Trends for the global auto supplier industry

IAA 2014

Roland Berger
Strategy Consultants

Hannover September 25, 2014
Roland Berger Strategy Consultants is a truly global firm – Dedicated Automotive Competence Center

Our profile

Founded in 1967 in Germany by Roland Berger

51 offices in 36 countries, with around 2,700 employees

About 250 RB Partners currently serving

~1,000 international clients
We serve clients along the entire automotive value chain – Dedicated commercial vehicle practice

Selected clients

**Passenger vehicles OEMs**
- BMW
- FIAT
- Volkswagen
- Audi
- Jaguar
- Land Rover

**Commercial vehicles OEMs**
- KOMATSU
- TATA
- MAN
- DAIMLER
- TRUCKS

**Suppliers**
- BOSCH
- MAGNA
- ZF
- Continental
- KAMAZ
- DENSO
- +GF+
- Valeo
- DELPHI
- FREIGHTLINER
- BROSE
- TRW
- BEHR
- Michelin
- Faurecia
- Dneprostpetstral

**Financial investors**
- cognetas
- Jefferies
- Ripplewood
- EQT
- Goldman Sachs
- CVC
- PAI partners
- Advent International

**Retail/services and mobility**
- Volkswagen Bank
- ATU
- Die Nr.1 Meisterwerkstatt
- BERGÉ
- MAHAG
- NÜRNBERGER VERSICHERUNGSGRUPPE
- Sixt
- TOYOTA FINANCIAL SERVICES
- Europcar
- DZ BANK
- The Carlyle Group

Source: Roland Berger
Contents

A. Looking back
   Five years of record profits for auto suppliers

B. Looking ahead
   An increasing number of challenges has to be managed

C. Future Growth in and beyond Europe
   Several success factors have to be considered
A. Looking back: Five years of record profits for auto suppliers
The industry is operating at a historically high margin level for quite some time. Positive results also expected for 2014

Supplier profitability 2001-2014e [%]

Source: Roland Berger Global Supplier Database
However, automotive suppliers generate far less margins than other industry sectors – But still more favorable ones than the OEMs

EBIT margin across selected industries¹)

- Healthcare
- Energy
- Machinery
- Aerospace & Defense
- Other industrial

Auto suppliers
Auto OEM's
Airlines

Source: Bloomberg; Roland Berger

¹) Top 100 publicly traded companies worldwide of each sector
Financial performance of suppliers varies greatly depending on region, company size, product focus and business model

Profitability trends in the global automotive supplier industry

<table>
<thead>
<tr>
<th>Region</th>
<th>Company size</th>
<th>Product focus</th>
<th>Business model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suppliers headquartered in <strong>Europe</strong> maintained an average EBIT margin of around 7%</td>
<td>Suppliers with <strong>&gt;EUR 10 bn</strong> revenues currently achieve the highest profitability of ~7%</td>
<td><strong>Chassis</strong> and <strong>tire-focused</strong> suppliers have strongest margins</td>
<td>&quot;<strong>Product innovators</strong>&quot; with stable above-average margins of ~7%</td>
</tr>
<tr>
<td>Japanese suppliers on average remain at a weaker profitability level</td>
<td><strong>Small/mid-sized suppliers</strong> (below EUR 1 bn revenues) with strongest margin decline since 2010</td>
<td><strong>Interior</strong> focused suppliers with strong additional margin reduction and overall lowest profitability level of below 5%</td>
<td><strong>Margin of &quot;process specialists&quot;</strong> below average</td>
</tr>
<tr>
<td>&gt; <strong>Chinese</strong> and <strong>Korean</strong> suppliers still have high margins, but ~3% drop versus 2010</td>
<td>&gt; Also <strong>powertrain</strong> suppliers still above average</td>
<td>&gt; 1%-point drop since 2010</td>
<td></td>
</tr>
</tbody>
</table>

Source: Roland Berger
NAFTA-headquartered suppliers improved their profitability compared to the pre-crisis 2007 level

Supplier EBIT margin by region 2012 vs. 2007 [%]¹)

> Europe-based suppliers benefit from leading technology positions in many segments and favorable customer mix

> NAFTA-based suppliers substantially restructured their business during the auto crisis

> Chinese-based suppliers are still leading-edge, but margin levels are gradually dropping due to intensified competition

¹) Bubble size represents revenue share

Source: Roland Berger Global Supplier Database
Small and mid-sized suppliers lost ground in recent years, while large globally operating suppliers maintained their high margins.

