The Global Automotive Outlook
Opportunity Identification in a Disruptive Market
February 20, 2019

Joseph McCabe, President
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MARKET DISRUPTION
BALANCING RISK & OPPORTUNITY
Competing in a Disruptive Global Market

- Consumer preference vs. market direction
- Shareholder value
- Supply chain importance to the VM strategy
- Innovation in product and strategy
- Investment strategies
- Regulations, incentives, and standards
- Geo-political impact on globalization
- Future players
- Minimize risk and maximize opportunities
- Defend core operations and identify areas for growth
NORTH AMERICA LIGHT VEHICLE PRODUCTION
NA Growth Outlook and OEM Group Contribution

Source: AutoForecast Solutions – January 2019
NA Production by OEM Parent Base Location

North America Light Vehicle Production

<table>
<thead>
<tr>
<th>Year</th>
<th>AP</th>
<th>D3</th>
<th>EU</th>
<th>EV</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>6.99</td>
<td>0.11</td>
<td>8.63</td>
<td>0.26</td>
</tr>
<tr>
<td>2018</td>
<td>6.77</td>
<td>0.26</td>
<td>8.66</td>
<td>0.11</td>
</tr>
<tr>
<td>2019</td>
<td>7.05</td>
<td>1.34</td>
<td>8.43</td>
<td>1.38</td>
</tr>
<tr>
<td>2020</td>
<td>8.63</td>
<td>1.79</td>
<td>8.46</td>
<td>1.34</td>
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<tr>
<td>2021</td>
<td>8.63</td>
<td>1.79</td>
<td>8.46</td>
<td>1.34</td>
</tr>
<tr>
<td>2022</td>
<td>8.63</td>
<td>1.79</td>
<td>8.46</td>
<td>1.34</td>
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<td>8.63</td>
<td>1.79</td>
<td>8.46</td>
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<tr>
<td>2024</td>
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<td>1.79</td>
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<td>2026</td>
<td>8.63</td>
<td>1.79</td>
<td>8.46</td>
<td>1.34</td>
</tr>
</tbody>
</table>

Source: AutoForecast Solutions – January 2019
North America: Passenger Car Segment Contribution

Annual Volume
2018 = 5.3M
2026 = 4.2M

D3 reduce car footprint by 625K+

Korean OEMs reduce 90K

European OEMs gain 120K

Japanese OEMs reduce by 490K+

EV – primarily Tesla – reduce 8K

Source: AutoForecast Solutions – January 2019
North America: Crossover Vehicle Segment Contribution

Annual Volume
- 2018 = 6.1M
- 2026 = 7.4M

- European OEMs add 400K units
- Japanese OEMs add nearly 485K units
- Korean OEMs down 10K
- EV group – adding about 135K
- D3 add 310K (but loses market share?)
  - Consider these imported models...
    - Jeep Renegade from Italy – 100K+
    - Buick Encore from Korea – 90K+
    - Ford EcoSport from India – 50K pace

Source: AutoForecast Solutions – January 2019

Data that drives tomorrow. February 2019
North America Production Highlights

• **U.S. Sales growth in 2018**
  - Over 17 million for 4th straight year

• **Growing mid-sized Pickups NOT cannibalizing full sized trucks (yet)**
  - Ford Ranger, expanded Jeep lineup, Ram entries

• **SUV resurgence**
  - Ford Bronco and Jeep Wrangler 4-door

• **Jeep Wagoneer / Grand Wagoneer to take on Escalade and Navigator**
  - Strong move for FCA

• **VW Atlas (both 2 and 3-row variants)**
  - to offset slow selling Passat

• **GM portfolio adjustment**
  - Product mix and plant utilization

• **Import Substitution**
  - Subaru Impreza
  - Lexus ES and RX
  - BMW passenger cars in Mexico

