 percent below the level of shipments in 2007 ($239 billion).[72] U.S. production of passenger vehicles totaled over 8.4 million units in 2011, nearly 20 percent below its peak of almost 10.5 million units in 2007.[73] However, U.S. production reached 10.1 million in 2012.

During the worst of the economic downturn for the passenger vehicle industry, U.S. capacity utilization in first quarter 2009 declined to 38 percent for passenger cars and 46 percent for light trucks and utility vehicles. These rates bounced back to 71.9 percent for passenger cars and 81.6 percent for light trucks and utility vehicles in the third quarter of 2012.[74] However, Big Three production in the United States experienced more significant increases and decreases in production than transplant manufacturers, declining from nearly 6.5 million units in 2007 to less than 3.0 million units in 2009 (54.0 percent decline) before rising by 76.9 percent to nearly 5.3 million units in 2012 (table 5). Big Three manufacturers closed assembly plants during 2007–12 and reduced capacity.[75] Transplant production also declined in 2008 and 2009, but only by 34.9 percent, then increases in 2010, 2011, and 2012 resulted in production that was more than double that of 2009.[76] This was likely due to transplant production being more focused on passenger cars and CUVs than SUVs and light trucks. Transplant production capacity also increased during the period, because of the new plants opening in Georgia, Mississippi, and Tennessee.[77]

[72] USDOC, Census Bureau, *Annual Survey of Manufactures* (accessed August 1, 2012 and November 21, 2012).

[73] OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–11 (accessed various dates).

[74] USDOC, Census Bureau, *Survey of Plant Capacity Utilization* (accessed July 19, 2011); USDOC, Census Bureau, *Quarterly Survey of Plant Capacity Utilization* (accessed July 3, 2012 and March 25, 2013).

[75] Binder, *Ward's Automotive Yearbook,* 2008, 234 and 241; Binder, *Ward's Automotive Yearbook,* 2010, 198–99; Binder, *Ward's Automotive Yearbook,* 2012, 182–83; Sousanis, "Manufacturing's New Necessity," June 2011.

[76] Binder, *Ward's Automotive Yearbook,* 2008, 234 and 241; Binder, *Ward's Automotive Yearbook,* 2010, 198–99; Binder, *Ward's Automotive Yearbook,* 2012, 182–83; Sousanis, "Manufacturing's New Necessity," June 2011; *Ward's Automotive Reports,* "Ward's North America Vehicle Production Summary," January 14, 2013, 8.

[77] These three plants featured 660,000 units of new capacity: 300,000 units at the Kia plant in West Point, Georgia (with an additional 60,000 from an expansion in 2012), 150,000 at the Toyota plant in Blue Springs, Mississippi, and 150,000 at the Volkswagen plant in Chattanooga, Tennessee. *Newnan Times-Herald,* "Kia's $100 Million Expansion Complete," January 4, 2012; Toyota Motor Manufacturing Mississippi, "Toyota Begins Corolla Production in Mississippi," November 17, 2011; Hirsch, "VW Opens Tennessee Plant," May 28, 2011.

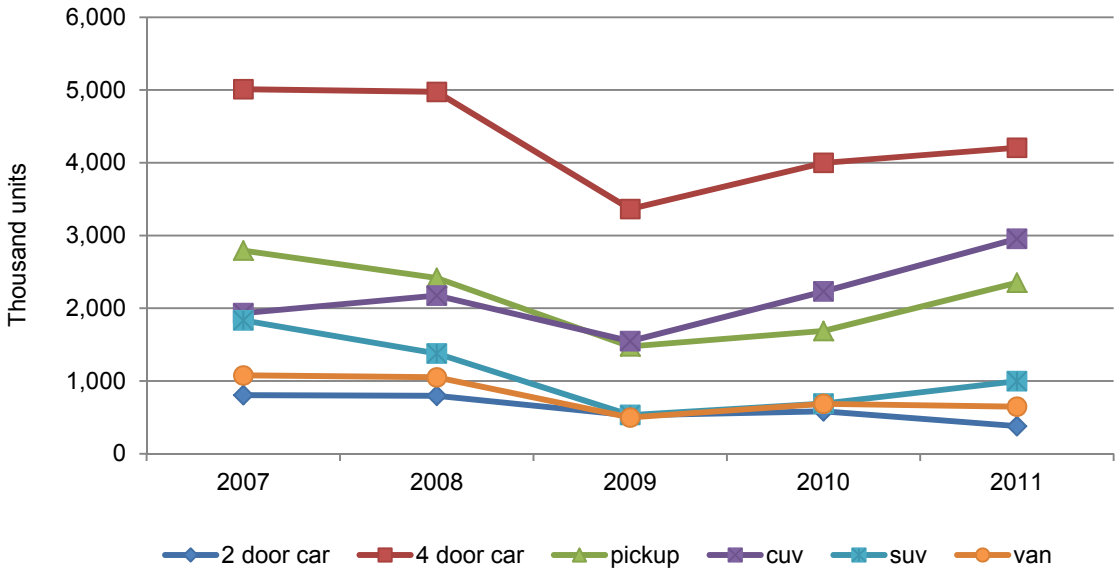
TABLE 5 U.S. passenger vehicle production by manufacturer type, 2007–12 (units)

	2007	2008	2009	2010	2011	2012	Percent change 2007–12
Big Three	6,496,505	4,908,308	2,988,096	4,171,425	4,882,434	5,288,729	–18.6
Transplant	3,462,573	3,089,465	2,252,683	3,242,206	3,457,136	4,615,161	33.2
Joint venture	606,661	509,502	370,875	213,568	117,836	133,004	–78.1
Total	10,565,739	8,507,275	5,611,654	7,627,199	8,457,406	10,036,894	–5.0

Sources: Binder, *Ward's Automotive Yearbook,* 2009, 234 and 241; Binder, *Ward's Automotive Yearbook,* 2010, 198–99; Binder, *Ward's Automotive Yearbook,* 2011, 196–97; Binder, *Ward's Automotive Yearbook,* 2012, 182–83; *Ward's Automotive Reports,* "Ward's North America Vehicle Production Summary," January 14, 2013, 8.

The composition of U.S. passenger vehicle output also changed during 2007–12 (figure 3). In 2012, the United States still produced more four-door passenger cars than any other type of passenger vehicles, but production of CUVs increased during the period by over a million units per year, surpassing pickup truck production to become the second-largest type of passenger vehicle produced in the United States during 2010–12. This trend likely reflects changes in the composition of U.S. demand, which will be discussed further in the U.S. market section.

FIGURE 3 Composition of U.S. passenger vehicle production, 2007–11

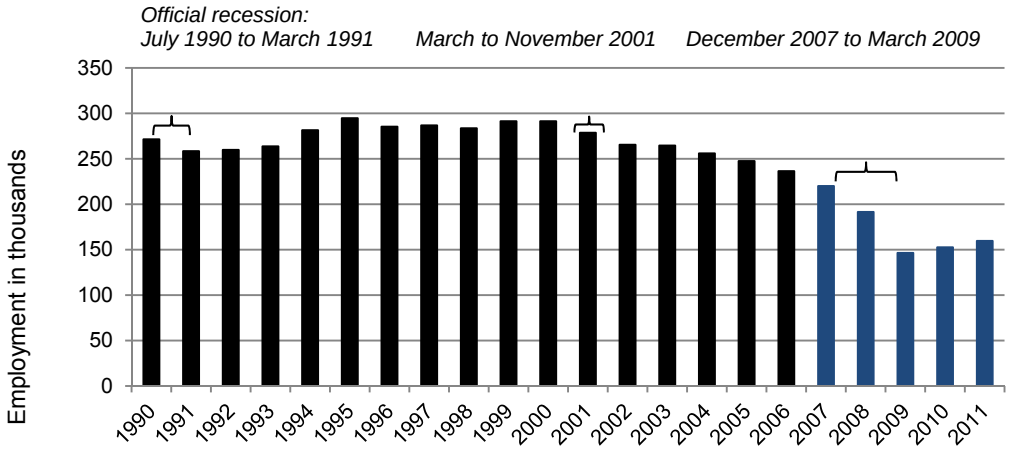


Sources: Binder, *Ward's Automotive Yearbook,* 2009, 237, 248; Binder, *Ward's Automotive Yearbook,* 2010, 208, 211; Binder, *Ward's Automotive Yearbook,* 2011, 202, 206; Binder, *Ward's Automotive Yearbook,* 2012, 187–92.

Employment and Wages

The economic downturn accelerated a trend of declining employment in U.S. motor vehicle manufacturing.[78] The decline in employment in the motor vehicle manufacturing industry was greater than in any other period of recession in the previous two decades. The increase from 2009 to 2011 reversed a decline in employment that began with the previous economic downturn in 2001, and continued throughout the decade. Increased demand for motor vehicles globally and in the United States, as well as a lower wage structure for new employees at unionized manufacturing plants, contributed to the growth in employment. U.S. motor vehicle manufacturers employed nearly 160,000 employees in 2011—a decline of more than 60,000 (27.5 percent) over the five-year period, but an increase over the 146,000 employed in 2009 (figure 4).[79]

FIGURE 4 The decline of U.S. motor vehicle manufacturing industry employment, 1990–2011



Sources: DOL, BLS, *Current Employment Statistics,* Automotive Industry: Employment, Earnings and Hours (accessed May 16, 2012, and August 17, 2012); NBER, "US Business Cycle Expansions and Contractions" (accessed November 27, 2012).

Note: This figure uses data for motor vehicle manufacturing industry employment because specific data for passenger vehicle manufacturers are not available.

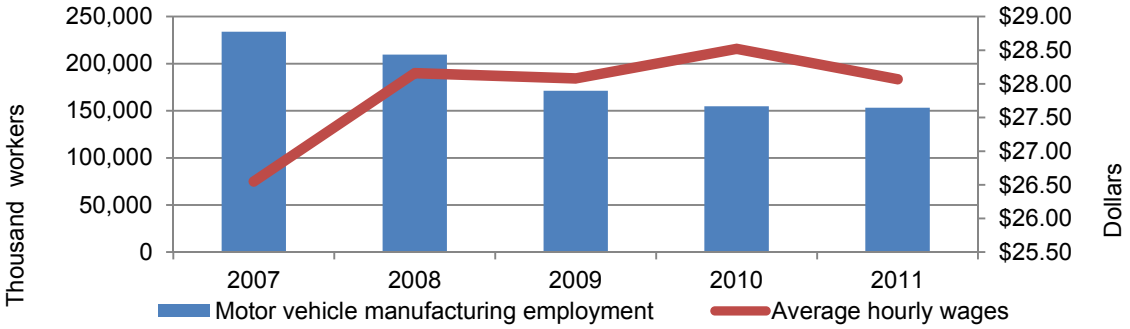
Data from the U.S. Department of Labor show an increase in average hourly wages for motor vehicle manufacturing from $26.55 an hour in its May 2007 report to $28.07 in the May 2011 report, with a peak of $28.52 in May 2010 (figure 5).[80] It's unclear why wage rates increased during the period.

[78] This section discusses motor vehicle rather than passenger vehicle employment levels and wage rates because specific data on wage rates for passenger vehicle manufacturers are not available.

[79] DOL, BLS, Census of Employment and Wages (accessed March 2, 2012).

[80] Please see the note to figure 5 for a discussion of the differences between the data in figures 4 and 5.

FIGURE 5 Average hourly wages and motor vehicle manufacturing employment, 2007–11



Source: DOL, BLS, Occupational Employment Statistics, December 19, 2012 [www.bls.gov/oes/].

Note: The employment figures in figure 5 are not comparable to those in figure 4 because they come from a different source with a different methodology. The Bureau of Labor Statistics (BLS) provides average hourly wage data by occupation through the Occupational Employment Statistics, a semiannual survey. Each year BLS provides data based on the previous six surveys, covering a three- year period. For example, the May 2007 employment and wage survey includes data from each of the six semiannual surveys through November 2004. Thus, the difference between May 2007 and May 2008 figures reflects the difference between the two most recent surveys (May 2008 and November 2007) and the last two surveys in the May 2007 data (May 2005 and November 2004).

Within the United States, wage rates differ among passenger vehicle assembly plants.[81] Workers for Big Three passenger vehicle assembly plants are members of the United Automobile, Aerospace and Agricultural Implement Workers of America (UAW) whereas only one exclusively transplant assembly plant is unionized.[82] Wage rates for transplant assembly plants tend to be lower, with fewer benefits and legacy costs[83] than at U.S. Big Three assembly plants.[84]

Before 2007, the difference between wages, benefits, and legacy costs at Big Three versus other passenger vehicle assembly plants in the United States was greater, but in 2007 and 2009 the UAW made concessions to help the Big Three remain competitive.[85] In 2007, the UAW agreed to allow the transfer of pension responsibilities to a separate trust, which increased the Big Three's ability to take advantage of productivity increases and labor cost savings.[86] In 2009, the UAW agreed to a two-tiered wage system in which current employees kept their current wages and benefits, but new employees would start at a lower wage rate.[87] These lower wage rates may be reflected in the estimated 2011 labor costs (including wages, benefits, and legacy costs) for GM, which were $22 per hour lower than the 2007 level of $70 per hour.[88]

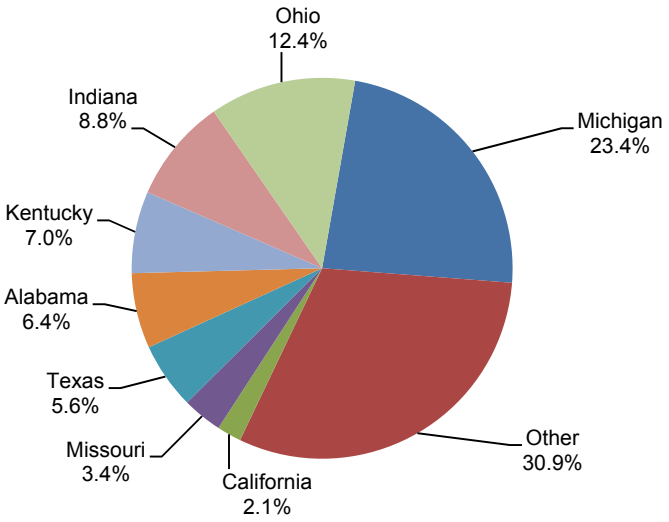
As mentioned earlier, this lower wage contributed to decisions by the Big Three manufacturers to resume assembly of lower-profit small cars[89] in the United States, and to reintegrate some assembly work that had been outsourced. For example, GM produces

[81] Vlasic and Bunkley, "Wheeling and Dealing," July 20, 2011.
[82] UAW website. http://www.uaw.org/cars (accessed January 26, 2012).
[83] Legacy costs are the pensions and health benefits paid to retired employees.
[84] Platzer and Harrison, *The U.S. Automotive Industry,* August 3, 2009, 18; Cohn, "Autoworkers Making $70 an hour? Not Really," September 22, 2009; Schwartz, "A Look Backward and a Look Forward," November 29, 2011.
[85] The wage difference between workers at Big Three was between $2 and $8 an hour in 2007, not including benefits or legacy costs. Cohn, "Autoworkers Making $70 an Hour?" September 22, 2009.
[86] Cooney, et al., *U.S. Motor Vehicle Industry,* January 30, 2009, 18.
[87] Vlasic and Bunkley, "Wheeling and Dealing," July 20, 2011.
[88] This includes not just wages, but also benefits and legacy costs. $70 is not the average wage. Cohn, "Autoworkers Making $70 an Hour?" September 22, 2009; Schwartz, "A Look Backward and a Look Forward," November 29, 2011.
[89] Eisenstein, "Mazda Will Build New Small Car for Toyota," November 9, 2012; Naughton, "Ford Sees Margins Shrinking," November 15, 2012.

the Chevrolet Sonic (a small car) in the United States, instead of in Mexico (where GM's previous small car was assembled).[90] GM also has new, lower-wage employees assembling the interior cockpit of the 2012 Sonic, a task that is outsourced for many other vehicles.[91] Starting in 2012, Chrysler began assembly of Dodge Darts (another small car) in the United States as well.[92]

Nearly 44 percent of U.S. motor vehicle employment in 2011 was concentrated in the Midwestern states of Michigan, Ohio, and Indiana (figure 6). Probably because of the concentration of Big Three plants in those states, wages tend to be higher than at the newer plants in the Southeastern states (table 6).

FIGURE 6 Employment in selected motor vehicle manufacturing states by percent share, 2011



Source: DOL, BLS, "State and Metro Area Employment, Hours, and Earnings," 2011.

Note: This figure uses data for motor vehicle manufacturing industry employment because specific data for passenger vehicle manufacturers are not available.

[90] Binder, *Ward's Automotive Yearbook*, 2011, 13.
[91] Murphy, "Tech Center Drives Inteva's Growth," July 2011, 10.
[92] Hirsch, "Chrysler Aims to Crack Small-Car Market," May 30, 2012.

TABLE 6 Average wages in selected states for motor vehicle manufacturing-related job classes, 2010 ($)

State	Average annual wages
Midwestern states	
Indiana	33,959
Illinois	32,183
Michigan	37,625
Ohio	34,367
Average	34,535
Southeastern states	
Alabama	31,417
Georgia	28,154
Kentucky	34,512
Mississippi	28,824
South Carolina	30,900
Tennessee	30,506
Texas	29,337
Average	30,574
National average	32,554

Sources: USITC staff calculations based on DOL, BLS, *Career Guide to Industries,* 2010–11, "Motor Vehicles and Parts Manufacturing" (accessed January 11, 2012); DOL, BLS, "May 2010 State Occupational Employment and Wage Estimates," May 18, 2011.

Notes: There are no data available for some occupations in Alabama, Kentucky, and Mississippi, but these occupations account for less than 1 percent of motor vehicle manufacturing and likely would not significantly change the estimated average wages in the southeastern United States.

This figure uses data for motor vehicle manufacturing industry employment because specific data for passenger vehicle manufacturers are not available.

While specific data for comparing motor vehicle manufacturing wages across countries are unavailable, international labor comparison statistics for all manufacturing appear to show that average hourly wages and benefits in U.S. manufacturing plants are relatively high compared to those in other passenger vehicle-producing countries. For example, average compensation costs for manufacturing jobs in the United States are higher than in Mexico, Japan, and Korea, although they are lower than for such jobs in Germany and similar to the rate in Canada (table 7).[93] A study comparing wages across manufacturing industries in the United States found that average annual earnings in motor vehicle and parts production in the United States are, on average, roughly equivalent to the average for all U.S. manufacturing.[94]

TABLE 7 Hourly compensation (wages and benefits) in manufacturing, 2010 ($)

Country	Hourly rate
Germany	43.76
Canada	35.67
United States	34.74
Japan	31.99
Korea	16.62
Mexico	6.23

Source: DOL/BLS, "Economic News Release: International Comparisons of Hourly Labor Costs," December 21, 2011.

[93] DOL, BLS, "International Comparisons of Hourly Compensation Costs in Manufacturing, 2010."
[94] Helper, Krueger, and Wial, "Locating American Manufacturing," May 9, 2012, 5.

Production Process and Strategies

To increase profits, passenger vehicle manufacturers use a number of strategies to keep their production costs as low as possible. Manufacturers seek economies of scale at the platform,[95] vehicle, and even the individual part level to reduce production costs. The passenger vehicle industry is capital intensive, requiring significant investments in equipment for automated and semiautomated tasks (box 1). Manufacturers use the same platform for multiple models to gain greater economies of scale and reduce R&D costs.[96] Passenger vehicle manufacturers spend nearly 50 percent of their R&D budgets on platform development, providing a strong incentive to decrease the number of platforms used.[97] The most dramatic example of using the same platform for multiple models is Volkswagen's MQB platform, which will reportedly be used in 30 different Volkswagen models.[98]

BOX 1 The production process

Although production processes vary across model lines and manufacturers, there are some activities common to all plants: production occurs along an assembly line, with workers or machines attaching specific parts or subassemblies to the vehicle frame/unibody.[a] Production is typically divided into three areas: the body shop, the paint shop, and final assembly. In the body shop, the body panels are stamped out of sheet metal and typically welded together, either to form a unibody or to be added to a separate frame. At some plants this process is automated, with all of the welding and materials handling performed by robots. The next step in the process is the paint shop, where the body is painted. This also tends to be automated. The final step is assembly, where all of the other components and subassemblies are attached to the vehicle. This is the most labor-intensive portion of passenger vehicle production, with workers performing specific tasks in a specific amount of time. A production plant may have different types of vehicles on the assembly line, depending on the assembly line's flexibility; this is a more recent innovation that will be discussed later.

As described later in more detail, passenger vehicle manufacturers are not vertically integrated; they purchase parts for their vehicles from hundreds of suppliers. Passenger vehicle manufacturers tend to keep only "in-house" signature systems of components, such as engines and transmissions.

Sources: Industry official, interview by USITC staff, April 5, 2013. Carfax, "Frame vs. Unibody Vehicles" (accessed November 26, 2012); GM Company website. http://www.gmpowertrain.com/PowertrainOverview.aspx (accessed October 12, 2012); Ford Company website. http://www.fordparts.com/Products/PowertrainProducts.aspx (accessed October 12, 2012).

[a] In frame construction, the body of the vehicle is mounted onto the frame, while in unibody construction the frame is stamped out as part of the vehicle's structure. Carfax, "Frame vs. Unibody Vehicles" (accessed November 26, 2012).

[95] Although there is no globally accepted definition, a "platform" typically consists of at least the "rolling chassis" and can also include braking systems, suspension parts, engines, and transmissions. Sturgeon et al., "Globalization of the Automotive Industry," 2009; Singh and Shankar, "30 Per Cent Reduction in Vehicle Platforms," August 23, 2011.

[96] Hill, Szakaly, and Edwards, "How Automakers Plan Their Products," 2007, 4; Guilford, "Soaring Costs Likely to Spark More Alliances," March 19, 2012, 4; Colias, "GM Wants Fewer Platforms, More Efficient Launches," August 15, 2011, 3.

[97] Bremner, "New Platform Family for Ford," November 21, 2012.

[98] Horrell, "Volkswagen's MQB Platform," June 2011.

Another strategy for reducing production costs is the sharing of parts or systems across platforms. For example, the Chrysler Pentastar engine family, which was introduced in 2010, replaced seven different Chrysler Group V-6 engines, significantly cutting costs.[99] A power-window switch, which is shared across the Toyota vehicle family, is an example of a relatively minor part that is used in many vehicles to achieve economies of scale.[100] Toyota's power-window switch is also an example of the potential downside of economies of scale.[101] If a widely shared part is later found to be defective and the manufacturer needs to recall the part, as happened with this switch in 2012, it can affect millions of consumers and cost the manufacturer millions of dollars to fix or replace.[102]

Manufacturers will also produce vehicles that only need slight modification for different markets internationally, thus increasing the volume of the product. "One Ford" is an example of such a strategy.[103] As a part of this strategy, Ford plans to reduce the number of models that it produces globally. In the past, the Ford Mondeo (in Europe) and the Ford Fusion (in the United States) were developed separately and required different parts, even though they were sized and priced similarly. The 2013 version of the Ford Fusion/Mondeo is a "world car" that is produced and sold in markets where previously the Mondeo was sold, in addition to the markets where the Fusion is already sold.[104]

However, different markets tend to reflect different consumer tastes, and many countries have specific safety or emissions requirements that can differ significantly, thereby requiring at least some design modification to meet these local needs. For example, diesel engines must pass strict emissions tests in many countries. In order to pass in the United States, they use filtering technology that is only compatible with ultra low sulfur diesel gasoline (ULSD).[105] However, in many developing countries, where ULSD is not available, the high sulfur content of the locally available diesel fuel would cause the filtration systems to malfunction, so the filtration system is not installed on vehicles destined for such markets.[106]

Just-in-time (JIT) manufacturing,[107] which originated from the Toyota Production System,[108] has been adopted by many manufacturers to reduce costs by lowering inventory expenses. Assembly plants using JIT keep very low levels of parts on hand and receive a near-constant stream of parts on demand from their suppliers.[109] For example, the Mercedes-Benz U.S. International Factory in Alabama strives to have only two hours of inventory stocked for the production line.[110] However, while low inventory levels save companies money, they can also increase a manufacturer's vulnerability to supply disruptions.[111]

An important variable in controlling supply chain costs for passenger vehicle manufacturers is raw material costs. Fluctuations in the price of raw materials can

[99] Chrysler Group LLC, "All-new Pentastar V-6 Engine," March 19, 2010.
[100] Greimel, "How Toyota Misjudged a Big Defect," October 15, 2012, 1 and 27.
[101] Ibid.
[102] Ibid.
[103] Ford Motor Company, 2009 Annual Report, 2 (accessed March 12, 2013).
[104] English, "Detroit Motor Show 2012: Ford Fusion/Mondeo," January 10, 2012.
[105] EPA, "Program Update: Introduction of Cleaner-burning Diesel," October 2006.
[106] Diem, "Cleaner Diesels for New Markets," July 1, 2012, 1; industry representative, telephone interview by USITC staff, August 9, 2010.
[107] Also known as zero inventory or lean manufacturing.
[108] Spear and Bowen, "Decoding the DNA," September–October 1999.
[109] Ibid.
[110] Mercedes-Benz U.S. International Company website, http://mbusi.com/pages/factory_home.asp (accessed July 6, 2011).
[111] Carey, Randewich, and Krolicki, "Special Report: Disasters Show Flaws," March 21, 2011.

directly affect the cost of passenger vehicle production via "pass-throughs" often written into contracts with suppliers, which allow the suppliers to pass at least some of the increased price of raw materials on to the passenger vehicle manufacturer.[112] Some passenger vehicle manufacturers control these costs by using their economies of scale to purchase raw materials for their suppliers (or at least negotiate a set price with a raw materials supplier) at lower prices than those at which the suppliers themselves could buy the materials.[113] The most important raw material in passenger vehicle production is steel, which is used in the frame, body, and other areas of passenger vehicles.[114] Other raw materials for passenger vehicle components include aluminum, copper, lead, and resins. The prices of many of these materials have experienced dramatic ups and downs. For example, during 2007–11 the price of hot-rolled steel, which is used in the frame of the passenger vehicle as well as internal structural parts and steering components, ran as low as $19 per 100 pounds and as high as $54 per 100 pounds in the United States.[115]

Passenger vehicle manufacturers use a number of demand indicators to help manage the difficult task of determining the production level of each model. They may have a number of internal and externally produced sales projections,[116] which may project different levels of demand for the same model. Another indicator used to gauge demand is inventory levels, which are typically measured in days of supply (number of units in dealer lots/average sales per day). Manufacturers use a variety of methods on the supply and the demand side to keep inventory low. If inventories are too high the manufacturer may temporarily halt production. For example, in November 2011, GM idled its Lordstown plant for a week because the inventory of the vehicle being produced there (the Chevrolet Cruze) had grown to 73 days of supply (manufacturers typically target 60 days of supply).[117] Because they produce a number of different cars and trucks, sometimes on the same assembly line (see next paragraph), decreasing production of one vehicle may mean producing more of another in order to maintain proper levels of capacity utilization at a particular assembly plant.[118] Manufacturers may also use incentives to encourage consumers to buy or dealers to sell more of a specific vehicle, and thus reduce inventory.[119]

Flexible production is used by many manufacturers to align production with demand and reduce inventory levels. Flexible production is the ability to produce different vehicles on the same assembly line.[120] The trend began with Japanese producers, which have the reputation of being the most flexible firms, and was later adopted by most U.S. producers, especially at newer or refurbished plants.[121] Flexible assembly lines allow manufacturers to adjust production rates of different vehicles based on demand while maintaining a high utilization rate at each plant.[122] This allows manufacturers to maintain lower inventories while meeting consumer demand.[123] Lower vehicle inventory levels increase profits, much as lower parts inventory levels do.