Supplier EBIT margin by company size (annual revenues) 2012 vs. 2007 [%]¹)

> Large multinational suppliers successfully benefited from the ongoing globalization

> Leveraging scale on the cost side clearly paid off over the past years

> Many small suppliers suffered from the growing cost of going global in recent years

¹) Bubble size represents revenue share; segment size <0.5 bn might be underrepresented as the underlying database does not cover suppliers <0.1 bn annual revenues

Source: Roland Berger Global Supplier Database
Chassis and Tire focused suppliers currently achieve the highest profitability. Interior suppliers remained significantly below average.

Supplier EBIT margin by product focus 2012 vs. 2007 [%]

1) Bubble size represents revenue share

> **Powertrain** margins reduced by intensified competition in this growing business

> **Exterior** suppliers improved, partly due to growing light-weight focus

> **Tire** suppliers clearly benefited from their strong aftermarket business

> **Interior** supplies continue to struggle with a high commoditization pressure
Product innovators have clearly outpaced process specialists in terms of profitability over the past years.

Supplier EBIT margin by business model 2012 vs. 2007 [%]\(^1\)

1) Bubble size represents revenue share

- Innovative products with **higher differentiation potential** and greater OEM willingness to pay
- High **entry barriers** through **intellectual property** in many innovation-driven segments
- **Competitive structure** more consolidated in innovation-driven segments
- **Higher fragmentation** in many process-driven segments drives price competition

Source: Roland Berger Global Supplier Database
Looking at the individual company level: A large number of suppliers outperform the global average margin levels

Distribution of suppliers based on EBIT margin 2012 vs. 2007 [%]

> Top performing suppliers are on average three times as profitable as their low performing peers

> The gap between top and low performing suppliers continues to widen over the past year

> However, a group of suppliers managed to substantially improve their performance since 2007

Source: Roland Berger Global Supplier Database
A significant number of suppliers have maintained their above-average profitability over a long period of time...

Distribution of suppliers based on EBIT margin 2012 vs. 2007 [%]

Source: Roland Berger Global Supplier Database
...while others even managed to improve their performance significantly over the past years

Distribution of suppliers based on EBIT margin 2012 vs. 2007 [%]

Source: Roland Berger Global Supplier Database
B. Looking ahead: An increasing number of challenges has to be managed
An increasing number of challenges needs to be mastered by automotive suppliers

Supplier CEO radar screen for 2014 and beyond

Note: Excluding product segment specific technology and operational issues

Source: Roland Berger
TRIAD markets have dramatically reduced their importance on the global Light vehicle market – Especially Western Europe

Light vehicle (LV) sales and production, 2002-2019 [m units, %]

<table>
<thead>
<tr>
<th>Sales</th>
<th>2002</th>
<th>2012</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>RoW</td>
<td>56.6 (100%)</td>
<td>79.5 (100%)</td>
<td>103.4 (100%)</td>
</tr>
<tr>
<td>BRIC</td>
<td>11%</td>
<td>17%</td>
<td>18%</td>
</tr>
<tr>
<td>Japan</td>
<td>30%</td>
<td>18%</td>
<td>15%</td>
</tr>
<tr>
<td>USA</td>
<td>29%</td>
<td>17%</td>
<td>14%</td>
</tr>
<tr>
<td>W.Europe</td>
<td>21%</td>
<td>23%</td>
<td>22%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>103.4</strong></td>
<td><strong>141.1</strong></td>
<td><strong>188.7</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Production</th>
<th>2002</th>
<th>2012</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>RoW</td>
<td>57.1 (100%)</td>
<td>81.5 (100%)</td>
<td>104.7 (100%)</td>
</tr>
<tr>
<td>BRIC</td>
<td>22%</td>
<td>27%</td>
<td>25%</td>
</tr>
<tr>
<td>Japan</td>
<td>17%</td>
<td>34%</td>
<td>42%</td>
</tr>
<tr>
<td>USA</td>
<td>21%</td>
<td>12%</td>
<td>7%</td>
</tr>
<tr>
<td>W.Europe</td>
<td>29%</td>
<td>15%</td>
<td>11%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>104.7</strong></td>
<td><strong>156.2</strong></td>
<td><strong>220.0</strong></td>
</tr>
</tbody>
</table>