• **Global Export Hub**
  - VW Atlas
  - Subaru Ascent
  - Audi Q5
  - BMW CUVs

• **Mexico**
  - Strong export hub
  - Multiple global free trade agreements
  - Established supply base
  - Strong government support
U.S. SALES ANALYSIS
U.S. Light Vehicle Sales

- U.S. light vehicle sales peaked in 2016
  - 17.46 million
- 2018 marked the forth straight year over 17 million units
- Slowdown expected in 2019 and 2020
  - 17 million not expected to return until 2024
  - 2% decline in 2019
- Market being driven by light truck growth
  - squeezing car share to near 27% in 2019
  - heading toward under 20% by 2023
- Import substitution offsetting future sales contributions

Source: AutoForecast Solutions – January 2019
Recession Risk

When long-term and short-term treasury rates bonds converge, the odds increase for a recession


- Convergence typically leads to a recession within 12-18 months

- Rates converged in late ‘18 and early ‘19, pointing toward a recession in early- to mid-2020

Source: United States Department of the Treasury/AutoForecast Solutions – February 2019
NORTH AMERICA OPPORTUNITY ANALYSIS
Domestic Investment Opportunity

- **Nissan Rogue**
  - Sourced from Japan, South Korea, and the U.S.
  - Two-thirds of U.S. derived from imports

- **Toyota RAV4**
  - Nearly 250,000 expected from Japan this year

- **Toyota 4Runner**
  - Potential for North American sourcing
  - Not enough factory space for 150,000

- **Subaru Forester**
  - Only made in Japan
  - Subaru U.S. plant running at full speed
  - Strained production capacity in Japan

- **Subaru Crosstrek**
  - Related to the U.S. sourced Impreza
  - U.S. plant running at full-speed
  - Strained production capacity in Japan

- **Mazda CX-5**
  - Top selling Mazda product
  - Sourced from Japan

- **Hyundai Tucson**
  - Among the best selling Hyundai models
  - Sourced from South Korea

- **Kia Soul**
  - Sourced from South Korea
  - Low-cost hampers North American sourcing

- **Honda Civic**
  - Specialty models imported from U.K.
  - BREXIT - production justification still valid?

- **Jeep Renegade**
  - Globally sourced from Italian plant
  - Shares plant with related Fiat 500X

- **Subaru**
  - Subaru Crosstrek
  - Related to the U.S. sourced Impreza
  - U.S. plant running at full-speed
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  - Subaru U.S. plant running at full speed
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GLOBAL VEHICLE OUTLOOK
Global Light Vehicle Production
(2010 – 2026)

GLOBAL LIGHT VEHICLE PRODUCTION

Source: AutoForecast Solutions – January 2019
Global Segment Analysis

Global Segment Contribution

<table>
<thead>
<tr>
<th>Segment</th>
<th>2010</th>
<th>2018</th>
<th>2026</th>
</tr>
</thead>
<tbody>
<tr>
<td>Van</td>
<td>15%</td>
<td>10%</td>
<td>9%</td>
</tr>
<tr>
<td>Pickup</td>
<td>9%</td>
<td>12%</td>
<td>15%</td>
</tr>
<tr>
<td>SUV</td>
<td>4%</td>
<td>4%</td>
<td>12%</td>
</tr>
<tr>
<td>CUV</td>
<td>38%</td>
<td>59%</td>
<td>40%</td>
</tr>
<tr>
<td>PC</td>
<td>40%</td>
<td>23.50%</td>
<td>-3.87%</td>
</tr>
</tbody>
</table>

Segment Growth 2026 vs. 2018

<table>
<thead>
<tr>
<th>Segment</th>
<th>2018</th>
<th>2026</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Van</td>
<td>10%</td>
<td>9%</td>
<td>-1%</td>
</tr>
<tr>
<td>Pickup</td>
<td>12%</td>
<td>15%</td>
<td>3%</td>
</tr>
<tr>
<td>SUV</td>
<td>4%</td>
<td>4%</td>
<td>0%</td>
</tr>
<tr>
<td>CUV</td>
<td>59%</td>
<td>23.50%</td>
<td>14.50%</td>
</tr>
<tr>
<td>PC</td>
<td>40%</td>
<td>40%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Source: AutoForecast Solutions – January 2019
“1 Million Unit Club” Brand Owner Analysis (2018 vs. 2026)

MILLION UNITS OF GLOBAL PRODUCTION RANKING BASED ON 2026 POSITION

- Toyota Motor
- Renault-Nissan-Mitsubishi
- Volkswagen
- Hyundai Motor
- Ford Motor
- General Motors
- FCA
- Honda Motor
- Groupe PSA
- Daimler
- Geely Group
- BMW
- SAIC-GM-Wuling
- Mazda Motor
- Maruti Suzuki
- Tata
- Suzuki Motor
- Changan Auto
- Subaru
- Great Wall Automobile

Source: AutoForecast Solutions – January 2019

<table>
<thead>
<tr>
<th>Inductees Since 2010</th>
<th>2026 Producing Over 1 Million Units/year</th>
<th>Per cent of Total Global Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beijing Automotive Group</td>
<td>20%</td>
<td>90%</td>
</tr>
<tr>
<td>Great Wall Automobile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geely Group (with Volvo)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tata</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subaru</td>
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</table>

73% of total market
China – Vehicle Production Outlook

China Vehicle Production

<table>
<thead>
<tr>
<th>Year</th>
<th>Production (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>16.8</td>
</tr>
<tr>
<td>2011</td>
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<td>2012</td>
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<td>2013</td>
<td>26.0</td>
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<tr>
<td>2014</td>
<td>27.7</td>
</tr>
<tr>
<td>2015</td>
<td>30.0</td>
</tr>
<tr>
<td>2016</td>
<td>28.7</td>
</tr>
<tr>
<td>2017</td>
<td>28.7</td>
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<tr>
<td>2018</td>
<td>27.7</td>
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<td>28.7</td>
</tr>
<tr>
<td>2026</td>
<td>28.7</td>
</tr>
</tbody>
</table>

71% GROWTH

Vehicle Manufacturers in China by year

<table>
<thead>
<tr>
<th>Year</th>
<th>Manufacturers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>94</td>
</tr>
<tr>
<td>2018</td>
<td>113</td>
</tr>
<tr>
<td>2026</td>
<td>126</td>
</tr>
</tbody>
</table>

Brand Owners in China by year

<table>
<thead>
<tr>
<th>Year</th>
<th>Owners</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>75</td>
</tr>
<tr>
<td>2018</td>
<td>91</td>
</tr>
<tr>
<td>2026</td>
<td>105</td>
</tr>
</tbody>
</table>

Source: AutoForecast Solutions – January 2019
China: Fractured Decision Making

2026

% of Total Production in China by Brand

Volkswagen 10%
Geely 6%
Changan 5%
Honda 5%
Baojun 4%
Wuling 4%
Buick 4%
Ford 4%
Toyota 4%
Nissan 3%
OTHER 51%

2018

11%
5%
5%
4%
5%
5%
5%
5%
2%
4%
4%

50%

28.7 Million Units in 2026

10 Brands = 50% of Market

Each producing 1M+ units

22 Vehicle Manufacturers

60% have foreign ownership

Navigating the Decision Making Process
Geography, leadership, politics, regulation, language

Source: AutoForecast Solutions – January 2019
POWERTRAIN & ELECTRIFICATION
Global Light Vehicle Production by Fuel Type

2010
- Gas: 79.64%
- Diesel: 18.92%
- Hybrid - Gas: 0.94%
- Hybrid - Diesel: 0.01%
- Other Fuels: 0.45%
- BEV: 0.03%

2017
- Gas: 77.15%
- Diesel: 18.53%
- Hybrid - Gas: 2.69%
- Hybrid - Diesel: 0.17%
- Other Fuels: 0.45%
- BEV: 0.82%

2020
- Gas: 74.53%
- Diesel: 18.00%
- Hybrid - Gas: 4.02%
- Hybrid - Diesel: 0.31%
- Other Fuels: 0.45%
- BEV: 2.50%

2026
- Gas: 72.19%
- Diesel: 16.69%
- Hybrid - Gas: 5.39%
- Hybrid - Diesel: 0.32%
- Other Fuels: 0.62%
- BEV: 4.54%

Source: AutoForecast Solutions – January 2019
2026 BEV Market
AFS = 4.6 Million
Announced Plans = 6.4 Million
Optimist View = 10.4 Million

Battery Price Parity

Variance to Optimist Viewpoint

Variance to Outlook

BEV Production Outlook

Optimist Viewpoint

Legacy (Plan Variance)

Start-Up (Plan Variance)

Legacy VM (AFS Forecast)

Start-Up (AFS Forecast)

EVEN AN OPTIMISTIC VIEW REQUIRES NEARLY 90% OF VEHICLES TO HAVE AN ENGINE

Source: AutoForecast Solutions – January 2019
Electric Platform Production Volume

MILLIONS

<table>
<thead>
<tr>
<th>Year</th>
<th>Shared Platforms</th>
<th>Dedicated EV Platforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>75%</td>
<td>25%</td>
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<tr>
<td>2018</td>
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</tr>
<tr>
<td>2019</td>
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<td>2020</td>
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</tr>
<tr>
<td>2024</td>
<td></td>
<td></td>
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<tr>
<td>2025</td>
<td>52%</td>
<td>48%</td>
</tr>
<tr>
<td>2026</td>
<td></td>
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</tr>
</tbody>
</table>

Source: AutoForecast Solutions – January 2019

Data that drives tomorrow. February 2019
Differing OEM Viewpoints

**Electrification Adopters**
- Renault/Nissan
  - Nissan Leaf and NV200 EVs
  - Renault Kangoo, Zoe and Twizy EVs

- Volkswagen
  - New direction to avoid past diesel issues
    - Creating ID sub-brand to Volkswagen
    - “Electrifying” Audi, Porsche, and Bentley

- Most Chinese Manufacturers
  - Adding EVs
    - BAIC, BYD, Changan, Chery, Dongfeng, Geely, Jianghuai, Jiangling, SAIC, Zotye
  - Adding PHEVs
    - BYD, Chery, Dongfeng, FAW, GAC, Geely, SAIC

**The Resistance**
- Mazda
  - Reluctantly adding EVs and hybrids
  - Rather refine current technologies
    - CIDI gasoline engines
    - Growing diesel volumes

- FCA
  - Losing money on each hybrid and EV
    - Marchionne came out said not to buy Fiat 500 EVs
  - Recently started adding EV and hybrid programs

- Toyota – Sort of
  - Fully embracing hybrids
  - Avoiding EVs as much as possible
    - China forcing production
China BEV Market Sizing

Manufacturers Adding BEVs

- BAIC Motor (10)
- BAIC-Yinxiang (2)
- Beijing Benz (4)
- Beijing Hyundai (1)
- Beiqi Foton (2)
- Blue Sky NEV (5)
- BMW Brilliance (5)
- Brilliance Jinbei (1)
- BYD (5)
- BYD Daimler (1)
- CH Auto (1)
- Changan Auto (7)
- Changan Ford (1)
- Changan PSA (1)
- Chehejia (1)
- Chery (6)
- Chery-JLR (1)
- Chongqing Lifan (2)
- Dongfeng Honda (2)
- Dongfeng Limited (5)
- Dongfeng Motors (3)
- Dongfeng Nanchong (1)
- Dongfeng PSA (7)
- Dongfeng PV (1)
- Dongfeng Yu'an (1)
- Dongfeng Yueda Kia (1)
- Dongfeng-Luxgen (1)
- FAW Car (2)
- FAW Haima (1)
- FAW Jiqing (1)
- FAW Toyota (5)
- FAW Volkswagen (11)
- FDG Electric Vehicles (1)
- Fujian New Longma (1)
- Future Mobility (3)
- GAC Changfeng (3)
- GAC Honda (2)
- GAC Motor (5)
- GAC Toyota (6)
- Geely Group (23)
- Great Wall Automobile (3)
- Greenwheel (2)
- Guojin Auto (3)
- Haima Zhengzhou (2)
- Hawtai (2)
- HK Motors (1)
- Honda China (2)
- Hozon Auto (3)
- Jianghuai (7)
- Jiangjuai-VW (1)
- Jiangling Holdings (6)
- Kandi Electric Vehicles (1)
- LeapMotors (1)
- LeEco (1)
- Link Your (1)
- Nanjing Ivecco (1)
- NEVS (2)
- NIO (2)
- Qoros (2)
- SAIC Commercial (3)
- SAIC GM (2)
- SAIC GM Dongyue (2)
- SAIC Motor (2)
- SAIC VW (10)
- SAIC-GM-Wuling (2)
- Shanghai Maple (3)
- Sichuan Auto (3)
- South-east Automobile (3)
- Tesla (2)
- WM Motor (2)
- Xiapeng (1)
- Youngman Lotus (1)
- Youxia (1)
- Yudo Auto (2)
- Zotye Auto (3)
- Zotye-Ford (4)

Red Entries are OEMS only producing EVs

Some nameplates built by more than one OEM

2026 BEV Models

219
NAFTA +
THE GLOBALIZATION IMPERATIVE
NAFTA+ (2026)

Light Vehicle Platforms containing NAFTA production and at least one other country in ROW

GLOBAL PLATFORMS

- NAFTA+ 14%
- NAFTA 80%

423 Platforms produced worldwide

16 NAFTA+ Platforms

NA VOLUME

- NAFTA Only

14.4 Million NAFTA+ North America Volume

Source: AutoForecast Solutions – January 2019
NAFTA+ Opportunity/Risk (2026)

GLOBAL NAFTA+ PRODUCTION

- NAFTA: 28%
- ROW: 72%

GLOBAL LESS NA PRODUCTION

- NAFTA+: 43%
- ROW: 57%

52.4 Million
NAFTA+ Global Volume

37.6 Million
NAFTA+ volume Produced OUTSIDE North America

Source: AutoForecast Solutions – January 2019
FINAL THOUGHTS
Disruption: The Fine Line Between Risk and Opportunity

Balancing a fickle consumer with an impatient shareholder

All players are jockeying for position in a race with no clear finish line

The goal is to understand the opportunities, develop a value proposition to defend core operations, and identify areas for growth.
AutoForecast Solutions (AFS) provides vehicle, powertrain, and drivetrain production forecasting and advisory services to the global automotive industry.

AFS helps our customer...

**Understand** the opportunities

**Develop** a value proposition to defend core operations

**Identify** areas for growth.
Alternative Propulsion Applications

A. BAS: Belt Alternator Starter (BAS) or Belt Starter Generator (BSG)

B. Central: Battery Electric Vehicle’s (BEV) traction motor in place of a traditional ICE

C. Crankshaft: Traction motor mounted on the transmission side of the crankshaft

D. ISG: Traction motor mounted on the transmission input shaft

E. eTrans: Traction motor placed in or on the transmission housing, acting on the gearset

F. eDriveshaft: Traction motor propels the output shaft or driveshaft via drive chains or gears

G. eAxle (Reduction Gear): Traction motor added to, or integrated with, the differential

H. eAxleDD: Traction motor provides direct drive, attaching directly to the axle(s)

I. Hub: Traction motor mounted in wheel hub driving the wheel directly

Source: AutoForecast Solutions – January 2019
The Global Automotive Outlook

Opportunity Identification in a Disruptive Market

February 20, 2019

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