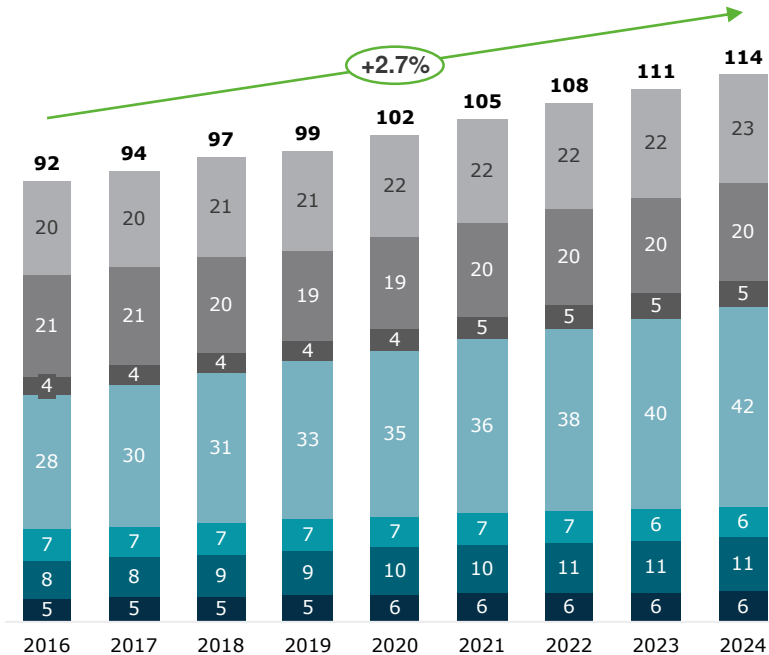


Automotive Study 2017 – European version

July 2017

Global auto market forecasted to grow at 2.7% p.a. to 2024 below global GDP forecast: Growth continues to be driven by China

Light vehicles sales volume 2016 to 2024 [# m]



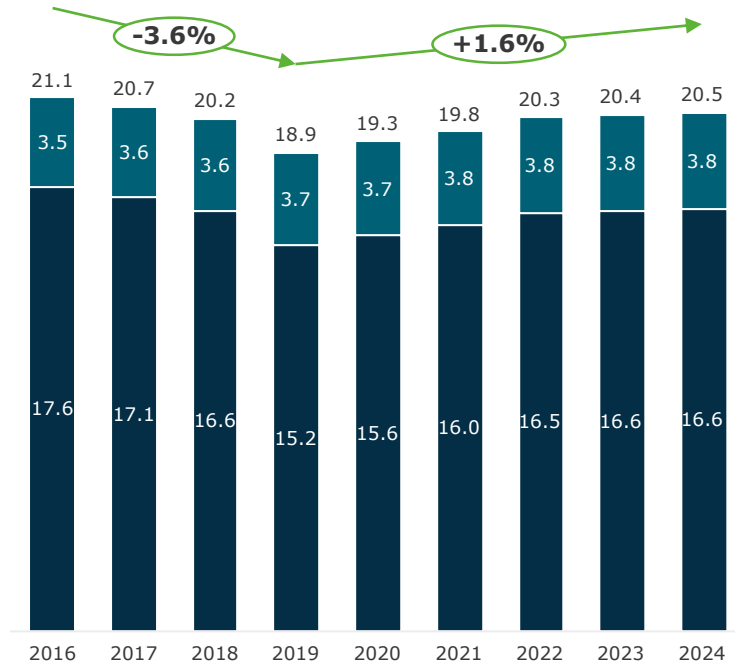
	CAGR (2010 to 2016)	CAGR (2016 to 2024)	Units (Delta m)	
Total	4.0%	2.7%	22.3	
Europe	1.2%	1.7% ▲	2.8	Growth driven from Russia and other non-Western Europe growing countries.
North America	7.1%	(0.4%) ▼	(0.6)	Growth slowdown as market passes cyclical peak
South America	(4.6%)	4.3% ▲	1.6	Growth mainly dependent on Brazil
Greater China	8.4%	5.2% ▲	14.0	Slowing down growth rate in line with macroeconomic trend and convergence to the level of mature markets
Japan/Korea	0.6%	(0.4%) ▼	(0.2)	Decline in line with demographic trend and weak macro economy
South Asia	3.7%	4.5% ▲	3.3	Growth from emerging markets, however from lower absolute levels
MEA	(0.8%)	3.2% ▲	1.4	

Source: AlixPartners Analysis @ 2017 (China, US, Japan, Germany, India, France, UK, Italy, Brazil, South Korea, Russia, Iran, South Arabia) - IHS March 2017 Release (Rest of the World)

Notes: Greater China: China, Hong Kong, Taiwan; South Asia: Australia, India, Indonesia, Malaysia, New Zealand, Pakistan, Philippines, Singapore, Thailand, Vietnam; MEA: Algeria, Bahrain, Egypt, Iran, Israel, Kuwait, Morocco, Oman, Qatar, Rest of World, Saudi Arabia, South Africa, Tunisia, United Arab Emirates. North America: United States, Canada, Mexico

US and North America market has moved past a 2016 cyclical peak, with declines expected through to 2019 before growth picking up

Light vehicles sales volume 2016 to 2024 [# m]



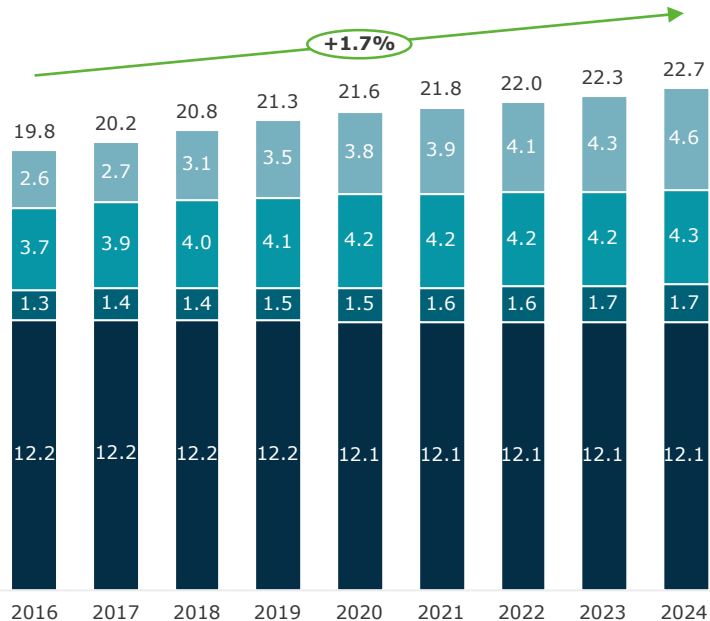
Source: AlixPartners Analysis @ 2017 (US) - IHS March 2017 Release (Canada, Mexico)

Notes: North America: United States, Canada, Mexico

	CAGR (2016 to 2024)	Units (Delta m)	
Total	(0.4%)	(0.6)	
Rest of North America	1.0% ▲	0.3	In 2018 the Rest of North America will start to recover its automotive market that was impacted by a modest decrease due to the lower demand from US
United States	(0.7%) ▼	(0.9)	<p>2016 cyclical peak as positive economic factors fail to add further demand through to 2019, and market moved from demand-pull to over-supply push</p> <p>Used car price drops c.10% and modest interest rate increases take buyers away from new cars</p> <p>In 2017, sales are down 2% YTD (-12% for cars and +5% for light trucks)</p> <p>Broad-based recession could drive further deterioration in sales outlook, but a rebound and acceleration of economic growth above 2% likely to mute the down-turn</p>