Note: Triad including Western Europe (excl. Balkan States), Japan, USA; Light vehicle include passenger cars and light commercial vehicles (GVW < 6 to)

Source: IHS Automotive; Roland Berger
Compared to LVs, the regional change for CVs has been far less dramatic

MHCV\(^1\)) vehicle sales and production, 2002-2019 [m units, %]\(^2\)

<table>
<thead>
<tr>
<th></th>
<th>Sales</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.7 (100%)</td>
<td>1.9 (100%)</td>
</tr>
<tr>
<td>RoW</td>
<td>15%</td>
<td>11%</td>
</tr>
<tr>
<td>W.Europe</td>
<td>17%</td>
<td>20%</td>
</tr>
<tr>
<td>USA</td>
<td>19%</td>
<td>15%</td>
</tr>
<tr>
<td>Japan</td>
<td>5%</td>
<td>13%</td>
</tr>
<tr>
<td>BRIC</td>
<td>44%</td>
<td>41%</td>
</tr>
</tbody>
</table>

2019
|      | 3.7 (100%) | 3.1 (100%) | 4.3 (100%) |
| RoW  | 18%        | 14%        | 14%        |
| W.Europe | 9%    | 12%        | 13%        |
| USA  | 12%        | 9%         | 8%         |
| Japan | 3%         | 11%        | 11%        |
| BRIC | 58%        | 53%        | 53%        |

Source: IHS Automotive; Roland Berger

1) Medium and Heavy Commercial Vehicles  2) Triad including Western Europe, Japan, USA
All in all, European component volumes will grow relatively stable, but only due production growth in Eastern Europe.

Development of global automotive components market, 2013-2020 [EUR bn]

Source: Roland Berger market model
As a result, approximately 10% of the total 750 k Western European automotive supplier jobs are at risk.

Estimated impact on automotive supplier employment in Western Europe

- **Western Europe automotive supplier employment 2012**: ~750 k
- **High-level job split**
  - Operations: ~80%
  - R&D: ~10%
  - SG&A: ~10%

**Mid-term "misalignment"**

- **Operations**: ~10-13%
  - Adjustment to reduce current avg. supplier overcapacity (5-10%) and to compensate efficiency gains in the next 3-4 years in a more or less constant market

- **SG&A and R&D**: ~5-7%
  - Adjustment to reduced "volume grid"
  - Adjustment due to "re-location" of activities

**Employees at risk**

- **~75 k**
  - Highest "relative" impact: FR, IT, ES
- **~85k**
  - Highest "absolute" impact (due to large number of locations): GER

Source: Eurostat; VDA; ACEA; Roland Berger simulation
At the same time, BRIC markets have more than tripled their share in global car sales and production

Light vehicle (LV) sales and production, 2002-2012 [m units, %]

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2012</th>
<th>CAGR 02-12</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sales</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RoW</td>
<td>56.6</td>
<td>79.5</td>
<td>3.5%</td>
</tr>
<tr>
<td>BRIC</td>
<td>11%</td>
<td>23%</td>
<td>4.6%</td>
</tr>
<tr>
<td>Japan</td>
<td>10%</td>
<td>36%</td>
<td>16.4%</td>
</tr>
<tr>
<td>USA</td>
<td>30%</td>
<td>7%</td>
<td>-0.9%</td>
</tr>
<tr>
<td>W. Europe</td>
<td>29%</td>
<td>18%</td>
<td>-1.5%</td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>57.1</td>
<td>81.5</td>
<td>3.6%</td>
</tr>
<tr>
<td></td>
<td>22%</td>
<td>27%</td>
<td>5.9%</td>
</tr>
<tr>
<td>BRIC</td>
<td>11%</td>
<td>17%</td>
<td>15.7%</td>
</tr>
<tr>
<td>Japan</td>
<td>10%</td>
<td>21%</td>
<td>-0.4%</td>
</tr>
<tr>
<td>USA</td>
<td>30%</td>
<td>12%</td>
<td>-1.7%</td>
</tr>
<tr>
<td>W. Europe</td>
<td>29%</td>
<td>15%</td>
<td>-2.6%</td>
</tr>
</tbody>
</table>

