

# An Assessment of Japanese Automakers' Impact & Activity in the United States



**CENTER FOR  
AUTOMOTIVE  
RESEARCH**

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## About the Authors

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The Center for Automotive Research is an independent non-profit that produces industry-driven research and fosters dialogue on critical issues facing the automotive industry and its impact on the U.S. economy and society. CAR researchers closely track current and future global automotive industry and technology trends and assess their impacts. CAR researchers also study international collaborations and stay abreast of changes in international trade and regulatory environments, the development of technology standards, and the deployment of new vehicle technologies.

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CAR's mission is to conduct independent research and analysis to educate, inform and advise stakeholders, policymakers, and the general public on critical issues facing the automotive industry, and the industry's impact on the U.S. economy and society.

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## Executive Summary

Since establishing sales operations in 1958, Japanese automakers have grown to play a vital role in defining the modern U.S. auto industry. In the early 1970s, after gaining a foothold in the U.S. market, Japanese automakers began to design and develop vehicles specifically for American consumers at design centers in Southern California. In 1982, Honda began building vehicles in Ohio, becoming the first Japanese automaker to do so in the United States. By the end of the 1980s, Nissan, Subaru, and Toyota had all established their first vehicle U.S. manufacturing facilities, as well.

Since that time, Japanese automakers have become an essential part of the U.S. manufacturing and vehicle development industry. With vehicle and major parts production operations across 24 U.S. facilities, 49 research and development (R&D) and design centers in various regions of the country, and dealership networks that span all 50 states, Japanese automakers have become a crucial part of not only the U.S. automotive industry but also the country as a whole. Companies such as Hino, Honda, Isuzu, Mazda, Mitsubishi, Nissan, Subaru, and Toyota, have supported a broad swath of the U.S. economy through the development of advanced automotive technology, the significant expansion of the automotive supply chain, and the pioneering of standard-setting manufacturing practices. Japanese automakers have actively strengthened the U.S. auto industry's global competitiveness by helping to ensure its leadership in the development of cutting-edge vehicle technology and the building of safer, more fuel-efficient cars and trucks. Japanese automotive companies are now interwoven with thousands of U.S. communities who count on them, their suppliers, and dealers, not only for employment but also for improved access to training and education, philanthropic support, environmental stewardship, and countless other benefits.

The U.S. auto manufacturing sector is a critical component of the global automotive market and the U.S. economy. With USD 53.3 billion in direct cumulative manufacturing investment since the early 1980s, Japanese automakers have continually deepened their commitment to supporting this vital aspect of the economy. Through significant investments in manufacturing, R&D, headquarters, distribution, and other facilities, the presence of these firms has grown to support 1.6 million jobs in the U.S. economy (Prusa, 2019a). Today, Japanese automaker production comprises one-third of all cars and trucks built in the United States (IHS | Markit, 2020). Many of the Japanese automakers' vehicles assembled in the United States have high proportions of U.S.-made content, supported by mature supply chains built up over decades in collaboration with other international and U.S.-based automakers and suppliers.

The global auto industry is currently in the midst of a technological evolution that will fundamentally reshape how people live, work, and move. As the industry and world embrace "future mobility," automated, connected, electrified, and shared vehicle (ACES) technology will be the cornerstone of this evolution. Japanese automakers are among the leaders in bringing such technological change to fruition, as these firms make deep investments in innovative R&D efforts in the United States. Such efforts have led to Japanese automakers accounting for a significant share of U.S. automotive patents filed in fields such as Advanced Driver Assistance Systems (ADAS) and electrified vehicle powertrains. These technologies improve critical vehicle safety capabilities and expand vehicle access for all members of society—including aging and disabled drivers.

The development of advanced vehicle technology is capital-intensive. As high-tech R&D efforts consume growing proportions of automakers' resources, a variety of new partnerships have developed between traditional automakers, nontraditional manufacturers, start-ups, research organizations, and U.S.

government entities. Japanese automakers have engaged in these kinds of alliances extensively in the United States. In this way, Japanese automakers have supported the formation of innovation hubs and research centers of excellence around the country, and have become leaders in the U.S. auto industry's advancements in the future mobility space.

This kind of investment in R&D, as well as in advanced manufacturing, would not be possible without the development of a highly-skilled future workforce. The workers who will develop and build the cars of tomorrow need new skills and a greater understanding of technology. Japanese automakers have invested heavily in ensuring there is a sustainable pipeline of talent by advancing science, technology, engineering, and math (STEM) education and advanced manufacturing awareness and training initiatives, running from early childhood through late-career education. These firms' prioritization of workforce development and forward-looking educational initiatives are coupled with a strong performance on workplace safety and a dedication to the inclusivity of employees in problem-solving efforts on the production floor and across the entire enterprise.

Through their continued focus on technological innovation; advanced manufacturing techniques; long-term investments in manufacturing, R&D, and design; the deployment of industry-leading fuel economy and reduced emissions vehicles; as well as employee inclusion and advanced workforce training; Japanese automakers have helped to increase quality and productivity in the U.S. automotive industry. As this focus and the firms' investments have progressed and expanded, Japanese automakers have helped develop a more diverse, more capable, and more resilient U.S. automotive industry.

## Introduction

The modern automobile has grown to play a significant role in American lives, serving not only as essential transportation but also as a deeply personal purchase that allows consumers to reflect their sense of style and individuality. Today's light vehicles are more advanced than ever and are moving toward technology that will enable vehicles that drive themselves, "talk" to one another, and fulfill unique and new transportation roles in society. Automakers are transitioning to focus on "mobility," enhancing vehicle safety, improving traffic congestion, reducing pollution, and providing technological innovations to address the needs and preferences of a rapidly changing society.

Japanese automakers are playing a critical role in the industry's historic transformation, and their commitment to technological progress has made them leaders in the creation of the "new mobility" paradigm. Like all major automakers, Japanese automakers are global firms that invest in the regions where they sell and produce vehicles. Having invested deeply in their U.S. manufacturing, R&D, and design presence, as well as the future workforce that such advancements require, Japanese automakers are actively supporting U.S. innovation leadership. In this respect, the Japanese automakers have not only become a vital part of the U.S. economy, but also key players in maintaining the United States' innovation edge.

As automakers continue to prepare for the fundamental evolution of the industry, the COVID-19 pandemic has taken a tremendous toll on the global economy. COVID-19 threatens the health and safety of communities across the country and around the world. With vast production and innovation capacity in the United States, automakers of all origins have supported relief efforts to address the crisis. Japanese automakers have stepped in to produce and donate personal protective equipment (PPE) as well as to support community-oriented relief programs. This report features roughly a dozen examples of these efforts.

This report focuses on the impact of Japanese automakers on the U.S. economy and society, as well as their long history of strengthening the U.S. auto industry while integrating into an ecosystem that is shared among thousands of automotive companies, technology firms, and public/private institutions. It reviews their entire U.S. presence, from vehicle production to job creation, and it details their contributions to innovative automotive advancements, the American workforce, and the local communities in which they operate.

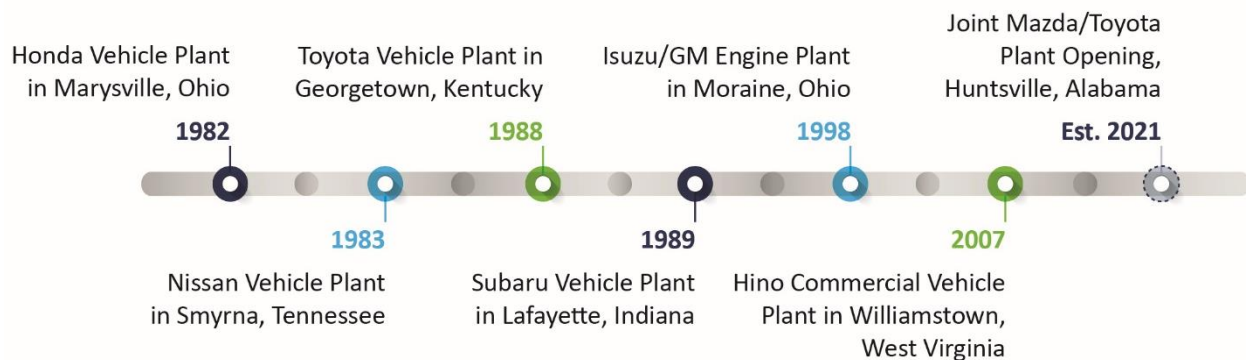
This study is intended as a guide to understanding the nature of Japanese automakers' role in an evolving industry. Yet, it also conveys critical aspects of their long history in the United States and the lasting impact these companies have had on the auto industry and the broader economy. This history and the depth of their investment in the United States illustrate how Japanese automakers have become an integral part of the U.S. auto industry, diversifying and improving cars and trucks offered in the market and making the industry more globally competitive.