Western Europe mature market expected to stay stagnant, we expect modest growth of 1.7% p.a. mostly driven by Eastern countries

Light vehicles sales volume 2016 to 2024 [# m]



	CAGR (2016 to 2024)	Units (Delta m)	
Total	1.7%	2.8	
East	7.3% ▲	2.0	Recovery forecast led by Russia and Turkey
South	1.9% ▲	0.6	Further recovery of Mediterranean markets, after 4 years at 10%pa, following bottom peak in 2012
Central	2.9% ▲	0.3	Growth forecast driven by economic growth
West	(0.1%) ▼	(0.1)	Auto volumes are expected to stagnate in the major markets, with political crises (Brexit, EU) under-mining trust and trading conditions, and increasing uncertainty for OEMs

Source: AlixPartners Analysis @ 2017 (Germany, France, UK, Italy, Russia) - IHS March 2017 Release (Rest of Europe)

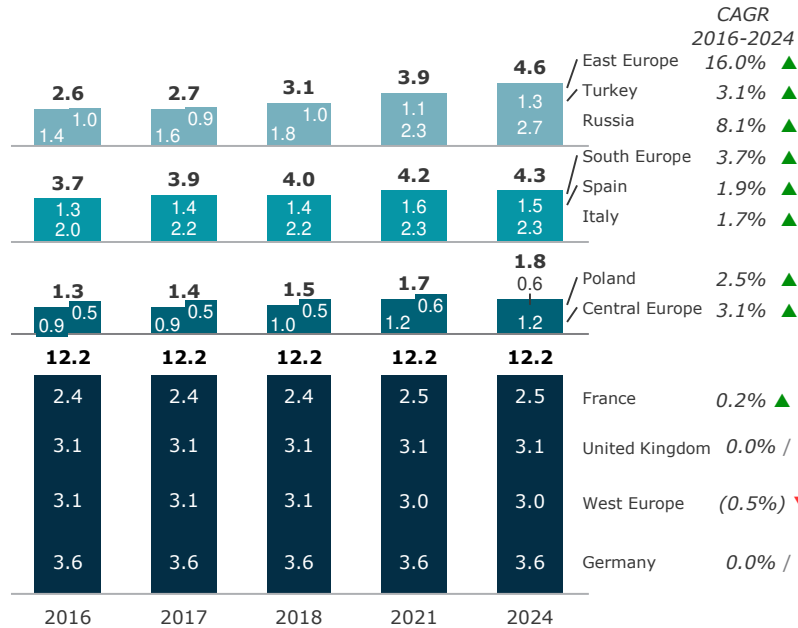
Notes: West Europe: Austria, Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxemburg, Malta, Netherlands, Norway, Sweden, Switzerland, United Kingdom

Central Europe: Bosnia, Bulgaria, Croatia, Estonia, Hungary, Latvia, Lithuania, Macedonia, Poland, Romania, Serbia, Slovakia, Slovenia

South Europe: Greece, Italy, Portugal, Spain; East Europe: Belarus, Kazakhstan, Russia, Turkey, Ukraine, Uzbekistan

Politics to be a major driver in Russia (public aid growth) and in UK (negative Brexit impact) while volumes shall be stagnant in West EU

Light vehicles sales volume 2016 to 2024 [# m]



	CAGR (2016 to 2024)	Units (Delta m)	
Total	1.7%	2.8	
East	7.3% ▲	2.0	Russia growth is driven by normalization of UKR/RUS crisis and strong public aid for automotive sector
South	1.9% ▲	0.6	GDP in Spain is expected to grow 2% to 2020, in Italy signs of economic recovery are visible (e.g. unemployment down 2.7% in 2016)
Central	2.9% ▲	0.3	Poland GDP is growing at +3% to 2020, while unemployment was 9% in 2014 and is expected to be ~6% in 2017-2020
West	(0.1%) ▼	(0.1)	In a mid-to-hard Brexit scenario, UK market is expected to suffer and remain stagnant in the next years due to uncertainty, decreasing purchasing power of households for economic downturn and currency FX. German is expected to stagnate. In France, a peak might be reached in 2020, followed by stagnation

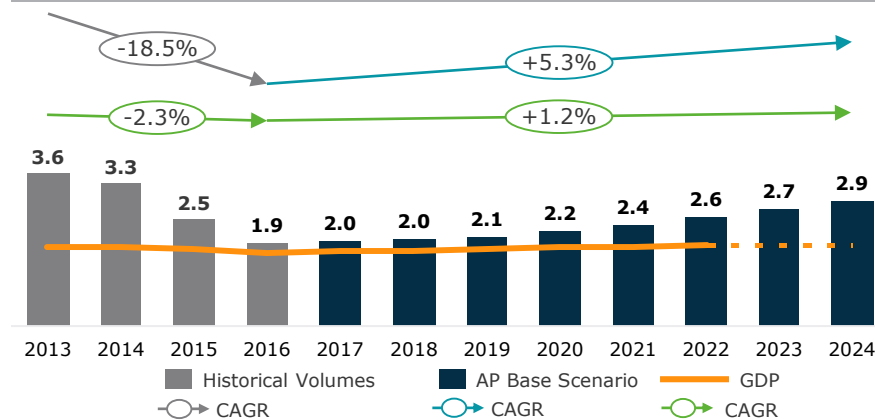
Source: AlixPartners Analysis @ 2017 (Germany, France, UK, Italy, Russia) - IHS March 2017 Release (Rest of Europe)

Notes: West Europe: Austria, Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxemburg, Malta, Netherlands, Norway, Sweden, Switzerland, United Kingdom Central Europe: Bosnia, Bulgaria, Croatia, Estonia, Hungary, Latvia, Lithuania, Macedonia, Poland, Romania, Serbia, Slovakia, Slovenia, South Europe: Greece, Italy, Portugal, Spain; East Europe: Belarus, Kazakhstan, Russia, Turkey, Ukraine, Uzbekistan

Brazil and Russia have reached bottom of the market, from here we expect recovery well above GDP but not reaching pre-crisis levels by 2024

Light vehicles sales volume 2016 to 2024 [units m] – AlixPartners Base Case

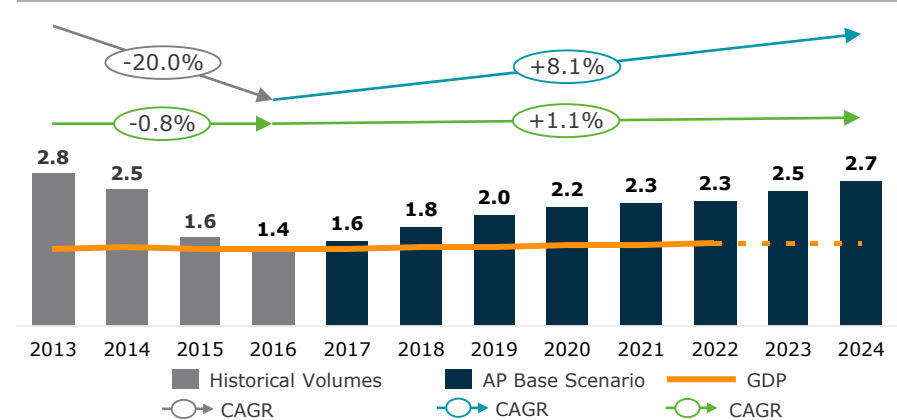
Brazil



Following mid 2016 impeachment and new agenda of reforms there are signs of slow recovery: in January 2017 employment positive. 2017(Exp.): inflation at 4% (vs 10% 2016) and interest rates reducing; GDP 0.5%.