Note: Triad including Western Europe (excl. Balkan States), Japan, USA; Light vehicle include passenger cars and light commercial vehicles (GVW < 6 to)

Source: IHS Automotive; Roland Berger
Of the world's top-10 OEMs, Volkswagen and Hyundai benefited most from growth in BRIC countries

LV sales incremental volumes BRIC and world market share with and w/o BRIC growth

Incremental volume 2002-2012 in BRIC [%]

World market share with and w/o BRIC growth

Note: Light vehicle include passenger cars and light commercial vehicles (GVW < 6 to)

Source: IHS Automotive; Roland Berger
For most global OEMs, China has become a key market contributing ~15% of total sales volume – With further increasing importance

China's share in total light vehicle sales volume by top 12 OEM groups [%]

<table>
<thead>
<tr>
<th>Year</th>
<th>Volkswagen Group</th>
<th>BMW Group</th>
<th>PSA Peugeot Citroën</th>
<th>Daimler</th>
<th>Hyundai-Kia</th>
<th>Honda</th>
<th>General Motors</th>
<th>Renault-Nissan</th>
<th>Toyota</th>
<th>Ford</th>
<th>Suzuki</th>
<th>Fiat/Chrysler</th>
</tr>
</thead>
<tbody>
<tr>
<td>'00</td>
<td>7%</td>
<td>31%</td>
<td>35%</td>
<td>7%</td>
<td>0%</td>
<td>0%</td>
<td>2%</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>'12</td>
<td>19%</td>
<td>25%</td>
<td>19%</td>
<td>2%</td>
<td>3%</td>
<td>3%</td>
<td>12%</td>
<td>11%</td>
<td>9%</td>
<td>4%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>'19</td>
<td>25%</td>
<td>23%</td>
<td>15%</td>
<td>15%</td>
<td>22%</td>
<td>22%</td>
<td>15%</td>
<td>15%</td>
<td>14%</td>
<td>14%</td>
<td>10%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Source: IHS
However, after a decade of solid growth rates in BRIC, in 2013 a turning point has been reached for all BRIC markets except China.

Light vehicle sales development, 2002-2013 BRIC [m units]

**Brazil**

<table>
<thead>
<tr>
<th>Year</th>
<th>2002</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>1.4</td>
<td>3.6</td>
<td>3.6</td>
</tr>
</tbody>
</table>

Note: Light vehicle include passenger cars and light commercial vehicles (GVW < 6 to)

**Russia**

<table>
<thead>
<tr>
<th>Year</th>
<th>2002</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>1.1</td>
<td>2.9</td>
<td>2.8</td>
</tr>
</tbody>
</table>

**India**

<table>
<thead>
<tr>
<th>Year</th>
<th>2002</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>0.8</td>
<td>3.3</td>
<td>3.0</td>
</tr>
</tbody>
</table>

**China**

<table>
<thead>
<tr>
<th>Year</th>
<th>2002</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>2.9</td>
<td>18.6</td>
<td>20.8</td>
</tr>
</tbody>
</table>

Source: IHS Automotive; Roland Berger
We expect all BRIC markets to return to a growth path medium term until 2019 – But with lower growth rates

Light vehicle sales development, 2002-2019 BRIC [m units]

**Brazil**
- 2002: 1.4 m
- 2013: 3.6 m
- 2015: 3.7 m
- 2019: 4.5 m

**Russia**
- 2002: 1.1 m
- 2013: 2.8 m
- 2015: 2.5 m
- 2019: 3.2 m

**India**
- 2002: 0.8 m
- 2013: 3.0 m
- 2015: 3.6 m
- 2019: 5.3 m

**China**
- 2002: 2.9 m
- 2013: 20.8 m
- 2015: 24.7 m
- 2019: 29.6 m

*Note: Light vehicle include passenger cars and light commercial vehicles (GVW < 6 to)*