## Economic Contribution

Japanese automakers began sales operations in the United States in 1958. These firms initially struggled to find a market for their vehicles, but by 1970, Honda, Nissan, and Toyota had all established sales operations and gained respect among U.S. consumers by offering high-quality, reasonably-priced vehicles. Following the implementation of the U.S. Clean Air Act, 42 U.S.C. §7401 et seq. (U.S. Code, 1970), Japanese automakers responded to meet the new stringent tailpipe emissions standards. These firms were well-positioned to meet American consumers' needs for more fuel-efficient vehicle options amid several oil crises throughout the 1970s. As Japanese automakers' vehicles became gradually more popular with American consumers, the companies expanded their U.S. investment to design, engineer, and build these vehicles in the United States. The first Japanese automaker design and R&D facilities opened in the United States in the early 1970s, and automobile manufacturing began in 1982. Now, nearly five decades later, Japanese automakers develop and build a range of compact cars, sedans, pickup trucks, SUVs, and commercial trucks in their U.S. facilities.

Japanese automakers have continually deepened their commitment to the U.S. auto manufacturing sector, with a cumulative USD 53.3 billion in direct manufacturing investment through 2019. Japanese automakers' manufacturing presence is perhaps the most well-known aspect of Japan's contributions to the U.S. economy. Currently, six companies have U.S. production facilities. That count will increase to seven with the completion of the Mazda-Toyota joint-venture plant in Huntsville, Alabama, scheduled to open in 2021. Figure 1 below reflects the establishment of each company's initial manufacturing operations in the United States.

Figure 1: Timeline of Japanese Automakers' Initial U.S. Vehicle Production Facilities

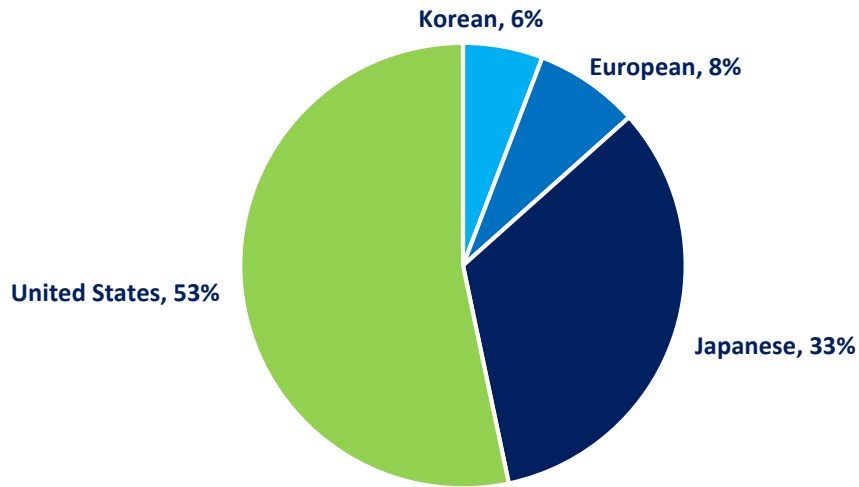


Source: Japan Automobile Manufacturers Association, 2020

Since the 1980s, Japanese automakers have increased their U.S. production volume ten-fold, and have grown their share of overall U.S. vehicle production to account for over one-third of U.S. vehicle production in 2019. International automakers from all countries produce nearly half of all light vehicles built in the United States (IHS | Markit, 2020). The international automakers' growing U.S. footprint helps frame the tremendous impact that these firms, particularly Japanese automakers, have had not only on the U.S. auto industry but also on the U.S. economy. The auto industry accounts for nearly 3.5 percent of overall U.S. GDP, meaning Japanese automakers provide roughly USD 250 billion in added value to the American economy every year. Figure 2 provides a breakout of U.S. vehicle production by automaker national origin.



Figure 2: 2019 U.S. Production by Brand Origin



Source: IHS/Markit, 2020

Japanese automakers now operate 24 manufacturing plants across the country. These plants are located in traditional auto manufacturing states like Indiana, Missouri, Ohio, Tennessee, and Texas, and Japanese automakers have also supported the creation of newer vehicle production ecosystems in states like Alabama, Georgia, Kentucky, Mississippi, and West Virginia.

## Employment

Japanese automakers contribute considerably to the communities which host their operations—and to the nation as a whole. Many studies document Japanese automakers' economic contributions—including previous research by the Center for Automotive Research (CAR) (Dziczek, et al., 2016) (Hill & Maranger-Menk, Contribution of Toyota Motor North America to the Economies of Sixteen States and the United States in 2010, 2011) (McAlinden, Hill, Cole, & Maranger-Menk, 2009) (Hill & Maranger-Menk, 2007) (Hill, 2005) (Cole, et al., 1998). In 2019, Japanese automakers directly employed 98,291 workers in the United States across their manufacturing plants; research, development, engineering, and design facilities; regional headquarters; sales offices; and other business activities (Japan Automobile Manufacturers Association, 2020). These operations, in turn, supported the production of around 3.5 million vehicles and 4.3 million engines (Japan Automobile Manufacturers Association, 2020). Figure 3 provides a history of Japanese automakers' employment and production levels in the United States.

Figure 3: Japanese Automakers' Direct Jobs and Vehicle Production Growth Since the 1980s

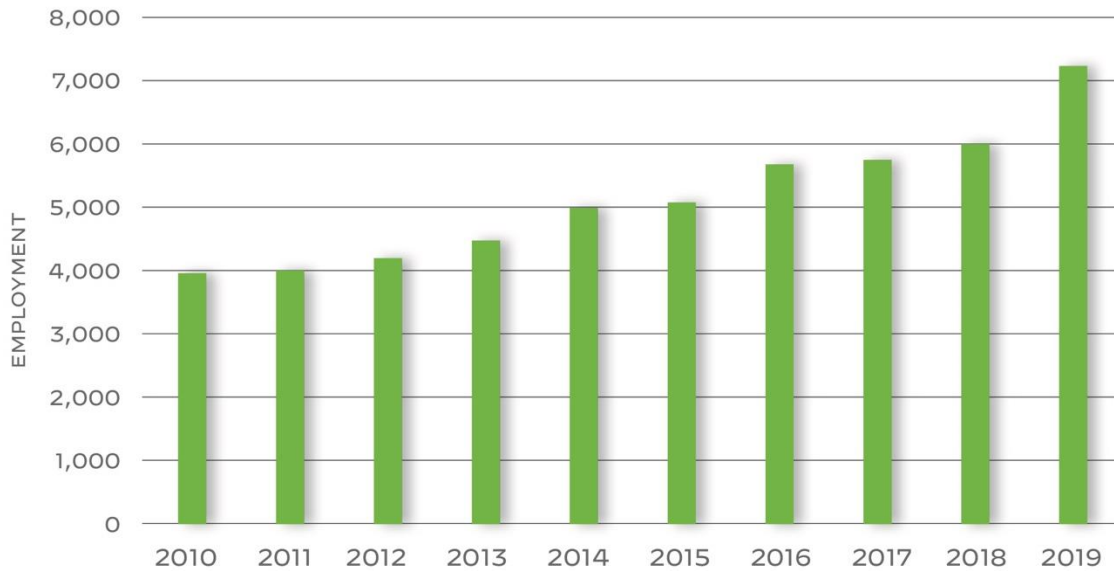


Source: Japan Automobile Manufacturers Association, 2020

Each automaker job supports many other jobs in the U.S. economy. For example, vehicle assembly requires components and systems purchased from external suppliers—such as airbags, seats, and instrument panels. Likewise, the dealership networks selling new Japanese vehicles directly employed 400,522 in the United States in 2019 (Japan Automobile Manufacturers Association, 2020). Dealerships buy advertising, storage, real estate, and accounting services to support their operations (U.S. Bureau of Economic Analysis, 2019). Also, economic activity in the automotive industry supports jobs in the broader economy when automaker, dealership, and supplier employees spend their paychecks in their communities. In total, Japanese automakers supported more than 1.6 million jobs in 2018 (Prusa, 2019a).

Among the most critical jobs in the auto sector are R&D and design jobs. The value-added of these jobs can be measured by looking at the value of R&D per vehicle—in the United States, R&D accounts for an average of USD 2,200 for every new vehicle produced (National Center for Science and Engineering Statistics, 2020a)(IHS | Markit, 2020). Figure 4 provides Japanese automakers' U.S. R&D and design employment from 2010 through 2019. During this time, Japanese automakers' U.S. R&D and design employment increased by 83 percent (from 3,978 R&D/design jobs in 2010 to 7,265 in 2019), reflecting a period of growth in this segment of the auto industry as the country recovered from the financial crisis and automakers invested more resources in emerging mobility technology. Many of these employees work and live in states that are considered the heart of the U.S. automotive industry, at facilities such as the Nissan Technical Center North America and Toyota Motor North America Research and Development center in Michigan, and Honda R&D Americas in Ohio.

Figure 4: Japanese Automaker U.S. Research, Development, and Design Employment, 2010 to 2019



Source: Japan Automobile Manufacturers Association, 2020

In addition to supporting many other jobs in the economy, the economic activity of the Japanese automakers generates government revenue in the form of income taxes and payments for government social programs. A study of Japanese automakers' economic contribution that used data from 2017 estimated that the average compensation per job was USD 71,855, supporting USD 10,918 in income taxes per job (Prusa, 2019b).<sup>1</sup>

### Total U.S. Investment

Japanese automakers have invested heavily in their U.S. operations. From 1982, when the first Japanese vehicle manufacturing plant began operations, to 2019, Japanese automakers' investments totaled USD 53.3 billion in U.S. manufacturing operations (Japan Automobile Manufacturers Association, 2020). With their extensive investments in the United States, Japanese automakers today operate 49 R&D and design offices, 24 manufacturing facilities, and 39 distribution centers across 28 states (Japan Automobile Manufacturers Association, 2020).