Auto Volumes: Expected a slow recovery in volumes, but not as fast as in 2008-2011.

Russia



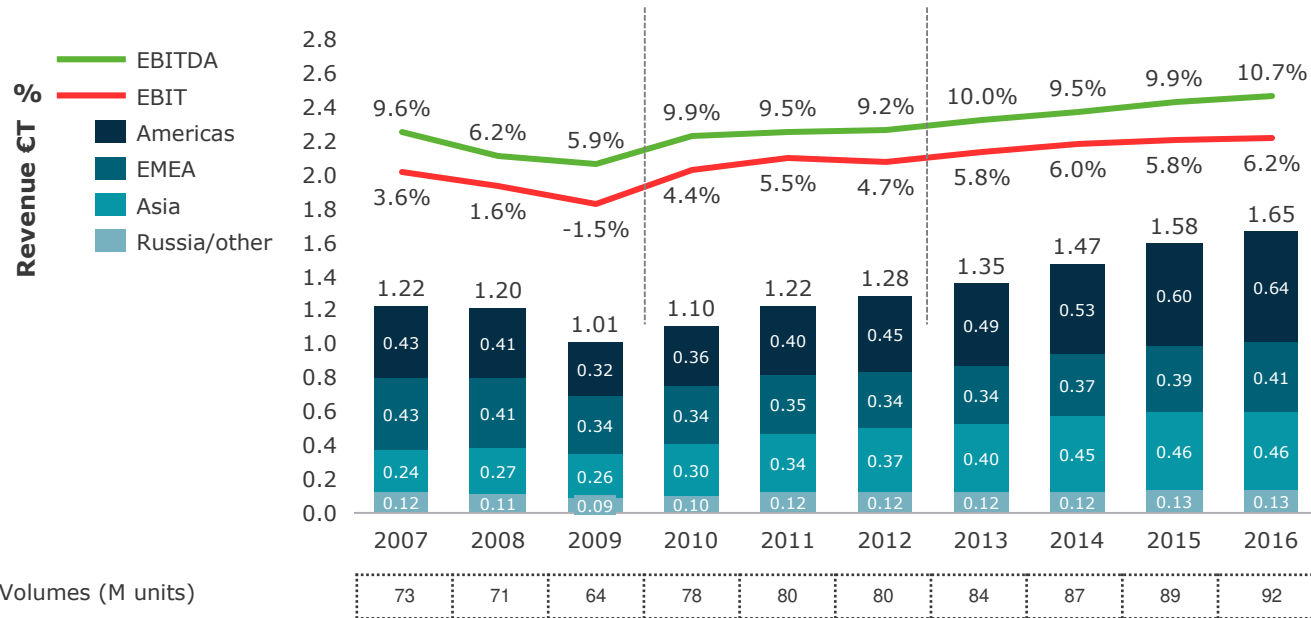
Normalization of crisis with Ukraine along with public aid to the industry are expected to drive a recovery in the auto volumes

Announcement of new program of auto industry support from Russia's Industry Ministry to 64 billion rubles in 2017 from 50 billion in 2016

Daimler already announced investments of >€250 million for manufacturing capacity of 20,000 units. The new plant will be the company's first factory to produce passenger vehicles in Russia

OEMs are in a strong position with revenues and profit at a 10 year high driven by Asian & American OEMs

Top 25 OEM Revenue (€Trillion), EBITDA (%), & EBIT (%) – 2007 to 2016



Insights

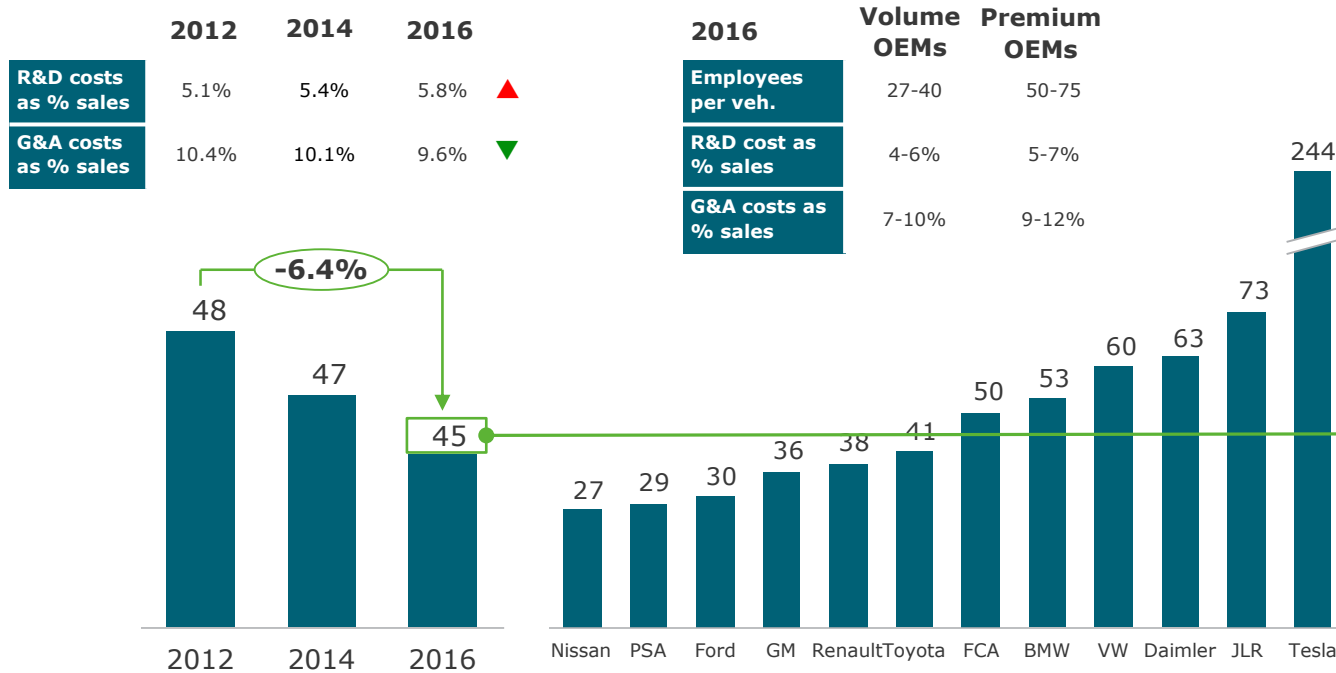
- Overall, OEM revenues recovered since the 2007 crisis and continued to grow through 2016
- Overall EBIT% up by c.0.5% to 6.2% in 2016. Better cost management and higher OEM volume in 2016 driving this trend
- Recovery of negative growth from OEMs in all regions (except Asia) in the 3 years post (2007 to 2009) crisis
- Asia growth fastest from 2007 to 2016 (7% CAGR)
- However, 2013 to 2016 growth in Asia slower than the 2010 to 2012

OEMs included: BMW, Chongqing Changan, DaimlerBenz, FCA, Ford, GM, Great Wall Motor, Honda, Hyundai, Isuzu, Kia, Mazda, Mitsubishi, Nissan Motors, PSA, Renault, SAIC, Suzuki, Tata, Tesla, Toyota, Volkswagen