*Source: IHS Automotive; Roland Berger*
An increasing number of challenges needs to be mastered by automotive suppliers

Supplier CEO radar screen for 2014 and beyond

Note: Excluding product segment specific technology and operational issues

Source: Roland Berger
BRIC markets will – With the exception of Russia – Basically be non-import markets

Light vehicle net export rate (based on production volume) BRIC, 2002-2019 [m units]

<table>
<thead>
<tr>
<th>Brazil</th>
<th>2002</th>
<th>2013</th>
<th>2015</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>-6%</td>
<td>-1%</td>
<td>-2%</td>
<td></td>
</tr>
</tbody>
</table>

- : Net exporter

- BRA developed from an import market to an export market
- Mostly low cost cars are produced in Brazil

<table>
<thead>
<tr>
<th>Russia</th>
<th>2002</th>
<th>2013</th>
<th>2015</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>-13%</td>
<td>-39%</td>
<td>-32%</td>
<td>-34%</td>
<td></td>
</tr>
</tbody>
</table>

- Car Production in Russia will stay on a low level
- Increasing vehicle demand cannot be covered through own production

<table>
<thead>
<tr>
<th>India</th>
<th>2002</th>
<th>2013</th>
<th>2015</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>3%</td>
<td>17%</td>
<td>19%</td>
<td>13%</td>
<td></td>
</tr>
</tbody>
</table>

- India has a (long) history in local car production by foreign brands
- India only export hub in the region, mainly driven by Hyundai with exports of ~250,000 units

<table>
<thead>
<tr>
<th>China</th>
<th>2002</th>
<th>2013</th>
<th>2015</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td></td>
<td>-1%</td>
<td></td>
<td>0%</td>
</tr>
</tbody>
</table>

- Very strong local car production hub
- China's import/export ratio is overall balanced, but historically high rate of premium brand imports is decreasing

Note: Net exports = Exports - Imports
Source: IHS Automotive; Roland Berger
OEMs continue to shift their production capacity toward emerging markets – Suppliers are required to follow

Global localization of suppliers – Example Europe

<table>
<thead>
<tr>
<th>LV production [m units]</th>
<th>Supplier sales [bn EUR]</th>
<th>Production footprint [# of plants]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>2012</td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>81</td>
<td>~81</td>
</tr>
<tr>
<td>49</td>
<td>66</td>
<td>~86</td>
</tr>
<tr>
<td>Outside Europe</td>
<td>Europe</td>
<td></td>
</tr>
<tr>
<td>+22%</td>
<td>+58%</td>
<td></td>
</tr>
<tr>
<td>+35%</td>
<td>+136%</td>
<td></td>
</tr>
<tr>
<td>-13%</td>
<td>+18%</td>
<td></td>
</tr>
</tbody>
</table>

Source: IHS; company information; press; Roland Berger/Lazard

1) Sample set of 19 suppliers (>EUR 1 bn annual sales) headquartered in Europe

OEMs continue to shift their production capacity toward emerging markets – Suppliers are required to follow
An increasing number of challenges needs to be mastered by automotive suppliers

Supplier CEO radar screen for 2014 and beyond

Note: Excluding product segment specific technology and operational issues

Source: Roland Berger
Emerging market suppliers are looking to strengthen their technology capabilities and overseas presence