Since 2009, Japanese automakers have invested over USD 24.6 billion into North America, and the majority of this investment (58 percent) was invested in the United States. This investment commitment illustrates the increased and continued importance of the United States to Japanese automakers. At the same time, as R&D investments become more capital intensive and critical to pursuing new mobility technology, these investments are playing a growing role in the profile of Japanese automakers' U.S. operations.

Research and development activities are a fundamentally important aspect of economic growth. Through the discovery and application of new knowledge, new technologies and processes are

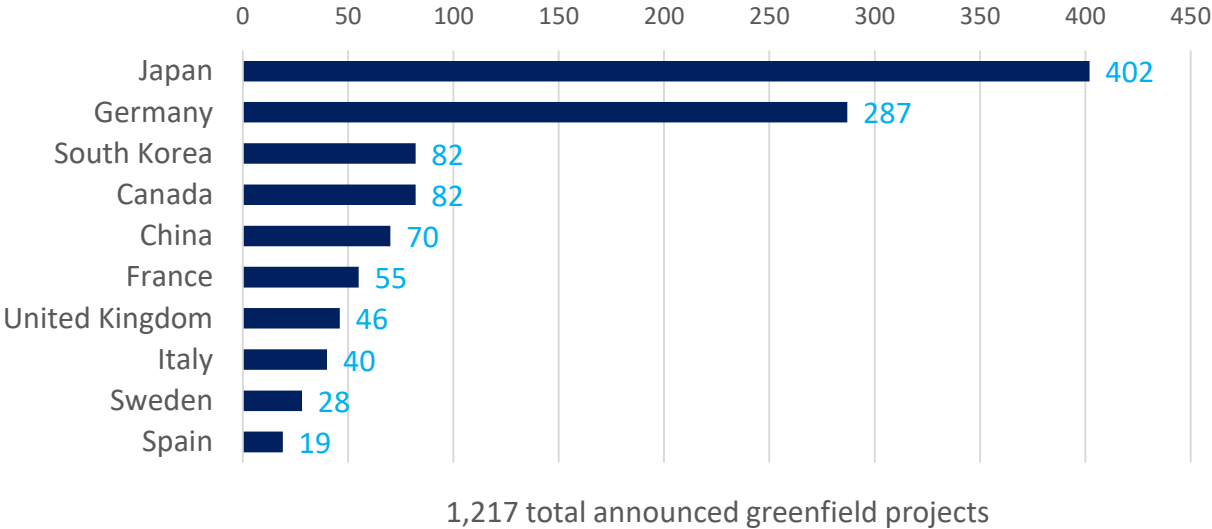
<sup>1</sup> This study estimated taxes under the tax system that was in place prior to the enactment of the 2017 Tax Cuts and Jobs Act.

developed, enabling gains to both productivity and resource efficiency, and providing a foundation for new products and services. One study of research and development in OECD countries concludes that a one percentage point increase in national R&D spending results in an additional 0.05 to 0.15 percentage points of GDP growth (Belitz, Junker, Podstawski, & Schiersch, 2015). Other research suggests larger—but more varied—effects at the regional level. For U.S. states, each dollar spent on R&D within a state contributes between USD 0.83 and USD 2.13 to gross state product (Blanco, Prieger, & Gu, 2013).

Japanese automakers’ investments in both manufacturing and R&D have been built up over a period spanning four decades. They are further bolstered by U.S. investments from Japanese automotive suppliers, as well as U.S.- and international-based suppliers, to provide U.S.-made parts and components to the Japanese automakers’ manufacturing plants.

In 2018, Japan was the third-largest source of Foreign Direct Investment (FDI) in the United States, with Japanese expenditures in R&D activity exceeding those of other international firms. Japan also leads in new automotive greenfield investments (Select USA, 2019).

Figure 5: 2018 Top Sources of U.S. Automotive Foreign Direct Investment (FDI), Number of Projects



Source: Select USA, 2019

### Introduction of High-Quality and High-Efficiency Business Practices

Perhaps the best known and most significant contribution of the Japanese automotive industry to the U.S. and international society is the Lean Manufacturing System (LMS). As Japanese automakers established manufacturing operations in the United States during the 1980s, other automakers, suppliers, and manufacturers rapidly emulated and adopted Japanese automakers’ lean manufacturing practices (Shimokawa & Fujimoto, 2009). Today, LMS’ guiding principles and novel management processes derived from LMS are integral to the operations of multiple production and service activities.

LMS is both an element of and a complement to the Japanese ideology of kaizen—or structured continuous improvement. Together, these practices improve productivity, quality, and flexibility. Because Japanese automakers directly involve manufacturing staff in the process of identifying problems and issues to be addressed, then enable workers to suggest and implement improvements, the firms maintain a greater degree of workplace communication and inclusivity. The communication

can improve morale by showing employees tangible examples of their contributions. LMS likewise involves early collaboration between different company departments (such as manufacturing staff collaborating with design engineers to ensure a new product can be manufactured efficiently), as well as suppliers of components and even materials.

The introduction of LMS has gradually transformed automotive manufacturing and resulted in clear benefits for consumers as well—LMS has resulted in automakers from around the world being able to offer a greater variety of higher quality vehicles than would be possible otherwise. The efficiencies made possible by the adoption of LMS practices through all levels of the automotive supply chain have also made it possible for vehicles to contain more features while keeping prices low. In addition, LMS practices have spread to nearly every industry. Production activities from automotive, to furniture, to rocket engine manufacturing, to construction, and even egg farms all rely upon lean principles and methods (Lee & Jo, 2007) (Hunter, 2008) (Greene, 2002) (Bryde & Schulmeister, 2012) (Ko, 2010) (Fuentes-Pila, Rodriguez Monroy, Antelo, Torrubiano, & Roldan, 2007). In the service sector, adoption of lean manufacturing practices is also widespread—with examples found in retail, logistics, aircraft maintenance, information & communications technology, sanitation, banking, insurance, government, and healthcare (Naruo & Toma, 2007) (Schultz, Chen, & Swiecki, 2020) (Kolanjiappan & Maran, 2011) (Dobrin, Dinulescu, Costache, & Voicu, 2015) (Vignesh, Suresh, & Aramvalarthan, 2016) (Roggenhofer, Ilebrand, & Mitcho, 2011). Japanese automakers' introduction of LMS and kaizen have therefore been a catalyst for the widespread improvement of American manufacturing and service industries beyond the auto industry itself.

## Japanese Automakers' Role in R&D and Innovation in the United States

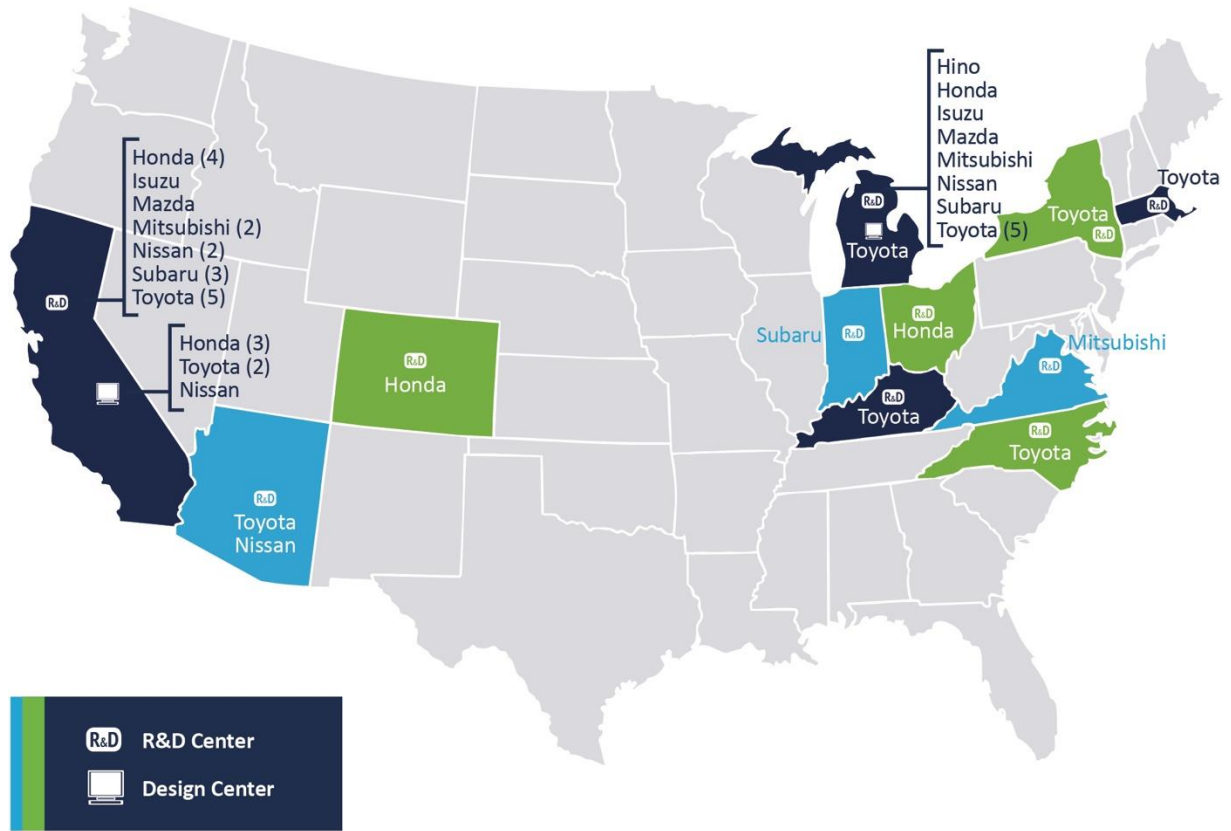
Japanese automakers' vehicle design and R&D presence in the United States dates back to the 1970s. Since then, teams of engineers working at these facilities have developed entirely new vehicles for the U.S. market, as well as adapting global products to the specific preferences of American consumers. Given the proximity to the country's top design schools and wealth of local talent, Southern California has been a prime location for these companies' design operations, where standard-setting exterior designs for vehicles like the Toyota Celica, Honda Odyssey, among others, were developed. At the same time, Japanese automakers have invested in local talent and benefitted from the expertise located in the traditional home of the North American automotive industry in Michigan and Ohio. Finally, with the advent of advanced and connected vehicle technologies, the Silicon Valley area has also become a renewed focal point for these companies.