Source: FT, Capital IQ, AlixPartners analysis

Last five year ave. has seen 6% efficiency gain in resources from 48 to 45 employees per 1k veh. across the panels of OEMs

Employees per Thousand of Vehicles Sold for Selected Automotive OEMs



Insights

- In the past five years the number of resources per thousand vehicles sold diminished consistently across the selected panels of OEMs
- With this, the level of G&A costs has decreased, indicating a continuous striving for efficiency and productivity
- R&D costs show an opposite trend, rising consistently due to increasing technical content and innovation
- Wide variation between Volume versus Premium OEMs driven by level of innovation and technical content of product mix, rather than efficiency
 - Scale also a factor driven by requirement to build technical support capability to drive innovation and new vehicle content, with headcount and costs spread across lower volumes

OEMs in the panel: Nissan, PSA, Ford, GM, Renault, Toyota, FCA, BMW, Volkswagen, Daimler, JLR
 Sources: company websites

€180bn capex + R&D: OEMs with premium portfolio spending double the investment per car vs volume OEMs – This is not a sustainable position

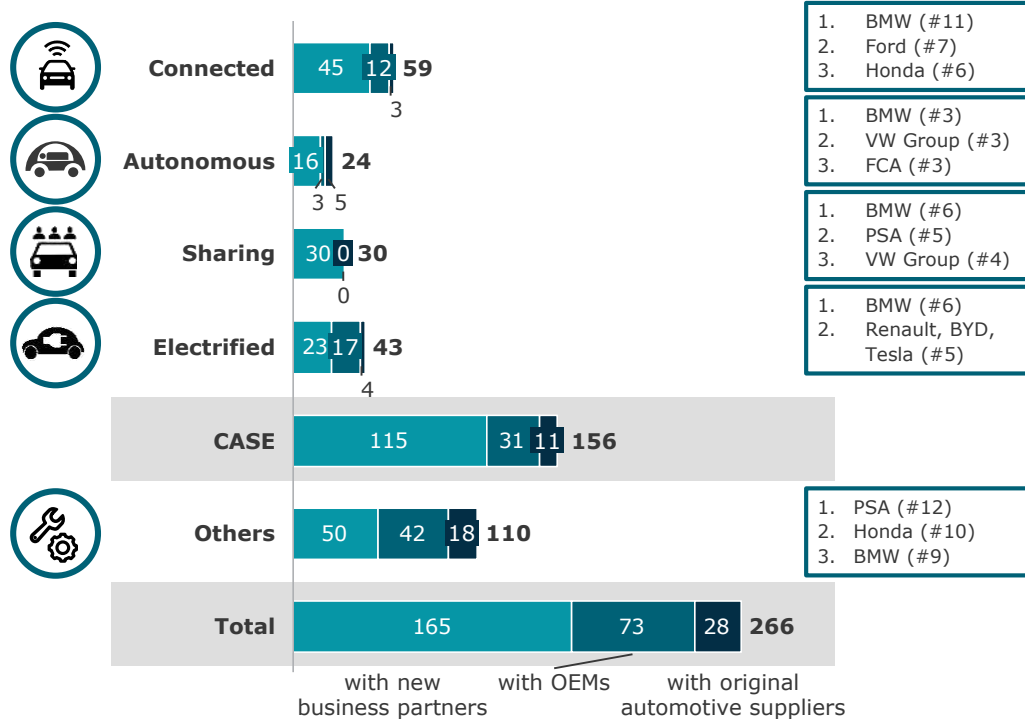
Investments in CAPEX and R&D per OEM, FY16

OEM	Revenue	Units	EBITDA	EBIT	CAPEX	R&D expenses	Investment (CAPEX/R&D)	Investment (CAPEX/R&D)
	€ b	m units	%	%	€ b	€ b	€ b	€/car
VW	213	9.9	7.8%	3.5%	13.2	11.9	25.1	2,524
Toyota	211	9.7	15.3%	10.1%	26.0	7.8	33.8	3,489
GM	140	9.9	9.0%	4.5%	21.2	6.9	28.1	2,840
Ford	138	6.3	10.7%	5.4%	6.6	6.2	12.8	2,044
Renault-Nissan	134	8.1	8.9%	5.1%	15.1	5.3	20.4	2,517
Hyundai-Kia	111	7.6	8.3%	6.2%	9.4	1.5	10.9	1,442
FCA	110	4.7	6.8%	3.0%	6.3	2.9	9.2	1,953
Honda	103	4.6	8.4%	5.0%	5.0	4.7	9.7	2,115
Daimler	95	2.3	14.8%	9.2%	5.9	5.1	11.0	4,791
BMW	92	2.3	13.9%	10.1%	5.9	4.3	10.2	4,516
PSA	55	3.0	8.2%	5.0%	1.6	1.9	3.5	1,172
JLR	28	0.5	14.9%	7.2%	3.5	0.4	3.9	7,317
Suzuki	23	2.7	10.4%	5.9%	1.5	1.0	2.5	915
Total	1,457	72.0	10.7%	6.2%	120	61	181	2,518

1. Exchange rate GBP/EUR: 1.25
Source: Capital IQ, AlixPartners Analysis

2016 saw 266 OEM partnerships: New CASE tech. driving market entry for new players in the supplier business (115 / 43% of all partnerships)

Numbers of OEM partnerships entered since 2016 by category [#]



Insights

- New technologies (CASE) driving OEMs to form partnerships
 - AUDI, BMW, Daimler, Ericsson, Huawei, Intel, Nokia and Qualcomm, announce the formation of the "5G Automotive Association" which will develop, test and promote communications solutions - *CONNECTED*
 - Volvo Car Group has agreed to a \$300-million alliance with Uber to develop self-driving cars - *AUTONOMOUS*
 - Uber has partnered with BMW and Nissan to bring Johannesburg UberGREEN, using electric vehicles on the Uber platform - *SHARING*
 - Ford, Daimler, BMW and Volkswagen (Audi & Porsche) to create high power charging stations on major European highways - *ELECTRIFIED*
- This partnerships are primarily established with companies outside of the original automotive business, new business partners are especially found in:
 - Telecommunication/Telematics industry
 - IT/Software industry
 - Mobility service provider
 - Utilities & EV charging system manufacturer
- German and French OEMs are the most active on forming CASE partnerships with 16 and 10 partnerships per OEM respectively

Source: AlixPartners research

Significant impact on the system level revenue as electric and autonomous vehicle volumes increase

Heat map of C.A.S.E impact on revenue by OEM commodity area

Electrical Systems

AV / ADAS	Audio / Telematics	Chassis Controls
Anti-Theft / KE	Vehicle Start / Stop	Rear Seat Entertainment
Driveline Suspension Ctrl.	Power Distribution	Driver Infor. Systems
Power Door	HVAC, Light. Other Elec. Ctrls	Sensors & Appl. Software

Interior Systems

Climate Control Systems	Cooling Systems	Acoustic/Carpet
IP	Overheads	Restraints
Hard Trim	Door Trim	Steering

Significant Upside

Small Change

Significant
Downside

New Systems

Body / Exterior Systems

Body Hardware	Sealing / Insulation /NVH	Body Closures / Sheet Metal	Deck Lid / Tail Gate	Bed Liners (Opt.)	Lighting
Glass	Exterior Ornamentation	Bumper System / FE Module	Paint & Other	Wiper Systems & Cowl Screen	Adv. Driver Safety Systems
Roof Systems	Door Module	Window Systems			