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[112] USDOC, ITA, "On the Road: U.S. Automotive Parts Industry," 2010, 7–8.
[113] *Supply Dynamics,* "Reduce Raw Materials Costs by 3–25%," (accessed October 2, 2012).
[114] USDOC, ITA, "On the Road: U.S. Automotive Parts Industry," 2010, 7–8.
[115] *American Metals Market,* "Steel Sheet, Hot-Rolled/Midwest," October 23, 2012.
[116] Hill, Szakaly, and Edwards, "How Automakers Plan Their Products," July 2007, 4.
[117] Colias, "This Isn't the Same GM," December 12, 2011, 1.
[118] Hill, Szakaly, and Edwards, "How Automakers Plan Their Products," July 2007, 4.
[119] Gorzelany, "Let's Make a Deal!" August 10, 2012; Vlasic, "When a Crisis Comes with a Reset Button," October 11, 2012.
[120] Sousanis, "Manufacturing's New Necessity," June 2011, 23–24.
[121] Winter, "Flexibility a Long Time Coming," June 2011, 26.
[122] Sousanis, "Manufacturing's New Necessity," June 2011, 23–24.
[123] Cachon and Olivares, "Drivers of Finished-Goods Inventory," January 2010, 202; Sousanis, "Manufacturing's New Necessity," June 2011, 23.

Supply Chain

Supply costs represent more than 75 percent of industry costs.[124] Today, passenger vehicle manufacturers are more horizontally than vertically integrated, producing a variety of vehicles but very few of the required components.[125] One exception is the vehicle drivetrain, which is generally produced by the passenger vehicle manufacturer, whereas the other parts and components are typically sourced from suppliers. Any disruption in these supplies can affect production, even if the part is relatively minor.[126]

Manufacturers attempt to diversify their supply chains in order to reduce the risk of production delays because of disruptions to output or delivery of parts from a particular supplier. However, in 2011 and 2012, passenger vehicle manufacturers realized that in some cases, their multiple suppliers all relied on the same lower-level Tier 3 suppliers for raw materials.[127] For example, a fire in March 2012 destroyed a factory in Germany producing 25–50 percent of the world's supply of cyclododecatriene (CDT).[128] This chemical is an input for producing the nylon resin PA-12, which is used in fuel systems for many passenger vehicles.[129] Other suppliers of CDT increased production, and manufacturers substituted other polymers for PA-12 to work around the CDT shortage.[130]

Despite the risks, manufacturers have begun "single-sourcing" many parts to increase profits and maintain quality. The idea behind single sourcing is to use the same supplier for the same part throughout the supply chain due to the consistent quality achieved by the supplier for that particular part.[131] Often the manufacturer then encourages the supplier to open plants around the globe in the vicinity of the manufacturer's production plants, thereby reducing transportation costs. Furthermore, single-sourcing provides the supplier with greater economies of scale, which should lead to a lower unit cost.

At the manufacturer level the passenger vehicle industry is highly globalized; most major manufacturers produce in numerous countries. But the supply chains for passenger vehicles tend to be more localized, with parts sourced from nearby plants owned by global or local suppliers. According to local-content statistics, during the 2011 model year 20 percent of carlines[132] in the United States incorporated more than 75 percent

[124] Thormahlen, "Car and Automobile Manufacturing in the U.S," June 2011, 22.

[125] Schumpeter, "The Trouble with Outsourcing." July 30, 2011.

[126] Xirallic pigment, which is used to make paints shiny, is one example of a minor product that had an effect on passenger vehicle supply. This pigment is used by U.S., European, and Japanese manufacturers, all of which had to limit their production of vehicles in specific colors after the tsunami in Japan, because the pigment was exclusively produced by Merck in Onahama, Japan, and its plant was damaged. Boudette and Bennett, "Pigment Shortage Hits Automakers," March 26, 2011.

[127] Tier 1 suppliers produce finished components (e.g., dashboard assembly, seats, battery packs for electric vehicles etc.) and sell them directly to the manufacturer. Tier 2 suppliers produce and sell parts to Tier 1 suppliers (e.g., window motors for door assemblies). Tier 3 suppliers supply raw materials (e.g., steel, resins, plastics, etc.) to the manufacturers, Tier 1, and Tier 2 suppliers. USDOC, ITA, "On the Road: U.S. Automotive Parts Industry Annual Assessment," 2010, 6.

[128] Evans, "Fire in Small German Town could Curb World Car Production," April 19, 2012.

[129] Woodall, "Dupont, Dow to Help Global Automakers Avoid Output Crunch," April 20, 2012.

[130] Krisher, "Automakers may have Dodged Resin Shortage Threat," April 27, 2012; Walsh, "Stainmaster Carpet Producer may Help Ease Looming Shortage of Auto Resin nylon12," April 19, 2012.

[131] Cooke, "The Japanese Tsunami & the Automotive Industry," July 2011, 4–6.

[132] "The term 'carline' refers to a name of a group of vehicles which has a degree of commonality in construction, e.g., body and chassis." This may include all of a particular model, or a subset. For example, for the 2011 model year all Dodge Dakota models were included in one carline, while the Ford Explorer 2.0L and the Ford Explorer 3.5L are listed as separate carlines because of differences in the parts included in a vehicle. *Source:* U.S. DOT, NHTSA, Part 583 American Automobile Labeling Act (AALA) Reports, 2011.

U.S./Canada content, and only 9 of 145 (6 percent) incorporated less than 50 percent U.S./Canada content.[133]

U.S. passenger vehicle manufacturers have built long-term relationships with many of their suppliers, and tend to have a group of Tier-1 suppliers known as core suppliers.[134] These suppliers tend to receive the majority of supplier work, but the amount varies by manufacturer. In Japan, the *keiretsu* system of interlocking corporate directorships promoted similar close cooperation between suppliers and manufacturers. [135] Relationships are often long term due to the nature of supplier contracts, which are typically for the life of the related vehicle.[136] Due to these historical connections, Big Three manufacturing plants tend to rely on U.S.-based suppliers, while transplant manufacturing plants tend to rely on foreign-based suppliers that often locate their U.S. facilities in the vicinity of the transplant assembly plant.[137]

Regulations Affecting the Industry

Two sets of federal passenger vehicle regulations, the Corporate Average Fuel Economy (CAFE) standards and Federal Motor Vehicle Safety Standards (FMVSS), have a significant impact on many aspects of the vehicles sold in the United States. While CAFE only governs vehicle emissions and fuel economy, FMVSS can affect a number of different elements inside and outside of a passenger vehicle. The FMVSS is administered by the U.S. Department of Transportation's National Highway Transit Safety Administration (NHTSA). CAFE standards are analyzed and administered by NHTSA and Environmental Protection Agency (EPA).

CAFE standards (box 2), which govern vehicle emissions (usually translated into fuel efficiency requirements) [138] on passenger vehicles, are scheduled to become increasingly stringent over the next 15 years, reaching an average of 49.6 miles per gallon (mpg) by 2025 (figure 7). NHTSA estimates that achieving the 2016 standard of 34.1 mpg will cost an average of $926 per passenger vehicle.[139] NHTSA and EPA estimate that achieving the 2025 standard of 49.6 mpg will cost an additional $1,800 per vehicle on average.[140] NHTSA and the EPA believe that the standards will be met using a number of different technologies, including improved gasoline engines and transmissions, lower tire rolling-resistance, increased aerodynamics, increased use of diesel engines, more efficient

[133] U.S. DOT, NHTSA, Part 583 American Automobile Labeling Act (AALA) Reports, 2011.

[134] Sedgwick, "Ford Exec Expects Supplier Mergers," June 27, 2011, 6; Ford Motor Company, "Ford Adds 17 Companies to List of Preferred Suppliers Selected for Long-Term Relationships," June 14, 2011; Sedgwick, "Honda Purchasing Chief Discusses Managing Risk," January 9, 2012.

[135] Treece and Greimel, "Japan Gets Tough on Collusion," February 6, 2012.

[136] Delphi Automotive, SEC 10-K filing, "Supply Relationships with Our Customers," February 17, 2012, 11; Visteon, SEC 10-K filing, "Risk Factors," February 17, 2012, 9.

[137] USDOC, ITA, "On the Road: U.S. Automotive Parts Industry," 2010, 3.

[138] Reports on the 2016 CAFE standard often cite 35.5 mpg as the fleet average fuel efficiency requirement. However, if manufacturers reduce CO_2 emissions through changes to the air conditioning system, then they only need fleet average fuel efficiency of 34.1 mpg, because the goal is reduced emissions, which have been translated into fuel efficiency requirements. *Source:* EPA and NHTSA, *Light-Duty Greenhouse Gas Emissions Standards and Corporate Average Fuel Economy Standards; Final Rule,* 40 C.F.R. § 85, 86 and 600; 49 C.F.R. § 531, 533, 536, et al.

[139] DOT, NHTSA, Office of Regulatory Analysis and Evaluation, National Center for Statistics and Analysis, *Corporate Fuel Economy for MY 2012–MY 2016 Passenger Cars and Light Trucks,* March 2010, 7, table 5.

[140] See footnote 153 for explanation of 49.6 mpg vs. 54.5. NHTSA and EPA, CAFE Final Rule, 77 C.F.R. § 199 (2012).

vehicle accessories, and increased electrification in terms of both hybrid and electric vehicles.[141]

BOX 2 Corporate Average Fuel Economy (CAFE) standards

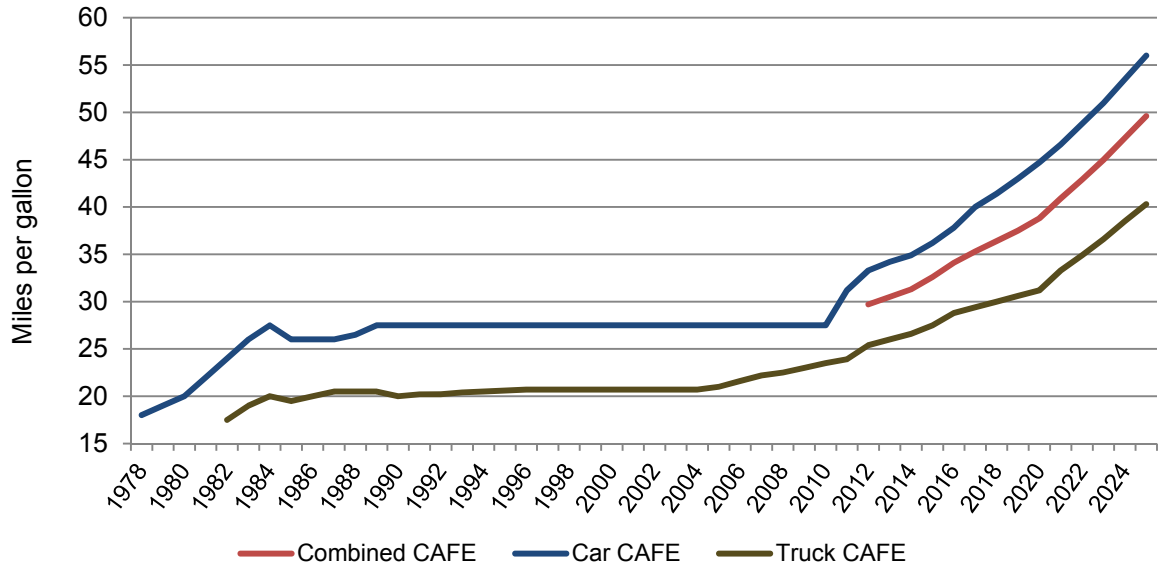
CAFE was originally created in 1975 in response to the 1973–74 oil embargo with the goal of reducing U.S. energy consumption. The CAFE standard is "the sales weighted average fuel economy, expressed in miles per gallon (mpg), of a manufacturer's fleet of passenger cars or light trucks with a gross vehicle weight rating (GVWR) of 8,500 lbs. or less, manufactured for sale in the United States, for any given model year." Today the standards seek to reduce both energy consumption and greenhouse gas emissions.

The CAFE standards for 2016 require each manufacturer selling vehicles in the United States to meet an estimated combined average of 34.1 mpg, a significant increase from the 29.7 mpg required in 2012. To meet this requirement, passenger vehicle manufacturers' average fuel efficiency must improve by an estimated 4.3 percent per year from 2012 to 2016.

The CAFE standards for 2017–25 increase 5 percent per year for passenger cars. For light trucks (including SUVs), the standard increases by 3.5 percent per year for the first five years and by 5 percent per year for the four years after that. Overall, the new CAFE standard in 2025 will be 49.6 mpg.

Sources: DOT, NHTSA, "CAFE-GHG Fact Sheet" (accessed July 5, 2011), 4; DOT, NHTSA, "CAFE Overview—Frequently Asked Questions" (accessed July 5, 2011); EPA and NHTSA, *Light-Duty Greenhouse Gas Emissions Standards and Corporate Average Fuel Economy Standards; Final Rule,* 40 C.F.R. Parts 85, 86 and 600; 49 CFR Parts 531, 533, 536, et al.; Vlasic, "Carmakers Back Strict New Rules for Gas Mileage," July 28, 2011.

FIGURE 7 Estimated required Corporate Average Fuel Economy (CAFE) standard levels will increase by 67 percent from 2012 to 2025 (mpg)



Sources: DOT, NHTSA, "NHTSA and EPA Establish New Program " (accessed February 2, 2012); DOT, NHTSA, "NHTSA and EPA Propose to Extend the National Program " (accessed February 2, 2012); DOT, NHTSA, "Light Truck Fuel Economy Standard Rulemaking" (accessed June 7, 2012); DOT, NHTSA, "2004 Automotive Fuel Economy Program" (accessed June 7, 2012).

[141] NHTSA and EPA, CAFE Final Rule, 77 C.F.R. § 199 (2012).

In the near term, many manufacturers plan to achieve CAFE standards without reducing the power or ability of a vehicle to perform the same tasks as previous models.[142] Manufacturers are using a number of strategies to raise fuel efficiency, including improving the aerodynamics of the vehicle,[143] adopting lightweight materials,[144] increasing the use of direct-fuel injection,[145] lessening internal engine friction,[146] incorporating start-stop technology,[147] adopting eight-speed transmissions,[148] and switching to electric power steering.[149] Most manufacturers are also working to improve the efficiency of the internal combustion engine, which the industry expects to remain the main vehicle powertrain[150] for at least the next 15 years.[151] It should be noted that these modifications do not dramatically change the driving dynamics of the vehicle from the driver's perspective.[152] However, many manufacturers are also downsizing engines and making up for the loss of power with turbochargers,[153] which can reduce the amount of power available at lower speeds.[154]

The U.S. FMVSS is a self-regulating set of standards,[155] meaning manufacturers perform their own testing to ensure that their products meet federal safety requirements. Although these standards require a certain level of safety performance, they do not mandate the method used to reach that level,[156] so manufacturers can choose the most effective method of meeting the standard.[157] For example, Standard 216 specifies a certain level of roof crush resistance over the passenger compartment,[158] but it does not specify the type of material to be used or manufacturing techniques involved. One unintended effect of the FMVSS has been to make new vehicles heavier, because of the added weight of many safety features, such as airbags.[159] The extra pounds can make it more difficult for manufacturers to meet fuel-efficiency requirements.

Government Incentive Programs

In addition to providing financial relief to two of the three U.S.-headquartered passenger vehicle manufacturers, the U.S. government assisted the U.S. passenger vehicle industry through R&D tax credits (for all companies),[160] tax credits for purchase of fuel-efficient vehicles,[161] and government grants and loan guarantees for specific technology programs.[162] The Energy Policy Act of 2005 established tax credits to consumers of

[142] Stein and Wernle, "Getting to 35.5: The ABCs of mpg," January 3, 2011.
[143] Ibid.
[144] Miel, "Execs: We're on the Prowl for Weight Savings," December 12, 2011, 26.
[145] Chappel, "MPG: Not Just for CAFE Anymore," June 11, 2012, 24–34.
[146] Ibid.
[147] Ibid.
[148] Stein and Wernle, "Getting to 35.5: The ABCs of mpg," January 3, 2011.
[149] Ibid.
[150] Definitions of powertrain vary by company, but include at least the engine and transmission.
[151] Winter, "We Need More Bullets, Not a Magic One," May 2011, 2.
[152] Stein and Wernle, "Getting to 35.5: The ABCs of mpg," January 3, 2011.
[153] Stein and Wernle, "Getting to 35.5: The ABCs of mpg," January 3, 2011; Colias and Wernle, "GM, Chrysler Full-sized Pickups," August 15, 2011, 14.
[154] Csere, "Turbocharged Engines to the Rescue!" October 2008.
[155] DOT. NHTSA. Federal Motor Vehicle Standards and Regulations (accessed July 29, 2011).
[156] Ibid.
[157] DOT, NHTSA, Title 49 Chapter V: Foreword, (accessed January 27, 2012).
[158] DOT, NHTSA, Federal Motor Vehicle Standards and Regulations (accessed February 28, 2012).
[159] Roland, "Resuming the Great Debate: Safety vs. Weight," May 9, 2011, 26.
[160] IRS, Credit for Increasing Research Activities, updated April 3, 2013; Tyson and Linden, "The Corporate R&D Tax Credit," January 6, 2012.
[161] IRS, "Alternative Motor Vehicle Credit," updated August 3, 2012.
[162] 10 C.F.R. § 611 (2008).

energy efficient vehicles purchased before January 1, 2011, with the credit amount varying with the efficiency of the vehicle; the American Recovery and Reinvestment Act of 2009 extended and expanded this tax credit program.[163]

Grants and loan guarantees to incentivize manufacturing are another avenue of assistance offered in the United States. The Advanced Technology Vehicles Manufacturing Incentive Program, a part of the Energy Independence and Security Act of 2007, offered grants and loans for companies to manufacture electric vehicles or components in the United States.[164] Under this program, the U.S. Department of Energy disbursed nearly $8.4 billion in loan guarantees to passenger vehicle manufacturers including Fisker, Ford, Nissan, and Tesla.[165] In all, the Congressional Budget Office estimates that federal incentives to consumers and manufacturers for electric and hybrid passenger vehicles will total approximately $7.5 billion over 2009–19.[166]

Research and Development

Passenger vehicle manufacturers spend billions of dollars annually on R&D to develop both new vehicles and new vehicle technologies to remain competitive and meet stricter fuel efficiency and safety requirements. The process of developing a passenger vehicle for production typically takes two and a half to three years, from business case to production (box 3). The passenger vehicle manufacturing industry is among the global leaders in R&D investment.[167] Worldwide, Big Three R&D expenditures totaled $14 billion in 2012 (table 8). According to the American Automotive Policy Council, the Big Three spend 80 percent of their R&D money in the United States.[168] R&D is centered in Michigan, where 9 of the world's top 10 passenger vehicle manufacturers have R&D facilities.[169] As with other industry indicators, Big Three R&D spending declined in 2008 and 2009, but then rebounded in 2010 and 2011. On an individual company basis, GM is one of the top 20 companies in all industries in global R&D.[170] High R&D expenditures, however, may partially be a function of the relatively large size of the passenger vehicle manufacturers, as passenger vehicle manufacturers' R&D spending as a percent of sales was in the bottom half of the top 20 firms globally.[171]

[163] IRS, "Alternative Motor Vehicle Credit," updated August 3, 2012.
[164] 10 C.F.R. § 611 (2008).
[165] DOE, LPO, "Our Projects" (accessed October 1, 2012).
[166] CBO, "Effects of Federal Tax Credits," September, 2012, 4.
[167] Jaruzelski, Loehr, and Holman, "Global Innovation 1000: Why Culture Is Key," Winter 2011, 7.
[168] American Automotive Policy Council website, http://www.americanautocouncil.org/industry-facts (accessed November 27, 2012).
[169] Shreffler, "Michigan Automotive Research and Development Facilities Directory," 2007.
[170] Jaruzelski, Loehr, and Holman, "Global Innovation 1000: Why Culture Is Key," Winter 2011, 7.
[171] Jaruzelski and Dehoff, "Global Innovation 1000," Winter 2010, 10.

BOX 3 The development process

The vehicle begins as an idea for a new version of an existing model or an entirely new model. In either situation, a business case must be made for the new vehicle or new version, including projections regarding customer type and target price. Once the idea has been approved, designers begin working on a concept vehicle. When the concept vehicle is finished, it is often shown at an auto show where interest is gauged. If the manufacturer detects enough interest, work begins to modify the concept vehicle's design into one that is ready for mass production.

Although concept vehicles are intended to represent the idea of a production model, designers also use them to experiment with incorporating new technology without consideration of price. These designs often include parts that are currently too expensive to mass-produce or unlikely to be able to endure the wear and tear of regular usage. Since a mass-production vehicle tends to have a strict per-vehicle budget, concept vehicles often undergo significant modifications to meet these goals. Vehicle shape is another aspect of a concept vehicle that typically changes before the production model is finalized. Most manufacturers assign a specific drag coefficient that a production vehicle must meet, and the modifications necessary to reach that requirement frequently change the shape of the vehicle.

Sources: Cumberford, "2011 Chevy Volt," March 2009; Hill, Szakaly and Edwards, "How Automakers Plan Their Products," July 2007, 20–21; Pope, "Are Aerodynamic Requirements Killing Exterior Design?" July 2011, 30.

TABLE 8 Big Three research and development (R&D) expenditures, 2007–12 (billion $)

	2007	2008	2009	2010	2011	2012
GM	8.1	8.0	6.0	6.9	8.1	7.4
Ford	7.5	7.3	4.7	5.0	5.3	5.5
Chrysler	[a]	[a]	[a]	[a]	[b]0.5	[b]1.1
Total	[c]15.6	[c]15.3	[c]10.7	[c]11.9	13.9	14

Sources: General Motors Corporation, Form 10-k, 2008 (accessed March 24, 2013); General Motors, *2011 Annual Report* (accessed March 24, 2013); General Motors Corporation, Form 10-k, 2012 (filed February15, 2013 (accessed March 24,2013); Fiat SpA, *2011 Annual Report* (accessed March 24, 2013); Fiat SpA, *2012 Annual Report* (accessed March 26, 2013); Ford Motor Co., Form 10-k, 2008 (filed February 26, 2009); Ford Motor Co., Form 10-k, 2012 (filed February 18, 2013).

Note: All numbers reflect global R&D expenditures, as none of the Big Three break down their R&D expenditures by region or country. Also, many foreign manufacturers conduct R&D in the United States, even if they do not assemble vehicles there.

[a]Because Chrysler was a part of Daimler from 2007 to 2008, and subsequently owned by Cerberus in 2009, its R&D expenditures during this time are not publicly available.
[b]Chrysler's 2011 and 2012 R&D expenditures are reported as a breakout of Fiat R&D, but some Fiat R&D expenditure likely also supports future Chrysler products.
[c]Excluding Chrysler.

European, Korean, Japanese, and even Chinese manufacturers all conduct R&D in the United States.[172] Manufacturers that produce vehicles in the United States use technical centers to design vehicles for the U.S. market, or at least "localize" the vehicle by making modifications that suit U.S. regulations and consumer tastes. For example, Toyota's Calty Design Research, Inc. designed and primarily engineered the Toyota Avalon, and has contributed exterior styling for a number of Toyota production models.[173] Top global R&D regions, such as Michigan, have also drawn manufacturers that do not produce in the United States or compete in the U.S. market to locate R&D facilities in the United States. For example, Changan (a Chinese passenger vehicle manufacturer) has an automotive chassis-focused R&D center in Michigan in order to keep up with global trends.[174]

[172] Shreffler, "Michigan Automotive Research and Development Facilities Directory," 2007.
[173] Toyota website, http://www.toyota.com/about/our_business/design/ (accessed November 28, 2012); Toyota, "Homegrown in the U.S.A." (accessed November 28, 2012).
[174] Changan U.S. Research and Development Center, Inc. website, http://www.changanus.com/ (accessed November 28, 2012).

The passenger vehicle industry evolves constantly, incorporating new technologies into vehicles every year. New technologies are often first introduced in high-priced luxury vehicles and then gradually added to less expensive vehicles.[175] This process can extend over a decade or more. An extreme example is the use of carbon fiber in the frame of a passenger vehicle. Carbon fiber was first used in Formula 1 racing in 1981, and the first on-road passenger vehicle to make use of it for the entire frame was the $1-million McLaren F1 in 1992.[176] In late 2013, BMW plans to sell the i3, a passenger car with a carbon fiber passenger cell, for under $100,000.[177]

Some innovations, such as electric vehicles, have a high profile, but a number of lower-profile technologies and improvements are introduced in new vehicles each year. In the last five years, direct injection, dual-clutch transmissions, Bluetooth connectivity, and a number of other technologies have either been introduced or spread to more new passenger vehicles. The proliferation of electronics (e.g., built-in navigation systems, adaptive cruise control) in passenger vehicles also has led to a dramatic increase in the reliance on microcontrollers in each vehicle. In 2008 between 35 and 45 microcontrollers were incorporated into the average passenger vehicle, and this number is projected to increase to 70 units by 2020.[178]

Passenger vehicle R&D focuses on developing products and technologies not just for the current product cycle, but also for future products, due to the relatively long development times for some technologies. For example, a number of manufacturers have invested in the development of hydrogen fuel-cell vehicles (FCVs) for decades, but the Honda FCX Clarity is the only FCV currently offered for sale in the United States—only in select markets, and only through a three-year, $600-a-month lease.[179] Further, if a passenger vehicle manufacturer succeeds at developing a technology in advance of its peers, the advantage may also yield lucrative licensing opportunities. For example, Toyota has licensed some of the hybrid technology originally developed for the Toyota Prius to Nissan and Mazda.[180]

Passenger vehicle manufacturers consistently find new ways to incorporate raw materials, including some that they have never before used in vehicles. They conduct R&D in this area to lower costs, lessen waste, and reduce the weight of the vehicle. Environmental concerns have led manufacturers to find new uses for the waste steel from the metal-forming (stamping) process[181] and to seek more efficient and environmentally friendly painting processes.[182] Manufacturers have also been looking to use recycled materials and plant products for vehicle interiors. For example, Ford uses recycled plastic from beverage bottles in the carpet of the 2013 Ford Escape.[183] The use of aluminum in passenger vehicle manufacturing is becoming increasingly important as manufacturers seek lighter alternatives to steel to reduce vehicle weight.[184]According to a report by Ducker Worldwide, average usage of aluminum reached an all-time high of 343 pounds

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[175] Ohanessian, "How Luxury Cars Drive Innovation," April 23, 2007.