Initial facility establishment dates for Japanese automakers' U.S. R&D and design facilities are listed below (Toyota, 2020), (Honda R&D Americas, 2020), (Toyota, 2020), (Nissan USA, 2020), (Mazda, n.d.):

- Toyota Caltex Design Research (1973)
- Honda Research of America (1975)—now Honda R&D Americas
- Toyota Motor North America, Research and Development (1977)
- Nissan Design America (1979)
- MMC Services, Inc (1982)-now Mitsubishi Motors R&D of America
- Mazda R&D Center Ann Arbor (1986)
- Nissan Technical Center North America (1988)
- Mazda R&D Center Irvine (1988)

This R&D activity has allowed Japanese automakers to not only tailor vehicles to the tastes and needs of U.S. consumers, but also to accelerate the pace of automotive innovation. As of 2019, Japanese automakers have 49 R&D and design facilities across the United States. As Japanese automakers' U.S. R&D investment has grown, so too has the portfolio of vehicles designed or developed in the United States. Currently, Japanese automakers offer nearly 40 vehicles that are designed and/or developed in their U.S. facilities, including but not limited to the Acura NSX, Honda Ridgeline, Infiniti QX60, Mazda CX-30, Nissan Leaf, and Toyota Highlander/Highlander HV (Japan Automobile Manufacturers Association, 2019). Figure 6 and Table 1 provide the locations of Japanese Automakers' U.S. R&D and design facilities in mapped and tabular form.

Figure 6: Japanese Automaker R&D and Design Facilities Across the United States, 2020



Source: Japan Automobile Manufacturers Association, 2020



Table 1: Japanese Automaker U.S. Design, Research & Development and Testing Facilities

LOCATION	FACILITY NAME
Arizona	Nissan Technical Center North America • Toyota Arizona Proving Ground
California	Acura Design Studio • Advanced Design Studio (Honda) • Honda Design Studio • Honda Innovations, Inc. • Honda Proving Center • Honda Research Institute USA, Inc. • Honda R&D Americas, LLC • Isuzu Technical Center of America, Inc. • Mazda North American Operations, Inc. • Mitsubishi Motors R&D of America, Inc. • Nissan Technical Center North America • Nissan Design America • Subaru Research and Development, Inc. • Toyota Motor North America, Research and Development • Caltly Design Research, Inc. • Toyota InfoTechnology Center, U.S.A., Inc. • Toyota Research Institute • TRD, U.S.A., Inc.
Colorado	Honda R&D Americas, LLC
Indiana	Subaru Research and Development, Inc.
Kentucky	Production Engineering & Manufacturing Center (Toyota)
Massachusetts	Toyota Research Institute
Michigan	Hino Motors Manufacturing U.S.A., Inc. • Honda R&D Americas, LLC. • Isuzu Technical Center of America, Inc. • Mazda North American Operations, Inc. • Mitsubishi Motors R&D of America, Inc. • Nissan Technical Center North America • Subaru Research and Development, Inc. • Toyota Motor North America, Research and Development • Caltly Design Research, Inc. • Toyota Research Institute
New York	Toyota InfoTechnology Center, U.S.A., Inc.
North Carolina	TRD, U.S.A., Inc.
Ohio	Honda R&D Americas, LLC
Virginia	Mitsubishi Motors R&D of America, Inc.

Source: Japan Automobile Manufacturers Association, 2020

## Innovation for a Changing Industry

The impact of Japanese automakers’ R&D spending on the U.S. automotive industry has been noteworthy, inclusive, and wide-ranging. These efforts have served to accelerate important scientific and technological innovation, to improve critical vehicle safety capabilities, and to expand vehicle access for all members of society, including aging and disabled drivers.

Japanese automakers have made significant investments within traditional R&D focus areas of environmental regulations compliance, vehicle-to-pedestrian and vehicle-to-vehicle safety technologies, vehicle electrification, product development, as well as other fields. Recent examples include Honda’s 2017 USD 124 million investment in East Liberty, Ohio, to establish a multifunctional aeroacoustic wind tunnel facility at the Transportation Research Center (Honda, 2017) and Toyota’s 2015 commitment to investing USD 1 billion over five years in Palo Alto, California and Cambridge, Massachusetts, to establish the company’s R&D enterprise, Toyota Research Institute Inc.

Japanese automakers’ R&D investments provide other benefits as well. For example, the Toyota Research Institute donated USD 100,000 to the Computer Vision Center (CVC) to develop an open-source (free to all users) simulator to support the development, training, and validation of autonomous vehicle systems. The simulator is called Car Learning to Act (CARLA) (Toyota Research Institute, 2018), and is expected to reduce development costs and time for the automotive industry overall.

## Partnerships

These R&D investments have solidified Japanese automakers’ status as a force within the United States, and have helped establish and reinvigorate innovation hubs and research centers across the country. For example, several Japanese automakers have joined forces with other automakers, suppliers, local government, and the University of Michigan to jointly fund Mcity, a non-profit, advanced mobility research and testing facility in Ann Arbor, Michigan. The facility is a unique public-private partnership that provides a collaborative space for conducting important exploratory research within such areas as

human access and interaction with autonomous vehicles, traffic flow modeling, machine learning, and augmented reality.

Japanese automakers' R&D investments have also expanded in nontraditional ways to support and nurture new ventures and to form technology alliances and partnerships with technology start-ups. In recent years, Japanese automakers have made significant capital commitments to help fund U.S.-based mobility start-ups—including involvement in over 50 investment rounds from 2000 through 2019, worth a combined USD 62.7 billion (including co-investors). These investments represent nearly 24 percent of deals involving automakers and 36 percent of the total USD 172 billion total investment by individual investors, venture capital, private equity, and corporations into mobility start-up companies from 2010 - 2019. Approximately 14 percent of these deals included co-investment by other automakers as well—illustrating the overall interconnectedness of the industry within the United States (Center for Automotive Research, 2020). Partnerships such as these are critically important to address many of the unique challenges facing automakers today. Whether they are looking at artificial intelligence (AI), human-machine interface, robotics, or connected vehicle technologies, the requirements to participate in today's auto industry have expanded. Japanese automakers, like all others, recognize the need to cooperate as well as compete to succeed. These new partnerships, which expand the breadth of academia (such as with Mcity), government, venture capital (VC), and business-to-business cooperation, help illustrate just how integral Japanese automaker participation in the U.S. industry has become. Other recent examples of Japanese automakers' innovation-focused partnerships are listed below:

- Honda and General Motors (GM) are working together on the development of hydrogen fuel cell vehicles. Honda has invested in GM's mobility start-up Cruise Automation, and the companies recently announced a new partnership to build electric vehicles together (General Motors, 2018).
- Nissan has partnered with NASA's Ames Research Center to collaborate on research and development of future mobility services. This partnership, which began in 2017, is part of Nissan's ongoing effort to advance the Nissan Intelligent Mobility initiative. The initiative consists of three interrelated workstreams including autonomous drive, electrification, and infrastructure technology (Nissan News, 2018).
- Toyota, along with Arm, Bosch, Nvidia, GM, NXP, and Denso, helped establish the Autonomous Vehicle Computing Consortium. The group's goal is to work together to solve some of the significant challenges in deploying autonomous vehicles at scale (Business Wire, 2019).