Chassis Systems

Tire & Wheel Systems	Suspension Systems	Steering Systems
Linkages & Pedal Systems	Fuel Vapor Systems	Foundation Brake Systems
Frames	Exhaust System	Mount Systems

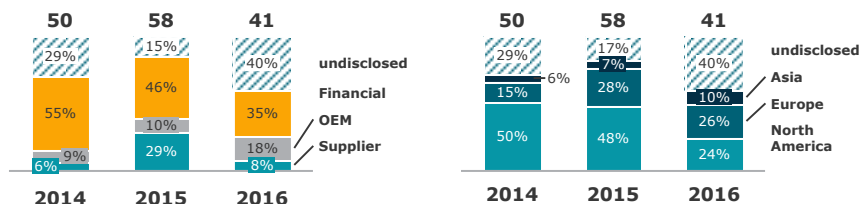
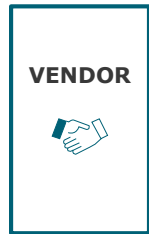
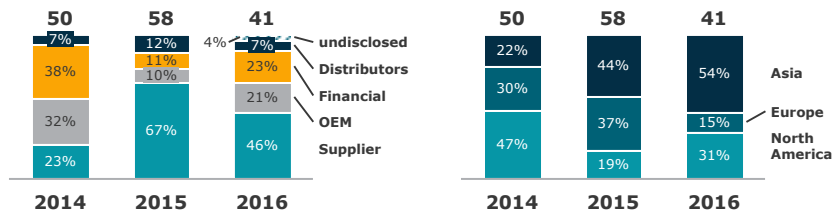
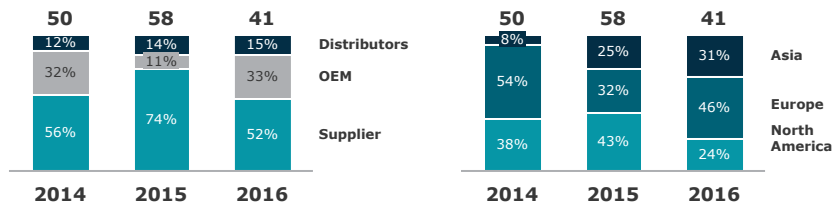
Powertrain I Systems

Air Induction Systems	Engine	Exhaust System
Driveline System	Charging	Transmission
Fuel System.	EV Software	Ignition System
Starting System	Battery / Inverter	E-Motor / Inverter System

Source: AlixPartners research

2016 M&A transactions mainly driven by Asian Strategic Investors buying in the European supplier industry

M&A transaction value (base 100%) per party involved & origin [€billion]



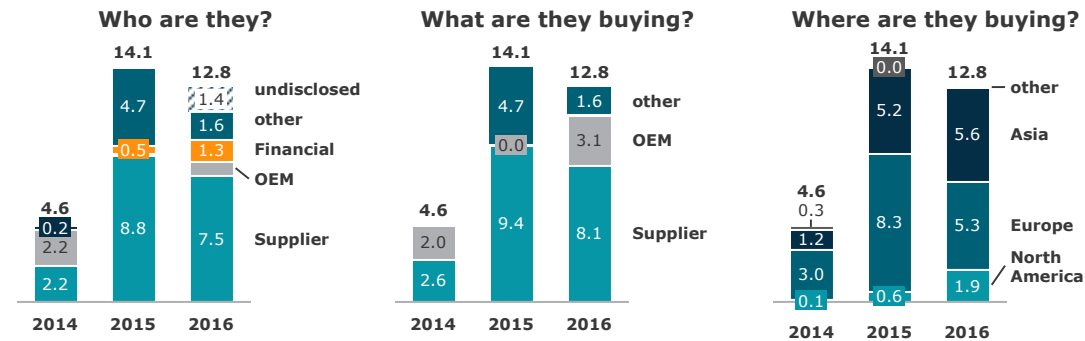
Insights

- Automotive suppliers are the main target group for investment activities followed by OEMs and distributors
- North American companies seem to become less attractive for potential investors
- Investment appetite of Financial Institutions and OEMs significantly declined over the last years
- Investments by Asian companies have doubled since 2014
- North American and European investment activities have dropped clearly over the last years
- Share of Financial vendors declining but still very high
- Divestment activities by American companies dropped significantly from 2014 to 2016
- Asian divestment activities historical very low

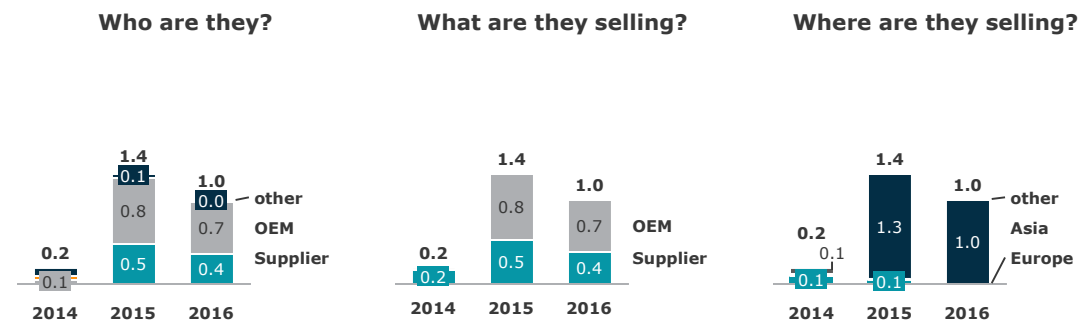
Source: AlixPartners research, Merger Market, S&P Capital IQ, structural analysis based on sample with coverage of 79%-86%

Chinese investors, especially suppliers, continuing to buy assets (mostly other suppliers) mainly in Europe and Asia

Chinese investors [€billion]



Chinese vendors [€billion]



Source: AlixPartners research, Merger Market, S&P Capital IQ

Insights

- Investments made by Chinese companies almost tripled over the last three years
- Chinese suppliers with the highest appetite to buy other companies, mainly automotive suppliers in Europe and Asia
- Chinese investors starting to invest more and more in Asian based companies
- Deal highlights 2016 Chinese market:
 - China Grand Automotive bought Baoxin Auto Group for €1.6 billion (both distributors)
 - SAIC Motor Corp. invested €0.8 billion in parts supplier Huayu Automotive Sys.
 - Undisclosed bidder invested €0.5 billion in Zhiche Auto, a china-based intelligent vehicle maker
- Overall divestment activities by Chinese companies are relatively small compared to the investment activities
- Divestments are primarily done by OEMs and suppliers and focused on Asian based companies









TOP 5 M&A transaction per year

Deal value [€m]