[176] *Economist,* "VW Buys into BMW's Carbon-Fibre Dream," March 1, 2011; Chambers, "Carbon Fiber Comes of Age," April 29, 2011.

[177] Chambers, "Carbon Fiber Comes of Age," April 29, 2011.

[178] Murray, "Automakers Aim to Simplify Electrical Architecture." October 21, 2008.A microcontroller is a small computer on a single chip.

[179] Honda Motor Co. website, http://automobiles.honda.com/fcx-clarity/ (accessed August 2, 2012).

[180] Reuters, "Toyota May Supply Daimler with Hybrid Parts," September 16, 2012.

[181] Pope, "Ford Borrows F-150 Leftover Steel," August 19, 2010.

[182] Murphy, "BMW, Ford Advance Paint Shops," September 2009, 13.

[183] Wernle, "Ford Puts the PET in Its Green Carpets," December 5, 2011, 14.

[184] Winter, "Survey: Auto Aluminum Use to Double," October 15, 2011, 7.

per new U.S. passenger vehicle in 2012, and is projected to reach 550 pounds per vehicle in 2025.[185]

Many passenger vehicle manufacturers are also investing in the development of alternative powertrains, such as hybrid, electric, and biofuel vehicles. These vehicles have been on the market since the late 1990s, but make up only about 3 percent of sales annually in the United States.[186] Hybrids use both a traditional internal combustion engine (ICE) and a battery to power the vehicle, functioning either in concert or separately. While driving, a hybrid's batteries are recharged by power from the ICE and regenerative braking. In plug-in hybrids, the battery may be charged with electricity from the power grid while the vehicle is parked. The distance a plug-in hybrid can travel on battery power alone varies, based on the size of the battery in the car. For example, the 2012 Chevrolet Volt has a 16 kilowatt-hour (kWh) lithium-ion battery and a range of 35 miles on battery power alone.[187] The Toyota Prius Plug-in has a range of 11 miles, when relying on its 4.4 kWh battery.[188] Traditional (non-plug-in) hybrids, such as the original Toyota Prius or the Honda Insight, have smaller batteries and a smaller electric motor that cannot power the vehicle alone for an extended period of time, but rather helps the ICE engine to run more efficiently, especially at lower speeds.

To meet long-term fuel-efficiency standards, manufacturers will likely have to adopt game-changing technologies, because eventually there will be little to no efficiency gain left to achieve incrementally.[189] With this point in mind, manufacturers are exploring how to move away from fossil fuels in a larger share of their passenger vehicles and instead use fuel cells or electricity to power their vehicles, as was mentioned previously.[190]

U.S. Market

The United States was the world's second-largest single-country passenger vehicle market, with 14.5 million units in sales in 2012. These sales, however, represented an almost 1.6 million unit decline from 2007. High gasoline prices and the recession combined to depress consumer demand for passenger vehicles in the United States in 2008 and 2009 by over 35 percent, from 16.1 million units in 2007 to a low of 10.4 million units in 2009 (figure 8).[191] Even in 2010, with the economy beginning to recover, only 11.5 million units were sold.[192] Import penetration (including vehicles from Canada and Mexico) increased from 56.1 to 57.1 percent during 2007–12.[193]

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[185] The Aluminum Association, "Auto Aluminum Usage Hits All-Time High," September 7, 2011.

[186] Hybridcars, "May 2012 Dashboard," June 5, 2012.

[187] Chevrolet website, http://www.chevrolet.com/assets/pdf/en/overview/12_Volt_Spec_Sheet.pdf (accessed June 20, 2012).

[188] Toyota website, http://www.toyota.com/byt4/2012/prius-plug-in/en/condensed_ebro.pdf (accessed June 20, 2012).

[189] Witzenburg, "Future Fuel Economy Mandates Part III: Chrysler," February 24, 2012.

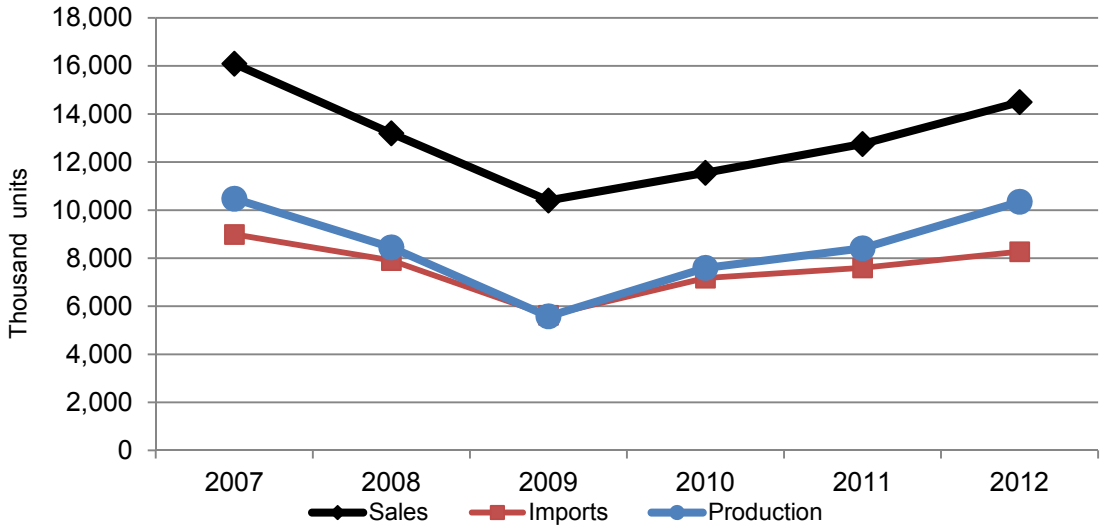
[190] Electric vehicles: Nissan Leaf, Ford Focus EV, Transit ConnectEV, SmartEV, etc. Fuel cell vehicles: Honda FCX Clarity.

[191] Binder, *Ward's Automotive Yearbook,* 2009, 258–67. Binder, *Ward's Automotive Yearbook,* 2010, 229–38. Binder, *Ward's Automotive Yearbook,* 2011, 220–29. Binder, *Ward's Automotive Yearbook,* 2012, 206–15.

[192] Ibid.

[193] For more information on producers in Canada and Mexico, see the "Foreign Industry Profiles" section. USITC staff calculation based on data from Binder, *Ward's Automotive Yearbook,* 2009, 258–67. Binder, *Ward's Automotive Yearbook,* 2010, 229–238. Binder, *Ward's Automotive Yearbook,* 2011, 220–29. Binder, *Ward's Automotive Yearbook,* 2012, 206–215; USITC/USDOC DataWeb, (accessed February 10, 2012).

FIGURE 8 U.S. passenger vehicle sales, imports, and production, 2007–12

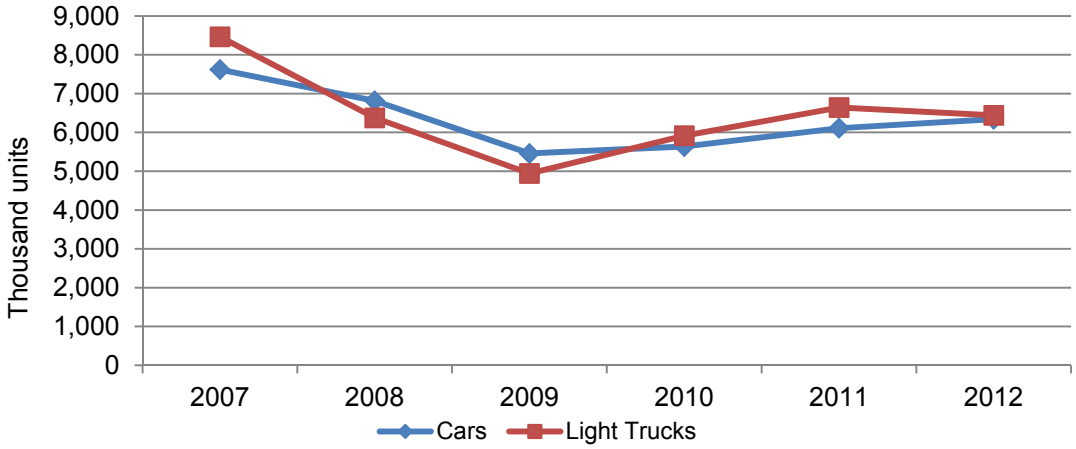


Sources: Automotive News, U.S. Light Vehicle Sales by Nameplate, January 7, 2013; *Automotive News,* North American Car and Truck Production, January 7, 2013; Binder, *Ward's Automotive Yearbook,* 2009, 258–67. Binder, *Ward's Automotive Yearbook,* 2010, 229–38. Binder, *Ward's Automotive Yearbook,* 2011, 220–29. Binder, *Ward's Automotive Yearbook,* 2012, 206–215; OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–11 (accessed various dates); and USITC, DataWeb/USDOC (accessed: February 10, 2012, March 8, 2013).

The composition of the U.S. passenger vehicle market changed during 2007–12. Light truck sales exceeded those of passenger vehicles in 2007, but in 2008 and 2009 passenger car sales exceeded those of light trucks (figure 9). One likely contributing factor was higher gasoline prices in 2008 and 2009, which stimulated demand for more fuel-efficient passenger cars. Light truck sales rebounded after 2009, probably because of the decline in gasoline prices and more efficient light truck[194]offerings. Two pickups, the Ford F-Series and the Chevrolet Silverado, continued to be the top selling passenger vehicles in the United States in 2011 (table 9).

[194] Light trucks include CUVs, pickup trucks, SUVs, and vans.

FIGURE 9 U.S. car and light truck sales, 2007–12



Sources: Binder, *Ward's Automotive Yearbook,* 2009, 258–267. Binder, *Ward's Automotive Yearbook.* 2010, 229–38. Binder, *Ward's Automotive Yearbook,* ,2011, 220–29. Binder, *Ward's*

TABLE 9 Ten top selling passenger vehicles in the United States in 2012 (units)

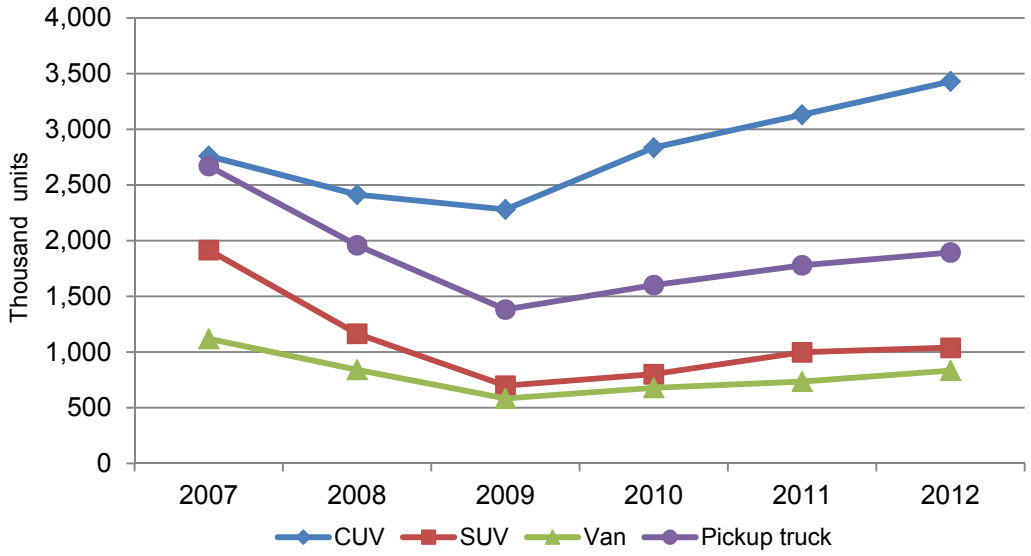
Vehicle	Sales
Ford F-Series (pickup)	607,854
Chevrolet Silverado (pickup)	418,312
Toyota Camry (passenger car)	404,886
Honda Accord (passenger car)	331,443
Honda Civic (passenger car)	317,909
Nissan Altima (passenger car)	302,934
Toyota Corolla/Matrix (passenger car)	290,947
Ram Pickup (pickup)	283,056
Honda CR-V (CUV)	281,652
Ford Escape (CUV)	261,008

Source: Ward's Automotive Reports, "Ward's U.S. Car Sales by Line and Brand – December 2012," January 7, 2013, 1–3; *Ward's Automotive Reports,* "Ward's U.S. Light Truck Sales by Line and Brand – December 2012," January 7, 2013, 3–5.

In the light truck category during 2007–12, the composition of demand also changed, likely due to higher gasoline prices (figure 10). During the economic downturn, demand for pickup trucks and SUVs declined sharply, whereas demand for the relatively more fuel-efficient CUVs fell more slowly.[195] At the same time, manufacturers introduced more CUVs to the market or converted their SUVs to CUVs.[196] Demand for all light trucks increased from 2010 to 2012, but demand for CUVs grew more quickly than the rest of the market.

[195] For more information, see the "Market Factors Influencing Demand" section.
[196] Cato, "The SUV Is Dead, Long Live the Crossover," May 19, 2011.

FIGURE 10 U.S. light truck sales by segment, 2007–12



Sources: Binder, *Ward's Automotive Yearbook* , 2009, 258–67. Binder, *Ward's Automotive Yearbook,* 2010, 229–38. Binder, *Ward's Automotive Yearbook* , 2011, 220–29. Binder, *Ward's Automotive Yearbook,* 2012, 206–15; *Ward's Automotive Reports,* Ward's U.S. Light Vehicle

The U.S. passenger vehicle market features heavy competition between foreign-brand and U.S. based manufacturers, but this competition varies by segment. Japanese manufacturers tend to be more competitive in small and mid-size cars, but the Big Three recovered market share in these cars in 2011 due to restricted Japanese supply and new vehicle product offerings.[197] Korean passenger vehicle manufacturers tend to compete in the same segments as the Japanese manufacturers. German manufacturers mainly compete in luxury passenger cars and SUVs. Pickup trucks are a segment with few foreign entries, and none involving vehicles produced outside North America.[198]

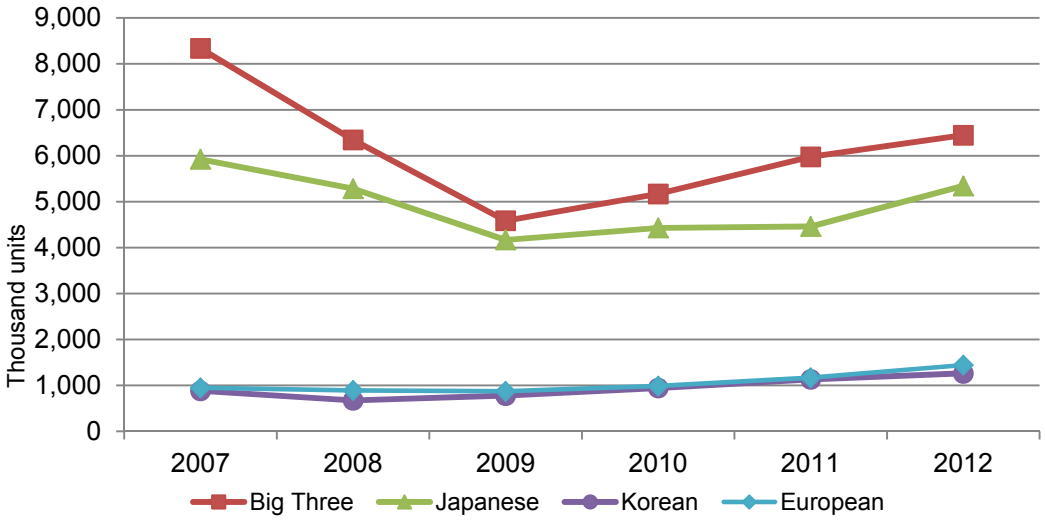
Big Three manufacturers recovered market share during 2009–11 due to a combination of new and attractive products, market opportunities, and overall U.S. economic recovery. During 2009–11, each Big Three manufacturer introduced new cars, CUVs, SUVs, and light trucks. These vehicles offered more efficient engines and enhanced interiors, which helped them to compete with foreign brands. For example, Ford converted its SUV, the Ford Explorer, into a CUV with a smaller, more efficient engine. Chevrolet began selling its Cruze in 2010 and the Sonic in 2011, each of which is more popular, higher rated, and more fuel efficient than the vehicle it replaced. At the same time, the availability of Japanese-brand vehicles declined in 2011 due to the tsunami in Japan and flooding in Thailand.[199] This led to stagnant sales of Japanese passenger vehicles in the United States in 2011 (figure 11).

[197] Schoenberger, "Chevrolet Cruze Dominates Small Car Sales," September 2, 2011.

[198] Pickup trucks from non-U.S. brands made up less than 18 percent of U.S. pickup truck sales in 2010. Binder, *Ward's Automotive Yearbook,* 2011, 217.

[199] For more information, see "Japan in the Foreign Industry Profiles section." Ohnsman, Mukai, and Yuki, "Toyota, Honda May Not Recoup Output," November 8, 2011.

FIGURE 11 Big Three and foreign-brand passenger vehicle sales in the United States, 2007–12



Sources: Automotive News, North American Car and Light Truck Sales by Make, January 7, 2013; Binder, *Ward's Automotive Yearbook* , 2009*,* 258–67. Binder, *Ward's Automotive*

The market share of vehicles sold by Korean brands in the U.S. passenger vehicle market rose rapidly, from 5.5 percent in 2007 to 8.7 percent in 2012, due to improved product offerings, high fuel efficiency, and U.S. production of Korean passenger vehicles.[200] From 2007 to 2012, Korean manufacturers offered a number of new or redesigned passenger vehicles (e.g., Hyundai's Sonata and Elantra, and Kia's Optima and Soul), which were particularly distinctive and received many positive reviews.[201] These vehicles also tended to be more fuel efficient than other vehicles of the same type. Furthermore, both Korean manufacturers opened plants in the United States, Hyundai in Alabama in 2005 and Kia in Georgia in 2009.[202] Such domestic production may have had an impact on consumer demand (as American consumers often prefer domestically produced vehicles) and also may have enabled the firms to lower their prices due to reduced transportation costs.[203]

Unlike industry production data, industry sales data classify vehicles assembled in any North American country as "domestically produced vehicles." Consequently, during 2007–12, the share of sales accounted for by imported vehicles (those originating from outside of North America) increased from 23.3 percent in 2007 to 26.2 percent in 2009, and then declined again to 20.9 percent in 2012 (figure 12).

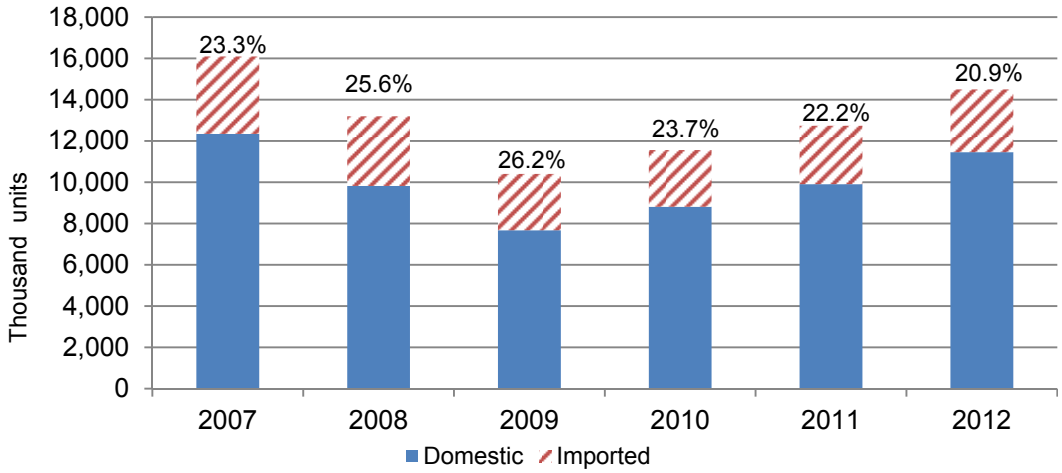
[200] USITC calculations based on Binder, *Ward's Automotive Yearbook,* 2008, 257–64; Binder, *Ward's Automotive Yearbook,* 2012, 206–13.

[201] Murphy, "Hyundai Design on 'Amazing Trajectory'," May 28, 2012, 5; Rendell, "How Design Risks Fuel Hyundai's Rise," June 20, 2012.

[202] Hyundai Motor Manufacturing Alabama, "About HMMA" (accessed September 26, 2012); Kia Motors Manufacturing Georgia, Inc., "About KMMG" (accessed September 26, 2012).

[203] *Auto Trader*, "Made in America More Important to Consumer," July 4, 2012.

FIGURE 12 U.S. passenger vehicle sales by location of production, 2007–12



Sources: Binder, *Ward's Automotive Yearbook*, 2012, 206–215; Binder, *Ward's Automotive Yearbook*, 2011, 220–29; Binder, *Ward's Automotive Yearbook*, 2010, 229–38; Binder, *Ward's Automotive Yearbook*, 2009, 258–67.

Note: Domestic includes vehicles produced in Canada and Mexico.

Distribution Channels

Passenger vehicles are largely sold in the U.S. market through independent dealerships affiliated with a manufacturer. Dealers buy their vehicles from manufacturers, but tend not to have total control over the number and type of vehicles delivered to their dealership. Demand calculations by the manufacturer determine the number of vehicles sent to each dealership as well as the model types, trim levels, and colors.[204] Manufacturers' allotments to dealers are based on the dealers' requests and their history in selling a particular vehicle—the faster the dealer has sold the vehicle in the past, the more rapidly a new vehicle is delivered.[205] When the manufacturer's allotment does not match the needs of the dealership, then the dealer may trade with another dealer to acquire the necessary vehicles.[206] The lone exception to the dealership system in the United States is Tesla Motors Inc., a small producer of electric vehicles that has 11 manufacturer-owned stores in a number of cities in the United States.[207]

Dealerships sell passenger vehicles to private individuals (retail sales) and businesses/governments (fleet sales).[208] The industry defines three categories of fleet owners: businesses with 15 or more vehicles (e.g., car rental agencies), businesses that have bought at least 5 vehicles for business use in the last year, or government agencies.[209] Some fleet sales are conducted at the dealership level, while other large fleet

[204] Rechtin, "Dealers Plea: You Send It, We'll Sell It," February 21, 2011.
[205] Colias, "Chevrolet Dealers Like New Allocation System," February 14, 2011, 30; Colias, "GM Revamps System for Ordering Cars," April 2, 2012, 4.
[206] Montoya, "The Pros and Cons of a 'Dealer Trade'" April 15, 2010.
[207] Tesla Motors, "Tesla Reinvents the Car Buying Experience," April 13, 2011; Rechtin, "Tesla Puts Its Factory-store Ideas to the Test," May 14, 2012, 4.
[208] Dealerships that sell new passenger vehicles also sell used passenger vehicles.
[209] Chrysler Fleet Operations Company website, www.fleet.chrysler.com (accessed July 26, 2011); Ford Fleet Company website, www.fleet.ford.com (accessed July 26, 2011); GM Fleet and Commercial Company website, www.gmfleet.com (accessed July 26, 2011).

purchases are negotiated directly with the manufacturer.[210] In 2011, retail sales made up 81 percent of sales of new passenger vehicles among the seven top-selling manufacturers in the United States, with fleet sales accounting for 19 percent.[211]

Retail sales are more profitable than fleet sales for two reasons: trim level (set configurations of options in a vehicle)[212] and the effect of fleet sales on the resale value of vehicles. Passenger vehicles sold to individuals are likely to be at a higher trim level, and thus likely to yield a higher profit per vehicle.[213] Most fleet purchasers, on the other hand, focus on lower costs rather than new technology.[214] An exception is vehicles sold to police or emergency vehicle fleets, as those vehicles tend to have expensive specialty equipment that is particular to their needs.[215] With respect to resale value, fleet vehicles are often only kept by the company for one to three years and are then resold.[216] This reselling of vehicles may have a negative effect on the resale value of privately owned vehicles of the same model as the fleet vehicles, because the value of a used fleet vehicle tends to be lower than a comparable privately owned vehicle. Thus the more used fleet vehicles available on the market, the lower the residual value for the same model of used vehicle.[217] This can lead to lower projected residual values for newer models of the same vehicle, which can hurt demand for such vehicles.

Due to the nature and size of fleet transactions, the purchasing process and vehicles available to fleets can differ from those available to private consumers. Some vehicles are available only to fleet purchasers, or even only to specific fleet purchasers, e.g., police and emergency vehicles. Many manufacturers have used fleet sales to private companies (or leases) to test alternative propulsion technologies.[218] Leases of such vehicles allow manufacturers to maintain ownership of the vehicle and receive "real-world" feedback on usage patterns.[219] Vehicles powered by electricity, natural gas, and even fuel cells vehicles have been leased to fleet users because businesses often have the central infrastructure needed to support the vehicles.[220] For example, there are relatively few natural gas or fuel-cell power stations available to the general public,[221] but if a company has a fleet of vehicles powered by natural gas or fuel cells parked in the same lot each night, then it can build the infrastructure to power those vehicles. The natural-gas-powered Honda Civic GX illustrates this pattern: it has been available to fleet purchasers for a number of years, but was only offered to private individuals in 2010.[222]

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[210] Chrysler Fleet Operations Company website, www.fleet.chrysler.com (accessed July 26, 2011); Ford Fleet Company website, www.fleet.ford.com (accessed July 26, 2011); GM Fleet and Commercial Company website, www.gmfleet.com (accessed July 26, 2011).

[211] Snyder, "Fleet Sales Inch Up, But Retail Dominates," January 16, 2012, 24.

[212] Most vehicles are sold with at least three different trim levels. Typically there is a low-cost, mid-cost, and high-end version. The low-cost option will often have the least powerful engine available, manual transmission, cloth seats, and manual windows, and may not have cruise control, while the higher end versions will often have a more powerful engine, automatic or dual-clutch transmission, leather seats, automatic windows, Bluetooth integration, etc. The higher trim levels may even have a radar sensor, rear camera, or automatic parking option. For some vehicles there is a fleet-only trim level that has even less expensive interior options than the lowest publicly available retail trim level.

[213] Thormahlen, "Hit the Road: Structural Changes and Consumer Trends," July 2011, 14.

[214] Ibid.

[215] Ibid.

[216] U.S. GAO, "TARP: Treasury's Exit from GM and Chrysler," May 2011, 18.

[217] Ibid.

[218] Thormahlen, "Hit the Road: Structural Changes and Consumer Trends," July 2011, 14.

[219] Mini USA Company website, www.miniusa.com (accessed July 26, 2011).