Japanese automakers' innovative use of strategic VC funds has also played a vital role in the U.S. new mobility space. Automakers have made significant investment pledges via their VC funds to help new, fledgling start-ups in the areas of advanced mobility, vehicle connectivity, and ADAS. For example, the Honda Xcelerator program in Silicon Valley, California, is providing funding for rapid prototyping, collaborative workspaces, and pairing with Honda mentors for innovators across all funding stages seeking to transform technology and business (Honda Xcelerator, 2017). Honda Xcelerator has facilitated collaborations with over 100 early-stage start-ups around the world since the program's inception in 2015. Additionally, Toyota AI Ventures, the VC subsidiary of the Toyota Research Institute, invests in U.S. start-ups focused in the areas of AI, autonomy, mobility, robotics, data, and cloud management (Toyota AI Ventures, n.d.). Its portfolio already includes several established names within the new mobility space, including May Mobility, Skip, and Revel (Toyota AI Ventures, n.d.).



## *Innovation as Environmental Stewardship*

Since the enactment of the U.S. Clean Air Act in 1970, Japanese automakers have been players in developing low emission vehicle technologies. Japanese automakers' technological capabilities have resulted in alternative powertrain vehicles that have driven the creation of a green vehicle market in the United States. Honda introduced one of the first modern battery electric vehicles—the EV Plus, in 1997, and the Honda FCX in 2002 was the very first fuel cell electric vehicle (FCEV) in the hands of an individual customer. Beginning with the Honda Insight (1999) and the Toyota Prius (2001), Japanese automakers also pioneered modern hybrid-electric vehicles (Porsche, 2020). These introductions were followed by other vehicles, such as the all-electric Nissan Leaf. As the world begins its transition back to electric powertrains that were first pioneered in the earliest days of the automotive industry, all automakers benefit from the groundwork laid by Japanese automakers in developing the modern-day technology.

Beyond just establishing a market, Japanese automakers' research contributions to the U.S. knowledge base within electrification, as well as alternative fuel drivetrains, are also noteworthy. Together, the Japanese companies accounted for 33 percent of electrical power system patents in 2019 and 62 percent of patents filed by automakers in fields including fuel cells, vehicle batteries, and battery management systems, as well as alternative fuel storage (Aistemos, 2019).

Japanese automakers' advanced powertrain contributions have helped to move the U.S. industry forward. Toyota has the highest share of the U.S. hybrid vehicle market, and the company is allowing others to use many of its hybrid vehicle technologies royalty-free through 2030. The company opened its patent filings for 6,000 fuel-cell technology patents to other firms in 2015. In 2019, the company also offered its 24,000 hybrid vehicle drivetrain patents to help accelerate technology adoption (O'kane, 2019). Toyota has also offered free technology consultation services—which will serve to reduce technology and capital investment hurdles for all industry participants so that automakers can meet increasingly stringent governmental emissions standards globally.

## *Safety and Connectivity*

R&D investments are helping drive an accelerating shift from conventional vehicle technologies to ACES vehicles. Japanese automakers are at the forefront of the development of ACES vehicles and technologies, and critical R&D and testing of these products are underway at their U.S. facilities. The automotive industry has been pursuing cross-industry partnerships with IT companies and others to accelerate the pace of ACES technologies and products. Technology startups and research institutions are key allies in developing new technologies, while automakers focus on applying that technology to vehicles. Japanese automakers' U.S. patent filings demonstrate their commitment to improving safety and vehicle access for all members of society. Japanese automakers continue to lead in their annual safety-related patents for safety-critical crash sensors and airbags systems—accounting for over 20 percent of all U.S. vehicle safety patents filed in 2019 and more than 50 percent filed by automakers (Aistemos, 2019).

Japanese automakers are also at the forefront of the fast-growing technology area of ADAS, including a broad range of essential technologies such as pedestrian detection, forward anti-collision systems, blind-spot warning, traffic jam assistance, and adaptive cruise control. Honda, for example, has been preparing infrastructure for the connected autonomous future with its Honda SAFE SWARM® and “Smart Intersection” prototype safety systems. Honda SAFE SWARM® allows vehicles to communicate with surrounding vehicles and share critical information to determine the safest course of action to

prevent collisions and reduce traffic congestion. The Honda “Smart Intersection” technology works in conjunction with intersection-mounted cameras to enable cars to virtually see through and around buildings and walls to help alert drivers to otherwise hidden hazards. Last year, Japanese automakers accounted for approximately 30 percent of all U.S. patent filings for ADAS systems, as well as over 50 percent filed by automakers (Aistemos, 2019).

Additionally, Toyota has sold over 5 million vehicles equipped with Toyota Safety Sense and Lexus Safety System+ ADAS in less than five years, as part of its sustained push to expand the availability of its safety technology. Roughly 92 percent of Toyota vehicles produced for the U.S. market between 1 September 2018, and 31 August 2019, have Automatic Emergency Braking (AEB) systems (Toyota Motor North America, Inc., 2019). Toyota prioritizes safety and continues to standardize TSS and Lexus Safety System across the company’s vehicle lineup.

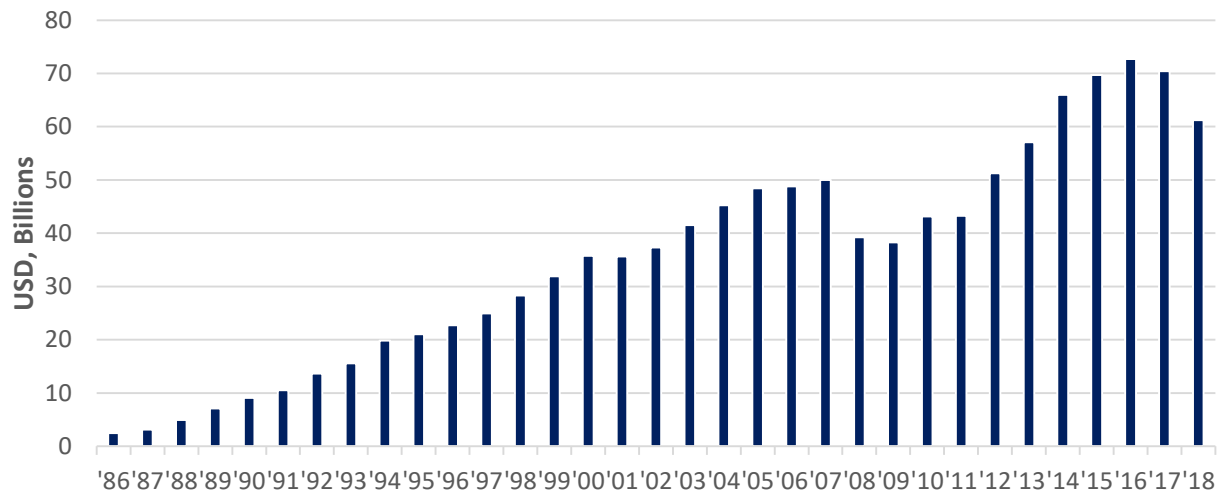
Furthermore, ADAS technologies are noteworthy because they are also driving industry-wide collaborations and alliances between automakers and technology start-up companies (nontraditional automotive suppliers), which are redefining the automotive markets within the United States and globally. ADAS systems were also the fastest-growing category of technology development last year, growing 16 percent year-over-year. Japanese automakers are also making significant research contributions in the areas of connectivity and advanced mobility, together with U.S.-based technology companies outside of the traditional automotive ecosystem, and accounted for close to 19 percent of total U.S. patent filings in 2019 and approximately 31 percent for automakers (second only to the traditional Detroit-3 Automakers, at 28 percent of total and 46 percent of automaker patents). Advanced mobility and connectivity patents are also notable because patented innovations have altogether more than doubled within the last decade, growing approximately 14 percent year-over-year in 2019, and hold promise for profound societal change with improved vehicle access and communications capabilities (Aistemos, 2019).

## Global, Regional, and Local Integration

No vehicle assembled in the United States—by any automaker—is 100 percent U.S.-made; the average vehicle produced in the United States relies on 40 to 50 percent of imported parts and component content (National Highway Traffic Safety Administration, 2018). The share of non-U.S. parts content ranges widely across vehicles and varies even within companies and vehicle brands. Trade with Japan-based automotive suppliers enable the U.S. automotive and parts industries to be globally competitive, allowing the U.S. industry to specialize in areas where it has a comparative advantage and achieve greater economies of scale. American consumers benefit from automotive trade with Japan both because there is a broader selection of models in the market and because international trade helps lower prices for all new U.S.-built vehicles from all automakers (Schultz, Dziczek, Swiecki, & Chen, 2019). Japanese automakers’ U.S. operations are therefore augmented by imported vehicles and parts from Japan, further expanding American consumers’ access to products from around the world.

Additionally, Japanese automakers exported 415,008 vehicles in 2019 from their U.S. facilities—nearly 12 percent of total production—to dozens of countries and regions around the world including Canada, South Korea, Latin America, the Middle East, Australia, and Japan. These vehicles are not only made in the United States, but they also contain high levels of U.S. parts and components, meaning that Japanese automakers are responsible for proliferating American inputs and technology across the globe. Figure 7 provides Japanese automakers’ U.S. purchasing history beginning in 1986.