Year	Target/Issuer	Transaction value €m	Buyers/Investors	Investor type	Investor Origin	Sellers	Seller type	Seller Origin	Target type	Target Origin
2014	ZF TRW Automotive Holdings	10.514	ZF Friedrichshafen	Strategic - Supplier	Germany	T. Rowe Price Group; Fidelity Investments; others	Financial	USA	Supplier	USA
2014	Anhui Jianghuai Automobile Group	7.155	Anhui Jianghuai Automobile Group	Strategic - OEM	China	JIC Investment; Anhui Jianghuai Automobile Group Holdings; others	Financial	China	OEM	-
2014	Pinafore Holdings	5.486	The Blackstone Group	Financial	USA	Onex Corporation; Canada Pension Plan Investment Board; Pinafore Coöperatief U.A.	Financial	Canada	Supplier	Netherlands
2014	Hanon Systems	3.132	Hankook Tire; Hahn & Co. Auto Holding	Strategic - Supplier	South Korea	VIHI	Strategic - Supplier	USA	Supplier	South Korea
2014	Schrader International	745	Sensata Technologies	Strategic - Supplier	Netherlands	Madison Dearborn Partners	Financial	USA	Supplier	USA
2015	GETRAG	2.357	Magna International	Strategic - Supplier	Canada	-	-	-	Supplier	Germany
2015	PIRELLI	1.909	China National Tire & Rubber; The Silk Road Fund	Strategic - Supplier	China	CAMFIN	Strategic - Supplier	Italy	Supplier	Italy
2015	Armored Autogroup Parent	1.258	Spectrum Brands Holdings	Strategic - Supplier	USA	Avista Capital Holdings	Financial	USA	Supplier	USA
2015	Affinia Group Holdings	1.179	Mann + Hummel Holding	Strategic - Supplier	Germany	OMERS Administration; Cypress Group	Financial	Canada/USA	Supplier	USA
2015	Remy International	1.150	BorgWarner	Strategic - Supplier	USA	SSGA Funds Management; H Partners Capital; H Partners Management; Fidelity National Financial Ventures	Financial	USA	Supplier	USA
2016	Calsonic Kansei Corporation	4.655	KKR & Co.	Financial	USA	Nissan Motor; Mizuho Asset Management; Zenkyoren Asset Management	Strategic - OEM/Financial	Japan	Supplier	Japan
2016	Metaldyne Performance Group	3.354	American Axle & Manufacturing Holdings	Strategic - Supplier	USA	American Securities; Levin Capital Strategies	Financial	USA	Supplier	USA
2016	Daihatsu Motor	2.645	Toyota Motor Corporation	Strategic - OEM	Japan	Silchester International Investors; RBC Global Asset Management	Financial	UK/Canada	OEM	Japan
2016	Yongkang Zolye Auto	1.525	Huangshan Jinma Co.	Strategic - Supplier	China	Tech-New Group; Minsheng Royal Asset Management; others	Strategic - Supplier/Financial	China	OEM	China
2016	Alliance Tire Group	1.082	The Yokohama Rubber Company	Strategic - Supplier	Japan	KKR & Co.	Financial	USA	Supplier	-

EU emissions continue to become more strict

Regulatory frame work for NO_x and CO₂ (simplified)

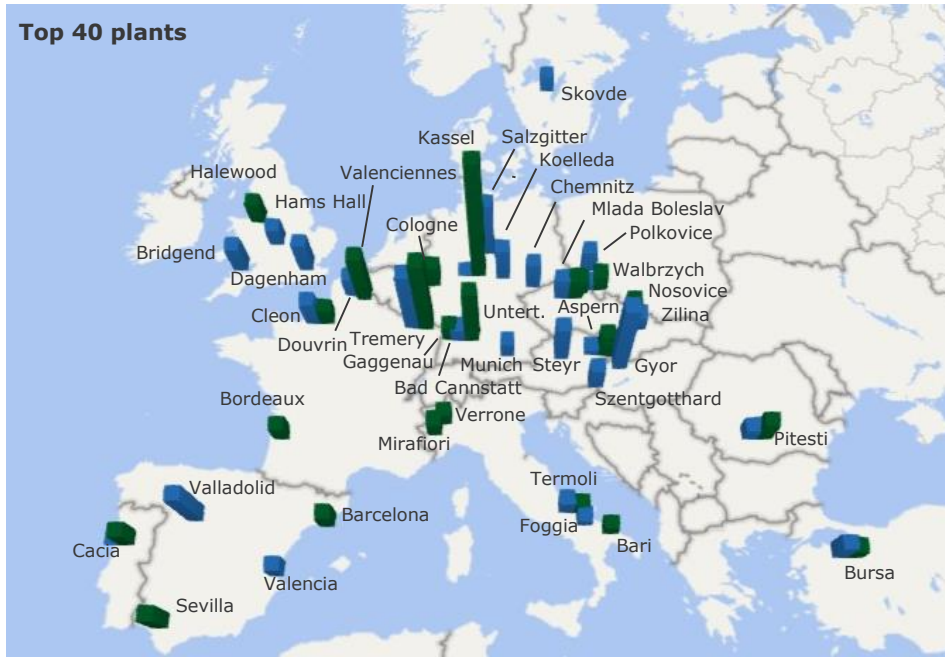
								
	EU Regulatory source	Target 2015	Target 2020/2021	2015 Measurement method	Status 2015 target	2020/2021 measurement outlook	Outlook 2020/2021 target	Challenge on outlook
CO ₂	No 443/2009, No 333/2014	130g/km	95g/km	New European Driving Cycle (EU-NEDC)	Targets achieved by all OEMs (average (6,7)g/km below target)	Worldwide harmonized Light vehicles Test Procedure (WLTP)	Achievable under NEDC expected, WLTP introduction poses new challenges for all vehicles (diesel and petrol)	Real world CO ₂ likely 40% to 50% higher than type approval today
NO _x	No 715/2007	80 mg/km (diesel); 60mg/km (petrol)**	80 mg/km (diesel); 60mg/km (petrol)**	New European Driving Cycle (EU-NEDC)	Target achieved by all OEMs (based on NEDC)	Real Driving Emission Test (RDE) (details pending)	Achievable under NEDC, RDE introduction creates major challenge especially for diesel vehicles	Real world NO _x likely three to seven times higher than type approval data

Source: AlixPartners

Note: * New passenger cars in the EU ** Significant further regulation on CO, THC and PM

Current European ICE powertrain production has 126 plants which employ about 112k people to assemble c.22m engines and transmissions

Main European Powertrain Plants as of 2015



Source: AlixPartners benchmarks and analysis

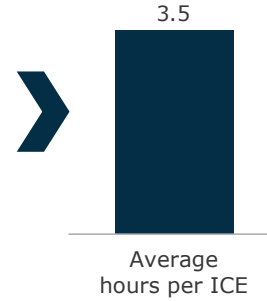
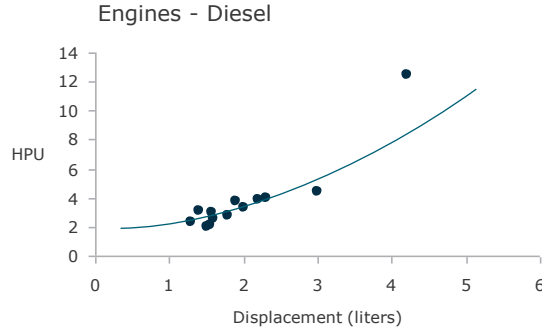
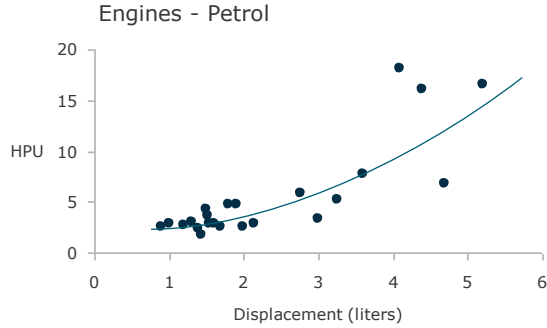
Insights