Overview of selected recent M&A deals in the automotive supplier industry

<table>
<thead>
<tr>
<th>Acquirer (origin)</th>
<th>Target</th>
<th>Segment</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amtek</td>
<td>Kuepper Group</td>
<td>Castings</td>
<td>2014</td>
</tr>
<tr>
<td>TMT</td>
<td>ZF Boge</td>
<td>Rubber &amp; Plastics</td>
<td>2013</td>
</tr>
<tr>
<td>Ningbo Huaxiang</td>
<td>HIB Trim Parts</td>
<td>Decorative interior trim</td>
<td>2013</td>
</tr>
<tr>
<td>Amtek</td>
<td>Neumayer Tekfor</td>
<td>Machined metal parts</td>
<td>2013</td>
</tr>
<tr>
<td>Consortium of Chinese investors</td>
<td>IEE</td>
<td>Safety sensors</td>
<td>2013</td>
</tr>
<tr>
<td>Wanxiang Group</td>
<td>A123</td>
<td>Automotive battery technology</td>
<td>2013</td>
</tr>
<tr>
<td>Metalsa</td>
<td>ISE Automotive</td>
<td>Hinges, structural parts</td>
<td>2012</td>
</tr>
<tr>
<td>Bohong</td>
<td>Wescast Industries</td>
<td>Castings (focus: exhaust manifolds)</td>
<td>2012</td>
</tr>
<tr>
<td>Hebei Lingyun Industrial</td>
<td>Kiekert</td>
<td>Hatches and actuators</td>
<td>2012</td>
</tr>
<tr>
<td>Citic</td>
<td>KSM Castings</td>
<td>Light metal castings</td>
<td>2011</td>
</tr>
<tr>
<td>Bayraktarlar</td>
<td>Odelo</td>
<td>Automotive signal lights</td>
<td>2011</td>
</tr>
<tr>
<td>Ningbo Huaxiang</td>
<td>Sellner</td>
<td>Decorative interior trim</td>
<td>2011</td>
</tr>
<tr>
<td>Samvardhana Motherson Group</td>
<td>Peguform</td>
<td>Plastic parts &amp; modules for interior/exterior</td>
<td>2011</td>
</tr>
<tr>
<td>Joyson Holding</td>
<td>Preh</td>
<td>Electronics/switches</td>
<td>2011</td>
</tr>
</tbody>
</table>

At least one Chinese investor has typically been involved in each relevant M&A auction process

Source: Thomson; Merger Market; press research; Roland Berger/Lazard
An increasing number of challenges needs to be mastered by automotive suppliers

Supplier CEO radar screen for 2014 and beyond

Note: Excluding product segment specific technology and operational issues

Source: Roland Berger
An increasing number of challenges needs to be mastered by automotive suppliers

Supplier CEO radar screen for 2014 and beyond

Note: Excluding product segment specific technology and operational issues

Source: Roland Berger
Regulatory requirements push improvements in most regions – In Europe, NA and Japan, there is also a strong customer pull

Assessment CO₂ emission/fuel consumption regulation and customer pull

1. **Corporate CO₂ emission target** [g/km]
   - Europe: >15.1 km/l (2012), >20.3 km/l (2025)
   - Japan: 95 g/km (2012), 75 g/km (2025)

2. **Fuel efficiency targets** [km/l]
   - Europe: t.d.b.
   - Japan: 2020, 105 km/l (2020)

3. **Potential** [g/km] corporate CO₂ emission targets
   - Europe: 169 g/km (2013), 116 g/km (2020), 95 g/km (2025)
   - Japan: 178 g/km (2013), 132 g/km (2020), 101 g/km (2025)

4. **CAFE** [g/mi]
   - Europe: 266 g/mi (2013), 213 g/mi (2020), 163 g/mi (2025)

5. **Inovar – Auto energy efficiency increases** [MJ/km]
   - Europe: >2.07 MJ/km (2013), >1.82 MJ/km (2025)

**Customer pull**

- **Customer will only buy cars with most efficient/lowest CO₂ emission technology (medium term)**
- **Customer do not consider CO₂ emissions/consumption in purchase decision (medium term)**

1) Average weight depended CO₂ emission target
2) Example for passenger car
3) End customer pull for low CO₂ emission/low fuel consumption powertrain and/or alternative powertrains
4) No decision made yet

Source: FAW; EPA; EU; Inovar; Roland Berger
In Europe, all OEMs focus on ICE optimization and road load reduction to comply with 95 g target, but minor xEV is also required.

Assessment is based on potential CO₂ emission reduction in each car model of an OEM.

ICE optimization is most cost efficient lever for CO₂ emission reduction, followed by road load reduction, xEV least efficient cost benefit ratio.