Figure 7: Japanese Automakers U.S. Parts Purchases: 1986-2018



Source: Japan Automobile Manufacturers Association, 2020

After nearly four decades of U.S. production, Japanese automakers have also developed extensive regional and local supply networks. As a result of these efforts, Japanese automakers are deeply invested in a shared U.S. supply chain that they have helped to create, expand, and strengthen by doing business with large American suppliers, attracting Japanese suppliers to invest in the United States, and supporting smaller local suppliers. This supplier network is composed of companies originating from countries around the world, with some production facilities dedicated to one specific automaker client and others serving a variety of customers. The breadth and depth of this supply chain have also benefited U.S. automakers, as well as automakers from other countries who produce in the United States. It has added robustness and diversity to the overall U.S. supply base, providing automakers who produce vehicles in the United States access to the best components and technologies available.

Japanese automakers that produce vehicles in the United States all use hundreds of U.S.-based suppliers, and many of these U.S. suppliers supply more than one Japanese automaker. Likewise, most automotive suppliers who supply Japanese automakers also provide parts and components to FCA, Ford, or GM’s U.S. manufacturing plants, as well as the U.S. facilities of automakers from other countries. According to MarkLines, more than half of FCA, Ford, and GM’s suppliers also supply Japanese automakers (MarkLines Automotive Industry Portal).

Japanese automakers produce 54 vehicle models in North America—with 38 of these models made in the United States. Since 1986, Japanese automakers have purchased more than USD 1 trillion for use in their U.S. operations, with 2018 purchases alone totaling over USD 61 billion (Japan Automobile Manufacturers Association, 2019).

## Workforce Development

The growing sophistication of vehicles and vehicle manufacturing facilities calls for increasingly skilled workers who can work with new technology, apply specialized skills, and adapt to change. These workers need advanced skills, such as engineering, robotics, precision quality control, and computer science. Japanese automakers have emphasized the cultivation of a highly capable and sustainable

workforce since beginning production in the United States. They have developed and funded programs with educational institutions around the country to achieve this goal. The following section will highlight individual automakers' efforts in the development of the future workforce for K-12, college and university, and other STEM-related programs.

## Company Workforce Development Efforts

### Hino

- Hino partners with West Virginia University at Parkersburg (WVU Parkersburg) to provide manufacturing courses. In the Basic Manufacturing Industry Preparedness certificate course, students learn from manufacturing professionals at Hino and other companies and have the opportunity to apply for a 12-week paid internship program with Hino (West Virginia University, 2020).
- Hino and WVU Parkersburg also partnered to create an associate of applied science in the Advanced Manufacturing Technology program. Full-time Hino employees also participate in this program, which was designed to support Hino's expanding operations in the region (The Parkersburg News and Sentinel, 2019) (West Virginia University, 2020).

### Honda

- Many U.S. manufacturers struggle to attract the next generation of skilled manufacturing workers. To address the talent and skill shortage in Ohio, Honda launched the EPIC workforce initiative in 2015 intending to create interest in manufacturing as a career, from middle school students through community colleges and four-year universities (Honda, 2015). As part of this program, Honda has partnered with Exempted Village School district in Marysville, Ohio, as well as Otterbein University, High Point Career Center, and Columbus State Community College to create the Marysville STEM Early College High School. The school's building and curriculum are focused on student-led, project-based learning involving hands-on problem solving and collaboration (OHM, n.d.).
- In Alabama, Honda Manufacturing of Alabama (HMA) collaborated with the state's Alabama Industrial Development and Training (AIDT) on two training facilities to help train local associates for Honda that had a direct, positive impact on Honda's successful start-up in the state. The jointly designed facilities, one in Lincoln, Alabama, near the HMA plant, opened in 2000 to support the launch of production, and the other in nearby Pell City, Alabama, also provide workforce recruitment and training facilities for Alabama residents who were training to work for other companies (Honda Manufacturing of Alabama, 2005).
- In 2014, Honda of America Manufacturing (HAM) established two Technical Development Centers (TDCs) to help prepare Honda and its associates for the 21st century of manufacturing (Eaton, 2014). The TDCs work to advance the skills of Honda engineers, equipment service technicians, and production associates involved in auto production at Honda plants in Ohio and throughout North America. As Honda introduces more sophisticated technologies in its products and its plants, the company is working to ensure that Honda associates are equipped with the skills required for the manufacturing demands of the future. The TDCs, one for vehicle production in Marysville, Ohio, and one for engine production in Anna, Ohio, give technicians more hands-on experience and instruction in fundamentals as well as advanced training for specialized areas (Honda, 2015)

- Honda supports the Hispanic Scholarship Fund (HSF) STEM Summit. This annual summit provides HSF STEM Scholars an opportunity to learn about career success in STEM fields through mentoring, professional insight, and career guidance. Attendees at this event have the chance to interact with leading Hispanic STEM professionals throughout the United States (Honda , 2020)
- In partnership with the Thurgood Marshall College Fund (TMCf), Honda awarded scholarships to five HBCU students for the 2018-19 academic year. The awards are part of an annual scholarship fund Honda established in 2018 to support students pursuing an education in engineering, supply chain management, and manufacturing-related fields (Honda, 2018).
- Founded and solely funded by Honda, Eagle Rock School and Professional Development Center is a nationally recognized, full academic, residential high school in Colorado that emphasizes experiential education and project-based learning for students who feel disconnected in traditional academic settings. The school's Professional Development Center works with educators across the U.S. to make the high school experience more engaging for young people. (Honda, 2018).
- In 2019, HAM opened another training center, to provide new production associates the skills to successfully transition into manufacturing roles. The innovative, two-week, hands-on program supports workforce training for Honda's Marysville Auto Plant, East Liberty Auto Plant, and the Anna Engine Plant. The USD 1.9 million investment enables up to 100 new production associates each week the opportunity to learn in three main categories of training: process simulation, hands-on static skills, and classroom instruction (Honda of America Mfg., Inc., 2019).

## Mazda

- Shortly after announcing their new assembly plant in Huntsville, Alabama, Mazda-Toyota Manufacturing (MTM) collaborated with the Limestone County Career Technical Center to create a new course in advanced manufacturing. MTM donated instructional equipment to the technical center, and Calhoun Community College provided instructors for the course (Robinson-Smith, 2019). MTM representatives also participate in the school's advisory council.
- Working in partnership with WyoTech (a technical training institute) and Zenith Education Group (a system of non-profit career colleges), Mazda has developed a certification course for automotive graduates to receive the skills needed to excel as a technician at a Mazda dealership. To support the program, Mazda has donated more than 20 vehicles, specialized tooling, and equipment, in addition to several current model year vehicles rotated out annually for current year technology (Mazda, 2015).
- As part of the groundbreaking for its new assembly plant in Huntsville, Alabama, MTM donated USD 750,000 to support STEM-related programs to encourage and motivate students to pursue a career in the manufacturing field. The company allocated USD 500,000 to the Huntsville/Madison Chamber Foundation to start a career exploration online platform to help highlight careers in manufacturing to students, build skills, and connect job seekers to opportunities. The remaining USD 250,000 will be split between six school districts in Madison, Limestone, and Morgan counties to advance STEM or career technical programs that align with advanced manufacturing (Vickers, 2019).
- MTM announced a partnership with Toyota Motor Manufacturing Alabama and Polaris to support a new program focused on empowering women to begin or develop a career in

manufacturing. Throughout this program, workshops will be held surrounding professional development and networking opportunities for women in manufacturing. These activities will help attract more women to careers in this industry and provide professional development opportunities for individuals currently working in the field. This program is located in Huntsville, Alabama (West, 2020).

## Nissan

- Nissan established a program with the 100 Black Men of America organization to work with the next generation of leaders. This annual initiative established seven years ago has had over 350 students participate in this program. In 2020, Nissan invited high school students from Atlanta, Georgia; Chicago, Illinois; Dallas, Texas; Jackson, Mississippi; Nashville, Tennessee; and Washington, D.C. to meet with leaders and participate in workshops at the company's headquarters office. This program, known as the Next Gen Summit, prepares students for a successful career (Nissan News USA, 2019).
- Nissan North America and the community college system of Tennessee established one of the leading public-private manufacturing partnerships in the United States. Through the joint effort, the State of Tennessee and Nissan worked together to build a state-of-the-art 162,000 square-foot technical training and manufacturing center. The campus offers advanced manufacturing programs to prepare students and Nissan employees for careers in advanced manufacturing. Nissan and the Tennessee College of Applied Technology (TCAT) share the space that is utilized to bolster the state's efforts to increase educational attainment rates as well as meeting future workforce needs (Nissan News USA, 2017).
- Nissan has established secondary education programs near its facilities in Mississippi and Tennessee. In Tennessee, Nissan, in partnership with Rutherford Chamber of Commerce, provides an externship program for K-12 grade teachers where Nissan invites teachers to their manufacturing plant to work alongside their employees. The program helps teachers to fully understand the skills and competencies Nissan requires at their organization. This opportunity provides teachers with a clearer understanding of what happens in the manufacturing plant and the numerous job opportunities that are available for their students (Tennesseans For Student Success, 2020).
- In 2017, Nissan partnered with Mississippi Robotics to host the STEM/Robotics Competition at Nissan's Canton Assembly Plant. The full-day event was designed to engage students from third through twelfth grade in activities that spark their interest in science, technology, engineering, and math (Nissan Group of North America, 2017).
- Nissan North America, Mississippi State University's CAVS Extension (CAVSE), the Mississippi Department of Education's Offices of Vocational Education and Workforce Development, and the following four Mississippi school districts: Madison County, Canton Public, Leake County, and Jackson Public schools partnered together to create "STEP Robotics." This initiative is designed to introduce students and instructors from the school districts to the latest technology used at Nissan's manufacturing facility in Canton, Mississippi. Nissan hosts the instructors' training, a student computer classroom, robotics lab, Nissan plant tour, robotics competition, and awards ceremony (Mississippi State University, 2020).
- Middle Tennessee State University (MTSU), in collaboration with Bridgestone and Nissan, created a Mechatronic Engineering degree utilizing the Siemens certification standards. While



the program planned to enroll 50 students after five years, enrollment exceeded 200 students at the beginning of the program's third year (Simpson, 2015).