- 126 powertrain plants (ICE + transmissions) employing c.112,000 people
 - 66,000 in powertrain
 - 46,000 in transmissions
- 22 million units of both powertrains and transmissions per year
- The top 40 plants manufacture about 90% of the volumes, adsorbing about 85% of the total powertrain resources
- Germany remains the centre of gravity of European powertrain production
- The largest engine plants are Audi-Gyor (10% of total EU engine production), PSA-Tremery (8%), VW-Salzgitter (7%), Renault-Valladolid (6%), BMW-Steyr (5%)
- The largest transmission plants are VW-Kassel (15% of total EU transmissions production), ZF-Saarbrücken (10%), Daimler-Untertuerkheim (8%), PSA-Valenciennes (6%), PSA-Metz-Borny (4%)

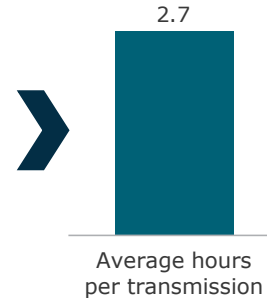
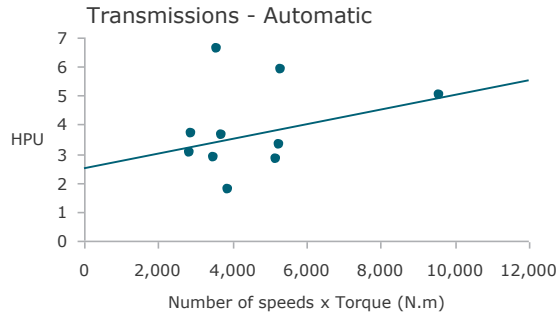
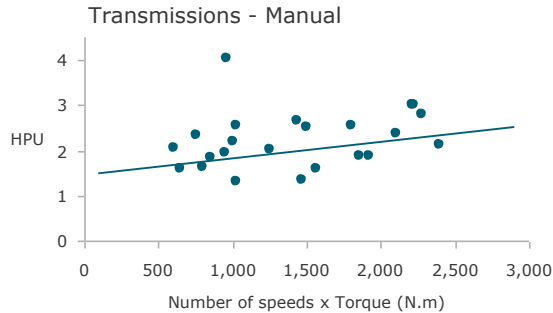
Average ICE powertrain assembly hours per unit (HPU) are 3.1 for ICEs and 2.7 for transmissions

Europe Labour requirements (hours/unit) for ICEs and transmissions

Insights



- ICE assembly time is a function of displacement
- Hours per ICE increase rapidly with displacement reflecting a higher complexity and also a lower automation of large displacement engine lines because of lower volumes

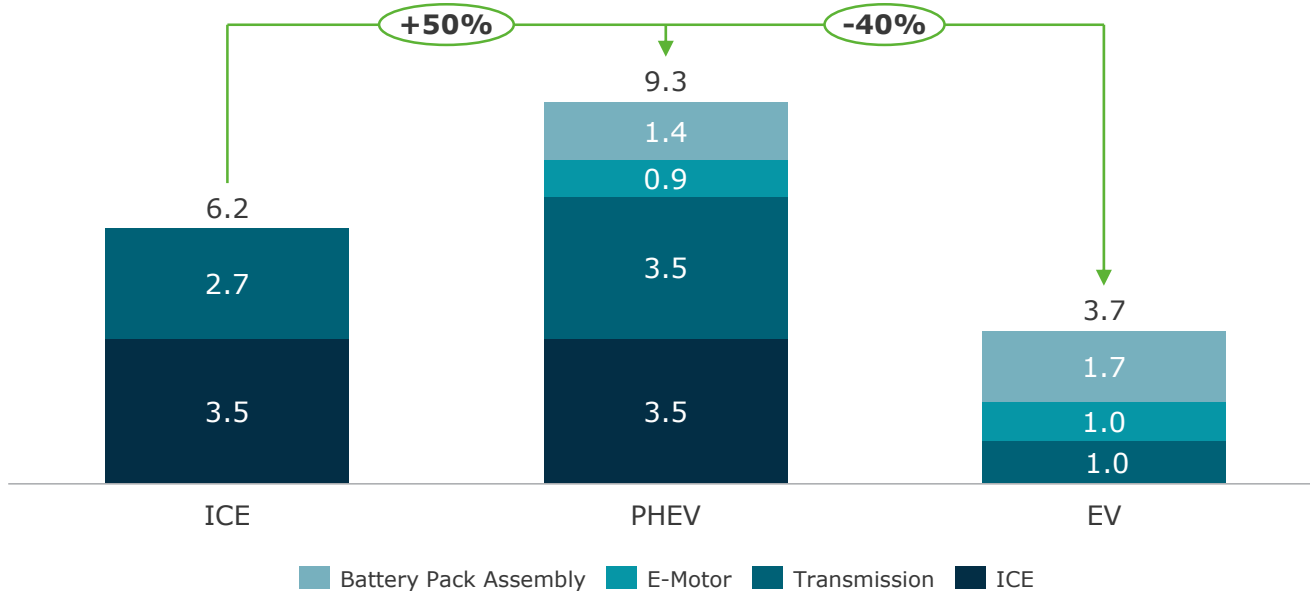


- Transmissions assembly time is a function of the number of speeds multiplied by the maximum torque
- Automatic transmissions require about 50% more labour than their mechanical counterparts (3.3 HPU vs. 2.1)

Source: AlixPartners benchmarks and analysis

Shift to electrification will have opposing impact on powertrain assembly hours: Hybrids require 50% more time to ICEs with EVs 40% less