[220] Trudell and Ohnsman, "Chrysler to Begin Natural-Gas Truck Sales to Fleets," January 11, 2012.

[221] There are five public hydrogen fueling centers in the United States (all in California), and 421 compressed natural gas stations. U.S. DOE, EERE, Alternative Fuels and Advanced Vehicles Data Center "Natural Gas Fueling Station Locations," (accessed January 13, 2012).

[222] *Consumer Reports,* "Honda Civic GX Natural-Gas Sedan," May 4, 2010.

While most passenger vehicles are sold to consumers, around 20–25 percent are leased each year.[223] Luxury vehicles are more likely to be leased than non-luxury vehicles.[224] Leasing luxury vehicles has become a popular trend, likely because of the relatively high cost of repairing luxury vehicles and because of consumers' desire to drive a new model every two to three years, which is the typical length of a vehicle lease.[225]

Market Factors Influencing Demand

From 2007 to 2012, a number of macro- and micro-economic factors had major impacts on the demand for passenger vehicles. Consumer demand for passenger vehicles in the United States tends to shift with consumer confidence.[226] When the economy is growing, consumer confidence tends to be higher, which increases demand for passenger vehicles.[227] When the economy is in recession, consumer confidence and demand for passenger vehicles tends to drop.[228]

Changes in gasoline prices can affect consumer demand for passenger vehicles as a whole, and can also affect demand for specific types of vehicles. During 2007–12, relatively high gasoline prices contributed to lower vehicle demand. Higher gasoline prices decrease overall vehicle demand because of the higher perceived cost of vehicle ownership;[229] conversely, lower-priced gasoline decreases the perceived cost of vehicle ownership.

The price of gasoline influences the composition of passenger vehicle purchases as well. Demand for fuel-efficient vehicles tends to grow when the price of gasoline rises due to the increased potential savings offered by a more fuel-efficient vehicle.[230] It also tends to shift back when the price of gasoline declines. From 2007 to 2012, there were two distinct periods that were strongly affected by gasoline prices. In 2008 the average price of gasoline rose to $3.25 per gallon for the year, peaking in June and July with average prices exceeding $4.00 per gallon.[231] As a result, sales of SUVs and pickup trucks declined to a 23.7 percent market share in 2008 from 28.5 percent in the previous year.[232] Much of this demand went to CUVs, which perform many of the same functions as SUVs, but offer greater fuel efficiency. Small cars also saw a sales increase. In March 2011, gasoline prices again rose above $3.50 per gallon, and market share for small cars (which tend to be more fuel efficient) increased by 1.5 percent to 20.5 percent.[233]

The availability of financing is an important demand factor for passenger vehicles. Most purchases of new vehicles are financed.[234] A purchaser can prearrange a loan with an outside lender such as a bank or credit union, or finance through the dealership. Financing increases the cost of a vehicle purchase in the long run, due to the interest

[223] AutoObserver, Data Center (accessed July 20, 2011).
[224] Ibid.
[225] Lease Guide, "How Car Leasing Works" (accessed January 18, 2012).
[226] Plache, "Feeling Uncertain about July Car Sales?" July 12, 2012.
[227] Ibid.
[228] Reed, "Car Sales Fall As Consumer Confidence Wanes," August 4, 2011.
[229] Smith and Chen, "The Major Determinants of U.S. Automotive Demand," August 2009, 7.
[230] Healey, "$1 Gas Price Rise Cuts SUV Value 13%," July 19, 2011; Smith and Chen, "The Major Determinants of U.S. Automotive Demand," August 2009, 7; McManus, "The Link Between Gasoline Prices and Sales," January 2007, 53–54.
[231] U.S. DOE, EIA, Gasoline and Diesel Fuel Update (accessed January 13, 2012).
[232] Binder, *Ward's Automotive Yearbook,* 2009, 255.
[233] U.S. DOE, EIA, Gasoline and Diesel Fuel Update (accessed January 13, 2012); *Ward's Automotive Reports,* Vehicle Segmentation and Price, March 8 and April 5, 2011.
[234] Thormahlen, "Road to Recovery: Wholesalers Will Regain Lost Ground," April 2011, 7.

payments in addition to the purchase cost, but reduces the upfront payment required, thus enabling more consumers to buy vehicles. During the economic downturn, many banks significantly tightened their eligibility requirements for all forms of loans, including those for the purchase of a passenger vehicle, making it difficult for many consumers to receive favorable loan terms.[235] This contributed to the observed decrease in demand for passenger vehicles at that time.[236]

The age of the existing passenger vehicle fleet also has a significant impact on new passenger vehicle demand. Consumers tend to purchase passenger vehicles every few years, but during the economic downturn, many held onto the vehicles they already owned for longer than usual. This led many analysts to conclude that there was considerable pent-up demand for passenger vehicles post-downturn, because the average age of passenger vehicles in the United States at the end of 2011 was 10.8 years, the oldest on record.[237] However, it is still unclear whether consumers will return to buying passenger vehicles at the same rate as before the economic downturn.

The main substitute for a new passenger vehicle is a used one, so the price of used vehicles is also a factor that influences consumer demand for new vehicles. Each consumer has a choice between a new and a used vehicle. While some consumers may make up their minds that they will only purchase a new or a used passenger vehicle, many consumers choose among new and used vehicles within their price range.[238] When the price of used passenger vehicles rises relative to new ones, demand for new passenger vehicles increases, and when the price of used passenger vehicles declines, demand for new passenger vehicles declines.[239] Moreover, due to the weaker sales of new passenger vehicles in 2008 and 2009, and the elimination of many used passenger vehicles from the U.S. market via the Consumer Assistance to Recycle and Save (CARS) program, the supply of used vehicles in 2011 and 2012 was relatively low and their prices were relatively high (box 4).[240]

BOX 4 The Consumer Assistance to Recycle and Save (CARS) Program

The CARS (also known as "Cash for Clunkers") program incentivized consumer trade-ins of used vehicles, increasing consumer demand for new vehicles in July and August 2009 and increasing the overall fuel efficiency of the U.S. passenger vehicle fleet, while also removing large numbers of older, relatively inexpensive used vehicles. The CARS Program was introduced as part of a supplemental appropriations bill on May 12, 2009. It became law on June 24, 2009, and was subsequently extended and expanded on August 7, 2009. The program authorized the issuance of an electronic cash voucher of $3,500 or $4,500 to consumers who upgraded to a new vehicle from a less fuel-efficient older vehicle. The traded-in vehicle was then scrapped, rather than being resold by the dealership. Ultimately, nearly 680,000 consumers traded in their vehicles as part of this $2.85 billion program. Many of these consumers probably would have bought a new vehicle without the incentive, but many others were likely drawn in to buy a new vehicle at that time due to the incentives offered. This may have decreased purchases of passenger vehicles in months immediately before and after the CARS Program was available. Also, without the program the old traded-in vehicle would have been sold in the used vehicle market, and likely continued to be a part of the U.S. passenger vehicle fleet. The Center for Automotive Research estimates that nearly 400,000 consumers traded in their vehicle because of the incentive program, while the other 280,000 consumers that traded in their vehicles at this time likely would have done so without the incentive program.

Sources: DOT, NHTSA, *Consumer Assistance to Recycle and Save Act of 2009,* December 2009; Cooper, Chen, and McAlinden, "The Economic and Fiscal Contributions of the "Cash for Clunkers" Program — National and State Effects," January 14, 2010.

[235] Binder, *Ward's Automotive Yearbook,* 2009, 163.
[236] Binder, *Ward's Automotive Yearbook,* 2009, 163.
[237] Shephardson, "Average Age of Cars, Trucks Hits 10.8 Years," January 18, 2012.
[238] Mays, "Why Used-Car Prices Are Going to Stay High," May 24, 2012.
[239] Mays, "Why Used-Car Prices Are Going to Stay High," May 24, 2012.
[240] Mays, "Why Used-Car Prices Are Going to Stay High," May 24, 2012.

Factors of Competition

Passenger vehicle manufacturers compete on the basis of price, efficiency, reliability, brand/reputation, technology, styling, utility, and safety of their vehicles.[241] These factors tend to differ by brand rather than country of manufacture. Preferences vary among consumers, but fleet customers tend to focus more on long-term cost and value (reliability and utility), whereas upfront costs (e.g., down payment and sticker price) and appearance are considered to be more important to individual retail consumers.[242]

- **Price—**This is the most complex area of competition between manufacturers, with a number of factors determining how much money consumers will eventually spend on the vehicles they purchase. The price of the vehicle itself, the value assigned to any trade-in vehicle, the down payment amount, and financing terms are all subject to negotiation between the dealer and the individual consumer. A manufacturer's suggested retail price (MSRP)[243] is typically listed in advertisements for vehicles. However, the actual purchase price of a passenger vehicle is negotiable, and in most cases vehicles are sold at a price between the MSRP and the invoice price (paid by the dealer) for the vehicle, with the latter being set by the manufacturer.[244] In some cases, dealers will sell vehicles below the invoice price.[245] In most of these cases, the manufacturer has offered a dealer incentive, which is a fixed payment to the dealer for each vehicle of a specific model sold during a given period to stimulate sales of that particular model.[246] Manufacturers may also offer additional incentives to consumers, including cash back or low-interest financing.[247]

- **Fuel efficiency—**Passenger vehicle manufacturers often seek to offer the most fuel-efficient models of each vehicle class.[248] Many believe that higher gasoline prices lead to increased sales of smaller and more fuel-efficient vehicles.[249] Although analyses of consumer choice are nearly evenly divided as to whether consumers over- or undervalue potential future fuel savings in their vehicle,[250] fuel efficiency has been found by *Consumer Reports* to be a leading consideration for U.S. consumers when purchasing their next vehicle.[251]

[241] Thormahlen, "Automobile Manufacturing in the United States," June 2011, 22.
[242] Ibid.
[243] Edmunds Company website, http://www.edmunds.com// (accessed July 21, 2011).
[244] Ibid.
[245] Ibid.
[246] Ibid.
[247] Gorzelany, "Let's Make a Deal!" *NBCNews,* August 10, 2012.
[248] As the term implies, "class" is a classification system which is used by passenger vehicle manufacturers to group like vehicles. Depending on the manufacturer, either a name or letter will be used for each class. For example, "A-class" or "mini-car" is the same designation.
[249] Krebs, "Fie on Gas Prices," March 1, 2012; *Ward's Automotive Reports,* Ward's Light-Vehicle Sales by Ward's Segmentation, April 4, 2011, 6; *Ward's Automotive Reports,* Ward's Light-Vehicle Sales by Ward's Segmentation, May 9, 2011, 6; *Ward's Automotive Reports,* Ward's Light-Vehicle Sales by Ward's Segmentation, June 6, 2011, 6; McManus, "The Link Between Gasoline Prices and Sales," January 2007; Pope, "U.S. Pickup Segment Hits 3-Decade Low," May 9, 2011.
[250] Greene, "How Consumers Value Fuel Economy: A Literature Review," March 2010, vii.
[251] *Consumer Reports,* "High Gas Prices Motivate Drivers to Change Direction," May 2012.

- **Reliability—**Consumers naturally prefer reliable vehicles[252] and use personal experience as well as third-party services, which tend to use surveys, to analyze reliability. One well-known third-party service is J.D. Power and Associates, which uses two different surveys to measure vehicle reliability: their Initial Quality Study, which is based on surveys of vehicle owners after 90 days of ownership, and their Vehicle Dependability Study, which surveys owners about problems in the third year of ownership.[253]

    - **Brand/Reputation—**Consumers often consider a vehicle's brand name or reputation as a substitute for otherwise imperfect information about the reliability of a specific vehicle.[254] The perceived longevity of vehicles made by Toyota and Honda likely contributes to their sales of the top-three selling passenger cars—Toyota Camry, Honda Accord, and Toyota Corolla—in the United States.[255] This reputation changes more slowly than actual quality changes, so brands with a history of reliability issues tend to find it takes longer for consumer perceptions of the brand to recover than for the manufacturer to resolve the specific prolems.[256]

- **Technology—**With technology being a very important consideration for the next generation of vehicle buyers,[257] manufacturers strive to introduce technologies into new models that are superior to those of other vehicles in the same class as a means of distinguishing their product. Add-ons such as built-in global positioning systems (GPS), back-up cameras, and Bluetooth integration are often offered separately, and can be a significant source of profit for the manufacturer.[258]

- **Appearance—**The vehicle's appearance or styling is a key determinant for a number of buyers. Hence, the exterior of a passenger vehicle is typically completely redesigned every five years,[259] with smaller changes made each model year. Each brand tends to have its own specific styling cues or design language, often including a front grille that is shared across a number of vehicles within the same brand.[260]

- **Utility—**For many consumers, especially fleet customers, a vehicle's utility is even more important than appearance. In their advertisements, passenger vehicle manufacturers often focus on aspects of utility such as cargo space and tow rating. As with technology and fuel efficiency, utility is compared within its vehicle class.

- **Safety—**Safety ratings also tend to be an important factor for consumers, especially those with families, so manufacturers have worked to achieve top ratings. NHTSA conducts both front and side crash tests under its New Car Assessment Program (NCAP), and gives each vehicle a one to five star rating. These ratings are displayed on informational "Monroney" labels, which are

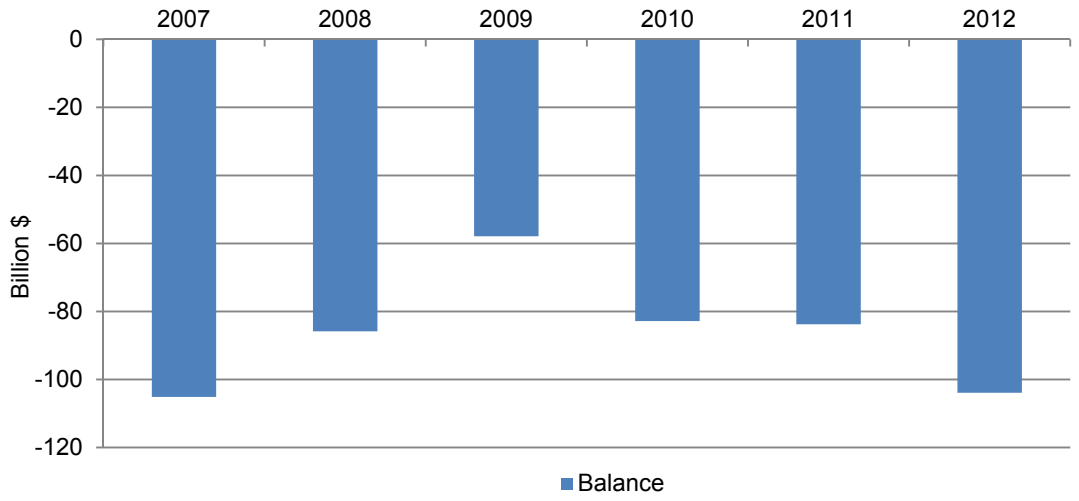
[252] Train and Winston, "Vehicle Choice Behavior," November 2007, 1.
[253] J.D. Power and Associates website; http://autos.jdpower.com/index.htm (accessed October 2, 2012).
[254] Rosevear, "Why Ford's Great Cars Aren't Selling," February 16, 2012.
[255] Thormahlen, "Automobile Manufacturing in the United States," June 2011, 22.
[256] Rosevear, "Why Ford's Great Cars Aren't Selling," February 16, 2012.
[257] Yvkoff, "What Gen Y Wants in a Car," January 20, 2012.
[258] Rosevear, "Why Ford's Great Cars Aren't Selling," February 16, 2012.
[259] Thormahlen, "Automobile Manufacturing in the United States," June 2011, 22.
[260] Cunningham, "The Language of Automotive Design: Nine Brands," February 7, 2011.

required to be displayed prominently on most passenger vehicles sold in the United States. Manufacturers have been so successful at passing the NCAP front and side-impact tests that the stringency of the test was increased in 2011 to include different-sized crash dummies[261] and to test side impact with a pole and not just another vehicle.[262]

U.S. Trade

The United States is a net importer of passenger vehicles, with a trade deficit of $103.9 billion in 2012. U.S. passenger vehicle imports and exports are notable components of overall U.S. merchandise trade flows. In 2012, U.S. imports of passenger vehicles totaled nearly $160.6 billion (7.1 percent of all U.S. imports), which was approximately $9.2 billion dollars more than in 2007, and an increase of almost $71.8 billion from the 2009 level. U.S. passenger vehicle exports amounted to $56.7 billion (4.2 percent of all U.S. exports) in 2012, representing a $25.7 billion increase from the 2009 total and an increase of more than $10.4 billion from the 2007 level. Increased U.S. exports led a decline of 1.1 percent in 2012 from the 2007 trade deficit (figure 13).

FIGURE 13 U.S. passenger vehicle trade balance, 2007–12



Source: USITC, DataWeb/USDOC (accessed October 9, 2012, and March 8, 2013).

U.S. Imports

U.S. imports of passenger vehicles fell in value terms from $151.4 billion in 2007 to $88.9 billion in 2009, and then increased to $160.6 billion in 2012. Units followed a similar trend, declining from nearly 9 million in 2007 to 5.6 million in 2009, before increasing to 8.3 million in 2012 (table 10 and 11). Leading supplying countries included Canada and Mexico, which have duty-free access to the U.S. market via the North American Free Trade Agreement (NAFTA). Moreover, their geographic closeness lowers transportation costs. Japanese, German, and U.S. passenger vehicle manufacturers produce vehicles in Canada and Mexico, a large percentage of which are destined for the

[261] Previously there had only been one adult male-sized crash dummy.
[262] DOT, NHTSA, Safercar.gov FAQ (accessed October 1, 2012).

United States. On the other hand, U.S. imports from Germany, Korea, and Japan are almost entirely assembled by manufacturers based in these countries.[263]

TABLE 10 U.S. passenger vehicle imports, by country, 2007–12 (thousands $)

Country	2007	2008	2009	2010	2011	2012	2007–12 percent change
Canada	44,263,542	33,744,577	23,426,969	35,940,368	38,497,044	45,563,542	2.9
Japan	44,404,605	42,063,614	24,669,246	32,745,157	31,347,055	39,221,599	–11.7
Mexico	20,527,905	19,816,520	15,368,928	22,603,586	23,641,928	27,662,348	34.8
Germany	21,834,198	20,202,488	12,142,140	18,357,091	21,009,316	25,167,627	15.3
Korea	8,791,618	7,850,828	6,472,103	6,938,420	8,996,227	10,889,484	23.9
Subtotal	139,821,868	123,678,027	82,079,386	116,584,622	123,491,570	148,504,600	6.2
Other	11,596,571	12,110,585	6,809,371	8,742,253	11,083,616	12,136,216	4.7
Total	151,418,439	135,788,612	88,888,757	125,326,875	134,575,186	160,640,816	6.1

Source: USITC, DataWeb/USDOC (accessed February 10, 2012, and March 25, 2013).

TABLE 11 U.S. passenger vehicle imports, by country, 2007–12 (units)

Country	2007	2008	2009	2010	2011	2012	2012 import share
Japan	3,504,850	3,120,217	2,030,205	2,434,166	2,376,719	2,441,298	29.5
Canada	2,244,286	1,706,016	1,193,823	1,747,004	1,840,870	2,105,848	25.5
Mexico	1,172,388	1,165,939	862,432	1,219,960	1,300,117	1,440,116	17.4
Korea	891,251	800,503	730,871	800,535	827,138	1,032,638	12.5
Germany	758,168	683,132	529,127	627,761	684,531	796,121	9.6
Subtotal	8,570,943	7,475,807	5,346,458	6,829,426	7,029,375	7,816,021	94.5
Other	418,878	427,187	278,331	343,695	569,851	453,443	5.5
Total	8,989,821	7,902,994	5,624,789	7,173,121	7,599,226	8,269,464	100

Source: USITC, DataWeb/USDOC (accessed February 10, 2012, and March 25, 2013).

U.S. imports during 2010–12 from Mexico exceeded 2007 levels, likely due to an increasing number of manufacturers shifting production to Mexico that was previously located in Canada, the United States, or outside North America.[264] U.S. imports from Japan, the second-largest supplier, declined substantially. The decrease was due to the rising value of the yen, along with supply and production disruptions caused by the tsunami in Japan and flooding in Thailand,[265] which limited the number of Japanese passenger vehicles available to the U.S. market.

U.S. imports of passenger vehicles tend to be of passenger cars, SUVs, CUVs, and passenger vans, rather than pickup trucks. In 2011, imports of vehicles of these four types made up 95.4 percent of U.S. passenger vehicle imports.[266] Of passenger vehicles not produced in North America, luxury cars, small cars, and CUVs made up 81.8 percent of U.S. imports from countries outside of North America in 2011.[267] U.S. imports in 2011 also included a greater share of two-door cars, hatchbacks, and wagons than U.S. domestic output.[268]

[263] Only domestic producers assemble passenger vehicles in Japan. GM produced the Chevrolet Aveo in Korea until 2011, but only 23,000 were imported in 2010. While GM and Ford produce vehicles in Germany, they are primarily for the European market. Binder, *Ward's Automotive Yearbook*, 2011, 7–13.

[264] For further information, see "Mexico" in the "Foreign Industry Profiles."

[265] For further information, see "Japan" in the "Foreign Industry Profiles."

[266] USITC, DataWeb/USDOC, (accessed November 27, 2012).

[267] Binder, *Ward's Automotive Yearbook,* 2012, 201–03.

[268] Binder, *Ward's Automotive Yearbook,* 2012, 187, 221.

U.S. Exports

The value of U.S. passenger vehicle exports increased overall by 22.6 percent during 2007–12, rising to over $56.7 billion (table 12), despite a 37.9 percent decline in the value of exports in 2009 due to the economic downturn. Growth in unit exports during the period was due to increased demand from China and Saudi Arabia (table 13) following the economic downturn. Exports also had higher unit values in 2012, likely reflecting higher-quality (and thus more expensive) exports than at the beginning of the period.

TABLE 12 U.S. passenger vehicle exports by country, 2007–12 (thousand $)

Destination	2007	2008	2009	2010	2011	2012	2007–12 percent change
Canada	21,131,045	18,535,933	13,184,793	17,793,065	18,578,277	19,425,453	–8.1
European Union	10,097,182	11,958,956	6,057,972	5,967,498	8,477,613	6,001,850	3.9
China	613,098	861,860	884,207	3,027,550	4,939,832	5,350,224	772.7
Saudi Arabia	1,762,339	2,965,077	1,722,123	2,906,424	3,476,640	4,933,677	179.9
Mexico	4,105,972	4,235,234	2,082,481	2,901,941	3,346,555	3,617,822	–11.9
Subtotal	33,384,622	34,371,368	22,463,286	30,535,988	35,748,688	39,329,026	17.8
Other	12,900,377	15,591,868	8,533,111	11,982,097	15,050,547	17,397,776	34.9
Total	46,285,001	49,963,237	30,996,395	42,518,086	50,799,234	56,726,802	22.7

Source: USITC, DataWeb/USDOC (accessed February 10, 2012, and March 25, 2013).

TABLE 13 U.S. passenger vehicle exports by country, 2007–12 (units)

Destination	2007	2008	2009	2010	2011	2012	2012 export shares
Canada	906,526	805,465	601,743	744,758	756,689	763,797	30
European Union	402,692	424,904	204,123	208,863	296,052	221,949	8.7
Mexico	296,507	269,527	152,105	183,311	198,774	188,628	7.4
Saudi Arabia	99,665	156,896	93,189	125,963	143,349	180,286	7.1
China	20,070	33,130	33,597	99,443	142,975	165,443	6.5
Subtotal	1,493,932	1,485,368	1,008,911	1,266,107	1,404,465	1,520,103	59.7
Other	774,754	928,297	604,049	800,068	931,067	1,027,134	40.3
Total	2,268,686	2,413,665	1,612,960	2,066,175	2,335,532	2,547,237	100

Source: USITC, DataWeb/USDOC (accessed February 10, 2012, and March 25, 2012).

Transplant manufacturers were likely a major contributor to the growth in passenger vehicle exports from 2007 to 2012. Currency appreciation concerns have led at least one Japanese manufacturer to meet demand in Central and South America using U.S. production, rather than production from Japan.[269] Also, both BMW and Mercedes produce SUVs for export from their plants in South Carolina and Alabama.[270]

Because U.S. manufacturers are especially competitive in the midsize to large passenger car, SUV, and light truck market segments, U.S. exports of passenger vehicles are primarily of these vehicle types.[271] Included in this export category are non-diesel versions of vehicles made by the Big Three, including the Jeep Wrangler, Ford Fusion, and Chevrolet Corvette, and vehicles made by transplants, including the Toyota Sienna, Honda CR-V, BMW X5, and Nissan Altima. The predominant source of export growth in

[269] *Automotive News,* "Talk From the Top: Osamu Masuko," November 14, 2011, 22.

[270] GTIS, World Trade Statistics database (accessed May 18, 2011); Binder, *Ward's Automotive Yearbook,* 2011, 9–13.

[271] GTIS, Global Trade Atlas database (accessed February 10, 2012).

terms of units during 2007–12, was for passenger cars, CUVs, and SUVs with engine sizes between 1.5 and 3 liters.[272]

Canada continued to be the leading market for U.S. exports of passenger vehicles during 2007–12, despite a 15.7 percent decline in such exports over the period. Its leading market position is likely attributed to the integrated nature of North American passenger vehicle production and market proximity.[273] As a member of NAFTA, Canada does not place any import tariff on vehicles imported from the United States.

U.S. exports to the European Union, the second-largest U.S. export market by value, tend to have higher unit values than U.S. exports to other countries (table 14), likely because of the luxury vehicles produced by German-headquartered manufacturers in the United States and exported to the European Union. German manufacturers BMW and Mercedes produce vehicles in their U.S. manufacturing plants that are not produced at any other facility worldwide.[274] As noted earlier, these manufacturers have plants in South Carolina and Alabama, and exports of passenger vehicles from these states accounted for approximately two-thirds of U.S. passenger vehicle exports to the European Union.[275] The United States was the third-largest source of EU passenger vehicle imports by value in 2011, trailing only Japan and Turkey, but ranked fourth in imports on a unit basis.[276]

TABLE 14 Unit values for U.S. passenger vehicle exports to major U.S. export markets, 2007–12 ($)

Destination	2007	2008	2009	2010	2011	2012
China	30,548	26,014	26,318	30,445	34,550	32,338
European Union	25,074	28,145	29,678	28,571	28,636	33,291
Canada	23,310	23,013	21,911	23,891	24,552	25,433
Mexico	13,848	15,714	13,691	15,831	16,836	16,300
Saudi Arabia	17,683	18,898	18,480	23,074	24,253	26,156
All U.S. exports	20,402	20,700	19,217	20,578	21,751	22,269

Source: USITC, DataWeb/USDOC (accessed August 6, 2012, and March 25, 2013).