## Subaru

- Subaru of America Foundation helps to fund the “Cradle of Liberty Council,” the Boy Scouts of America’s Philadelphia Exploring program. This program provides young individuals with the opportunity to participate in job shadowing and learn vital skills onsite at corporations (Subaru, 2020).
- Subaru of America Foundation funded the renovation of The POINT program’s facility to create a training center. For over 15 years, The POINT has been committed to assisting at-risk youth. One program in particular—Hands-On Training—provides students with the opportunity to learn skills that expose them to future careers in trade industries (Subaru, 2020).
- Subaru of America Foundation supports “Students Rising Above” (SRA). This non-profit organization supports low-income, first-generational college students by assisting them throughout their college career and into the workforce. SRA helps to serve the community, provides a new generation of employees, and sends diverse thought leaders into the workforce (Subaru, 2020).
- Subaru of America Foundation has consistently supported “Techbridge Girls” (TBG), a program that was launched in 2000 to empower girls from low-income communities to achieve greater economic mobility through STEM careers. This program offers hands-on after-school activities with leadership and support of mentors and role models. Subaru is a national supporter of all three TBG direct service locations in Oakland, Seattle, and Washington, D.C. (Subaru, 2020).
- Subaru of Indiana Automotive (SIA) has partnered with Vincennes University and the Purdue College of Technology to create the Advanced Internship in Manufacturing (AIM) program to help bridge the gap between post-secondary educational opportunities in Indiana and highly skilled job opportunities in the manufacturing industry. After the completion of the internship, students are eligible to continue their education and earn a bachelor’s degree in engineering technology from the College of Technology, with SIA covering the cost of the degree (Vincennes University, 2016).

## Toyota

- Toyota Motor Manufacturing Indiana recently announced plans to provide funding of USD 1 million over the next four years to a new Gibson County regional workforce program. The goal of this program is to connect high school students with career opportunities in advanced manufacturing (Assembly Magazine, 2020)
- Toyota Motor North America operates the “Federation for Advanced Manufacturing Education” (FAME). In the program, students earn a two-year advanced manufacturing technician degree while working part-time. The program has received recognition from the White House (Hughes, 2019).
- Toyota has announced a donation of USD 500,000 to “Alamo Promise” in San Antonio, Texas, over five years to support the organization’s mission to end poverty, enhance economic and social mobility, and meet workforce demands throughout the region (Toyota Newsroom, 2019).
- In partnership with community colleges, vocational schools, and dealerships, Toyota began the Technician Training & Education Network (T-TEN). This program provides hands-on training and

education for automotive technicians. This program helps technicians obtain well-paid positions with dealers throughout the United States (Japan Automobile Manufacturers Association, 2019).

- Toyota Motor North America has been a principal corporate sponsor of SAE Foundation and “A World in Motion” (AWIM) STEM educational programming since it began in 1990. Recently, Toyota Motor North America pledged a USD 1 million gift to inspire K-8 and university students with SAE International’s AWIM and “Learn Twice” initiatives (SAE International, 2020).
- Toyota, in partnership with “Project Lead the Way” (PLTW), awarded USD 150,000 in grants to help prepare students for the next generation of STEM jobs. The grants, funded by the Toyota USA Foundation, provide a curriculum focused on computer science, engineering, and biomedical science while helping create engaging, hands-on classrooms for students to develop the knowledge and skills needed to thrive (Toyota, 2018).

## Philanthropy

Japanese automakers provide significant support to non-profit organizations, charities, educational organizations, cultural institutions, and events in their communities. This philanthropic activity represents an investment not just of money, but of staff time that is emblematic of Japanese automakers’ commitment to serving and improving the communities where their facilities are located. These philanthropic activities, therefore, complement the investments made by Japanese automakers in plants and equipment. The resulting company presence frequently represents the global state-of-the-art, not just in manufacturing but also in environmental stewardship and community benefits. Taken together, these benefits represent the full contributions made by Japanese automakers—and convey why officials compete intensely to attract these companies to their communities. This section provides an overview of locally-administered activities, and a separate summary of Japanese automaker corporate philanthropy in the United States, focusing on their support for cultural events and institutions.

## Philanthropy & Community Service Activities

Japanese automakers and their workers support charitable giving and volunteering in the communities that host their facilities and nationwide. Many of the automakers specifically encourage their workers to be engaged in community service and fundraising efforts—often with either donation matching or official volunteering programs. All of the Japanese automakers with a presence in the United States operate philanthropic foundations or grant-writing bodies, and some also have corporate-level service programs (Honda, 2020d) (Mazda, 2019) (Mitsubishi News, 2020) (Nissan, 2020c) (Subaru, 2019a) (Subaru, 2020a) (Toyota, 2020b). Each year, these corporate efforts provide substantial support to charities and communities in the United States.

### Hino

- Hino Motors Manufacturing USA employees in Arkansas and West Virginia participate in numerous local charity events, such as Relay for Life and the St. Jude 5K walk (Hino Motors Manufacturing USA, 2020) (Hino Motors Manufacturing USA, 2020).
- In West Virginia, Hino donated USD 10,000 to help build a playground at Williamstown Elementary (Phelps, 2018).

### Honda

- At Honda’s Ohio and Alabama operations, the “HondaGo” program furthers the contributions of Honda employees by providing small grants to the non-profits with which employees volunteer,



and matching funds when employees donate to a non-profit (Honda, 2020a) (Honda, 2020b). A similar program exists under the “Hands-on Honda” name for the company’s Indiana operations (Honda, 2020c).

- Honda operates three separate charitable foundations that are active in the United States: the American Honda Foundation, which focuses on support to youth and science education-oriented non-profit organizations; the Honda of America Manufacturing Foundation, which supports non-profit organizations and initiatives in Ohio; and the Honda Marine Science Foundation, which focuses on restoring marine ecosystems and facilitating climate change resilience (Honda, 2020e). Through these and other corporate programs, Honda supports a multitude of non-profits and community service initiatives; its corporate social responsibility map indicates 230 sponsored groups across the United States and Canada (Honda, 2020f).
- Honda also conducts an annual “Team Honda Week of Service,” wherein its North American associates are encouraged to participate along with the company’s suppliers and dealers in a coordinated set of volunteering projects. The 2019 “Week of Service” mobilized more than 25,000 volunteers throughout North America (Honda, 2020g) (Honda, 2020h).
- One of Honda’s most significant and longest-running philanthropic initiatives in the United States is the Honda Campus All-Star Challenge (HCASC), an academic competition for Historically Black Colleges and Universities (HBCUs). Since the program’s inception in 1989, Honda has awarded more than USD 8 million in grants to participating HBCUs through HCASC (Honda, 2020).

## **Mazda**

- Since 1992, the Mazda Foundation has provided grants cumulatively totaling USD 12.9 million to U.S. charities (Mazda, 2019). Foundation initiatives include “After-School All-Stars,” which offers youth leadership development and community service; “Building Homes for Heroes,” which gives houses to injured veterans of the Iraq and Afghanistan wars; and the Second Harvest Food Bank of Orange County.
- Mazda also operated the “Mazda Drive for Good” charity event. During the event, Mazda commits to one hour of community service work for every customer test drive, and the company donates USD 150 to charity for every Mazda vehicle purchased. From its inauguration in 2012 through the conclusion of the 2016 event, Mazda donated more than USD 18.4 million to charities across the United States and delivered more than 263,000 volunteer hours (Mazda, 2017).

## **Mitsubishi**

- Mitsubishi developed its corporate social responsibility initiative, “Small Batch – Big Impact,” to provide vehicle loans to small non-profits to help support local communities. Recent donations have been made to Nashville, Tennessee-based Community Resource Center (2020); Las Vegas, Nevada-based Goodie Two Shoes Foundation (2019); and Dallas, Texas-based Record the Journey (2019), with all three charities using their Mitsubishi vehicles to further their outreach and mission.

## **Nissan**

- Over its 27-year history, the Nissan Foundation has awarded more than USD 11.5 million to approximately 150 organizations promoting respect and understanding among cultural and ethnic groups. Founded in 1992, the mission of the Nissan Foundation is to build community by

valuing cultural diversity. Formed in response to the civil unrest that occurred near Nissan North America's then-U.S. sales operations in Southern California following the Rodney King trial verdict, the Nissan Foundation has annually awarded hundreds of thousands of dollars to nonprofit organizations that support the Foundation's mission (Nissan Group of North America, 2017).