Average assembly labour – hours



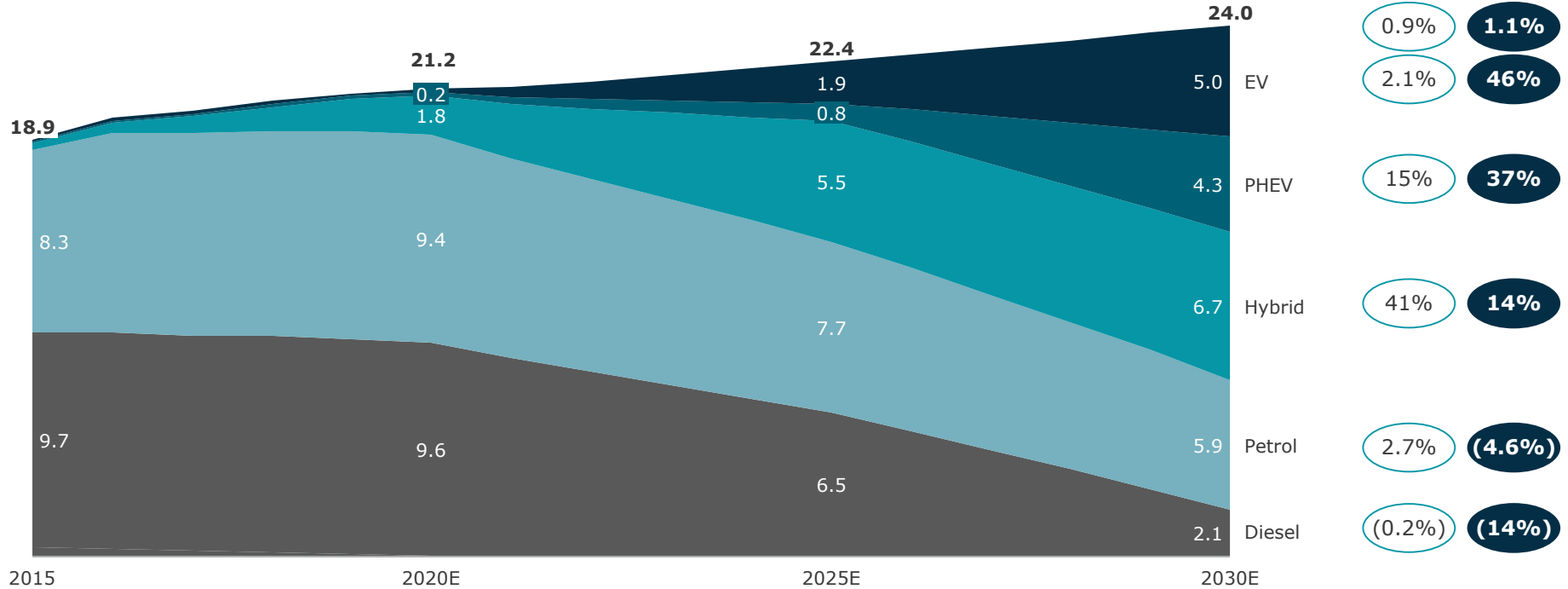
Insights

- Assembly hours for an ICE based power unit (engine + transmission) amount to 6.2 hours
- On top of the ICE, a PHEV requires a more complex transmission, an e-motor and a battery reaching a total of 9.3 assembly hours
- The EV replaces the ICE with an e-motor, a sizeable battery and a basic transmission

Source: AlixPartners benchmarks and analysis; Transmission and ICE based on averages across European plants

By 2030, we expect EVs and PHEVs to be nearly 40% of all European vehicles sold each year

Expected Evolution of PC, LCV volume in Europe, by powertrain type (million units)



Source: IHS, AlixPartners analysis and estimates

Electrification already starting to bite, with EV growth of 168% over last two years

Global Electrification – incremental by quarter

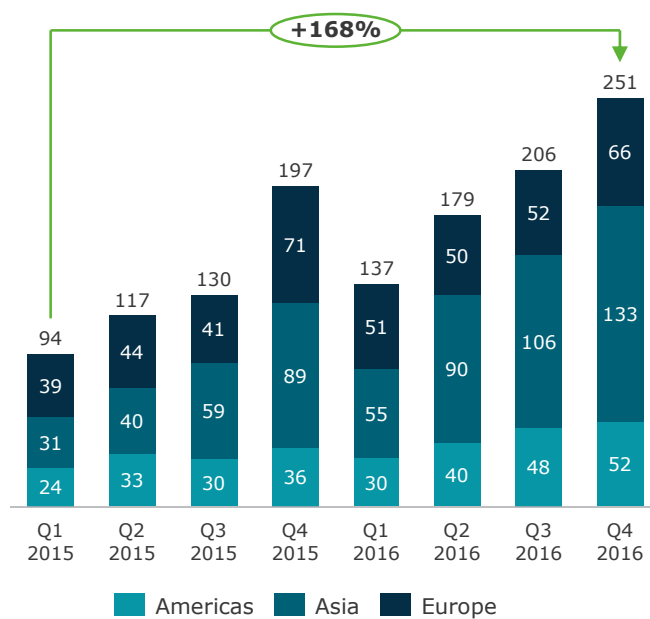
Q1 2015

No. of EVs
93,601

% of market
0.4

Ave. EV range
169 km

EV + PHEV Sales (# 000s per quarter)



Q4 2016

No. of EVs
251,051

% of market
1.0

Ave. EV range
181 km

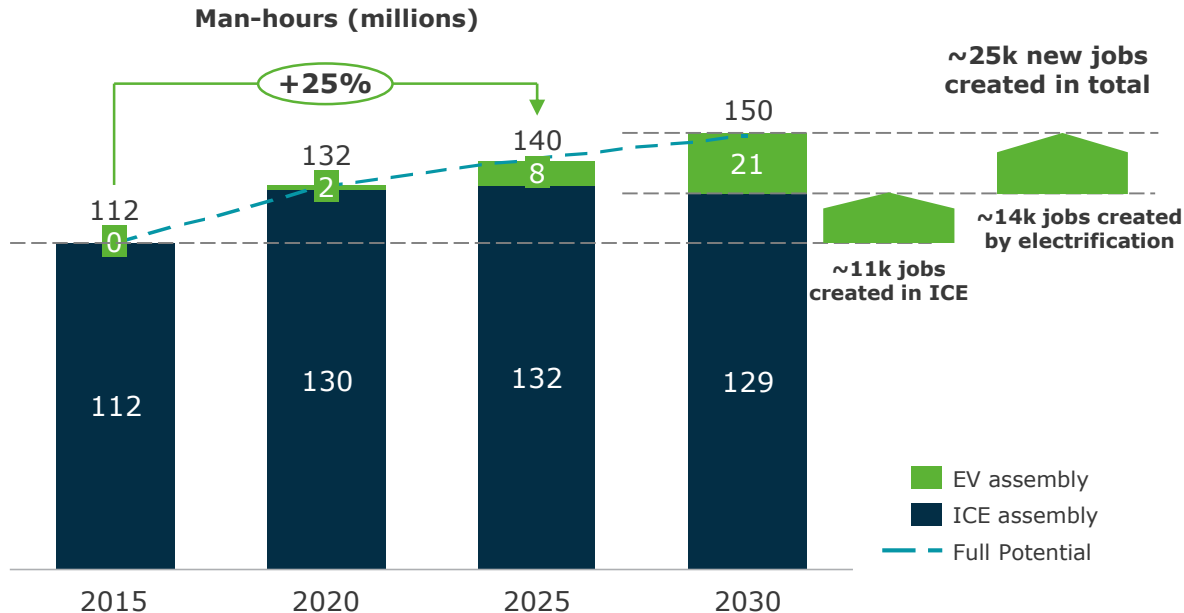
Insights

- EV sales are based on PHEV, FCEV, and EV only. Standard Hybrids are not included – thus average range above 100 km
- China with more than 50% of globally sold electric kilometres due to high number of electric vehicles offered by local OEMs on the Chinese market
- US is strongly influenced by success of fully electrified Tesla vehicles, Chevrolet Bolt and Nissan Leaf
- France with high average range due to high proportion of full EV such as Renault Zoe, Nissan Leaf and Renault Kangoo
- Norway characterized by a blended mix of EV and PHEV across OEMs

Sources: I.H.S., EV-volumes.com, AP research

EV onset to 20% of veh. sales by 2030 would see an 11k increase in traditional ICE jobs off hybridisation, and further 14k from electrification

Evolution of workforce requirement for European passenger cars and light commercial vehicles by powertrain type (million man-hours)



Insights

Under the assumptions of:

- Battery packs and e-motors are assembled in Europe
- No assumption on localisation of EV components

The net impact of electrification by 2030 is 25k new jobs compared to 2015

- By 2030, the take-up of Hybrids will lead to a gain of 11k in ICE jobs, peaking between 2025 and 2030
- Electrification will drive a further 14k new openings on battery and e-motor assembly
- New openings will require new skills in the area of e-motors, power electronics, batteries and high voltage cables



Full topics of AlixPartners Automotive Study 2017

Sections and contents of 2017 report

Full report contents	Details
1 Global market development	Detailed view of sales per major market
2 OEM performance	OEM profitability and investments
3 Partnerships	Assessment of auto-to-auto & non-automotive partnerships
4 M&A activity	View on M&A trends in the automotive industry
5 The effects of Powertrain changes	Restructuring requirements for EMEA powertrain assembly
6 AlixPartners Electrification Index (APEX)	<i>Due for release in September 2017</i>
7 AlixPartners Global Mobility Study	<i>Due for release in September 2017</i>