The rapid growth during 2007–12 of the Chinese market led to a 165,000 unit (724 percent) increase in U.S. exports of passenger vehicles to China, despite relatively high tariffs and consumption taxes on vehicles with larger engine sizes.[277] Since passenger vehicles exported from the United States typically have larger engines, the rate of the consumption tax placed on the U.S. vehicles tends to be higher than the rate for vehicles produced by China's own passenger vehicle manufacturers.[278] However, Chinese consumers purchasing vehicles from the United States tend to be higher-income

[272] USITC, DataWeb/USDOC (accessed October 3, 2012 and March 24, 2013).

[273] *Economist,* "They Aren't Building That," September 29, 2012.

[274] Binder, *Ward's Automotive Yearbook,* 2011, 9–13.

[275] State-specific trade data show that most exports from the United States to the European Union come from South Carolina (the location of the BMW assembly plant) and Alabama (the location of the Mercedes plant). BMW is the only passenger vehicle manufacturer assembling vehicles in South Carolina, but Hyundai and Honda also produce vehicles in Alabama, so they could be the source of exports to the European Union. But this is unlikely, because Hyundai plants in Central Europe are probably the source of most EU Hyundais, and Honda also has European production. GTIS, World Trade Statistics database (accessed May 18, 2011); Binder, *Ward's Automotive Yearbook,* 2012, 9–13.

[276] GTIS, Global Trade Atlas database (accessed October 15, 2012).

[277] See "China Foreign Industry Profile" for further detail.

[278] Vehicles with engines of less than 1,500 ccs have the lowest tax rate, which during the stimulus of 2009 and 2010 was only 5 percent. Less than 1 percent of imports from the United States were of such vehicles. *Xinhua,* "China's Auto Stimulus Retained for 2010," December 10, 2009; GTIS, Global Trade Atlas database (accessed May 23, 2012).

individuals and less sensitive to price and ongoing costs of ownership.[279] U.S. vehicle exports to China were $4.7 billion higher in 2012 than in 2007 (772.6 percent). However, the U.S. share of Chinese passenger vehicle imports increased by only 5 percent, as Chinese imports from Germany, Japan, and the United Kingdom also increased rapidly, and total Chinese imports grew by 363 percent during 2007–12.[280] U.S. exports of some passenger vehicles to China in 2012 will be assessed antidumping and antisubsidy duties that the Chinese government imposed on SUVs imported from the United States beginning in December 2011.[281]

Saudi Arabia was the fourth-largest market for passenger vehicles from the United States in 2012.[282] U.S. exports of passenger vehicles to Saudi Arabia were largely vehicles with engines over 3,000 cubic centimeters.[283] This category includes large cars and SUVs.[284] Luxury vehicles and SUVs sell especially well in Saudi Arabia, due to the large number of high-net-worth individuals living there,[285] and the United States is an important global producer of both these types of vehicles.

The Mexican passenger vehicle market is the third-largest market for U.S. exports in terms of quantity, but only fifth in terms of value. From 2007 to 2009, likely due to the economic downturn, U.S. exports to Mexico dropped by 48.7 percent. In 2012, however, U.S. passenger vehicle exports to Mexico were 45.9 percent higher than in 2009, probably because of Mexico's economic growth of 5.5 percent in 2010 and 3.9 percent in 2011.[286] While U.S. passenger vehicle exports to Mexico were relatively high in volume, the value of U.S. passenger vehicle exports to Mexico was lower than the value of those to the European Union, China, and Saudi Arabia. The difference is that consumers in Germany, China, and Saudi Arabia are likely purchasing luxury passenger vehicles from the United States, whereas purchasers in Mexico appear to be buying more economy models.

Foreign Industry Profiles

During the six-year report period, passenger vehicle production in the European Union and Canada fell, but production in China, Korea, and Mexico increased. China's increase in production was primarily driven by internal factors, while the growth in production in Korea and Mexico was likely a result of increasing use of domestic production as export bases by manufacturers. This section discusses the major global passenger vehicle manufacturing countries by examining the key features of their industry, including major manufacturers, government involvement, trade, R&D efforts, wage levels, and currency

[279] This is evident in the average unit price of vehicles purchased from the United States, which was over $40,000 in 2009 and 2010 and nearly $45,000 in 2011. GTIS, Global Trade Atlas database (accessed May 23, 2012).

[280] GTIS, Global Trade Atlas database (accessed March 28, 2013).

[281] The United States has requested consultations with China under the WTO's dispute settlement system regarding these duties, which include antidumping duties ranging from 2.0 to 21.5 percent and countervailing duties ranging from 6.2 to 12.9 percent. The highest duties have been placed on SUVs produced by Chrysler and GM. Harman, "U.S. Files Trade Complaint with WTO," July 5, 2012; Bradsher, "China Imposes New Tariffs on U.S. Vehicles," December 14, 2011.

[282] USITC, DataWeb/USDOC (accessed March 24, 2013).

[283] GTIS, Global Trade Atlas database (accessed January 10, 2012).

[284] HS number 870324 contains passenger vehicles with a spark-ignition engine. This includes sport-utility vehicles, but excludes pick-up trucks as their primary purpose is for the transport of goods.

[285] Business Monitor International. "Saudi Arabia Autos Report." Q4 2010, 43.

[286] World Bank, "World Development Indicators and Global Development Finance" (accessed August 8, 2012).

valuation effects. The foreign industries are discussed in descending order of export volumes.

European Union (EU)

As a unit, the EU is the second-largest producer of passenger vehicles in the world. Of its 27 member states, 9 produced over 93 percent of the passenger vehicles produced in the EU in 2012 (table 15). Three of these countries—Germany, France, and Italy—are home to major global passenger vehicle manufacturers. BMW, Daimler, Opel (a GM subsidiary), and Volkswagen are headquartered in Germany. PSA Peugeot Citroën and Renault are headquartered in France, and Fiat is headquartered in Italy. Some smaller luxury-vehicle manufacturers are headquartered elsewhere within the EU (e.g., Aston Martin Lagonda Limited in the United Kingdom). A number of passenger vehicle manufacturers headquartered outside of the EU also have a significant manufacturing footprint in the EU, including Ford, Hyundai, Kia, Mitsubishi, Suzuki, and Toyota.[287]

TABLE 15 Major European Union (EU) producers of passenger vehicles, 2007–12 (units)

	2007	2008	2009	2010	2011	2012	2012 percent share
Western Europe							
Germany	5,960,733	5,778,296	5,112,668	5,764,920	6,311,318	5,649,269	35.2
Spain	2,795,364	2,466,377	2,143,819	2,350,755	2,299,769	1,932,304	12.0
France	2,944,123	2,495,066	2,018,344	2,186,650	2,242,928	1,967,765	12.3
United Kingdom	1,730,462	1,622,176	1,079,666	1,381,839	1,446,824	1,558,951	9.7
Italy	1,231,749	974,198	819,189	809,173	755,948	638,003	4.0
Belgium	789,674	680,131	524,595	528,996	562,386	507,204	3.2
Subtotal	15,452,105	14,016,244	11,698,281	13,022,333	13,619,173	12,253,496	76.4
Central Europe							
Czech Republic	931,298	940,334	979,085	1,072,263	1,194,981	1,174,267	7.3
Poland	786,825	934,887	868,729	858,972	823,815	643,923	4.0
Slovakia	571,071	575,776	461,340	561,933	639,763	900,000	5.6
Subtotal	2,289,194	2,450,997	2,309,154	2,493,168	2,658,559	2,718,190	16.9
Major producers*	17,544,976	16,334,839	13,918,562	15,463,876	16,216,452	14,971,686	93.3
EU total production	17,103,687	17,717,794	15,003,221	18,749,979	17,476,400	16,047,672	100.0

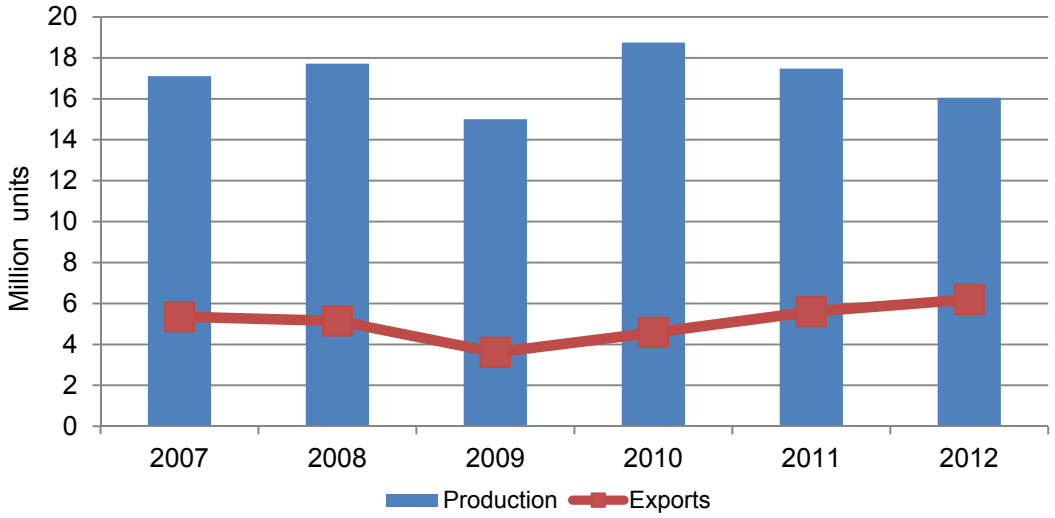
Source: OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–11 (accessed October 11, 2012, and March 25, 2013).

Note: Except in 2007, the major producers subtotal is less than the sum of the above columns due to double-counting of production in Germany and Belgium each year.

During the six-year period, overall EU production declined. However, this decline was uneven, with Western European production dropping from 15.5 million units to 12.3 million, but Central European production rising from 2.3 to 2.7 million units. Production in Central European countries by U.S.- and Korean-based manufacturers contributed to an increase in production in the region of over 400,000 units (18.7 percent) from 2007 to 2012. In Western European countries, a decline in demand has exacerbated an issue of overcapacity that major manufacturers have yet to fully address. This lack of demand likely led to the 6.8 percent decline in EU total production in 2012 to 16 million units (figure 14).

[287] ACEA, Automobile Assembly and Engine Production Plants in Europe by Manufacturer, Summer 2012.

FIGURE 14 European Union (EU) passenger vehicle production and exports, 2007–12



Sources: OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–12 (accessed October 11, 2012, and March 8, 2013); GTIS, Global Trade Atlas database (accessed October 11, 2012, and March 8, 2013).

As Germany is a particularly large manufacturer within the European Union, this section further considers its policies and manufacturing in addition to those of the European Union as a whole. Germany remains the largest passenger vehicle producer in Europe, accounting for 35 percent of EU production in 2012. The German labor situation is unusual, with a cooperative union structure that keeps wages and skills at high levels while maintaining a large stable workforce.[288] The unionized workforce has a reputation for high skill and quality,[289] which may contribute to the above-average manufacturing wages and benefits in the industry compared to the overall average in German manufacturing ($43.76 per hour).[290] IG Metall is the German automotive union of which "virtually all" workers in German passenger vehicle manufacturing plants are members.[291] The cooperative union-management structure reflects the Works Constitution Act, which provides for the creation of Works Councils. Both management and employees participate in Works Councils to address issues particular to each factory. During the recent economic downturn, Germany's cooperative structure helped Germany maintain relatively high employment levels, as manufacturers decreased work hours for employees instead of reducing the size of the workforce, and had constrained employment growth during the previous economic boom.[292] As a result, national unemployment increased by only 0.5 percent despite a 6.6 percent decline in Germany's gross domestic product (GDP) in 2008.[293] Germany's motor vehicle industry has the most employees among EU countries that manufacture motor vehicles (table 16).

[288] Deloitte, "Global Manufacturing Competitiveness Index," June 2010.
[289] Brown, "A Tale of Two Systems," December 21, 2011; Deloitte, "Global Manufacturing Competitiveness Index," June 2010.
[290] DOL, BLS, "Economic News Release: International Comparisons of Hourly Labor Costs," December 21, 2011; Brown, "A Tale of Two Systems," December 21, 2011.
[291] Brown, "A Tale of Two Systems," December 21, 2011.
[292] Burda and Hunt, "What Explains the German Labor Market Miracle in the Great Recession?" March 6, 2010, 35.
[293] Ibid.

TABLE 16 Number of employees in the manufacture of motor vehicles in European Union (EU), by country, 2008–10

EU member state	2008	2009	2010
European Union	1,069,900	1,028,800	999,600
Western Europe			
Germany	482,072	472,118	464,155
France	150,331	144,611	137,527
Spain	69,548	65,136	63,301
Belgium	24,069	21,532	18,927
Italy	68,409	68,291	n/a
United Kingdom	76,029	n/a	n/a
Central Europe			
Czech Republic	n/a	n/a	33,163
Poland	35,202	32,909	31,919
Slovakia	14,260	12,502	12,303

Source: Eurostat, Labour Costs Annual Data—NACE Rev. 2, October 29, 2012.

Note: Data for employees in manufacture of motor vehicles are used because data for passenger vehicles are not available.

Outside of Germany, passenger vehicle production has stagnated or decreased in the major western European economies and grown in Central Europe, where overall manufacturing wage rates are lower (table 17). Ford, Hyundai, Kia, and Renault began manufacturing passenger vehicles in Central Europe during 2007–12, adding approximately one million units of capacity.[294] With declining passenger vehicle demand in the EU market, some estimate that the EU passenger vehicle sector could be as much as 20 percent over capacity.[295] Passenger vehicle manufacturers have been producing at less than ideal levels, leading to profit losses in the EU for a number of passenger vehicle manufacturers since 2009, including Fiat, Ford, Opel, PSA Peugeot Citroën, and Renault-Nissan.[296] Opel closed a plant in England and has announced plans to close a plant in Germany in 2016,[297] Ford has announced plans to close a passenger vehicle plant in Belgium and two parts-producing plants in England in 2013,[298] Fiat closed a passenger vehicle plant in Italy in 2011 and may close another,[299] and PSA Peugeot Citroën has announced plans to close a passenger vehicle plant in France in 2014.[300]

[294] Hyundai Motor Manufacturing Czech Company website. http://www.hyundai-motor.cz/english.php?rubrika=basic-info (accessed November 20, 2012); Kia Motors Corp., "Grand Opening Ceremony for Kia's Slovakia Plant," April 25, 2009; Snyder, "West Slows, Center Grows, East Buds," November 12, 2007.

[295] Ewing, "Auto Overcapacity Gives Leaders Another Issue to Ponder," March 7, 2012.

[296] Boxell, "Renault Reports Sharp Decline in Profits," July 27, 2012; Ewing, "Auto Overcapacity Gives Leaders Another Issue to Ponder," March 7, 2012; Healey, "GM Still Can't Solve Opel," July 13, 2012; Webb, "GM-Peugeot Seen as Europe Money-Losers," February 22, 2012.

[297] Hetzner and Schwartz, "Opel Cuts Won't Be as Severe," November 13, 2012.

[298] Naughton and Webb, "Ford to Cut 5,700 Jobs," October 25, 2012.

[299] Ebhardt and Rosemain, "Fiat Weighs Closing Another Italian Car Factory," July 4, 2012.

[300] Frost and Hetzner, "Peugeot Cuts 8,000 Jobs," July 12, 2012.

TABLE 17 Monthly per-employee labor costs for the manufacturing sector in the European Union (EU), 2008–10 (euros)

EU member state	2008	2009	2010
Western Europe			
Belgium	4,646	4,853	5,077
France	n/a	4,324	4,485
Germany	4,358	4,436	4,427
United Kingdom	3,656	3,282	3,341
Spain	2,924	3,018	3,093
Central Europe			
Czech Republic	1,237	1,206	1,303
Slovakia	n/a	1,061	1,107
Poland	1,006	846	962

Source: Eurostat, Labour Costs Annual Data-Nace Rev. 2, May 25, 2012.

Note: Costs shown in euros to maintain comparability across years. In 2010, the labor costs in the market of the largest manufacturer (Germany) were $5,919.

The extent and type of government involvement in the industry varies by individual member state. But involvement can include a variety of incentives that are not specific to the automotive industry, such as R&D credits, deductions on taxes, and various incentives for manufacturing and employment; some countries also offer specific incentives to boost passenger vehicle sales. Certain government policies require European Commission (EC) approval to implement.[301] Moreover, the EC has the power to penalize member states that prevent their companies from relocating operations within the EU.[302] In response to the global economic downturn in 2009, the EU created the Temporary Framework for State Aid, which allowed member states to assist companies experiencing liquidity problems.[303] Some other examples of government involvement in EU member states include (this list is not comprehensive):

- **Czech Republic**—Incentives are the same for the passenger vehicle industry as for other Czech industry sectors including a five-year deduction on corporate taxes, cash incentives for staff training or retraining, and cash incentives for creating jobs in certain regions.[304]

- **France**—The French government responded to plans by PSA Peugeot Citroën to close a major manufacturing plant by offering $280 million in incentives to boost sales of hybrid and electric vehicles.[305]

- **Germany**—Both the federal and local governments offer reimbursements of investment costs and incentives for R&D expenditures specifically to passenger vehicle manufacturer.[306] Moreover, the state of Lower Saxony holds a 12.7 percent stake in Volkswagen, with a 20-percent voting rights share,[307] and may block major decisions by Volkswagen.[308]

[301] *EU Focus,* "The EU and the Automobile," September 2009, 2.
[302] Chee, "EU Commission Plans Regulatory Holiday for Auto Sector," March 8, 2012.
[303] Individual grants are not notified to the European Union, so the size and number of grants offered to passenger vehicle manufacturers under this program is unknown. *EU Focus,* "The EU and the Automobile," September 2009, 2; European Union, "State Aid: Commission Adopts Temporary Framework," News Release, December 17, 2008.
[304] Janosec, "Automotive Sector in the Czech Republic," June 14–17, 2010.
[305] Erlanger, "Peugeot's Troubles," August 15, 2012.
[306] Invest in Germany, "The Automotive Industry in Germany," April 2008.
[307] Volkswagen AG, "Shareholder Structure," June 30, 2011.
[308] Cremer, "Lower Saxony Plans to Sell Some VW Shares," August 2, 2010.

- **Poland**—The Polish government offers a corporate income tax exemption in any of its 14 Special Economic Zones, employment and investment grants for large projects, and a real-estate tax exemption in certain cases.[309]

Passenger vehicle manufacturers in the EU invest $36 billion per year in R&D.[310] Among passenger vehicle manufacturers headquartered in the EU, the top three investors in R&D are headquartered in Germany. Volkswagen made the largest investments in R&D, with $11.7 billion (4.6 percent of revenues) in such expenditures in 2012 (table 18),[311] followed by Daimler ($7.4 billion, 4.9 percent of revenues) and BMW (5.2 billion, 5.1 percent of revenues).[312] Much of this R&D is conducted in the same country where the manufacturer's headquarters is sited. However, they also conduct R&D elsewhere in the EU and the world. For example, Renault has a design center in Romania,[313] and BMW develops its diesel engines in Austria.[314] In addition to those manufacturers headquartered in the EU, Japanese, Korean, and U.S. manufacturers also invest in R&D in the EU.[315]

TABLE 18 European Union (EU) research and development (R&D) expenditures by manufacturer, 2012 (billions $)

Company	Headquarters	2012 R&D spending
Volkswagen	Germany	11.68
Daimler AG	Germany	7.43
BMW	Germany	5.21
PSA Peugeot Citroen	France	2.69
Renault	France	2.53
Fiat SpA	Italy	2.43

Sources: Daimler AG, *Annual Report 2012,* 3 (accessed March 26, 2013); BMW AG, *Annual Report 2012,* 33 (accessed March 26, 2013); Fiat SpA, *2012 Annual Report,* 26 (accessed March 26, 2013); Renault, *Consolidated Financial Statements 2012,* 2 (accessed March 26, 2013); PSA Peugeot Citroën, *Annual Results 2012*, 30 (accessed October 15, 2012); *October 2011*; VW, *Annual Report 2012*, 190 (accessed March 26, 2013).

Note: Figures converted from euros to dollars at the conversion rate for the first business day of January 2013.

Safety, fuel efficiency, alternative technologies, and cost savings are four major R&D areas emphasized by EU passenger vehicle manufacturers.[316] Volkswagen's MQB architecture[317] is a result of R&D into production cost savings. Renault, a French passenger vehicle manufacturer, has conducted extensive electric vehicle R&D in cooperation with Nissan.[318] German passenger vehicle manufacturers Daimler and BMW, as well as Volkswagen, have reputations for their innovations in passenger vehicle

[309] *Invest in Poland,* Automotive, December 2011.

[310] Figure converted from euros to dollars at the conversion rate of the date of publication. May include some R&D for other motor vehicles, or in the case of BMW, motorcycles. ACEA, "Innovation Research and Development," April 14, 2010.

[311] Figure converted from euros to dollars at the conversion rate for the first business day of January of the following year. EC, Joint Research Centre, Directorate General Research and Innovation, "The 2011 EU Industrial R&D Investment Scoreboard," October 2011; VW, Annual Report 2012, 190 (accessed March 26, 2013).

[312] Figure converted from euros to dollars at the conversion rate for the first business day of January of the following year. Daimler AG, Annual Report 2012, 3 (accessed March 26, 2013); BMW AG, Annual Report 2012, 33 (accessed March 26, 2013).

[313] Renault website. http://www.renault.com/en/groupe/renault-dans-le-monde/pages/conception.aspx. (accessed October 15, 2012);

[314] BMW Group website. http://www.bmwgroup.com/bmwgroup_prod/e/0_0_www_bmwgroup_com/forschung_entwicklung/netzwerk/innovationsnetzwerke.shtml (accessed October 15, 2012).

[315] ACEA, "Innovation Research and Development," April 14, 2010.

[316] ACEA, "Finding Intelligent, Affordable and World-Leading Mobility Solutions," April 14, 2010.

[317] For more information, see the previous "Production Techniques and Strategies" section.

[318] Phipps, "Renault-Nissan Alliance: Mileage in the Electric Union," October 16, 2012.

technology, and Daimler's and BMW's R&D expenditures per unit produced were even higher than Volkswagen's.[319]

Japan

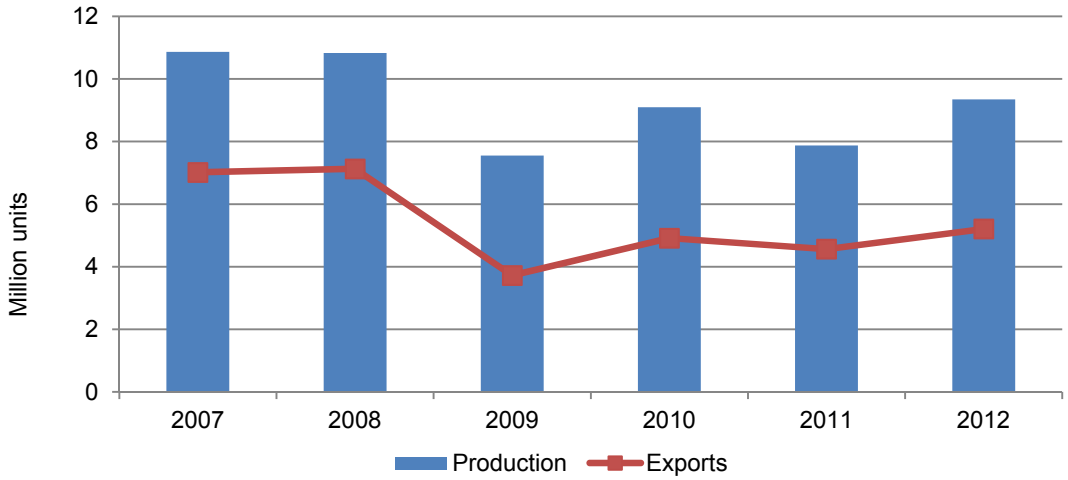
Japan is the world's fourth-largest producer of passenger vehicles, although production declined over the 2007–12 period, likely due to the rising value of the yen and short-term supply issues caused by the tsunami in March 2011. Japan is home to many of the largest manufacturers in the industry, including Toyota, the world's leading passenger vehicle manufacturer from 2007 to 2011, and Honda, Mazda, Mitsubishi, Nissan, Subaru, and Suzuki. However, no foreign-based firms produce passenger vehicles in Japan (table 19).[320] Japan is also a leading global exporter, with $477.9 billion or over 32.5 million units of Japanese passenger vehicle production exported during 2007–12 (figure 15).[321]

TABLE 19 Japanese passenger vehicle production by manufacturer, 2007–11 (units)

Company	2007	2008	2009	2010	2011
Toyota	4,654,172	4,431,247	3,378,215	3,818,550	3,209,129
Nissan	1,225,073	1,293,088	890,096	1,127,120	1,108,026
Mazda	995,511	1,078,690	717,175	909,856	813,302
Honda	1,331,845	1,264,381	840,924	992,502	710,621
Mitsubishi	846,083	841,949	426,530	660,105	603,594
Subaru	475,850	524,916	408,399	495,124	430,729
Suzuki	1,218,297	1,208,629	908,302	162,851	138,110

Sources: Binder, *Ward's Automotive Yearbook*, 2009, 51; Binder, *Ward's Automotive Yearbook,* 2010, 44; *Binder, Ward's Automotive Yearbook,* 2011, 46–48; Binder, *Ward's Automotive Yearbook*, 2012, 43.

FIGURE 15 Japanese passenger vehicle production and exports, 2007–12



Sources: OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–11 (accessed June 20, 2011, April 18, 2012, and March 8, 2013);

[319] Daimler AG, *Annual Report 2010* (accessed February 7, 2012); BMW AG, *Annual Report 2010* (accessed February 7, 2012).

[320] OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–10 (accessed June 20, 2011); Binder, "Ward's Automotive Yearbook," 2012, 9–13.

[321] GTIS, Global Trade Atlas database (accessed January 4, 2012, and April 18, 2012); OICA, World Motor Vehicle Production by Country and Type 2007–2011 (accessed June 20, 2011, and April 18, 2012).

