The Changing Landscape of the Automotive Industry

Concordant Crossroads: Regulation and Innovation in the Automotive Industry
October 4, 2018

Carla Bailo, President & CEO, Center for Automotive Research
Automotive industry contract research and service organization (non-profit) with more than 30 years experience forecasting industry trends, advising on public policy, and sponsoring multi-stakeholder communication forums.

RESEARCH
Independent research and analysis on critical issues facing the industry.

EVENTS
Industry-driven events and conferences that deliver content, context, and connections.

CONNECTIONS
Consortia that bring together industry stakeholders in working groups and offer networking opportunities and access to CAR staff.
Health of the Automotive Industry and Outlook
GM 2017 earnings suffered $4.2 billion losses from the discontinued operations in Europe.

Source: SEC Filings and Annual Financial Reports, Google Finance
Corporate North American Automotive Revenue
2007 – 2017 (in millions)

*Former Chrysler Group LLC. FCA Group data after 2014.
**EBIT or automotive operating income per vehicle sold.
Source: CAR Research based on companies’ SEC Filings and Annual Financial Reports
North American Operating Profit Per Vehicle
2007 – 2017

* Former Chrysler Group LLC. FCA Group data after 2014.
** EBIT or automotive operating income per vehicle sold.

Source: CAR Research based on companies’ SEC Filings and Annual Financial Reports
U.S. Market Share
YTD June 2018

<table>
<thead>
<tr>
<th>Company</th>
<th>Units</th>
<th>Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>GM</td>
<td>1,473,237</td>
<td>17.2%</td>
</tr>
<tr>
<td>Ford</td>
<td>1,239,302</td>
<td>14.5%</td>
</tr>
<tr>
<td>Toyota</td>
<td>1,189,312</td>
<td>13.9%</td>
</tr>
<tr>
<td>FCA</td>
<td>1,107,864</td>
<td>12.9%</td>
</tr>
<tr>
<td>Nissan/Mitsubishi</td>
<td>848,022</td>
<td>9.9%</td>
</tr>
<tr>
<td>Honda</td>
<td>787,824</td>
<td>9.2%</td>
</tr>
<tr>
<td>Hyundai-Kia</td>
<td>628,611</td>
<td>7.3%</td>
</tr>
</tbody>
</table>

Source: Wards Auto; CAR Research
Percent Change in Sales of Light Vehicles Per OEM:
YTD Through July: 2018 vs. 2017

Source: Wards Auto; CAR Research
Electric Vehicles
U.S. Light Vehicle Sales 2018 YTD Through July - Segment Breakdown

<table>
<thead>
<tr>
<th>Segment</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUV</td>
<td>37.1%</td>
</tr>
<tr>
<td>Pickup</td>
<td>16.1%</td>
</tr>
<tr>
<td>Small Car</td>
<td>13.4%</td>
</tr>
<tr>
<td>Middle Car</td>
<td>9.9%</td>
</tr>
<tr>
<td>SUV</td>
<td>8.4%</td>
</tr>
<tr>
<td>Van</td>
<td>5.5%</td>
</tr>
<tr>
<td>Luxury Car</td>
<td>4.9%</td>
</tr>
<tr>
<td>Electrified</td>
<td>3.4%</td>
</tr>
<tr>
<td>Large Car</td>
<td>1.3%</td>
</tr>
</tbody>
</table>

Note: Electrified Segment consists of BEVs, HEVs and PHEVs; all other segments are sales exclusive of Hybrid models

Source: Ward’s Automotive Reports and CAR Research
Electric Vehicles

U.S. Light Vehicles Sales 2018 YTD vs. 2017 YTD Through July - Percent Change

<table>
<thead>
<tr>
<th>Segment</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1.3%</td>
</tr>
<tr>
<td>CUV</td>
<td>13.6%</td>
</tr>
<tr>
<td>Electrified</td>
<td>8.6%</td>
</tr>
<tr>
<td>SUV</td>
<td>5.3%</td>
</tr>
<tr>
<td>Pickup</td>
<td>4.9%</td>
</tr>
<tr>
<td>Van</td>
<td>-1.9%</td>
</tr>
<tr>
<td>Large Car</td>
<td>-9.0%</td>
</tr>
<tr>
<td>Luxury Car</td>
<td>-10.5%</td>
</tr>
<tr>
<td>Small Car</td>
<td>-13.7%</td>
</tr>
<tr>
<td>Middle Car</td>
<td>-14.7%</td>
</tr>
</tbody>
</table>

Note: Electrified Segment consists of BEVs, HEVs and PHEVs; all other segments are sales exclusive of Hybrid models

Source: Ward’s Automotive Reports and CAR Research
CAR’s U.S. Light Vehicle Sales Forecast
2018-2025

U.S. Sales

Source: CAR Research, July 2018
Headwinds: Tariffs and Emissions
Trade Tariffs

Globalization: The United States Cannot Self-Supply Vehicles

Sourcing of U.S. Light Vehicle Sales in 2017

U.S. Production 11.0 million
less U.S. Exports - 2.4 million
plus U.S. Imports + 8.7 million

U.S. Sales = 17.3 million
Trade Tariffs
A 25% Tariff on U.S. Imports of Light Vehicles & Parts Would:

- Raise the average price of a new light vehicle $4,400 (+13%)
- Drop U.S. light vehicle sales volume by more than 2 million units (-12% or a 14.8 million unit market)
- Reduce U.S. light vehicle exports by 357,000 units (-18%)
- Increase U.S. motor vehicle manufacturing output by $62.4 billion (+18%)
- Decrease U.S. motor vehicle parts output by $15.8 billion (-6% for parts that would have been exported to Canada and Mexico)
- Result in 714,670 fewer U.S. jobs
- Lead to increased used light vehicle prices (+10% or more)
- Result in less choice for consumers
Trade Tariffs
Which Trading Partners Will Be Affected?