- Since opening in 2003, Nissan's Canton plant has focused on causes that matter to the local community, its employees, and their families including education, diversity, humanitarian aid, and the environment. Nissan and its employees have given more than USD 17 million in charitable contributions since 2003. Nissan's Canton Vehicle Assembly Plant has supported more than 200 organizations that help serve the area including Habitat for Humanity, Mississippi Food Network, Community Stewpot, Our Daily Bread, United Way, area school districts and colleges, Boys and Girls Clubs, 100 Black Men, Mississippi Children's Museum, Mission Mississippi, the Natural Science Museum, and the Nature Conservancy (Nissan Group of North America, 2017).

### Subaru

- At Subaru of Indiana Automotive (SIA), the "Subaru Serves" initiative directly connects employees with volunteering opportunities in their community. Likewise, Lafayette, Indiana, area non-profits in need of volunteers can directly file a request with the company (Subaru, 2020a).
- SIA hosts the Subaru Color 5K, an annual fundraiser for Special Olympics Indiana (Subaru, 2020b).
- Subaru has two U.S. philanthropic foundations. The SIA Foundation is affiliated with manufacturing operations located in Lafayette, Indiana, and offers grants only to causes situated in the Lafayette region (Subaru, 2019a). At the corporate level, the Subaru of America Foundation provides funding for youth career exploration and skills training for young adults in under-served communities (Subaru, 2020a).
- Since its inauguration in 2008, Subaru's annual "Share the Love" event has resulted in more than USD 145 million in donations to the ASPCA, Make-A-Wish, Meals on Wheels, and the National Park Foundation (Subaru, 2020b) (Subaru, 2019b).

### Toyota

- The Toyota Motor Manufacturing, Kentucky (TMMK) "Volunteers in Place" program was established in 1994 to encourage employees to be active in their communities, and now TMMK also has company-sponsored volunteering and service events. Each year, TMMK recognizes its top ten volunteers for their service to the community, and TMMK awards small grants to the supported non-profits. These grants contribute more than USD 50,000 each year to Georgetown, Kentucky area non-profits (Toyota, 2020a).
- Since 1999, Toyota has been the national sponsor for the National Environmental Education Foundation's National Public Lands Day (National Environmental Education Foundation, 2020). In this partnership's first year, Toyota provided 1,500 volunteers who assisted two projects in Washington, D.C., and California. For National Public Lands Day in 2018, Toyota provided 3,000 volunteers to 50 projects across 20 states and Puerto Rico (Toyota, 2018).

## COVID-19 Community Support Activities

With vast production and innovation capacity in the U.S., automakers of all origins have supported relief efforts to address the COVID-19 crisis. As integral members of the communities in which they operate, Japanese automakers have stepped in to produce and donate PPE as well as to support community-oriented relief programs. The following section highlights key examples of these efforts.

### Honda

- Honda teamed up with Dynaflo Inc. to produce and deliver diaphragm compressors, a critical component for ventilators. Dynaflo had been making 75 compressors per week before the COVID-19 crisis. However, through their partnership, the companies aimed to reach a production capacity of 10,000 compressors per month and maintain production through the end of August 2020. Honda transformed a 6,000-square foot area of its Technical Development Center in Marysville, Ohio, into space for associates to assemble the compressors. The process was developed using production know-how from Honda's experienced manufacturing associates, including parts tracking, build timing, quality checks, and lot control (Honda, 2020).
- Honda has taken numerous steps to support the efforts of healthcare workers across North America, including donating over 200,000 items such as gloves, face shields, and other types of protective gear to healthcare providers and first responders. Honda has also utilized its 3D printers to manufacture parts for face shields (Honda Corporate News, 2020).
- Honda pledged USD 1 million to provide access to food for those impacted by the COVID-19 crisis. Also, Honda has initiated a COVID-19 Special Matching Gift program enabling associates to make donations to local food programs in their community with the company matching up to USD 1,000 for each associate (Honda, 2020).
- Honda modified 10 Odyssey minivans and provided them to the City of Detroit to transport people potentially infected with COVID-19, as well as healthcare workers. To help protect the driver from the potential for droplet infection during transportation, the Honda Odysseys were retrofitted with a plastic barrier behind the front seating area, as well as modifications to the ventilation system to maintain an air pressure differential between the front and rear seating areas (Honda, 2020).
- Honda engineers developed new methods to use manufacturing equipment to produce critically needed face shields and have donated 70,000 face shields to healthcare workers at more than 300 medical facilities across the United States. Honda engineers made the face shields by designing new uses for high-speed injection-molding technology ordinarily used in the production of vehicle components (Honda News, 2020).

### Mazda

- Mazda provided free standard oil changes and enhanced cleaning services for U.S. healthcare workers at participating dealers nationwide. This program, called Essential Car Care, ran from mid-April through early June. This service was not limited to Mazda owners and was offered to many makes and models from other automakers. (Inside Mazda, 2020).

### Mazda-Toyota

- The Mazda-Toyota plant (under construction) in Huntsville, Alabama supplied local first responders and essential workers with medical equipment, such as masks (WZDX News, 2020).

## Mitsubishi

- Mitsubishi Motors North America announced that they were reimbursing their dealer partners for 100 percent of their expenses related to COVID-19 supplies and support, including the purchase of employee and consumer PPE (Mitsubishi Motors, 2020).

## Nissan

- Nissan printed headbands and assembling protective face shields for local healthcare workers at their facilities in Tennessee, Michigan, and Mississippi (Nissan. [@NissanUSA], 2020).
- Nissan leaders provided the following items to healthcare staff in Mississippi: 1,250 coveralls, 125 boxes of gloves, 1,000 pounds of cleaning towels, and 150 spray bottles for cleaners (WJTV, 2020).

## Subaru

- Subaru announced a partnership with Feeding America to support the community through the pandemic. The company, along with two regional independent distributors, announced a commitment to support feeding people by helping to provide 50 million meals to Feeding America. This donation will help the Feeding America network respond to the increased need across communities. These companies together will work to provide support through food drives, donations, and volunteer events (Subaru, 2020).
- Subaru of Indiana Automotive (SIA) donated over 400 N95 masks and 13 sets of goggles to the IU Health Arnett Hospital Emergency Room in Lafayette, Indiana. The plant also donated 75 Tyvek suits and 320 packages of cleaning wipes to the Lafayette Professional Firefighters Local 472 (Global Business Alliance, 2020).

## Toyota

- Toyota has provided more than USD 8 million in funding and in-kind donations across critical areas (as of May 2020), including:
  - Manufacturing of Protective Equipment: Fabrication and donation of 500,000 commercial-grade face shields (USD 1.8 million total value) through June, producing approximately 13,000 face shields per day at Toyota facilities in Alabama, Kentucky, Michigan, and Texas. Nearly 73 organizations in 18 states will receive Toyota-made face shields (Toyota, 2020).
  - Donations to Emergency Relief: Monetary donations (USD 6 million) to organizations such as The Salvation Army, The Boys and Girls Club, The United Negro College Fund, the American Red Cross, and local branches of The United Way to address crucial needs, particularly food assistance, as well as e-learning programs to help keep youth engaged (Toyota, 2020).
  - Supporting Health Care Workers: More than 50,000 in-kind donations of personal protective equipment (PPE) supplies (USD 100,000 total value) to hospitals, emergency management teams, and first responders. Items donated include masks, safety glasses, shoe/boot covers, gloves, blankets, and cotton swabs (Toyota, 2020).
  - Partnerships: Partnering with organizations, such as FC Dallas on the Taking Care of Those Who Take Care of the Community initiative, to provide meals to essential workers and community volunteers who continue to work and service North Texas communities during the COVID-19 pandemic (FC Dallas, 2020).

- Volunteering of Employee Time: Toyota donated consulting hours by its team of LMS experts to companies that make much-needed health and safety devices. This consulting helped to improve production and speeds up the delivery of new equipment where it is needed most (Toyota, 2020).
- Dealer Support: Toyota dealers from around the country offering free Wi-Fi for students doing online schoolwork, delivering lunches to kids who are out of school due to the pandemic, and sanitizing city vehicles (police, fire, handicap, and parks department) (Toyota, 2020).

## Conclusion

For many decades, Japanese automakers have been a significant and critical part of the U.S. economy and local communities in which they operate. Their importance, however, goes beyond their substantial employment and investment contributions. Japanese automakers have positively impacted a wide array of U.S. economic and social trends through the advancement of technology, the support of myriad philanthropic efforts, the strengthening of the automotive supply chain, and the pioneering of lean principles through a diverse array of government and industry sectors. Japanese automakers have become an interwoven part of not just the fabric of the U.S. automotive industry, but also the U.S. economy as a whole.

At the same time, Japanese automakers in the United States face many of the same challenges as other automakers that have invested in the U.S. automotive ecosystem. To ensure that the United States maintains a leadership role in shaping the future of this critical sector requires auto companies to partner with other automakers, suppliers, high-tech companies, research universities, non-profit institutions, and U.S. government agencies to advance mobility technology. Japanese automakers are playing a central role in ensuring that the U.S. auto market remains vibrant and diverse, while at the same time redefining what an automobile is and how vehicle technology evolves toward a new mobility paradigm.

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