Japanese passenger vehicle production has a reputation for being extremely efficient. For example, the Toyota production system (TPS) has been imitated many times and helped spawn JIT manufacturing, an approach that maintains minimal inventory of parts to reduce inventory costs.[322] Under TPS, each work process is rigidly scripted, so rather than a step in the process being merely to attach a bolt, the process is to attach a bolt using a specific amount of torque from a specific tool in a specific amount of time.[323] This rigid scripting enables individual employees to find time savings that can be replicated in each plant to generate tremendous savings for Toyota.[324] Another example of production innovation is Mazda's Skyactiv engines, which were designed to be simpler and less expensive to produce than previous Mazda engines. Skyactiv reduced the machining process for its engines from 45 steps to 4 through a minimal common conveyor and machining points.[325]

Japanese passenger vehicle manufacturers are at the forefront of global industry R&D. Toyota spent nearly $9.5 billion (4.2 percent of revenue), on R&D in fiscal year 2012[326] Honda spent $6.3 billion (6.5 percent of revenue) in FY 2012, and Nissan spent over $4.7 billion (4.6 percent of revenue) in FY 2011 (the most recent year available).[327] As a multinational company with research centers scattered globally,[328] Toyota likely spent a significant percentage of its R&D budget outside of Japan; this is true of other Japanese passenger vehicle manufacturers as well.[329]

During the recent worldwide economic downturn, the Japanese manufacturing labor force was largely preserved despite a decline in production, leading to a decline in productivity (on an output-per-employee basis). [330] In 2010 (the most recent year available), approximately one million Japanese workers were employed in transportation equipment manufacturing, a decline of about 170,000 from 2007.[331]

Japanese passenger vehicle manufacturers reportedly benefit from the government's strict vehicle inspection requirements. All passenger vehicle owners are required to have their vehicles inspected by the National Agency of Vehicle Inspection, or a designated maintenance garage, every two or three years.[332] This policy was enacted to ensure that vehicles are safe to operate and to reduce pollution. However, the relatively high cost of inspection reduces the value of used cars in Japan, increasing Japanese consumers'

[322] Spear and Bowen, "Decoding the DNA of the Toyota Production System," September–October 1999.

[323] Ibid.

[324] Ibid.

[325] Greimel, "Mazda's Skyactiv Line Reduces Factory Costs," December 12, 2011, 20.

[326] Toyota's FY 2012 went from April 2011 to March 2012, which is not comparable to R&D reported on a calendar year basis by competitors Volkswagen and General Motors. Toyota, "Form 20-F," June 25, 2012, 88.

[327] Honda, "CAPEX, Depreciation and R&D" (accessed October 2, 2012); *Honda Annual Report 2012,* 4 (accessed April 17, 2013); *Nissan Annual Report 2012*, 19 (accessed October 2, 2012).

[328] Toyota Company website, Design and R&D Centers, http://www.toyota-global.com/company/profile/facilities/r_d_center.html (accessed January 10, 2012).

[329] Honda R&D Co., website http://world.honda.com/RandD/global/index.html (accessed November 19, 2012); Nissan Company website. http://www.nissan-global.com/EN/COMPANY/PROFILE/EN_ESTABLISHMENT/NORTH_AMERICA/ (accessed November 19, 2012).

[330] Steinberg and Nakane, "To Fire or Hoard," January 2011, 4.

[331] The category "transportation equipment" includes not only motor vehicle manufacturing but also other forms of transportation equipment manufacturing, including ships, aircraft, and bicycles. Government of Japan, Labour Force Survey Basic Tabulation Whole Japan Yearly, "Employed Persons by Industry and Status in Employment," (accessed November 19, 2012); Government of Japan, Japan Standard Industrial Classification, Structure and Explanatory Notes (accessed November 19, 2012).

[332] An owner may wait three years after the purchase of a new car, but then must have the vehicle inspected every two years. National Agency of Vehicle Inspection Agency website (accessed June 4, 2012).

propensity to purchase new vehicles, and increases Japanese exports of used vehicles.[333] In 2005, the inspection was reported to cost around $1,000, not including the additional costs of any repairs.[334]

The predecessor of Japan's Ministry of Economy, Trade and Industry (METI), the Ministry of International Trade and Industry, actively supported large industrial enterprises, including major passenger vehicle manufacturers, and played a key role until the late 1970s.[335] Today, METI is considered to operate on a more strategic level, laying out a vision for Japanese industries and offering incentives to achieve goals.[336] For example, in its "Next-Generation Vehicle Plan 2010," METI announced a goal of 80 percent eco-friendly vehicle sales by 2020.[337] METI hopes to achieve these goals through incentives and a focus on developing battery technology, infrastructure, and international standards, as well as establishing a strategy to insure a consistent supply of rare-earth metals.[338] The government-owned Japan Bank for International Cooperation has supported Japanese passenger vehicle exports by providing loans for Japanese firms to finance foreign customers' purchases of passenger vehicles.[339]

Despite their traditional competitiveness in passenger vehicle manufacturing, Japanese manufacturers have recently lost global market share. In 2012 Japanese production remained below 2007 levels due to the March 2011 tsunami, November 2011 flooding in Thailand, and appreciation of the yen.[340] The tsunami severely disrupted the supply chain in Japan and reduced Japanese passenger vehicle manufacturing capacity for the rest of the year.[341] Flooding in Thailand heavily damaged a number of component plants in Thailand that supplied assembly plants in Japan,[342] including some owned by Pioneer Electronics Incorporated, a major producer of vehicle-navigation systems.[343] The flooding also disrupted two Honda passenger vehicle assembly plants capable of producing 240,000 units per year.[344]

While the tsunami and flooding had a short-term impact on Japanese production, the rising value of the yen is affecting production over the longer term. From January 2007 to December 2012, the value of the Japanese yen increased by over 27 percent compared to the U.S. dollar.[345] A stronger yen reduced the value of foreign-currency proceeds that Japanese manufacturers receive from their exports abroad, while domestic labor and manufacturing costs in Japan remained denominated in yen terms.[346] This revenue-cost squeeze led Japanese passenger vehicle manufacturers to shift some current and planned

[333] Clerides and Hadjiyiannis, "Trade-inducing Quality Standards for Used Durables," January 2005, 1.
[334] Ibid.
[335] Nezu, "Industrial Policy in Japan," July 2007, 232.
[336] Ibid., 229.
[337] Government of Japan, METI, Automobile Division, Manufacturing Industries Bureau, "Summary of the Next-Generation Vehicle Strategy 2010," April 12, 2010.
[338] Ibid.
[339] Levin and Fujimura, "Toyota Borrows from Japan-Owned Bank to Finance U.S. Car Sales," April 3, 2009.
[340] OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–11 (accessed June 20, 2011, and October 4, 2012).
[341] Greimel, "Why Japan Is Bouncing Back So Quickly," June 13, 2011.
[342] Greimel, "Thai Trauma: Snakes, Live Wires, Water," November 7, 2011, 8.
[343] Harrison, "Thai Floods Hit Technology, Auto Outlook," October 20, 2011; Mukai, Hagiwara, and Horie, "Thai Floods Disrupting Japanese Car Production," October 31, 2011.
[344] Ploy Ten Kate, "Thailand Assesses Damage," October 10, 2011.
[345] USITC staff calculation based on Federal Reserve, Historical Rates for the Japanese Yen, March 25, 2013.
[346] Greimel, "Strong Yen Jolts Japan's Plant Plans," November 7, 2011, 4.

production from Japan to other countries, including Thailand and the United States.[347] For example, Nissan began exporting passenger vehicles it produces in Thailand to Japan.[348] Mitsubishi announced plans to rely on production in Normal, IL, for exports to Central and South American markets;[349] Toyota announced plans to export vehicles produced in France to both the United States and Canada;[350] and Honda began importing vehicles from China to Canada that were previously imported from Japan.[351]

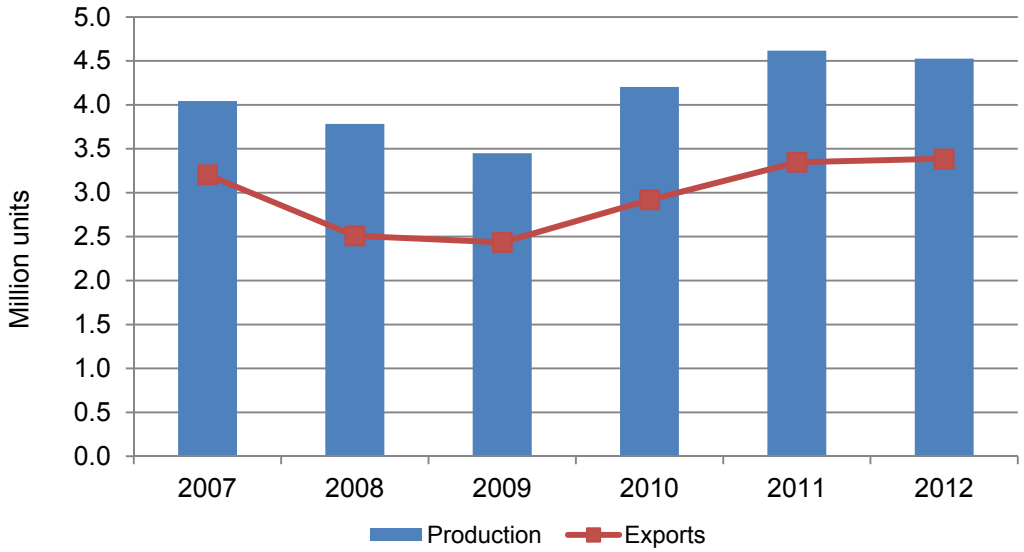
Korea

Korea is a fast-growing passenger vehicle producer that has benefited from the fact that its two largest manufacturers—Hyundai and Kia (both owned by the Hyundai Group)—have released several well received new vehicle designs since 2009.[352] Korea was the world's fifth-largest passenger vehicle manufacturer from 2007 to 2012[353] and a major exporter as well, with nearly 75 percent of its passenger vehicle production exported in 2012 (figure 16).[354] The third leading manufacturer in Korea is GM Korea.[355] Korea's top three export markets were the United States, Russia, and Australia.[356]

Korean labor can be characterized as relatively inexpensive and productive, with average compensation for all manufacturing in Korea at $16.62 per hour.[357] Nevertheless, Korean labor-management relations can be contentious. From 2009 to 2011, Hyundai managed to successfully reach a labor agreement each year without a strike.[358] However, in 2012, a strike lasting from mid-July to early September cost Hyundai an estimated $1.5 billion in lost production, making it the costliest strike in Hyundai's corporate history.[359]

[347] Dawson and Takahashi, "Toyota Confronts Rising Yen," September 8, 2011; Greimel, "To Fix Yen," February 4, 2009.
[348] Chester and Takahashi, "Toyota Confronts Rising Yen," September 8, 2011.
[349] *Automotive News,* "Talk from the Top: Osamu Masuko," November 14, 2011, 22.
[350] Keenan, "Toyota Shifts Production of Yaris to France," June 25, 2012.
[351] Phillips, "Honda Imports China-built Fit to Canada," December 21, 2011.
[352] Glinton, "Design, Price Are Keys to Success for Hyundai," October 4, 2011.
[353] OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–11 (accessed June 20, 2011, April 18, 2012 and March 8, 2013).
[354] OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–11, (accessed June 20, 2011, April 18, 2012, and March 8, 2013); GTIS, Global Trade Atlas database (accessed January 4, 2012, April 18, 2012, and March 8, 2013).
[355] Binder, *Ward's Automotive Yearbook,* 2011, 10.
[356] GTIS, Global Trade Atlas database (accessed April 19, 2012).
[357] DOL, BLS, "International Comparisons of Hourly Compensation Costs," December 21, 2011.
[358] *Reuters,* "Hyundai Union Threatens Work Stoppages After Worker Self-Immolation," January 9, 2012.
[359] Song, "Hyundai Workers Agree to Wage Deal," September 4, 2012.

FIGURE 16 Korean passenger vehicle production and exports, 2007–12



Sources: OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–11 (accessed June 20, 2011, April 18, 2012, and March 8, 2013); GTIS, Global Trade Atlas database (accessed January 4, 2012, April 18, 2012, and March 8, 2013).

Note: Korean trade data report over 7.6 million exported in 2008. According to these data, however, 4.5 million of the exports were diesel passenger vehicles to Russia. Since this figure exceeded the total vehicles produced in Korea in 2007 or 2008, those exports were removed from the figure.

Historically, tax policies and unique safety restrictions gave domestic producers a base from which to achieve economies of scale in passenger vehicle manufacturing, but made it difficult or expensive for foreign manufacturers to compete in Korea.[360] With reforms to the tax code and free trade agreements (FTAs) with the European Union and United States in place, the Korean market appears to be more open to foreign competition.[361] However, the Korean won was estimated to be undervalued by 5–20 percent in 2011,[362] which could have helped lower the cost of exported Korean vehicles and increased the relative cost of imported passenger vehicles.

Both foreign and domestic firms use Korean R&D institutes. R&D efforts for Hyundai and Kia vehicles occur primarily in Korea,[363] though Hyundai does have a technical center in the United States.[364] In 2011, Hyundai reported R&D expenditures of over $1.2 billion, and Kia reported R&D expenditures of over $867 million.[365] However, these numbers may underrepresent development activity for these two manufacturers, as some development costs are not included in these figures.[366] Korea has also been GM's hub for

[360] Shepardson, "South Korea to Get More Fords," February 3, 2012.

[361] USTR, "USTR Releases Preliminary Analysis of Korea-EU Free Trade Agreement," October 19, 2009; *Official Journal of the European Union,* "Notice Concerning the Provisional Application of the Free Trade Agreement between the European Union and its Member States, of the one part, and the Republic of Korea, of the other part," June 28, 2011. Shepardson, "South Korea to Get More Fords," February 3, 2012.

[362] U.S. Department of Treasury. Office of International Affairs. "Report to Congress on International Economic and Exchange Rate Policies," February 2011.

[363] Hyundai Annual Report, 2010, 47.

[364] Hyundai America Technical Center, Inc Company website. http://www.hatci.com/ (accessed March 8, 2012).

[365] Hyundai Annual Report, 2011, 105; Kia Annual Report, 82.

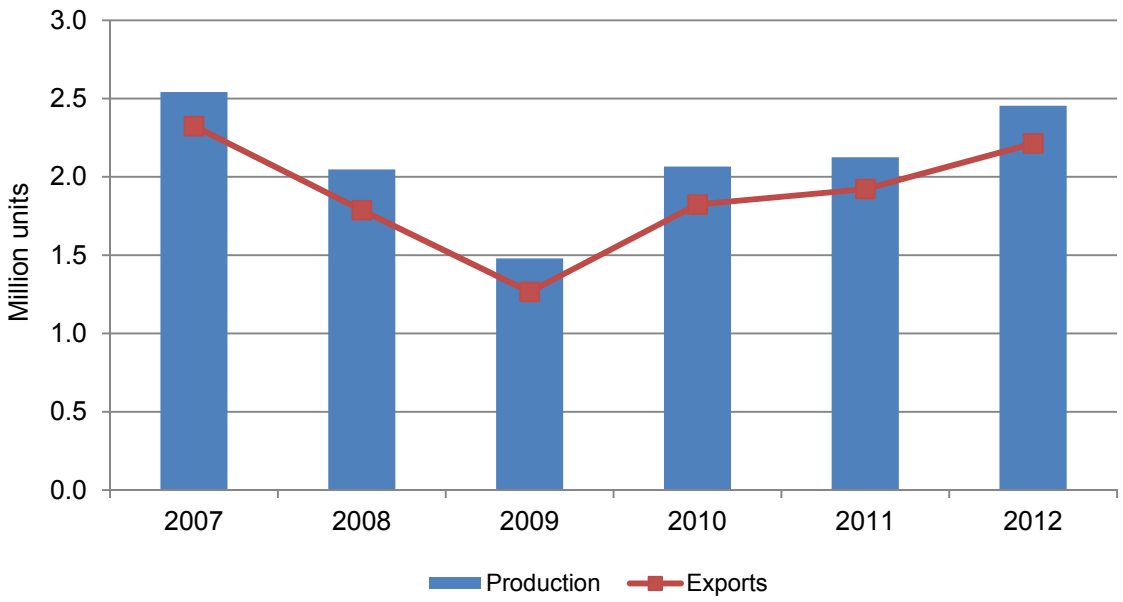
[366] Ibid., 91; Kia Annual Report, 65.

small car R&D since it purchased much of Daewoo Motors in 2001,[367] with the lead work designing compact and sub-compact cars including the Chevrolet Cruze, Cobalt (Cruze's predecessor), Sonic, and Spark.[368]

Canada

Canada is a major passenger vehicle producer with a long history of association with the U.S. passenger vehicle industry. In 1965, the United States and Canada agreed to liberalize trade in passenger vehicles and parts.[369] Canada produced more than 2.4 million passenger vehicles in 2012, a 3.5 percent decline from 2007 (figure 17). Canadian passenger vehicle production benefits from both its proximity to the U.S. market and membership in NAFTA, as over 85 percent of passenger vehicles produced in Canada are exported to the United States.[370] These exports are a part of the integration of the North American passenger vehicle industry, with passenger vehicles and parts flowing across the border in both directions. Manufacturers with plants in Canada include the Big Three as well as Honda and Toyota.[371] All Canadian passenger vehicle manufacturing plants are located in Ontario, Canada.[372]

FIGURE 17 Canadian passenger vehicle production and exports, 2007–12



Sources: OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–11 (accessed June 20, 2011, April 18, 2012, and March 8, 2013); GTIS, Global Trade Atlas database (accessed January 4, 2012, April 18, 2012, and March 8, 2013).

[367] Moon and Welch, "GM May have Landed a Dandy Daewoo Deal," October 8, 2001.
[368] O'Leary, "GM's in a Korean State of Mind," November 9, 2011; Lorio, " First Drive: Chevrolet Sonic," September 23, 2011.
[369] Fuss and Waverman, "The Canada-U.S. Auto Pact of 1965, 1986, 1.
[370] USITC staff calculation using OICA. World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–11 (accessed June 20, 2011 and April 18, 2012) and GTIS, Global Trade Atlas Database (accessed January 9, 2012).
[371] Binder, *Ward's Automotive Yearbook,* 2011, 12–13.
[372] Ibid., 2012, 13.

The Canadian government used loans and direct investment in passenger vehicle manufacturers to ensure continued passenger vehicle production in Canada by GM and Chrysler during the economic downturn. The provincial governments of Ottawa and Ontario, for example, owned a 1.7 percent stake in Chrysler from 2009 to 2011 as part of Chrysler's bailout in 2009.[373] Also as a result of the bailout, the Canadian federal government continues to own nearly 9 percent of GM.[374]

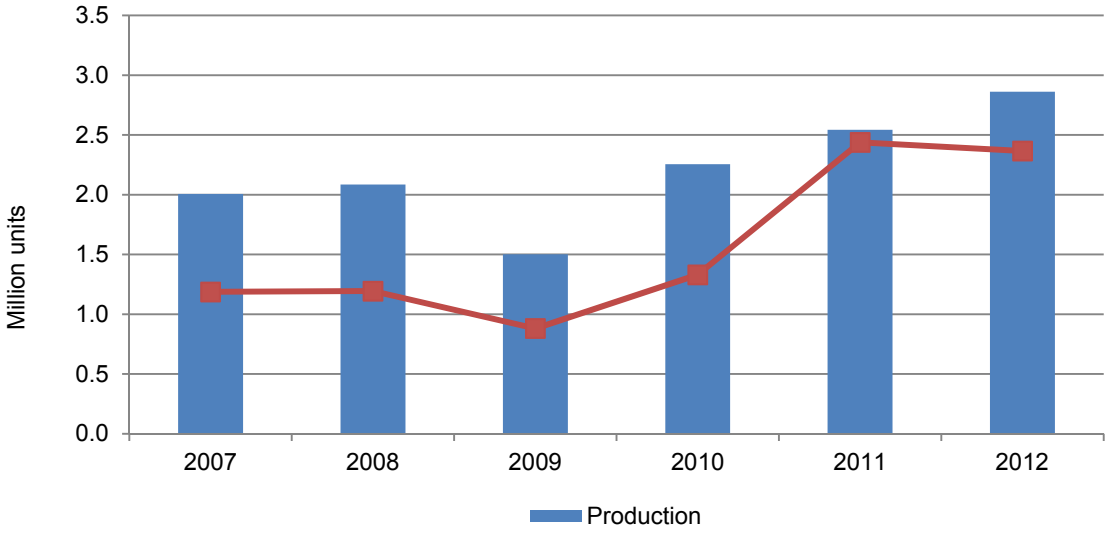
Canadian passenger vehicle manufacturing employment declined by nearly 10,000 employees from 2007 to 2010 (the most recent year available) to about 29,000.[375] Employees at Big Three manufacturing plants in Canada are members of the Canadian Auto Workers union (CAW).[376] According to the Center for Automotive Research, these workers' wages and benefits averaged $2–$8 more per hour in 2012 than those of workers at Big Three plants in the United States.[377] It is unclear whether workers at Japanese transplants in Canada receive similar pay or not.[378]

Mexico

Mexico is a NAFTA partner and a leading manufacturing site for U.S. and foreign producers. Mexican passenger vehicle production declined by 29 percent to 1.5 million units from 2007 to 2009 in response to decreased demand, likely due to the global economic downturn (figure 18). However, production rebounded and passed pre-recession levels in 2010, with 2.25 million units produced—due in part to the opening or reopening of new passenger vehicle plants[379] by manufacturers seeking to operate in a location with favorable wage costs and access to the North American market.[380] Currently, the Big Three, Honda, Nissan, Toyota, and Volkswagen produce passenger vehicles in Mexico,[381] and Japanese manufacturers Honda,[382] Mazda,[383] and Nissan[384] announced in 2011 that they will open new plants in Mexico (table 20) to produce primarily small cars. Moreover, Mexican passenger vehicle production will likely continue growing in the future, as manufacturers looking to sell in both the North and Latin American markets—particularly in Brazil—open up more plants in Mexico.

[373] *Globe and Mail.* "Ottawa, Ontario Sell Remaining Stake in Chrysler to Fiat," July 21, 2011.
[374] General Motors, Proxy Statement 2011, 24.
[375] Industry Canada. Data Tables. Automobile and Light-Duty Motor Vehicle Manufacturing. Employment by Type of Employee (accessed November 16, 2012).
[376] Canadian Auto Workers union website (accessed November 19, 2012). http://www.caw.ca/en/about-the-caw-caw-assembled-vehicles.htm.
[377] CAW's wages and benefits average $60 an hour, compared to $58 at GM in the U.S., $56 at Ford, and $50 at Chrysler. Snavely, "CAW Got Most of What It Wanted in Contract Talks with Detroit 3," September 30, 2012.
[378] Amend, "CAW Sees Momentum in Organizing Honda's Ontario Plant," June 28, 2012.
[379] Ford reopened its Cuautitlan assembly plant in 2010. *Source:* Ford Motor Company, "Ford Begins All-New Fiesta Production at Transformed Cuautitlan Plant Complex," May 11, 2010.
[380] *Reuters,* "VW's Audi to Build Factory in Mexico," April 18, 2012.
[381] Binder, *Ward's Automotive Yearbook,* 2011, 12–13.
[382] Honda, "Honda to Build New Automobile Plant in Mexico for Production of Subcompact Vehicles, Starting in 2014," August 12, 2011.
[383] Greimel, "To Fight Strong Yen, Mazda Heads to Mexico," November 14, 2011, 29.
[384] *Reuters,* "Nissan Sees New Plant Doubling Mexican Car Output," December 14, 2011.

FIGURE 18 Mexican passenger vehicle production and exports, 2007–12



Sources: OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–12 (accessed June 20, 2011, April 18, 2012, and March 8, 2013); GTIS, Global Trade Atlas database (accessed January 4, 2012 , April 18, 2012, and March 8, 2013).

Note: Chile and Costa Rica's reported imports of passenger vehicles from Mexico are used rather than Mexico's reported exports because Mexico's exports to these countries were reported in terms of pieces rather than units (complete vehicles). This may have occurred in other countries as well, leading to over-reporting of passenger vehicle exports.

TABLE 20 Recently upgraded and planned assembly plants in Mexico

Company	Plant location	Capacity at opening (units)	Opening date
Ford	Cuautitlan (upgrade)	[a]	2010
Nissan	Aguascalientes (new)	600,000	end 2013
Mazda	Guanajuato (new)	140,000	by March 2014
Honda	Guanajuato (new)	200,000	2014
Audi	Unknown (new)	[b]150,000	2016

Sources: Mazda, "Mazda, Sumitomo Begin Construction of Mexican Production Facility," October 11, 2011; Honda, "Honda to Build New Automobile Plant in Mexico," August 12, 2011; Reuters, "Nissan Sees New Plant Doubling Mexican Car Output," December 14, 2011; Reuters, "VW's Audi to Build Factory in Mexico," April 18, 2012; Ford News Release, "Ford Begins All-New Fiesta Production," May 11, 2010.

[a]Not reported.
[b]Plant capacity has not been officially announced but is reported to be 150,000 units.

A relatively skilled and inexpensive labor force, geographic location, trade agreements, and government policies promoting exports have been important factors in increasing Mexico's role in passenger vehicle manufacturing. Among countries analyzed by the U.S. Bureau of Labor Statistics in 2010, Mexico had the second-lowest labor compensation costs for all manufacturing, at $6.23 per hour.[385] Also, an increasing number of Mexican graduates from engineering and technical colleges have expanded the pool of skilled labor available for the manufacturing sector.[386] Moreover, the Mexican government's

[385] Some countries, including China and India, were not included because of data gaps and methodological issues. DOL, BLS, "International Comparisons of Hourly Compensation Costs," December 21, 2011.
[386] Downer, "Mexican Evolution: Adding High-Tech Savvy," June 27, 2011, 24.

maquiladora programs promote foreign direct investment in export-oriented manufacturing by allowing the duty-free import of equipment used, goods, and services that are inputs for production of export-bound goods, a program that is used for both passenger vehicle and parts assembly.[387] Mexico's extensive network of FTAs also makes it an ideal location for export-oriented producers, as it has signed 12 FTAs with 44 partners, including the EU and the United States.[388]

China

China is the world's largest producer of passenger vehicles, with almost all production going to the domestic market. China passed the United States (2008) and Japan (2009) to become the largest passenger vehicle producing country in the world, and continued to increase production while passenger vehicle manufacturing worldwide declined.[389] China is a relative latecomer to the passenger vehicle industry, with passenger vehicle production for private consumption only emerging in the 1980s.[390] The Chinese industry is also relatively diffuse, with over 100 indigenous manufacturers assembling vehicles of varying quality, though most of indigenous vehicles do not typically compete with imported or domestically produced vehicles produced under foreign brands.[391] U.S., EU, Japanese, and Korean manufacturers assemble vehicles in China under their brands as part of joint ventures with Chinese state-owned enterprises (SOEs).

Due to government restrictions, foreign manufacturers can only produce vehicles in China as a joint venture.[392] For example, GM and Volkswagen have partnered with Shanghai Automotive Industry Corporation (SAIC) and were the top two foreign brands in terms of units sold in 2011 (table 21).[393] Ford also produces passenger vehicles with a joint venture partner. Honda plans to export passenger cars from China to Canada, marking the first time a passenger vehicle that is mass produced in China will be exported to North America.[394]

[387] Gorjidooz and Vasigh, "The Maquiladora Industry: Recent Downturn," March 2009, 1. Klier and Rubenstein, "Imports of Intermediate Parts in the Automotive Industry," October 23, 2009, 5.

[388] DFAT, "Mexico Country Brief," February 2012.

[389] OICA, World Motor Vehicle Production by Country and Type 2007–11 (passenger cars and light commercial vehicles) (accessed June 20, 2011, and April 18, 2012).

[390] FAW website, http://www.faw.com/aboutFaw/aboutFaw.jsp?pros=forward.jsp&phight=580&about=forword (accessed November 16, 2012).