Eight countries constitute 92 percent of U.S. auto and parts imports

<table>
<thead>
<tr>
<th>Share of U.S. Auto &amp; Parts Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
</tr>
<tr>
<td>Canada</td>
</tr>
<tr>
<td>Japan</td>
</tr>
<tr>
<td>Germany</td>
</tr>
<tr>
<td>South Korea</td>
</tr>
<tr>
<td>China</td>
</tr>
<tr>
<td>United Kingdom</td>
</tr>
<tr>
<td>Italy</td>
</tr>
<tr>
<td>Others</td>
</tr>
</tbody>
</table>

Source: U.S. Department of Commerce

The top four countries account for 76 percent of all U.S. auto and parts imports.
Trade Tariffs
How Will U.S. Automotive and Parts Industries React?

• Investment scale is large, and lead time is long
• Short-term:
  • Very little will change
  • OT can be used to stretch existing capacity without much additional investment, but roughly half of the capacity “headroom” is tied up in sedan production that consumers don’t want
  • Auto sales are already weakening (peak year was 2016); economic growth not robust
• Medium term:
  • U.S. export producers will move some production outside the United States (BMW, Tesla, Volvo have already announced)
  • U.S. profits will fall—which will lead to lower investments in plants, equipment, new models, & new technologies
• Longer term:
  • New U.S. plant investment is risky and unlikely—overcapacity was a problem in the 2000s; automakers and suppliers will be cautious
  • Smaller U.S. market—lower output, imports, & exports—and fewer choices
CAFE/GHG Policy
Potential Impacts on BEV Market

• The proposed NPRM “SAFE” vehicle rule freezes 2020 fuel economy standards and extends it to 2026. It removes credits, and leads to significantly less electrification.

• Comments are due 10/23 followed by technical and legal negotiations.

• EPA is challenging California’s autonomy to make unique GHG standards for the state.

• Automakers say plans are already in place to advance electric powertrain technology because rest of the world is moving forward. There may be some revisions, but unclear.
New Business Models and Disruption Vectors
The rise of shared mobility services is part of a mobility evolution that brings many opportunities for the auto industry.
Major Automakers' Partnerships Related to Mobility, Connectivity, and Driving Automation
Shared Mobility Services
Growth of North American Carsharing Programs

Yearly data represents July numbers, unless otherwise specified. Totals include one-way and round-trip carsharing and exclude P2P programs. Proxies were used for five of the 32 round-trip operators.

Connected and Automated Vehicles

Deployment Models

**Robo-Taxis**
- Waymo
- Drive.ai

**Low-Speed Shuttles**
- Navya Arma
- May Mobility

**Urban Delivery**
- Nuro
- Ford

**Long-Haul Freight**
- Daimler
Connected and Automated Vehicles
Deployment Timeline for Automated Driving Systems (SAE J3016 Levels 3-5)
Connected and Automated Vehicles
Potential Impacts on Liability

Impact of vehicle connectivity and automation:
• Improvements in vehicle safety
• Abundance of real-world data
• More predictability, less fraud

Paradigm shifts:
• Apportioning blame to driver and manufacturer/suppliers
• Greater reliance on product liability
• Significant shifts in liability and insurance coverage only at L4-L5
• New risks: cyber threats at the individual, vehicle, fleet, infrastructure level
Challenges:

- Assigning liability for SAE L1 to L3 between the human operator and the vehicle
- Lengthy litigation between manufacturers, suppliers, and vehicle operator/driver
- Shifting from driver-focused insurance laws to vehicle-focused laws

Opportunities:

- Establish advanced analytics capabilities
- Plan for product and business-line shifts
Adoption and Utilization of Ridesourcing in Major U.S. Metropolitan Areas

Shared Mobility Services
Threats and Opportunities for Dealers

Threats

• Vehicle ownership decreases and the use of shared mobility services increases
• Automakers bypass dealers with subscription services and in-house mobility services
• Automated vehicles act as a catalyzer for these trends

Opportunities

• Create carsharing programs run by dealerships
• Provide special lease programs for ridesourcing drivers
• Provide service, maintenance and fleet operations to carsharing, ridesourcing, or future automated taxis
• Fractional ownership
• Add new lease options: bundle insurance, maintenance, limited car swap
Convergence of Automated, Connected, Electrified, and Shared Vehicle Technology
Impact on Vehicle Design

• Largest structural impact will come due to change of powertrain

• Exterior design might not be an important differentiator for consumers anymore (especially for shared, automated)

• Integration of sensors will be a priority for designers

• New challenges and innovations (e.g., biometrics, flexible seating, scratch and bacteria resistance) will emerge

• The end of driver-centric design?
Shared Mobility Services
Services Available in North America

- 600+ cities with ridesourcing
- 20+ cities with pooled rides
- 10+ cities with microtransit
- 400+ cities with carshare (round trip, free floating, P2P)
- 400+ cities with bikeshare (stationed, dockless) & scooters

Source: Shared Use Mobility Center
THANK YOU