Assumed changes in fleet structure:
- Limited shift towards smaller vehicle segments
- No change in average vehicle power
- No active shift in fuel shares in a model line

Credits for low CO₂ emitting vehicle are not considered.

Potential of ICE almost 100% leveraged – Further reduction need to come from xEVs.

Source: Roland Berger
In order to be compliant with the 2025 CO₂ emission targets (75 g/km), PHEVs will be main lever

Propulsion share forecast EU 2025 [% of sales] and rationale

Road load reduction

- Continuously improvements of weight, aero efficiency and tire will allow to reduce CO₂ emission by additional 5-6 g/km

ICE efficiency enhancement

- Potential of ICE was already utilized until 2020, only some minor additional potential – Factors like WLTP introduction or new exhaust gas emission standard will increase CO₂ emissions

Alternative fuels

- CNG will gain market share (major challenges infrastructure and customer information and acceptance are solved) – Almost all vehicles model lines with SOP 2019 or later will have CNG option
- But CNG will not become a standard fuel
- Long term tax benefits for a main stream fuel are questionable
- LPG will play only a niche role in aftermarket

Alternative propulsion

- Remaining high battery cost and high weight/size will hinder broad application of BEVs (Will gain importance for inner urban traffic)
- PHEVs will gain importance on a broad scale due to relatively good cost-CO₂ emission benefit ratio for OEM (assuming emission certification procedure remains)
- Advanced Micro and mild hybrids will gain importance as low cost solution offering both efficiency and functional benefits (customer willing to pay)

Source: Roland Berger
Low emission regulations are standard in all developed market – Emerging market will follow until 2020

Emission regulation commercial vehicles worldwide

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>EU V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EU VI</td>
<td></td>
<td></td>
<td></td>
<td>EU VII?</td>
<td></td>
</tr>
<tr>
<td>North America</td>
<td></td>
<td>EPA10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GHG Regulation</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>JP 09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>JP 16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Korea</td>
<td></td>
<td>EU V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Euro VI</td>
<td></td>
<td></td>
<td>EU VII?</td>
</tr>
<tr>
<td>Brazil</td>
<td>EU III</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EU V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EU VI?</td>
</tr>
<tr>
<td>Russia</td>
<td>EU III</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EU IV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EU V?</td>
</tr>
<tr>
<td>Main Cities</td>
<td></td>
<td>EU IV</td>
<td></td>
<td></td>
<td></td>
<td>EU V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EU VI?</td>
</tr>
<tr>
<td>Nationwide</td>
<td></td>
<td>EU III</td>
<td></td>
<td></td>
<td></td>
<td>EU IV</td>
<td></td>
<td>EU IV – requires catalyst fitment</td>
<td></td>
<td></td>
<td>EU V?</td>
</tr>
<tr>
<td>Beijing</td>
<td>EU IV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EU V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EU VI?</td>
</tr>
<tr>
<td>Nationwide</td>
<td></td>
<td>EU III</td>
<td></td>
<td></td>
<td></td>
<td>EU IV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>EU V?</td>
</tr>
</tbody>
</table>

Low emission regulation

Source: Roland Berger
In the CV area after exhaust gas emission reductions, new combustion engine technologies will improve thermal efficiency …

- Efficiency improvements:
  - Downsizing
  - Improved injection
  - Improved combustion control (e.g. partial HCCI)
  - Thermal management
  - Friction reduction
  - On demand auxiliaries
  - Exhaust waste heat recovery
  - etc.

- Emission reductions:
  - NOx
  - PM

1) Compared to EURO III
2) Compared to EPA ’04
3) Compared to JP ’03
4) Homogenous Diesel combustion
5) Without improvement truck

Source: Interviews; Roland Berger
… while the use of Natural Gas, Hybrids and EVs will further emerge

**Diesel** (incl. Gasoline)

- Conventional fuels (Diesel and Gasoline) are expected to decrease by 2025
- Small operators will stick to Diesel

**Natural Gas** (CNG/LNG)

- New potentials for Natural Gas are emerging driven by low commodity prices and emission advantages
- Limited due to infrastructure requirements

**Hybrid and EV**

- Opportunities for Hybrid also in long-haulage
- Full Electric only for city transportation

Note: Min-max ranges based on current forecasts
To support the reduction of fatality targets, the regulatory framework related to safety applications will become more strict.