[391] *Economist,* "Stepping on the Gas," April 24, 2012.

[392] Thun, *Changing Lanes in China,* 2006, 66.

[393] EIU, "China: Automotive Report," February 9, 2012.

[394] Phillips, "Honda Imports China-built Fit to Canada," December 21, 2011. There are also two small electric vehicle manufacturers importing vehicle bodies to the United States for use in their passenger vehicles. Guilford, "Short Circuited: Some Green-Tech Auto Startups Struggle," January 9, 2012, 30; Sickinger, "Wheego Electric Cars Targets Oregon," June 20, 2011.

TABLE 21 Chinese passenger vehicle sales by manufacturer, 2011 (units)

Manufacturer	Chinese joint venture partner(s)	Sales
Volkswagen	SAIC and First Automobile Group Corp.	2,149,888
GM	SAIC	1,224,484
Hyundai-Kia	BAIC and Guangzhou Automotive Industry Group	1,186,572
Toyota	Guangzhou Automotive Industry Group	831,854
Nissan	Dongfeng Motor Corp.	792,873
Honda	Guangzhou Automotive Industry Group	570,868
FAW (Chinese)		486,481
BYD (Chinese)		420,483
Chery (Chinese)		394,625
PSA Peugeot Citroen	Dongfeng Motor Corp.	388,184
Geely (Chinese)		377,496
Ford	Chang'an Automobile Group Corp.	320,655
Great Wall Motor (Chinese)		315,761
Suzuki		273,951
Mazda	Chang'an Automobile Group and First Automobile Group Corp.	207,794
Chang'an (Chinese)		203,669
Subtotal		10,145,638
Total passenger vehicle sales		11,461,008

Source: China Automotive Review, "China PV Sales by Multinational/Chinese Make & Model," March 2012, 36.

Note: Chinese passenger vehicle company sales data do not include data for light trucks and vans. Aggregate sales of light trucks and vans totaled 2,699,781 in 2011.

In addition, China has over 100 indigenous passenger vehicle manufacturers, with a variety of different ownership structures. Some, including FAW (formerly First Automobile Works), are owned by the central government. Others, including Shanghai Automotive Industry Corporation (SAIC), are owned by local governments.[395] Although consolidation of the industry has been a goal of the central government since the 1980s, there continue to be a large number of small firms.[396] Still others, such as BYD, are privately owned. Indigenous manufacturers in joint ventures with foreign manufacturers tend to be owned by either state or local governments.

Chinese indigenous manufacturers that are not partnered with foreign firms tend to have lower sales and levels of technology; the same is true of manufacturing by indigenous manufacturers outside of the joint venture. Indeed, many indigenous manufacturers started by reverse-engineering foreign vehicles and designs.[397] However, recently some domestic manufacturers have made significant advances. For example, in late 2011, two Chinese-produced vehicles, the Geely Emgrand EC7 and MG6, achieved the first four-star ratings awarded a Chinese independent brand in the European New Car Assessment Program (NCAP) test.[398]

The relatively low Chinese export level—only 767,000 passenger vehicles (4 percent of production) in 2012 (figure 19)—likely reflects several factors. Foreign passenger vehicle manufacturers that have invested in joint ventures with Chinese manufacturers prefer to focus on the Chinese domestic market.[399] Although China has a large number of indigenous passenger vehicle manufacturers, few of them are well known internationally, and the quality of their vehicles is not yet considered high enough to suit them for the world market. In addition to the quality issues, China's domestic manufacturers must face

[395] SAIC Motor Corporation, *2009 Annual Report*, 84 (accessed November 26, 2012).

[396] Sims Gallagher, China Shifts Gears, 2006;

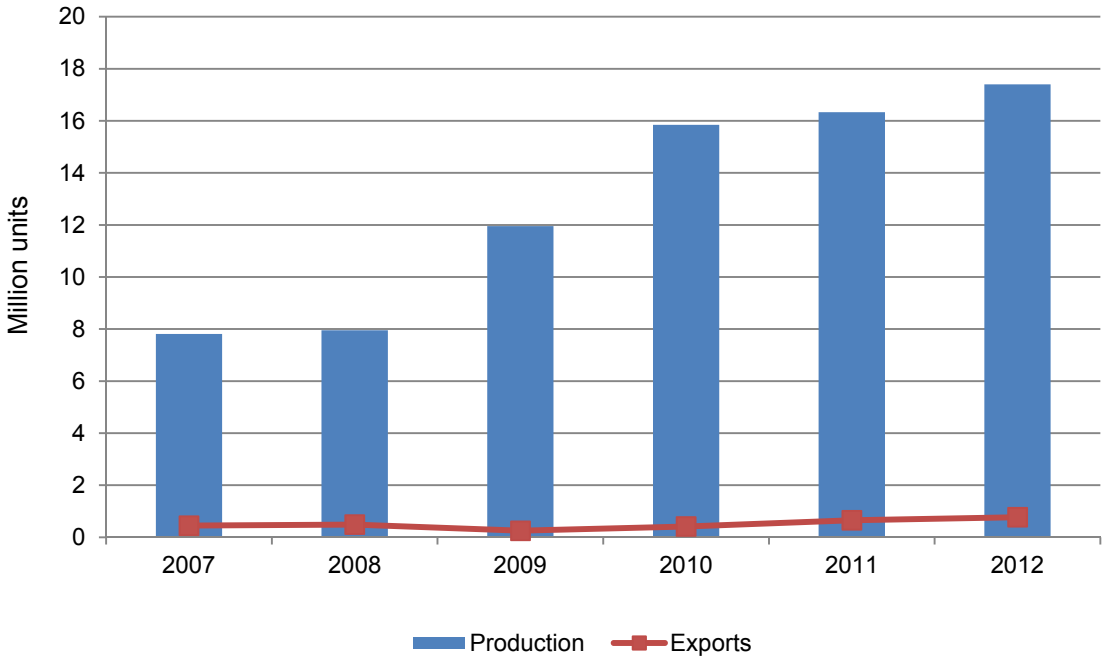
[397] Norihiko Shirouzu. "Special Report: China's Car Makers Cut Corners to Success," September 17, 2012.

[398] Xin, "Chinese Independent Brands Score Four Stars in Euro NCAP," January 2012, 4.

[399] Tang, *The Rise of China's Auto Industry,* November 16, 2009. GTIS, Global Trade Atlas database (accessed August 2, 2012).

several other important export restrictions in many developed markets, including the United States.[400] Key barriers include the difficulties of establishing the necessary dealership and service networks, as well as meeting stringent safety and emissions requirements. Many domestic Chinese passenger vehicle exports are of lower-value vehicles [primarily] sent to newly industrialized or developing country markets, such as Algeria, Brazil, and South Africa.[401]

FIGURE 19 Chinese passenger vehicle production and exports, 2007–12



Sources: OICA, World Motor Vehicle Production by Country and Type (passenger cars and light commercial vehicles) 2007–12 (accessed June 20, 2011, April 18, 2012, and March 8, 2013); GTIS, Global Trade Atlas database (accessed January 4, 2012, April 18, 2012, and March 8, 2013).

China's automobile manufacturing industry reportedly employs over 3.6 million people, likely making it the world's largest employer of labor in automobile manufacturing, which is a subset of passenger vehicle manufacturing.[402] The cost of labor for passenger vehicle manufacturing in China is likely also lower than in other major passenger vehicle manufacturing countries.[403] However, Chinese labor costs have begun to rise, which will likely increase the cost of producing passenger vehicles in China.[404] The Chinese government promotes domestic passenger vehicle manufacturing in a number of ways. First, the central government not only regulates the industry, but also creates detailed five-year plans to guide its direction.[405] Furthermore, a number of companies are owned

[400] Wang, "BYD's Electric Car Dream in the U.S. Sparks Concerns," January 12, 2011.

[401] GTIS, Global Trade Atlas database (accessed August 2, 2012); Bradsher, "Chinese Cars Make Valuable Gains in Emerging Markets," July 5, 2012.

[402] This data includes employment in auto parts manufacturing and repairs. ACMR, All China Data, China Yearly Industrial Data (accessed December 20, 2012).

[403] DOL, BLS, "International Comparisons of Hourly Compensation Costs, 2010." December 21, 2011.

[404] *BBC News,* "China Raises Minimum Wage by 23%," December 22, 2011.

[405] With varying results. For example, consolidation has been a major goal in industry-specific plans since the early 1990s, but overcapacity and an overabundance of small passenger vehicle manufacturers continues to be an issue. Stewart and Stewart, "China's Support Program for Autos," January 2012, ii.

by the central government, or by local governments.[406] As state-owned enterprises (SOEs), these companies may have access to low-interest loans and other government support that would not be available to private enterprises.[407] Additionally, as noted earlier, passenger vehicle production by wholly foreign-owned enterprises in China is prohibited.[408] Only a limited number of joint ventures are allowed, and they must gain government approval.[409] In order to gain such approval, foreign passenger vehicle manufacturers are strongly encouraged to transfer technology to the joint venture and establish R&D centers in China, which helps the domestic joint venture partner learn newer technology and manufacturing techniques.[410]China also offers incentives for R&D and manufacturing in "New Energy Vehicles" (hybrids, electric, and alternative-fuel vehicles).[411] Additionally, the Chinese government announced in 2012 that the sales tax would be waived for both domestically produced electric vehicles and fuel-cell vehicles.[412]

A number of leading global manufacturers have R&D facilities in China. For example, GM has multiple R&D centers in China, including the Pan Asia Technical Automotive Center, a joint venture R&D center in Shanghai that has researched passenger vehicle issues with SAIC,[413] and an electric technology center.[414] These R&D facilities offer foreign manufacturers access to relatively inexpensive engineering expertise, as well as an opportunity to tailor passenger vehicles to the Chinese market. The level and type of R&D conducted at the R&D firms vary by manufacturer, but each one of the foreign R&D centers at least strives to adapt vehicles for the local market, and in some cases the centers have designed their own passenger vehicles.[415]

The Chinese government has prioritized advancing automotive R&D beyond the adaptation of foreign vehicle platforms,[416] with a particular focus on hybrid and electric technologies. Chinese indigenous manufacturers conduct R&D, but they tend to not be as advanced as foreign manufacturers. In the past, much of their R&D focused on imitating or reconstructing advanced vehicles produced in other countries.[417] Some of these indigenous manufacturers have innovated by outsourcing responsibility for design to private design firms.[418] Chinese manufacturers have also been seeking to leapfrog foreign manufacturers, and move into areas, such as electric vehicles, where manufacturers in developed countries have less of an established presence.[419]

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[406] Thun, *Changing Lanes in China*, 2006, 29.
[407] Ibid., 28–29.
[408] Ibid., 66.
[409] Ibid., 66–68.
[410] Ibid., 68.
[411] *People's Daily*, "Alliance Drives Promotion of Electric Cars," August 19, 2010; Reuters, "China to Subsidize Hybrid, Electric Car Purchases," June 1, 2010.
[412] *China Daily*, "China Waives Sales Tax on Locally Made EV's," January 9, 2012.
[413] Sims Gallagher, *China Shifts Gears*, 2006, 67–68; and Yang, "GM Becomes a Trendsetter in China," January 10, 2011, 46.
[414] Webb, "GM Develops EV Supplier Base in China," December 12, 2011, 6.
[415] Sims Gallagher, *China Shifts Gears*, 2006, 67–68; Yang, "GM Becomes a Trendsetter in China," January 10, 2011, 46.
[416] Welle, "China's Car Industry Needs to Change Gears," September 13, 2012; Stewart and Stewart, "China's Support Program for Autos," January 2012, ii.
[417] Norihiko Shirouzu. "Special Report: China's Car Makers Cut Corners to Success," September 17, 2012.
[418] Norihiko Shirouzu. "Special Report: China's Car Makers Cut Corners," September 17, 2012.
[419] Mckinsey, "Recharging China's Electric Vehicle Aspirations," April 2012, 7.

Foreign Markets

Foreign markets have become increasingly important for U.S. passenger vehicle manufacturers as they attempt to maintain economies of scale using global platforms to compete with other global passenger vehicle manufacturers (table 22). Manufacturers sold 75 million passenger vehicles worldwide in 2011, and sales are anticipated to increase in 2012.[420] However, despite a reduction in production capacity in the United States, global production capacity continues to exceed anticipated demand.[421] Passenger vehicle manufacturers are also looking to industrializing countries such as China, India, and Brazil for demand growth, because consumers in these countries are now reaching income levels that allow them to afford to buy passenger vehicles. Industry observers have projected that as many as 3 billion passenger vehicles will be added to the global fleet by 2050,[422] and most of that growth will likely come from developing countries.[423] This section discusses the top-five markets for U.S. passenger vehicles from 2007 to 2012—Canada, European Union, China, Mexico, and Saudi Arabia—as well as key emerging markets—Brazil and India.

TABLE 22 Passenger vehicle sales, selected markets, 2007–11 (units)

Countries	2007	2008	2009	2010	2011
China	7,909,762	8,448,050	12,674,392	16,227,728	16,415,862
European Union	17,724,813	16,262,352	15,519,862	14,853,359	14,740,758
Brazil	2,486,147	2,867,565	3,027,076	3,329,170	3,425,596
India	1,722,281	1,751,356	2,066,707	2,727,527	2,955,374
Canada	1,690,538	1,674,145	1,484,856	1,554,700	1,581,987
Mexico	1,093,352	1,020,492	752,552	818,504	904,199
Saudi Arabia*	519,732	590,080	595,586	619,220	688,900

Sources: ACEA, "New Vehicle Registrations—By Country" (accessed October 15, 2012); Statistics Canada, "New Motor Vehicle Sales" (accessed January 12, 2012); Business Monitor International, "Saudi Arabia Autos Report," Q4 2010; Business Monitor International, "Industry Brief- Saudi Vehicle Sales Up 7 percent in 2011," February 10, 2012; *China Automotive Review,* China PV Sales by Multinational/Chinese Make & Model, March 2008–12; Binder, *Ward's Automotive Yearbook,* 2009, 44, 102–103,161; Binder, *Ward's Automotive Yearbook,* 2010, 38, 97, 152; Binder, *Ward's Automotive Yearbook,* 2011, 38, 96, 145; Binder, *Ward's Automotive Yearbook,* 2012,37, 88–91, 120, 137.

Canada

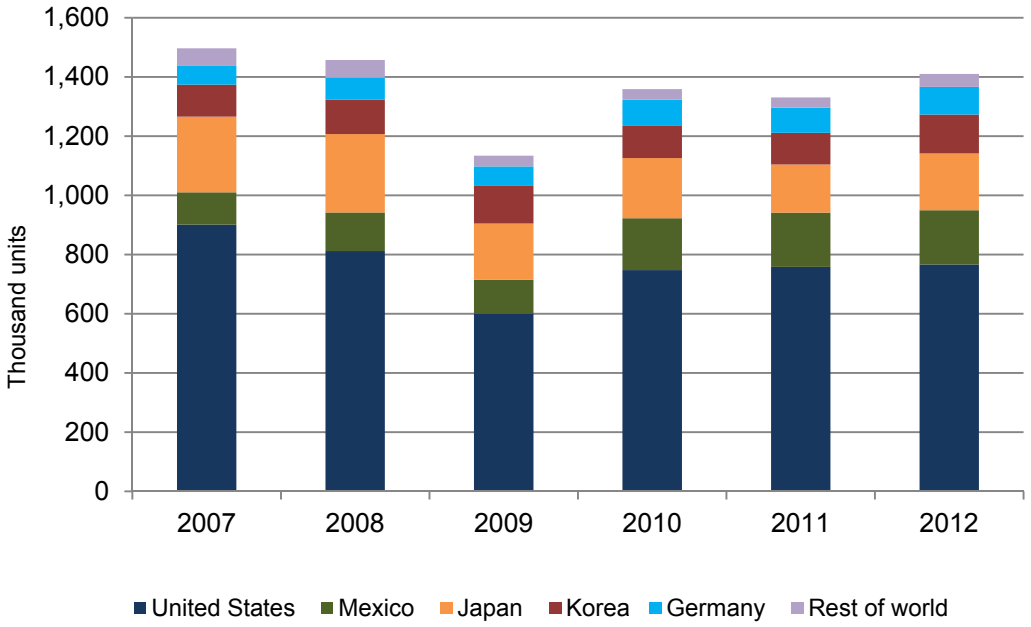
Over this five-year period, Canadian passenger vehicle sales were relatively stable, apart from a decline in 2009 that was likely due to the economic downturn. The Canadian passenger vehicle market is similar in structure to its U.S. counterpart. The market is characterized by a large pickup truck segment made up predominantly of vehicles produced in North America, but there is intense competition between North American-made and imported vehicles in the small car market.[424] In 2011, imports accounted for over 84.1 percent of passenger vehicle sales.[425] From 2007 to 2011, imports of passenger vehicles declined by nearly 166,000 units (11.1 percent).[426] However, imports of pickup trucks grew by over 10 percent during 2007–11, possibly due to the closing of the

[420] Ford Motor Company, "2011 10-k," 33.
[421] Ford Motor Company, "2011 10-k," 33.
[422] *Autocar,* "Spotlight: How Connected Cars Can Combat Global Gridlock," May 9, 2012, 26.
[423] Grier, "What the Future of the Auto Industry Will Look Like," July 2, 2009.
[424] Binder, *Ward's 2012 Automotive Yearbook*, 2012, 119–20.
[425] USITC calculation based on Binder, Statistics Canada, "New Motor Vehicle Sales" (accessed January 12, 2012); GTIS, Global Trade Atlas database (accessed September 28, 2012).
[426] GTIS, Global Trade Atlas database (accessed November 16, 2012).

Oshawa truck assembly plant in 2009.[427] For countries without an FTA with Canada, Canada's rate of duty on passenger vehicle imports is 6.1 percent.[428]

The United States was Canada's top source of imported passenger vehicles during 2007–12.[429] Others were Japan, Mexico, Germany, and Korea, although Canada's imports from these four countries combined were less than those from the United States during the six-year period (figure 20).[430] Major suppliers of passenger vehicles included (in descending order of 2011 sales) Ford, GM, Chrysler, Toyota, Hyundai, and Honda.[431]

FIGURE 20 Canadian passenger vehicle imports, by country, 2007–12



Source: GTIS, Global Trade Atlas database (accessed August 2, 2012, and March 8,

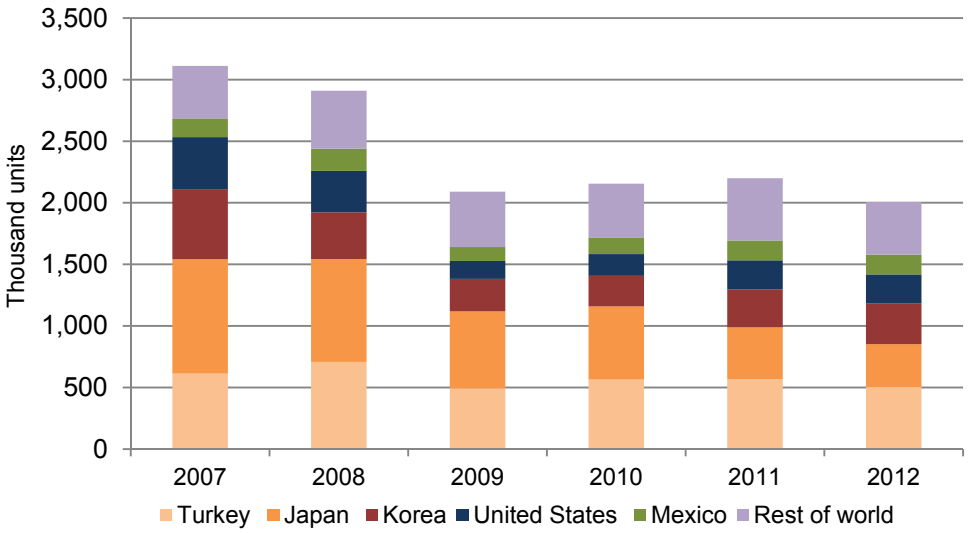
European Union (EU)

Unlike sales in most developed countries during 2007–12, the EU passenger vehicle market has stagnated since the economic downturn in 2009, likely due in part to the lack of economic growth in the EU.[432] EU passenger vehicle sales are made up primarily of small cars, and feature more diesel-powered passenger cars and SUVs than in the United States.[433] This preference for diesel-powered vehicles is likely due to the lower cost of diesel fuel in many European countries.[434]

[427] Keenan, "Oshawa GM Plant to Close Next Year," June 1, 2012; GTIS, Global Trade Atlas database (accessed November 16, 2012).
[428] Canadian Border Services Agency, Customs Tariff-Schedule, Section SVII Vehicles, Aircraft, Vessels and Associated Transportation Equipment, 2011.
[429] GTIS, Global Trade Atlas database (accessed January 10, 2012).
[430] Ibid.
[431] Binder, *Ward's Automotive Yearbook*, 2012, 108–14.
[432] Ibid., 47.
[433] ACEA, "New Passenger Car Registrations in Western Europe," September 2010; Winton, "More Americans Go for Hybrids," September 22, 2012.
[434] Drive Alive! "Fuel Prices in Europe," August 15, 2012.

Turkey, Japan, Korea, the United States, and Mexico were the five leading suppliers of passenger vehicle to the EU market in 2012 (figure 21). Passenger vehicle imports made up nearly 17 percent of EU passenger vehicle sales in 2011.[435] Within the European Union, the largest single-country markets in 2011 were Germany, France, and the United Kingdom.[436]

FIGURE 21 European Union (EU) passenger vehicle imports, by country, 2007–12



Source: GTIS, Global Trade Atlas database (accessed October 15, 2012, and March 8, 2013).

The EU has relatively high passenger vehicle tariffs and stringent emissions and safety regulations. EU tariff rates of 10 percent for imports of passenger cars and 22 percent for imports of light trucks may reduce imports of passenger vehicles.437 The EU regulates emissions on the basis of grams of carbon emitted per kilometer, with each manufacturer needing to meet an average emissions target for its passenger car fleet. 438 Light commercial vehicles, a category that includes pickup trucks and vans, are regulated separately.439 EU safety regulations for passenger vehicles use a type-approval system, where safety features of an approved type are required for specific goals, including pedestrian safety.440 Manufacturers that produce passenger vehicles in countries such as the United States and Japan, which regulate emissions or safety differently, may face increased costs to meet these standards.

[435] USITC staff calculations based on data from GTIS, Global Trade Atlas database (accessed November 15, 2012); ACEA, "New Vehicle Registrations—By Country" (accessed October 15, 2012).

[436] Binder, *Ward's Automotive Yearbook,* 2012, 52.

[437] WTO, Tariff Analysis database (accessed November 16, 2012).

[438] In this case passenger car refers to the category of vehicle the European Union categorizes as M1: "Vehicles designed and constructed for the carriage of passengers and comprising no more than eight seats in addition to the driver's seat." This includes passenger cars, CUVs, and SUVs. Regulation 443/2009/EC (April 23, 2009); Directive 2007/46/EC (September 5, 2007).

[439] The EU refers to this category of vehicles as N1: "Vehicles designed and constructed for the carriage of goods and having a maximum mass not exceeding 3,5 tonnes." Directive 2007/46/EC (September 5, 2007).

[440] Regulation (EC) No. 78/2009 (January 14, 2009).

China

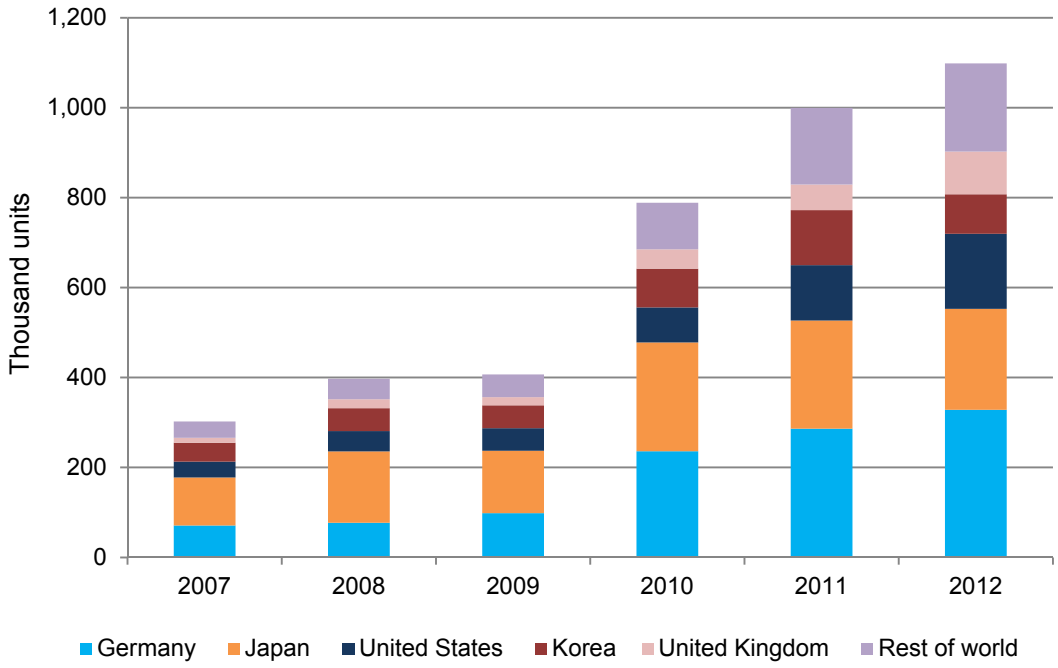
The Chinese passenger vehicle market is the largest in the world, having mushroomed from 7.9 million units in 2007 to 16.4 million units in 2011 due to a combination of rising domestic income and short-term government stimulus. Chinese personal income growth, which more than doubled from $2,651 in 2007 to $5,445 in 2011,[441] was the primary driver of the growth in passenger vehicle sales.[442] Passenger vehicle sales will likely continue to rise, due to further growth in personal incomes in China and the relatively low level of passenger vehicle ownership in the Chinese population. In 2009, China had 47 vehicles per 1,000 people, far less than the United States, which had 802 vehicles per 1,000 people.[443]

Another factor that contributed to growth in the Chinese passenger vehicle market was the government stimulus provided during 2009–10, when the Chinese government cut taxes on purchases of small-displacement vehicles and increased subsidies for trade-ins.[444] China applies a 25 percent tariff on passenger vehicle imports, in addition to an excise tax, and also levies a consumption tax on all passenger vehicles. The excise tax was temporarily reduced from 10 percent to 5 percent for vehicles with engines of 1.6 liters or less in 2009, then rose to 7.5 percent in 2010 before returning to 10 percent in 2011.[445] The consumption tax is applied based on engine size, with rates increasing from 1 percent for vehicles with an engine displacement of less than 1 liter to 40 percent for vehicles with engine displacements over 4 liters.[446]

Between 2007 and 2012, Chinese passenger vehicle imports increased to over a million units despite China's 25 percent tariff on passenger vehicle imports[447] and rapidly increasing domestic production.[448] Nonetheless, imports accounted for only 6.1 percent of China's passenger vehicle sales in 2011.[449] Because luxury buyers tend to be less sensitive to price, many of the imported vehicles were likely luxury vehicles from Germany, Japan, the United Kingdom, and the United States (figure 22).[450] Vehicles built independently by indigenous manufacturers tend to be less expensive and are marketed to a different segment of the Chinese market than imported passenger vehicles and those produced by joint ventures with non-Chinese manufacturers.[451]

[441] World Bank. World Development Indicators (accessed September 28, 2012).
[442] Ying, "China Ends U.S.'s Reign as Largest Auto Market," January 11, 2010.
[443] World Bank. World Development Indicators (accessed November 16, 2012).
[444] *Xinhua,* "China's Auto Stimulus Retained for 2010," December 10, 2009.
[445] Ruan and Fletcher, "China Ends Small-Car Tax Break," December 28, 2010.
[446] The tax rates are 1 percent for less than 1.0 liters, 3 percent for 1.0 to 1.5 liters, 5 percent for 1.5 to 2.0 liters, 9 percent for 2.0 to 2.5 liters, 12 percent for 2.5 to 3.0 liters, 25 percent for 3.0 to 4.0 liters, and 40 percent for greater than 4.0 liters. China State Administration of Taxation, "Ministry of Finance, State Administration of Taxation on the Adjustment," August 1, 2008.
[447] Bradsher, "China Imposes New Tariffs on U.S. Vehicles," December 14, 2011.
[448] Ying, "China Ends U.S.'s Reign as Largest Auto Market," January 11, 2010.
[449] USITC staff calculation based on data from *China Automotive Review,* "China PV Sales by Multinational/Chinese" March 2012, 36; GTIS, Global Trade Atlas database (accessed September 28, 2012).
[450] This is evident in the trade data. The average unit price for Chinese imports of passenger vehicles was over $40,000 in 2011. GTIS, Global Trade Atlas database (accessed January 17, 2012).
[451] Tian, "China's Plans for Its Own Car Brands Stall," August 30, 2012.

