#disruptivemobility

Society of Automotive Analysts 2016 Outlook Conference
10 January 2016

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We’ve been here before

Henry Ford and the Model T

Source: media.ford.com (used with permission)
1920 was Peak Horse

U.S. Horse Population 1850-2000 (mn of equines)

Equines (mn)

1850 | 1870 | 1900 | 1910 | 1920 | 1930 | 1940 | 1950 | 1960 | 2000
---|---|---|---|---|---|---|---|---|---
5 | 8 | 22 | 24 | 25 | 19 | 14 | 8 | 3 | 4

Source: USDA, Kentucky Equine Research, Barclays Research
Cars, like horses, used for different “jobs to be done”

Mix of vehicles sold by use

- Transport: 54%
- Performance: 10%
- Status: 18%
- Work: 18%

Source: Barclays Research estimates
Some traditional vehicles remain for work and rural use

Four types of vehicles in the future

**Traditional Vehicles**

- limited self-driving capabilities
- work or personal use
  - work: pickups, large SUVs, commercial vans
  - personal: cars/CUVs, performance

**Rural areas (~20% of vehicles in use) remain traditional**

Flow: Family with two vehicles

- Home
- Work
- School
- Social

Source: Barclays Research

Note: US Households by density of census block (HH units per square mile)
Source: NHTS (National Household Travel Survey); Kim, Jinwon & Brownstone, David, “The impact of residential density on vehicle usage and fuel consumption”, 01/2010
Performance/status evolves to family autonomous vehicles

Four types of vehicles in the future

<table>
<thead>
<tr>
<th>Vehicles/household</th>
<th>Annual miles/vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>11,346</td>
</tr>
<tr>
<td>1.2 vehicles</td>
<td>22,692 miles</td>
</tr>
</tbody>
</table>

Flow: one vehicle shared by multiple family members

SAVs – “Uber without the dude”

**Four types of vehicles in the future**

**Shared Autonomous Vehicles (SAVs)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Annual miles/vehicle</th>
<th>Cost/mile ride to consumers per SAV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedan</td>
<td>11,346 miles</td>
<td>$0.29</td>
</tr>
<tr>
<td>Two seater</td>
<td>64,000 miles</td>
<td>$0.19</td>
</tr>
</tbody>
</table>

**7:1** traditional vehicles displaced per SAV

12% additional VMT due to empty trips

**Flow:** “robot taxis” with average wait time of 1min


Source: 40 Fires Foundation, used under a Creative Commons license, attribution 3.0 from http://www.40fires.org/
PSAVs “Uberpool without the dude”

Four types of vehicles in the future

Pooled Shared Autonomous Vehicles (PSAVs)

- Only solution to reduce VMT
- Greatest cost savings
- Can car pooling be cool?

<table>
<thead>
<tr>
<th>Sedan</th>
<th>Two seater</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.12 per mile ride cost to consumers per PSAV</td>
<td>$0.10 per mile ride cost to consumers per PSAV</td>
</tr>
</tbody>
</table>

Flow: “perpetual ride” with average wait time of 5min

Car parc falls by 60% and SAAR by 40%, with mass market down 70%

Future U.S. fleet vehicles and sales

<table>
<thead>
<tr>
<th>Vehicles in use</th>
<th>Annual U.S. light vehicle sales in millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>Pro Forma</td>
</tr>
<tr>
<td>Work Truck</td>
<td></td>
</tr>
<tr>
<td>Cars/CUVs</td>
<td>Pro Forma</td>
</tr>
<tr>
<td>Luxury</td>
<td>17.0 total</td>
</tr>
<tr>
<td>46</td>
<td>10.3 total</td>
</tr>
<tr>
<td>182</td>
<td>13.8 mass-market</td>
</tr>
<tr>
<td>28</td>
<td>3.2 luxury</td>
</tr>
<tr>
<td>66</td>
<td>4.4 mass-market traditional</td>
</tr>
<tr>
<td>22</td>
<td>3.7 SAV/PSAV</td>
</tr>
<tr>
<td>13</td>
<td>2.2 FAV</td>
</tr>
<tr>
<td>256 million current total</td>
<td>101 million pro forma total</td>
</tr>
</tbody>
</table>

Therefore we see...

...vehicles in use falling...light vehicle sales falling

~60%  ~40%

Source: LMC Automotive, Wards AutoInfoBank, Barclays Research estimates

Model is based on the following conservative assumptions:
- Vehicle sharing only feasible outside of rural areas
- Some cars are bought for reasons other than functional transportation
- No growth in population
Current plant footprint: 30 plants in North America

Ford and GM combined operate 30 assembly plants in North America

Source: IHS Automotive, Barclays Research estimates
Future plant footprint: 17 plants in North America

**Ford/GM capacity would need to be cut sharply for our new paradigm**

Source: IHS Automotive, Barclays Research estimates
Disruptors emerge in new structure

Will OEMs be Kodak or Verizon?

Disruptive Mobility Industry Structure

Suppliers → Traditional OEMS → FAV, Work Trucks → Transportation Network Companies → Consumers

New OEMS → SAVs → Fleet managers

Source: Barclays Research
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