Increasing safety regulations in Europe – Selected examples

Safety regulation roadmap

- Within last decade focus of regulations shifted towards pedestrian protection – introduction within two phases:
  - Phase 1 contains impact on adult head and lower leg form
  - Phase 2 adds impact on child head and hips

- Mid-term focus on passive safety systems
- Further mandatory implementation of driver assistance systems currently under discussion

<table>
<thead>
<tr>
<th>2005</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passive safety</td>
<td>Active safety</td>
<td>Passive safety</td>
<td>Active safety</td>
</tr>
<tr>
<td>Pedestrian protection I</td>
<td>Electronic Stability Control</td>
<td>Pedestrian protection II</td>
<td>Autonomous braking(^1)</td>
</tr>
<tr>
<td>Daytime running light</td>
<td>Intelligent speed assistance systems</td>
<td>Lane departure warning(^1)</td>
<td></td>
</tr>
<tr>
<td>Tire Pressure Monitoring Systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>eCall</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: EC; ETSC; Roland Berger

1) For heavy duty vehicles only

Not finally decided
Commercial Vehicle automated driving will further develop – Highly automated driving is expected for 2025

Market drivers

**Regulation pressure**
- ESC\(^1\) 11/2014
- LDWS\(^2\) from 2015
- AEBS\(^3\) from 2015/18

**Reduction TCO\(^4\)**
- Improve driver productivity
- Reduce fuel costs (e.g. platooning)

Stages of automated driving

**Warning information**
- Lane departure warning
- Blind spot detection
- Collision warning

**Assist functions**
- Adaptive cruise control
- Autonomous emergency braking
- Lane keeping assist
- Lane change assist

**Partly automated driving**
- Platooning
- Automated highway driving for selected situation

**Highly automated driving**
- Full automated highway driving

**Autonomous driving**
- Fully automated driving highway, rural roads, city

1) ESP = Electronic Stability Control 2) LDWS = Lane Departure Warning System 3) AEBS = Advanced Emergency Breaking System 4) Total cost of ownership
Push and pull factors drive the penetration of connectivity solutions

**Push factors**

- Regulatory pressure (e.g. emission reduction, road safety, inner-city restriction)
- Decreasing technology costs, overcome limitations (e.g. data storage, M2M communication)
- Deteriorating OEM margins, need for new profit pools
- Competitive pressure, demand for differentiation by innovation

**Pull factors**

- Customers' demand for more sophisticated trucks (e.g. efficiency, comfort, uptime)
- Focus on total cost of ownership and fleet transparency
- Complexity, amount and intrinsic value of data
- Increasing demand for telematics in emerging markets

**CV fleet telematics market [USD bn]**

- 2012: 7.3
- 2018e: 26.8

+270%

Source: ABI Research; Roland Berger
An increasing number of challenges needs to be mastered by automotive suppliers

Supplier CEO radar screen for 2014 and beyond

Note: Excluding product segment specific technology and operational issues

Source: Roland Berger
An increasing number of challenges needs to be mastered by automotive suppliers

Supplier CEO radar screen for 2014 and beyond

Note: Excluding product segment specific technology and operational issues

Source: Roland Berger
An increasing number of challenges needs to be mastered by automotive suppliers

Supplier CEO radar screen for 2014 and beyond

Note: Excluding product segment specific technology and operational issues

Source: Roland Berger
C. Future Growth in and beyond Europe
The recipe for success: Five key success factors for future growth

1. Strong efforts to maintain/increase USP and *technological differentiation and innovation*

2. Focus on product segments with above-average *growth rates and margin potential*

3. Anti-cyclical *efficiency improvement* efforts (overheads, plant locations, …)

4. Strong increase of *production and engineering footprint* in Eastern Europe and outside TRIAD markets

5. Good *organization* of processes and structures in globalized setups

Source: Roland Berger
It's character that creates impact!