FIGURE 22 Chinese passenger vehicle imports, by country, 2007–12



Source: GTIS, Global Trade Atlas database (accessed September 28, 2012, and March 8, 2013).

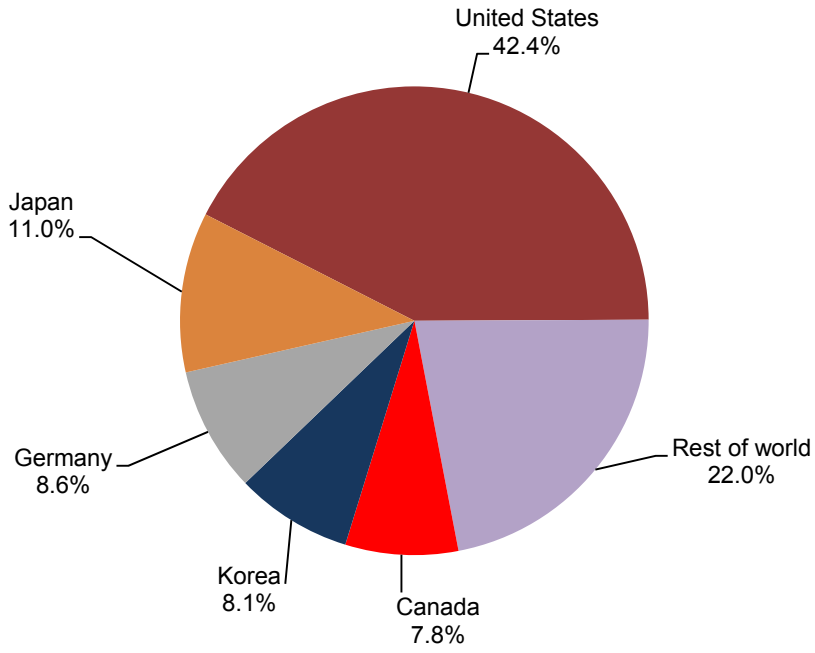
Mexico

Mexican passenger vehicle sales declined from nearly 1.1 million units in 2007 to over 900,000 units in 2011, likely as a result of the economic downturn. As a NAFTA member, Mexico is integrated into the North American supply chain with the United States and Canada for the production of passenger vehicles. These factors likely contribute to the predominance of imports from the United States in the Mexican market (figure 23).

While the United States is still its leading source of passenger vehicles, Mexican demand for small cars has led to greater diversity among its imported passenger vehicles than in Canada. Small cars made up nearly 59 percent of passenger vehicle sales in Mexico, an increase of nearly 10 percent over the share in 2007.[452] Volkswagen, Nissan, and Chevrolet had the largest share of small car sales in Mexico.[453] Mexican imports are almost evenly divided between light trucks with gasoline engines; cars, vans, CUVs, and SUVs with 1.5–3 liter gasoline engines; and cars, vans, CUVs, and SUVs with gasoline engines larger than 3 liters.[454]

[452] Binder, *Ward's Automotive Yearbook*, 2009, 160; Binder, *Ward's Automotive Yearbook*, 2012, 136.
[453] Binder, *Ward's Automotive Yearbook*, 2012, 121.
[454] GTIS, Global Trade Atlas database (accessed June 1, 2012).

FIGURE 23 Mexican passenger vehicle imports, by country, 2012



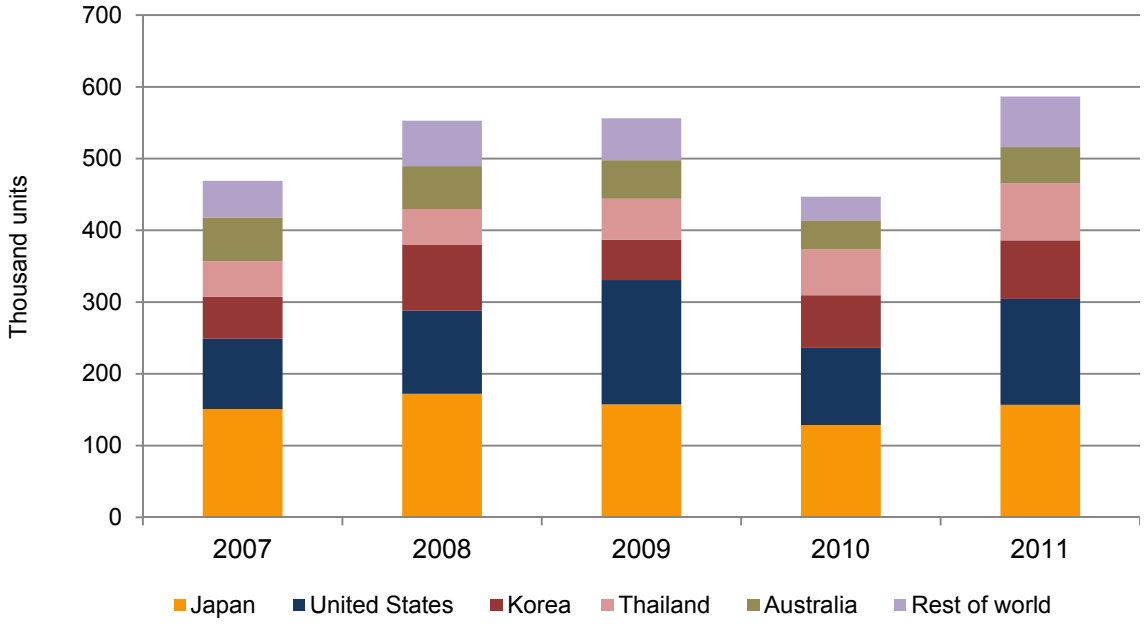
Source: GTIS, Global Trade Atlas database (accessed March 8, 2013).

Saudi Arabia

Although it does not produce passenger vehicles, Saudi Arabia is the largest passenger vehicle market in the Middle East, and one of the five largest markets for U.S. passenger vehicle exports by value in 2007–12. Increases in Saudi passenger vehicle sales, during the global economic downturn, in 2008 and 2009 likely reflected the increased income that Saudi Arabia received due to higher crude-petroleum prices during this period. [455] Much of Saudi Arabia's passenger vehicle demand is tied to crude petroleum prices (crude-petroleum exports accounted for approximately 60 percent of Saudi GDP in 2010).[456] Demand is also limited by culture, since only the male portion of the population is allowed to drive.[457] Saudi Arabia imposes a duty of 5 percent on imports of passenger vehicles. [458] Japan and the United States are the two largest suppliers of passenger vehicles to Saudi Arabia (figure 24).

[455] Business Monitor International, "Saudi Arabia Autos Report," Q4 2010, 5, 7.
[456] USITC staff calculations based on data from GTIS, Global Trade Atlas database (accessed January 17, 2012); and EIU, Data Tool (accessed January 17, 2012).
[457] Business Monitor International, "Saudi Arabia Autos Report," Q4 2010, 7.
[458] Kingdom of Saudi Arabia, MOF, Saudi Customs database (accessed July 5, 2012).

FIGURE 24 Saudi Arabian passenger vehicle imports, by country, 2007–11



Source: GTIS, Global Trade Atlas database (accessed August 2, 2012).

Brazil

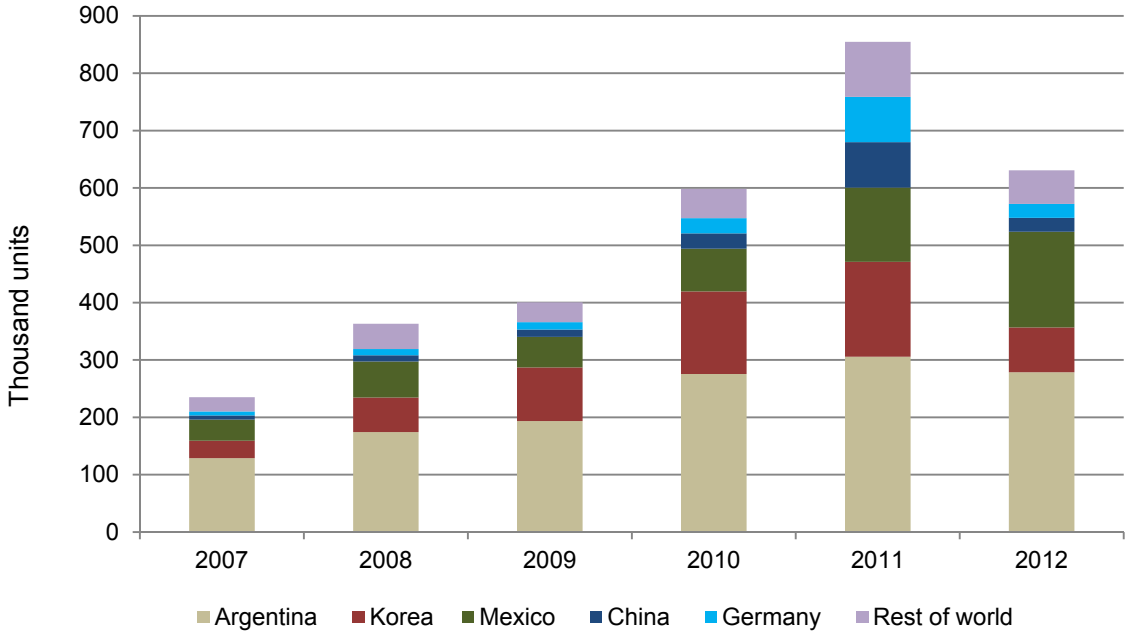
Brazil is the fifth-largest passenger vehicle market in the world.[459] Despite the global economic downturn that depressed passenger vehicle sales in many countries, Brazilian sales of passenger vehicles grew from over 2.4 million in 2007 to more than 3.4 million in 2011.[460] Moreover, the Brazilian market places a unique emphasis on vehicles with engines capable of burning both gasoline and ethanol, known as flex-fuel vehicles.[461] Although flex-fuel vehicles were only introduced in 2003, Brazilian government policies supporting ethanol began in 1975 with a system of subsidies and mandates intended to reduce Brazil's dependency on foreign oil and increase the availability and use of ethanol as an alternative. [462]

During 2007–12, Brazilian imports of passenger vehicles (in terms of units) more than tripled. Nearly 40 percent of its imports were sourced from fellow Southern Cone Common Market (MERCOSUR) member and neighbor Argentina (figure 24). Other leading suppliers include Korea, Mexico, China, and Germany. However, Brazilian imports of passenger vehicles were discouraged by an increase in the tariff on passenger vehicles from 25 percent to 55 percent in 2012 that was imposed by the Brazilian government in response to rapidly rising passenger vehicle imports.[463]

[459] Muller, "Why the World's Automakers Love Brazil," October 5, 2012.
[460] Binder, *Ward's Automotive Yearbook,* 2012, 88–89; Binder, *Ward's Automotive Yearbook,* 2012, 103.
[461] UN-Energy, "Ethanol Fuel in Brazil," January 8, 2011; Reel, "Brazil's Road to Energy Independence," August 20, 2006.
[462] Ibid.
[463] Haynes, "Helping Hand Could Smother Brazil's Auto Industry," August 28, 2012; Muller, "Why the World's Automakers Love Brazil," October 5, 2012.

Although the United States is only the 11th ranked supplier of Brazilian passenger vehicle imports (figure 25), Ford and GM are two of the four market leaders in the Brazilian passenger vehicle market (figure 26).[464] As in many markets, both Ford and GM produce vehicles in Brazil rather than importing them from the United States due to lower production costs and the unique dual-fuel requirements of the Brazilian market.[465]

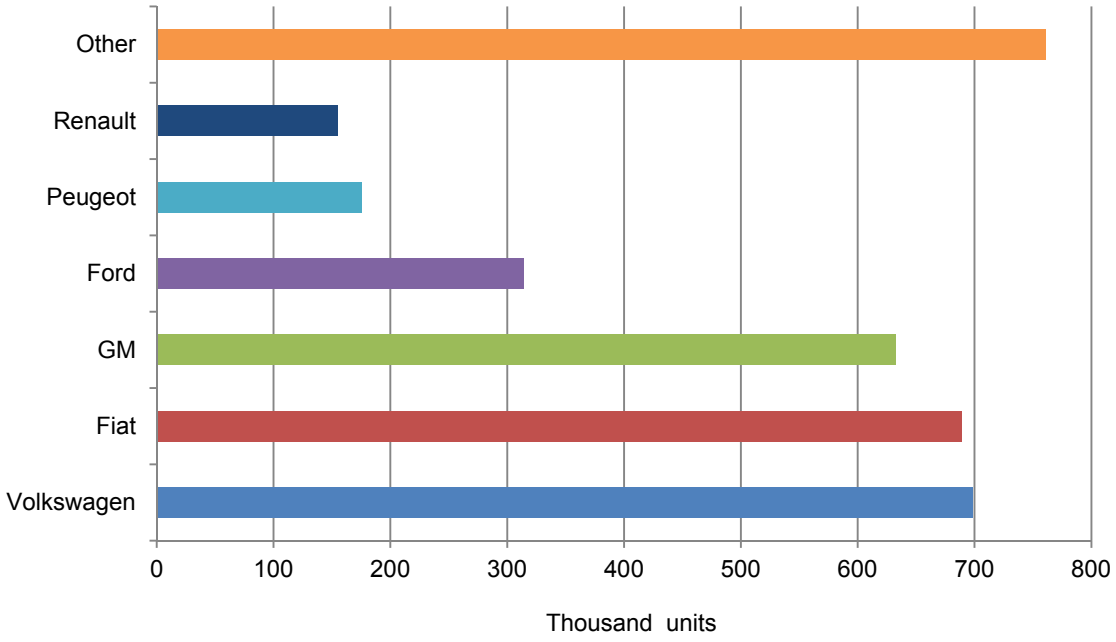
FIGURE 25 Brazilian passenger vehicle imports, by country, 2007–12



Source: GTIS, Global Trade Atlas database (accessed October 9, 2012, and March 8, 2013).

[464] Winterstein, "Brazil's Big Four Automakers Could Gain," October 9, 2012.
[465] Reel, "Brazil's Road to Energy Independence," August 20, 2006.

FIGURE 26 Passenger vehicle sales in Brazil, by manufacturer, 2011



Source: Binder, *Ward's Automotive Yearbook,* 2012, 87–89.

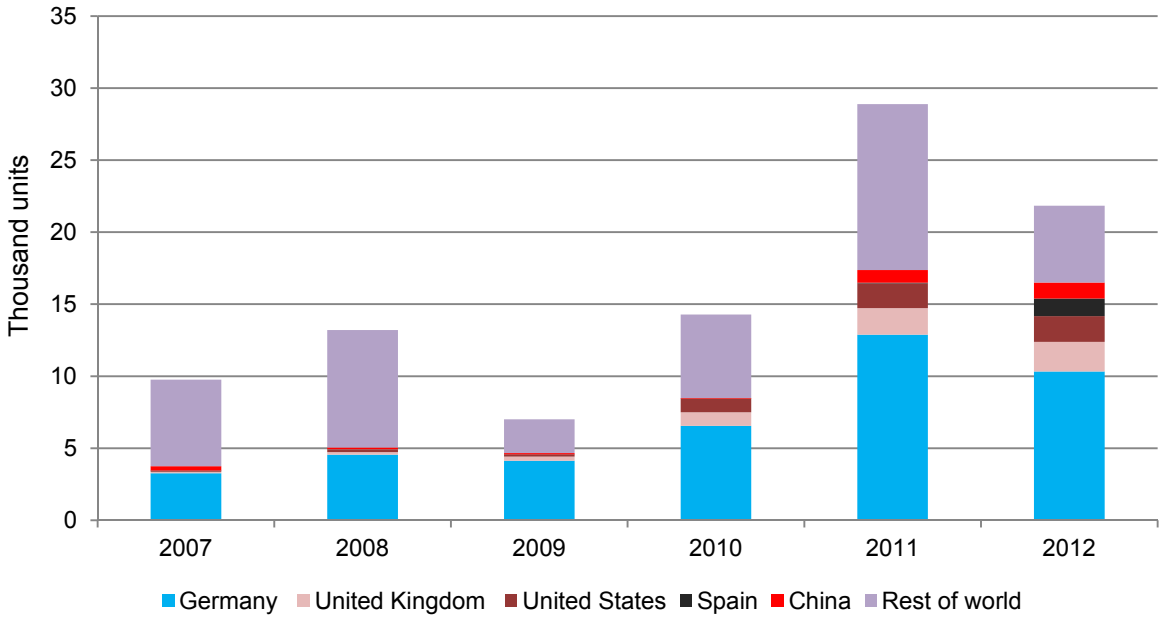
India

Due to competition from two-wheeled vehicles and high tariffs on imported vehicles, the Indian passenger vehicle market is small in relation to its population. Although India is the world's second most populous country, passenger vehicle sales are lower there than in countries with much smaller populations, including Germany and Brazil. Sales of two-wheeled vehicles in India are four to five times larger than passenger vehicle sales, and the former are likely to be preferred by many consumers because they are much less expensive.[466] Nevertheless, there is ample room for India's passenger vehicle sales to grow because of India's low ratio of cars to people (13 per 1,000 people), and sales are expected to rise in view of India's growing per capita income.[467]

Imports make up less than 1 percent (28,000 units) of the nearly 3-million-unit Indian passenger vehicle market,[468] likely due to the 60 percent tariff India imposes on most imported passenger vehicles.[469] Germany is India's top source of passenger vehicle imports (figure 27), accounting for 49.8 percent of these imports in 2012. The United States was the sixth leading supplier by volume but was the third leading supplier by value, due to a higher vehicle unit price than many other suppliers to the Indian market.[470] Other leading suppliers were Korea, Japan, and South Africa.

[466] Ranawat and Tiwari, "Influence of Government Policies on Industry Development," March 2009, 5.
[467] Denyer, "U.S. Automakers in Race for Indian Market," March 13, 2012.
[468] USITC calculation based on GTIS, Global Trade Atlas database (accessed November 15, 2012), and Binder, *Ward's Automotive Yearbook*, 2012, 37.
[469] The tariff rate for light trucks is only 10 percent, but for reasons unknown, only four were imported in 2011. WTO, Tariff Analysis database (accessed October 10, 2012); GTIS, Global Trade Atlas database (accessed October 10, 2012).
[470] GTIS, Global Trade Atlas database (accessed October 10, 2012).

FIGURE 27 Indian passenger vehicle imports, by country, 2007–12

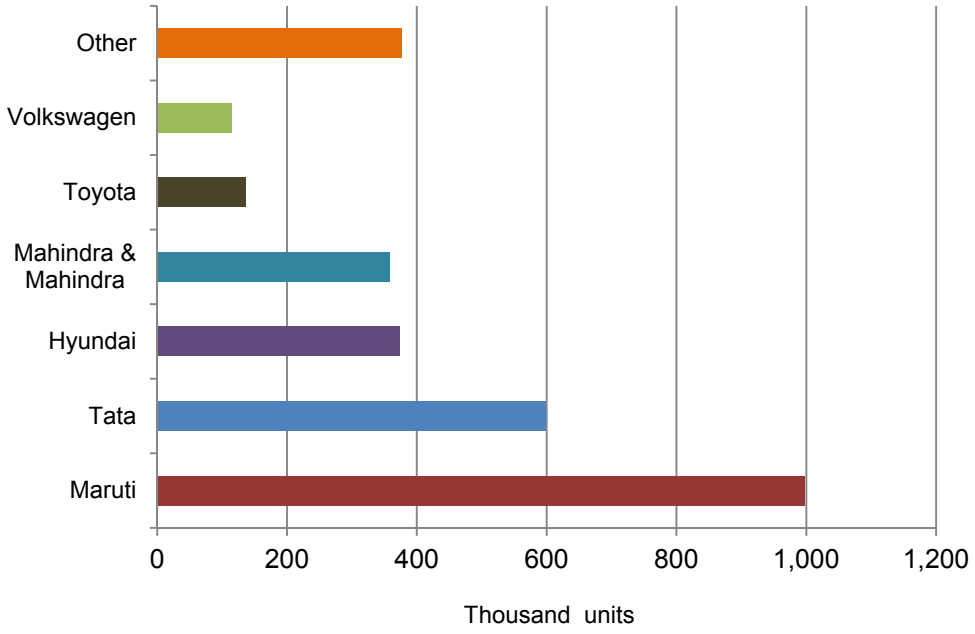


Source: GTIS, Global Trade Atlas database (accessed October 9, 2012, and March 8, 2013).

Foreign-headquartered, Indian-headquartered, and joint venture manufacturers compete in the Indian passenger vehicle market. The leading passenger vehicle supplier in India is Maruti Suzuki (figure 28). Originally a joint venture between Suzuki (a Japanese-headquartered manufacturer) and the Indian government, 54.2 percent of Maruti Suzuki is now held by Suzuki, with the remainder available on Indian stock exchanges.[471] Of the next five largest passenger vehicle suppliers, two are Indian-headquartered firms (Tata and Mahindra & Mahindra) and three are foreign-headquartered firms (Hyundai, Toyota, and Volkswagen).

[471] Maruti Suzuki India website http://www.marutisuzuki.com/Latest-Maruti-Company-Update.aspx (accessed November 15, 2012).

FIGURE 28 Passenger vehicle sales in India, by manufacturer, 2011



Source: Binder, *Ward's Automotive Yearbook,* 2012, 37.

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Appendix A
Harmonized Tariff Schedule Numbers

TABLE A.1 Harmonized Tariff Schedule number, column 1 duty rate, special duty rate, U.S. exports and imports, 2011 *($1,000)*

HTS number	Description	Column 1 duty rate, in percent	Special duty rate	U.S. exports, 2011	U.S. imports, 2011
8703.22.00	Mtr cars & o/mtr. vehicles for transport of persons, w/spark-ign. int. combust. recip. piston engine w/cyl. cap. o/1000 cc n/o 1500 cc	2.5	Free (A+,AU,B,BH,CA,CL,CO,D,E,IL,J,JO,MA,MX, OM,P,PA,PE,SG) 2.5% (KR)	709,285	2,373,875
8703.23.00	Mtr cars & o/mtr. vehicles for transport of persons, w/spark-ign. int. combust. recip. piston engine w/cyl. cap. o/1500 cc n/o 3000 cc	2.5	Free (A+,AU,B,BH,CA,CL,CO,D,E,IL,J,JO,MA,MX, OM,P,PA,PE,SG) 2.5% (KR)	22,318,030	64,354,940
8703.24.00	Mtr cars & o/mtr. vehicles for transport of persons, w/spark-ign. int. combust. recip. piston engine w/cyl. cap. o/ 3000 cc	2.5	Free (A+,AU,B,BH,CA,CL,CO,D,E,IL,J,JO,MA,MX, OM,P,PA,PE,SG) 2.5% (KR)	15,536,586	56,502,271
8703.31.00	Mtr cars & o/mtr. vehicles for transport of persons, w/compress.-ign. int. combust. recip. piston engine w/cyl. cap. n/o 1500 cc	2.5	Free (A+,AU,B,BH,CA,CL,CO,D,E,IL,J,JO,MA,MX, OM,P,PA,PE,SG) 2.5% (KR)	10,326	634
8703.32.00	Mtr cars & o/mtr. vehicles for transport of persons, w/compress.-ign. int. combust. recip. piston engine w/cyl. cap. o/1500 cc n/o 2500 cc	2.5	Free (A+,AU,B,BH,CA,CL,CO,D,E,IL,J,JO,MA,MX, OM,P,PA,PE,SG) 2.5% (KR)	815,627	1,122,377
8703.33.00	Mtr cars & o/mtr. vehicles for transport of persons, w/compress.-ign. int. combust. recip. piston engine w/cyl. cap. o/2500 cc	2.5	Free (A+,AU,B,BH,CA,CL,CO,D,E,IL,J,JO,MA,MX, OM,P,PA,PE,SG) 2.5% (KR)	2,568,019	1,182,474
8703.90.00	Mtr cars & other motor vehicles for transport of persons, o/than w/spark ign. or compress. ign. recip. piston engine, nesoi	2.5	Free (A+,AU,B,BH,CA,CL,CO,D,E,IL,J,JO,MA,MX, OM,P,PA,PE,SG) 2% (KR)	1,056,217	478,283
8704.21.00	Mtr. vehicles for transport of goods, w/compress.-ign. int. combust. recip. piston engine, w/G.V.W. not over 5 metric tons	25	Free (A+,AU,B,BH,CA,CL,CO,D,E,IL,J,JO,MA,MX, OM,P,PA,PE) 25% (KR) 2.5% (SG)	662,795	987,232
8704.31.00	Mtr. vehicles for transport of goods, w/spark.-ign. int. combust. recip. piston engine, w/G.V.W. not over 5 metric tons	25	Free (A+,AU,B,BH,CA,CL,CO,D,E,IL,J,JO,MA,MX, OM,P,PA,PE) 25% (KR) 2.5% (SG)	7,122,349	7,573,098

Source: