



AUTOMOTIVE

Global Sales and Production Redefined

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Global outlook for vehicle production

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Summary



MARKET FLEXIBILTY

Volume

Where should you expand your production footprint?



RANGE FLEXIBILTY

Product

Which products will be strategic to future growth?



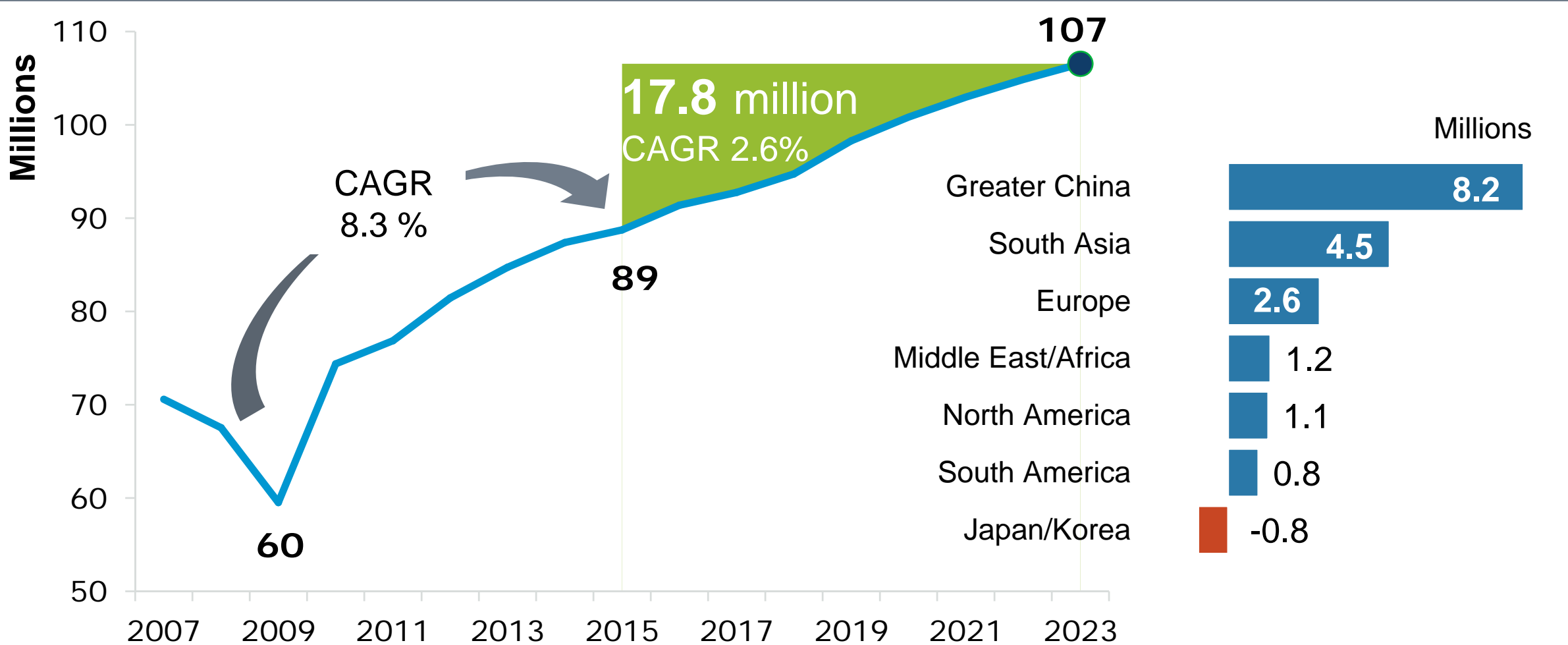
INDUSTRIAL FLEXIBILTY

Manufacturing

Industrial trends shaping the automotive industry

Global production

Post recovery cycle growth rates slow

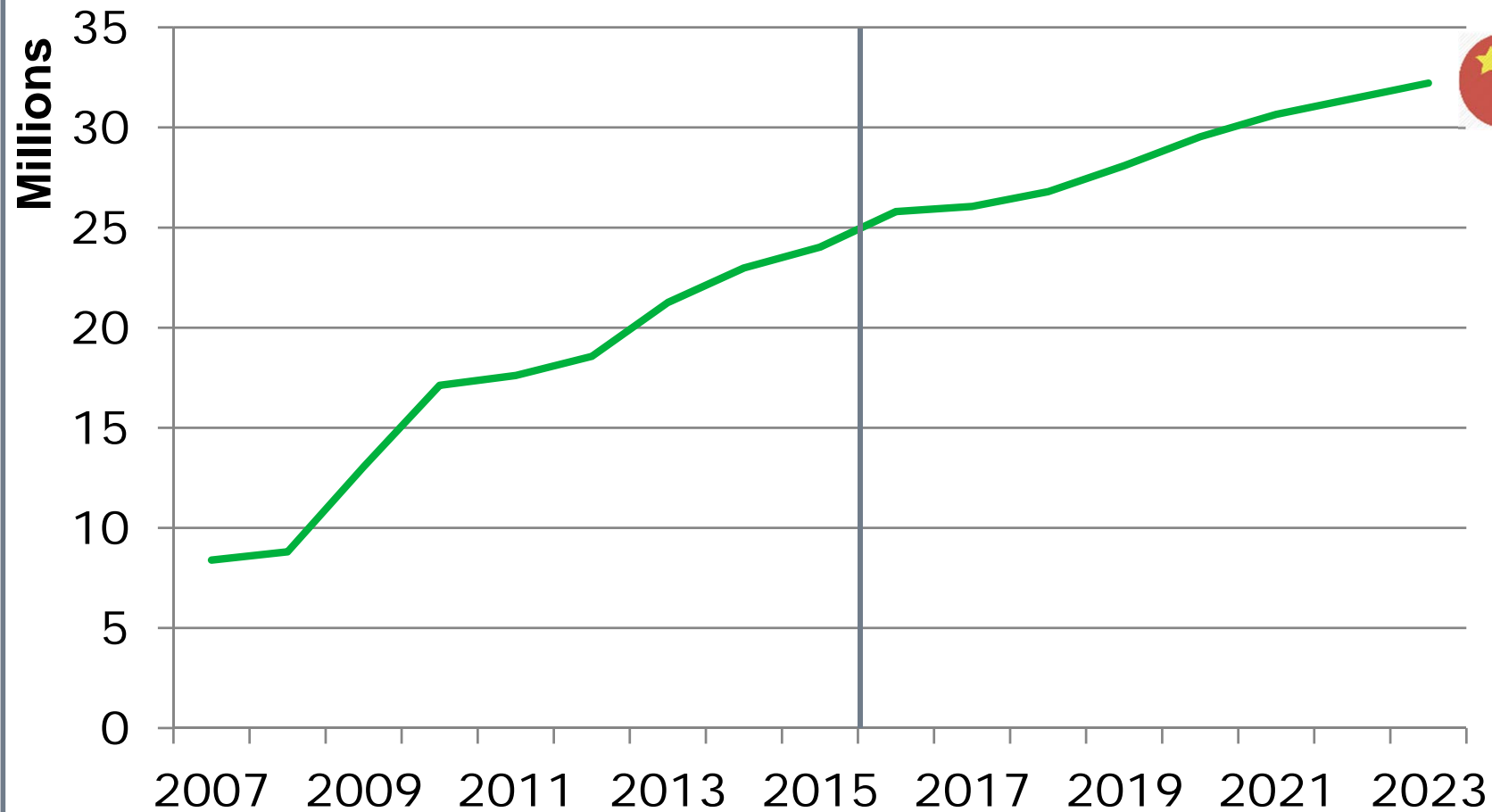


Source: IHS Markit

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China

Growth moderates as pressures build; focus on technology



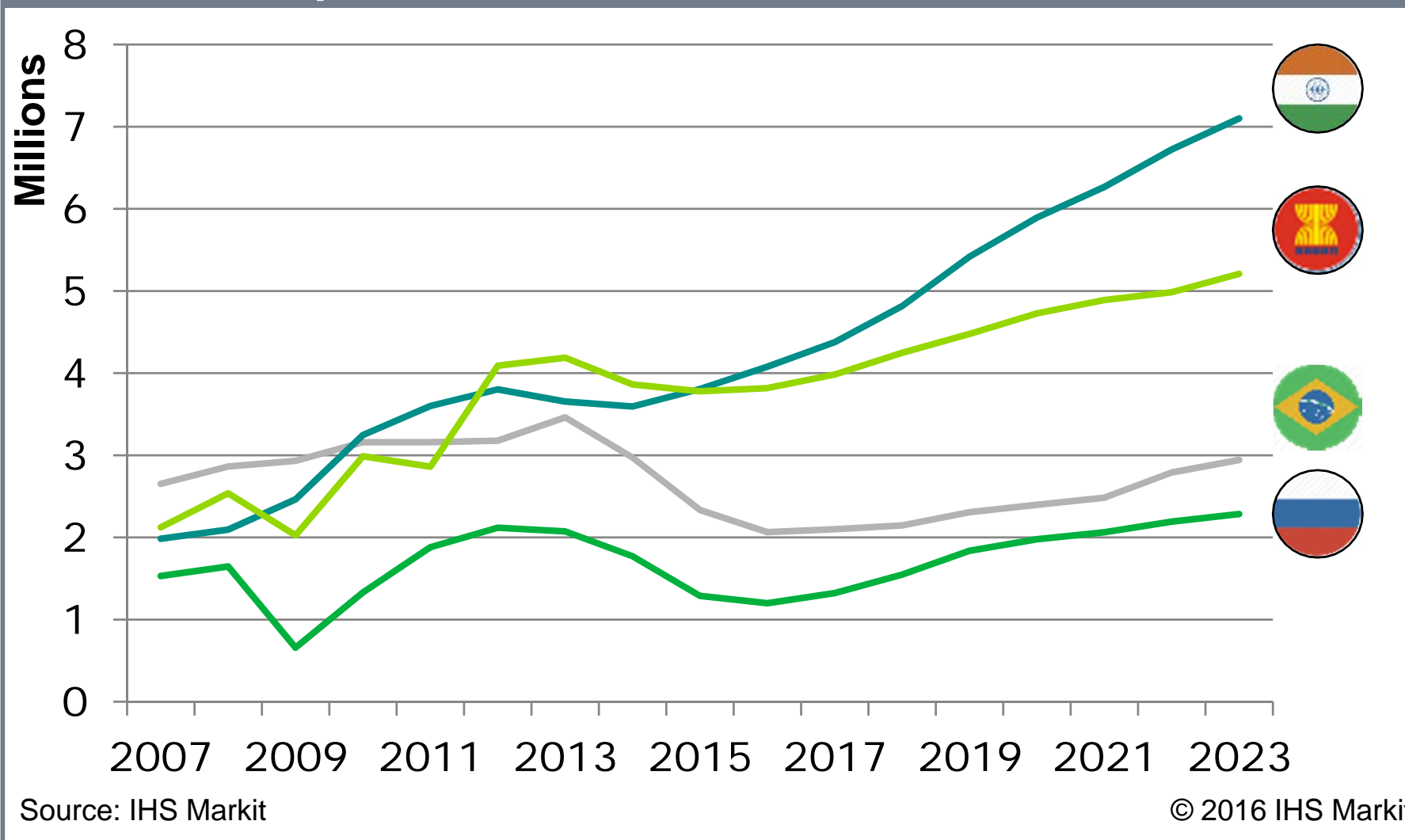
Source: IHS Markit

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- Economic pressures slow growth rates to 'new normal' levels
- Government intervention to support no less than 6.5% GDP
- Latest 5-Year Plan will boost infrastructure, NEVs and sharing economy
- Second child and regional planning to balance long term outlook
- Urbanization to accommodate cleaning of manufacturing and lower carbon development

Brazil, Russia, India and ASEAN

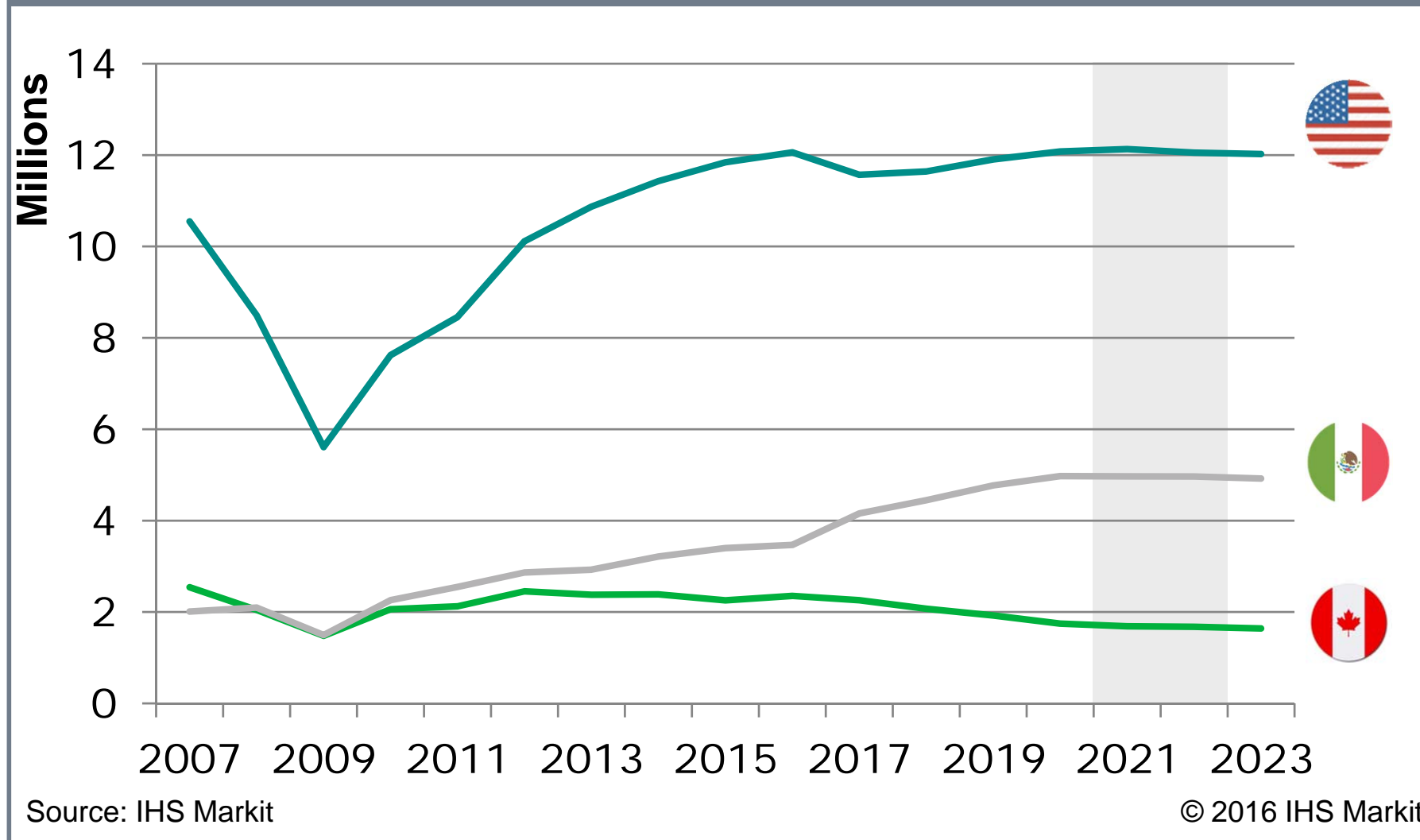
Reset the map; Brazil and Russia lose momentum



- Brazil and Russia face prolonged recessions; signs of hitting the floor only just emerging
- Failure to diversify into exports during expansion years limits ability to offset domestic weakness
- India realising potential after political impasse; infrastructure investments to pay off
- ASEAN has slowed but exports have helped and AEC could provide stimulus and bolster existing regional hubs

North America

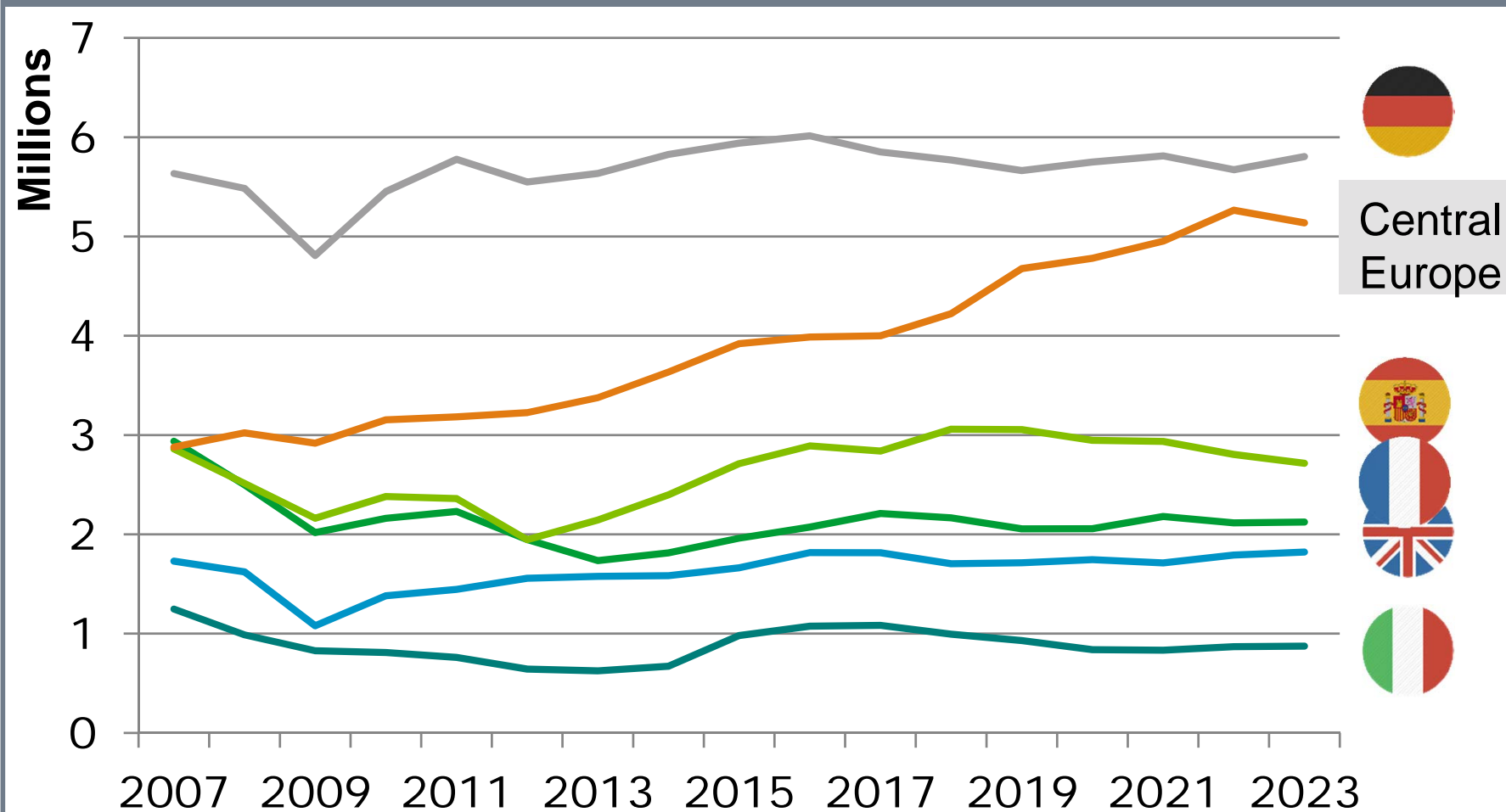
Mexico pushes region to new highs but plateau coming soon



- Strong recovery cycle in US sees post-crisis restructuring pay off, greater capacity discipline, platform alignment and renewed focus on exports
- GM, FCA unwind Canada footprint volume moves south
- Mexico set for another phase of investment from D3, Asians and Europeans
- Localization overseas and domestic ceiling will cap growth in this cycle

Europe

Flexibility key and Central Europe becomes attractive again



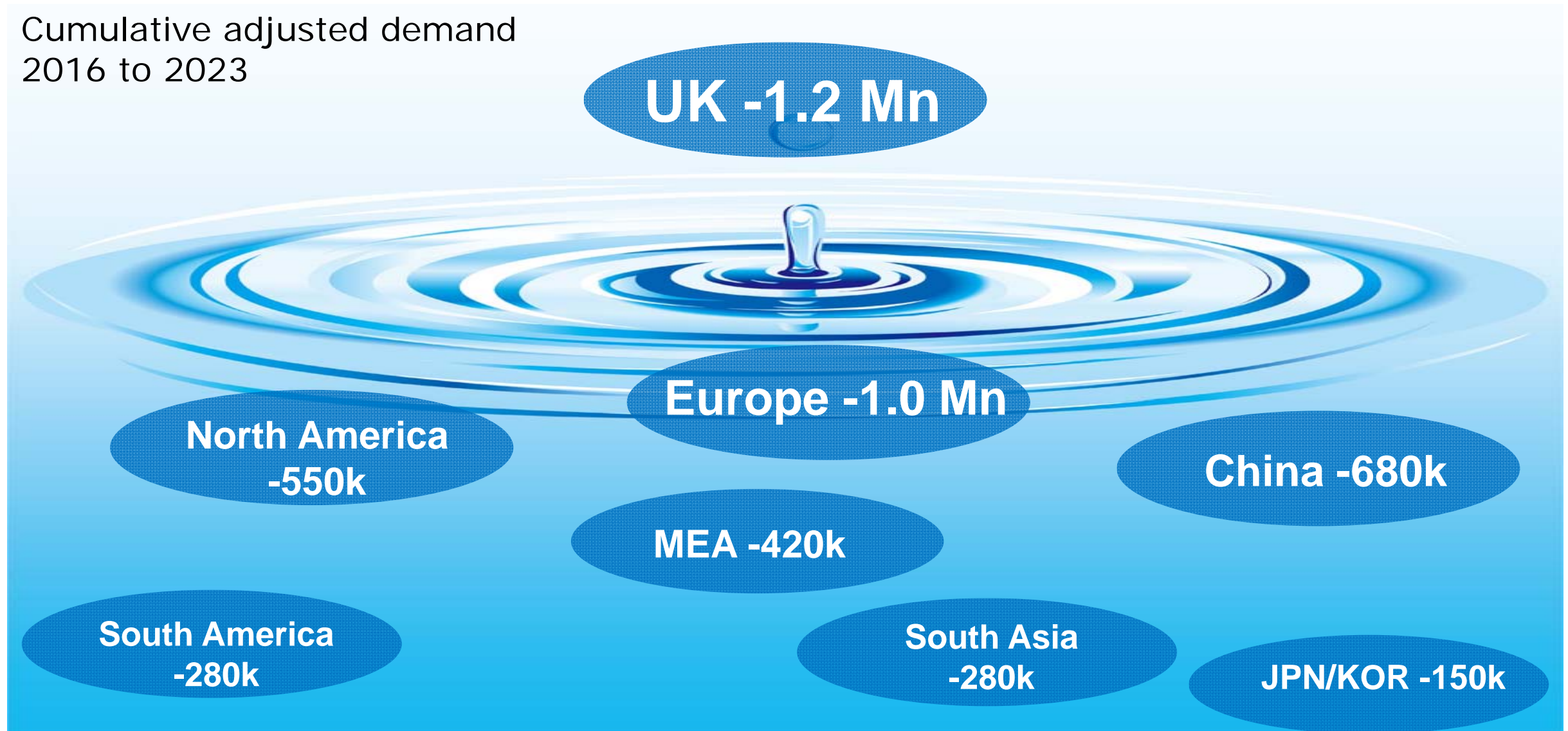
Source: IHS Markit

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- Big 5 western European producers supported by strengthened domestic recovery but Brexit poses risks
- Exports to North America remain robust but China capacity investments will that flow
- Increased movement across the region reflects enhanced flexibility and willingness to change
- Central Europe gains: Daimler Hungary, FCA, GM, Poland, JLR Slovakia, VW Slovakia, Poland

Brexit the global risk

Cumulative adjusted demand
2016 to 2023



Brexit impact on UK production – initial analysis

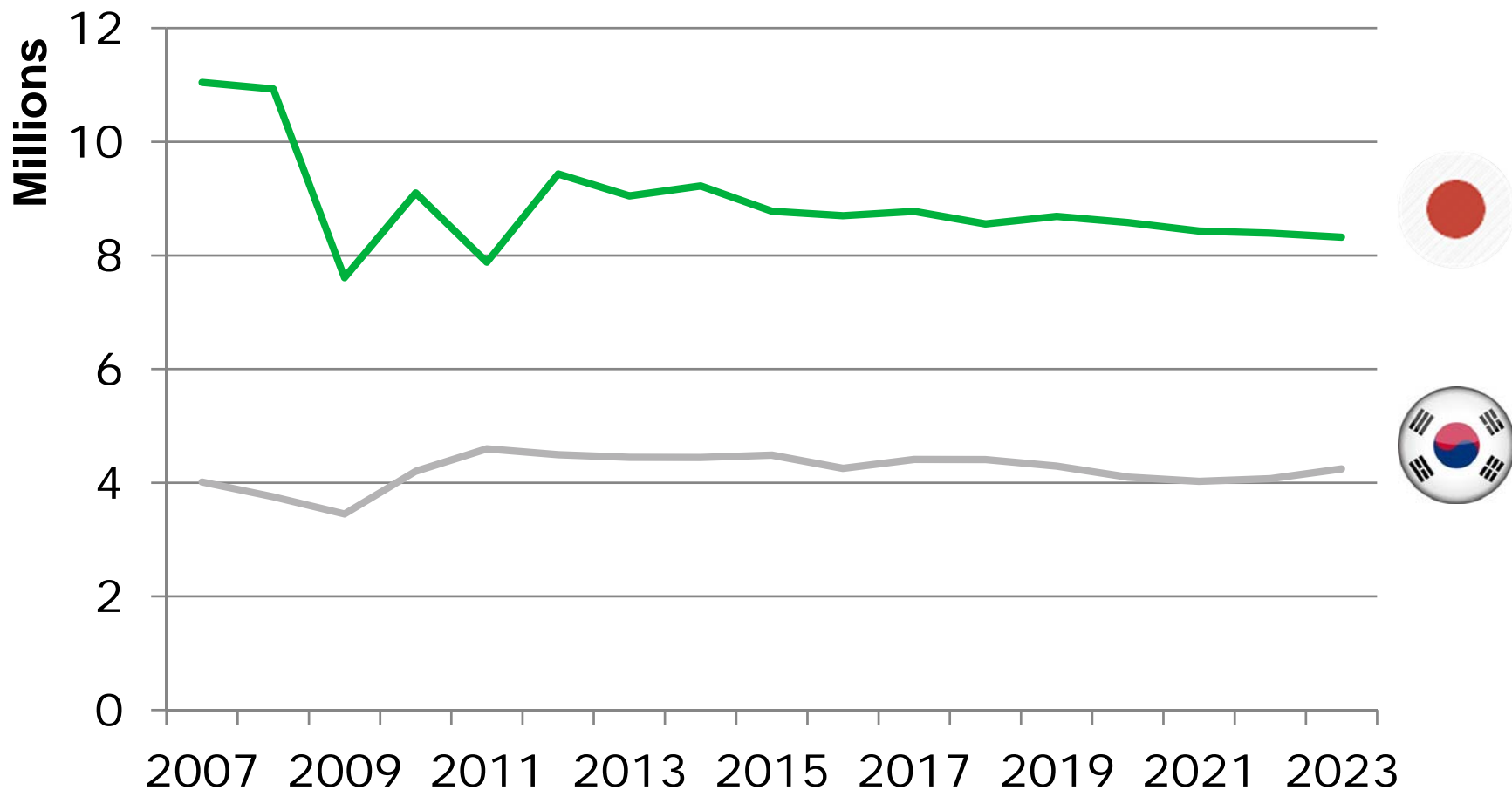
Brexit event			UK car market		UK auto plants	
Impact area	Issue	Scenario	Short term (1-2 years)	Long Term (3+ years)	Short term (1-2 years)	Long term (3+ years)
Macro	GDP	unwind	- - -	-	-	=
	Interest rates	lower	-	-	-	=
Currency	£/€ £/\$	depreciation	- - -	- / =	+	+ / =
Market Access	Tech regs	Keep & copy	=	=	=	-
	Trade rules	Trade agreement	=	- / =	=	- / =
Labour market	Labour laws	Lighter	=	=	=	+
	Skilled migration	Tighter	=	- / =	=	-
Bottom line			- -	-	=	- / =

Brexit exposure UK operations



Japan/Korea

Domestic output constrained; overseas expansion dominates

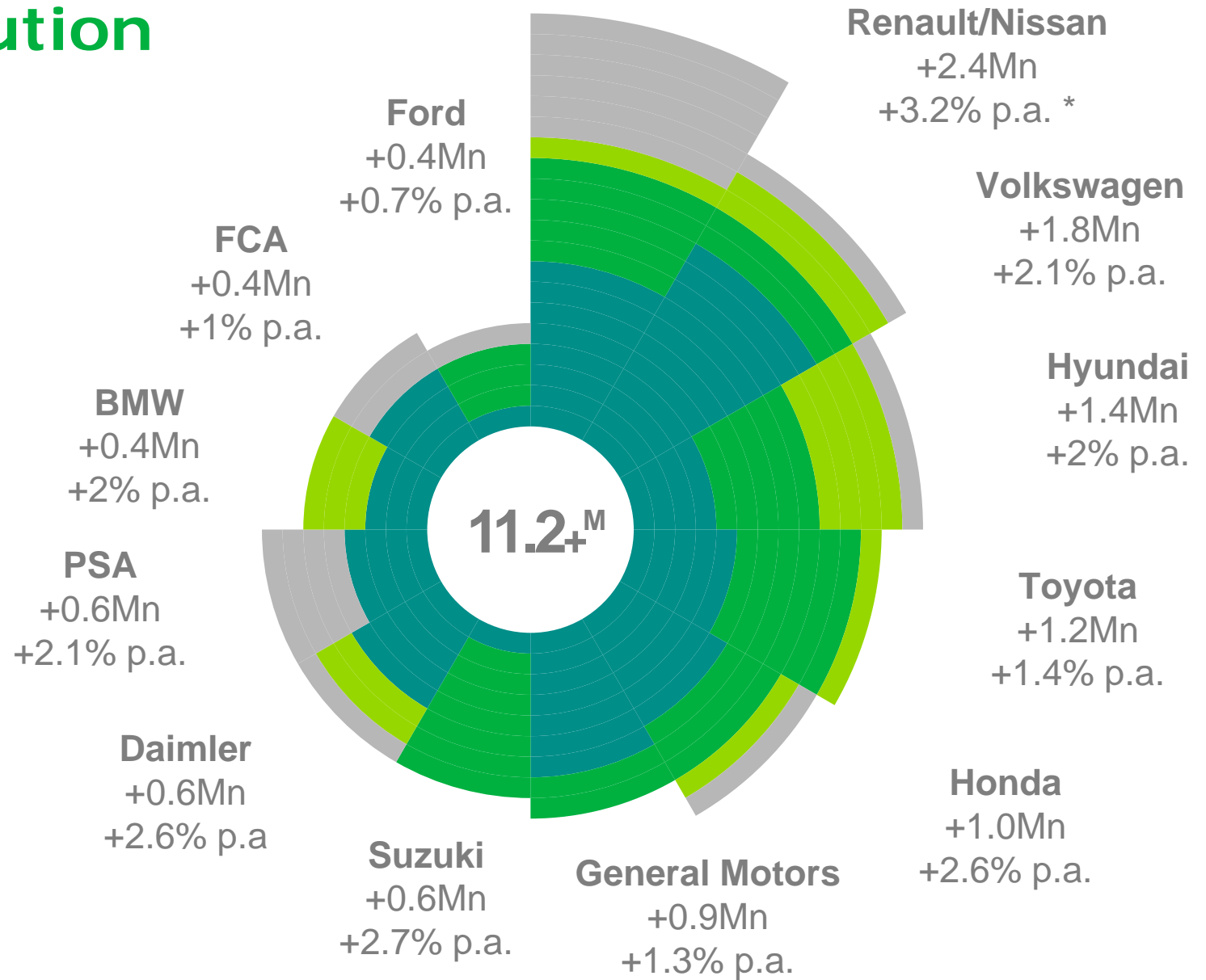


Source: IHS Markit

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- Following short term stimulus/disruption in both markets as the result of consumption tax cuts long term return to trend of decline and stagnation.
- Japanese OEMs pick up overseas growth hedge to currency movements despite recent support for exports
- Hyundai/Kia pursues expansion; NA and India mix mature and emerging

OEM growth distribution 2015 to 2023



* p.a. = per annum

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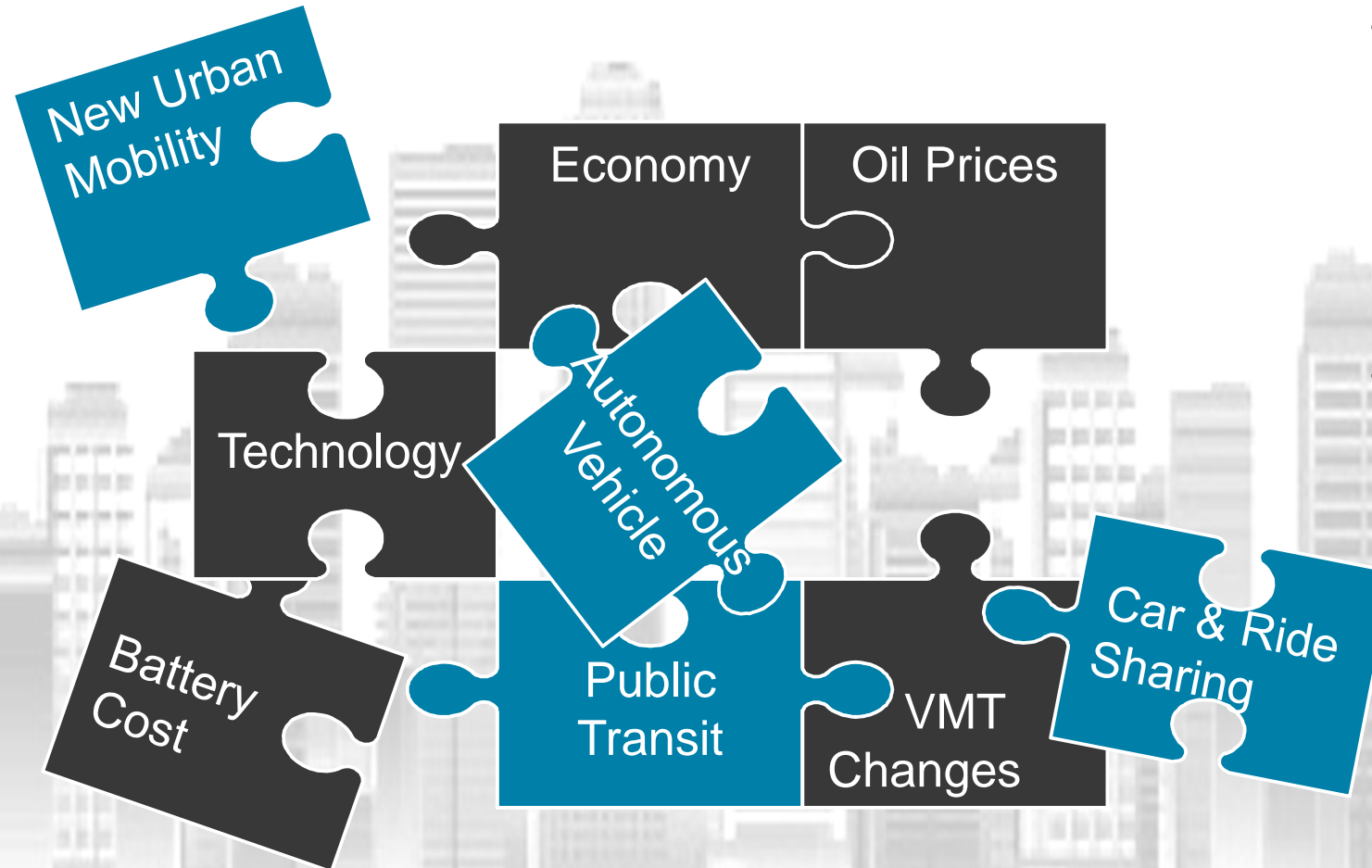
New platform dynamics

Summary

The future mobility jigsaw is starting to fall into place

New business models will materialize

Mobility will be redefined



Technology and society drive fundamental change

VMT = Vehicle miles travelled

Future mobility patterns emerging (1/2)

- Rapid increase in expectation of disruption of traditional business models as new personal mobility options emerge and evolve
 - KPMG Survey* - 82% of execs now say a major business model disruption is 'extremely likely' or 'somewhat likely' – it was just 12% last year
 - only 33% think that current OEMs will retain customer relationship – it was 75% last year
 - IBM survey** suggests by 2025 personal mobility developments could become more important than economic and market trends
 - 66% of consumers say they expect new types of ownership models to be offered



* Source: KPMG Global Automotive Executive Survey 2016

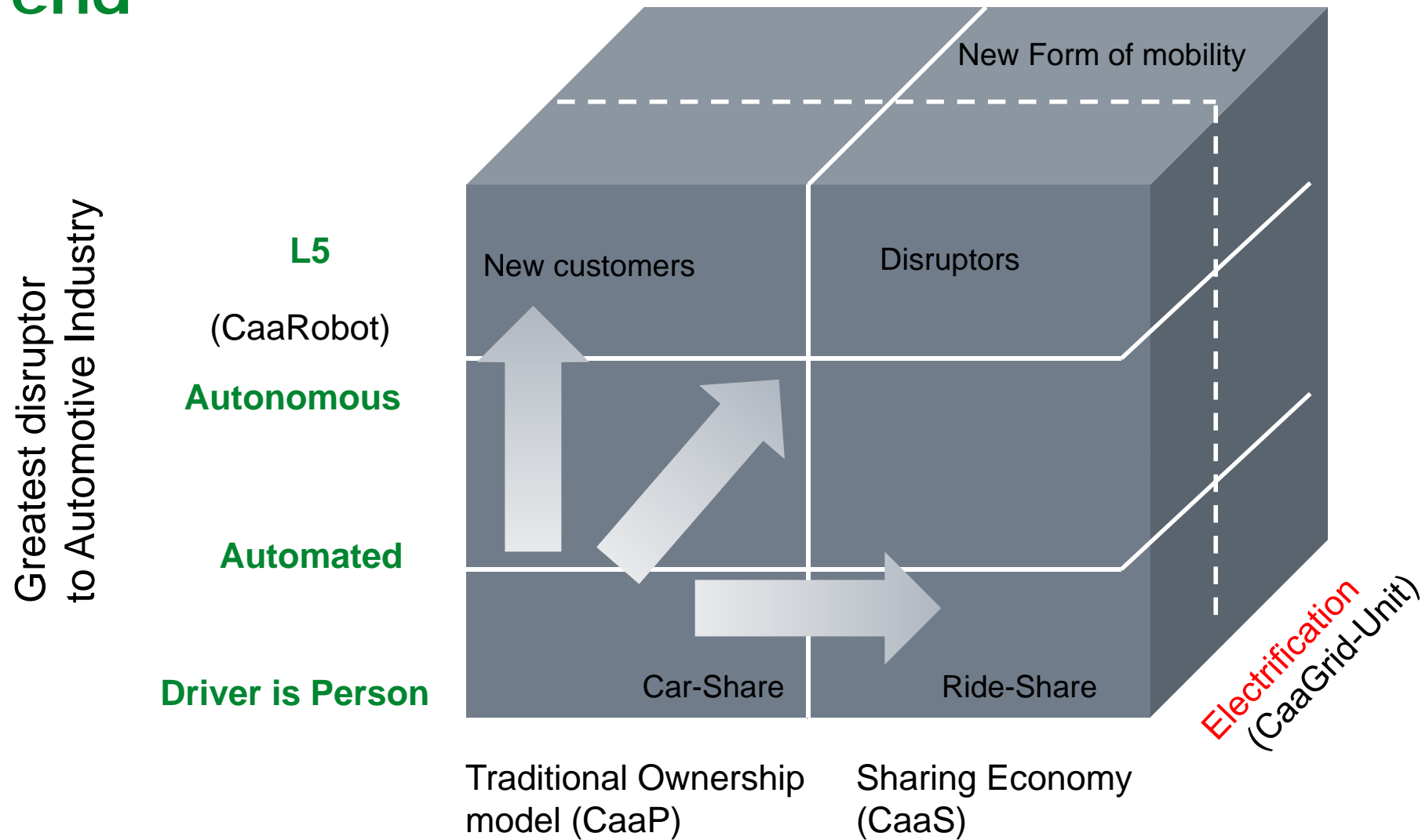
** Source: IBM Automotive 2025: Industry Without Borders 2015

Future mobility patterns emerging (2/2)

- Developed market car cultures have embedded inertia to fast and fundamental change, Emerging market consumers are far more open to new modes
 - Preference of traditional ownership to a car as a service model: US/Europe ~ 40-50% , Rest of World ~30%, China/India ~20% (KMPG Survey)
 - IBM survey – EM's showed 20-25% higher declared interest in 'mobility solutions' than Mature markets
 - Stated 'interest' in self driving cars lowest in mature markets , highest in emerging markets (Japan and Brazil are exceptions to both)
- Premium's chances? Potential impact on premium is equally questioned as it is for low cost manufacturers
 - "The important image attached to a car seems to lose significant importance in a future dominated by sophisticated mobility services" (KPMG survey 'editorial')



New mobility megatrends converge to a potential 'Giga-Trend'



New manufacturing required...

Greater product customisation?

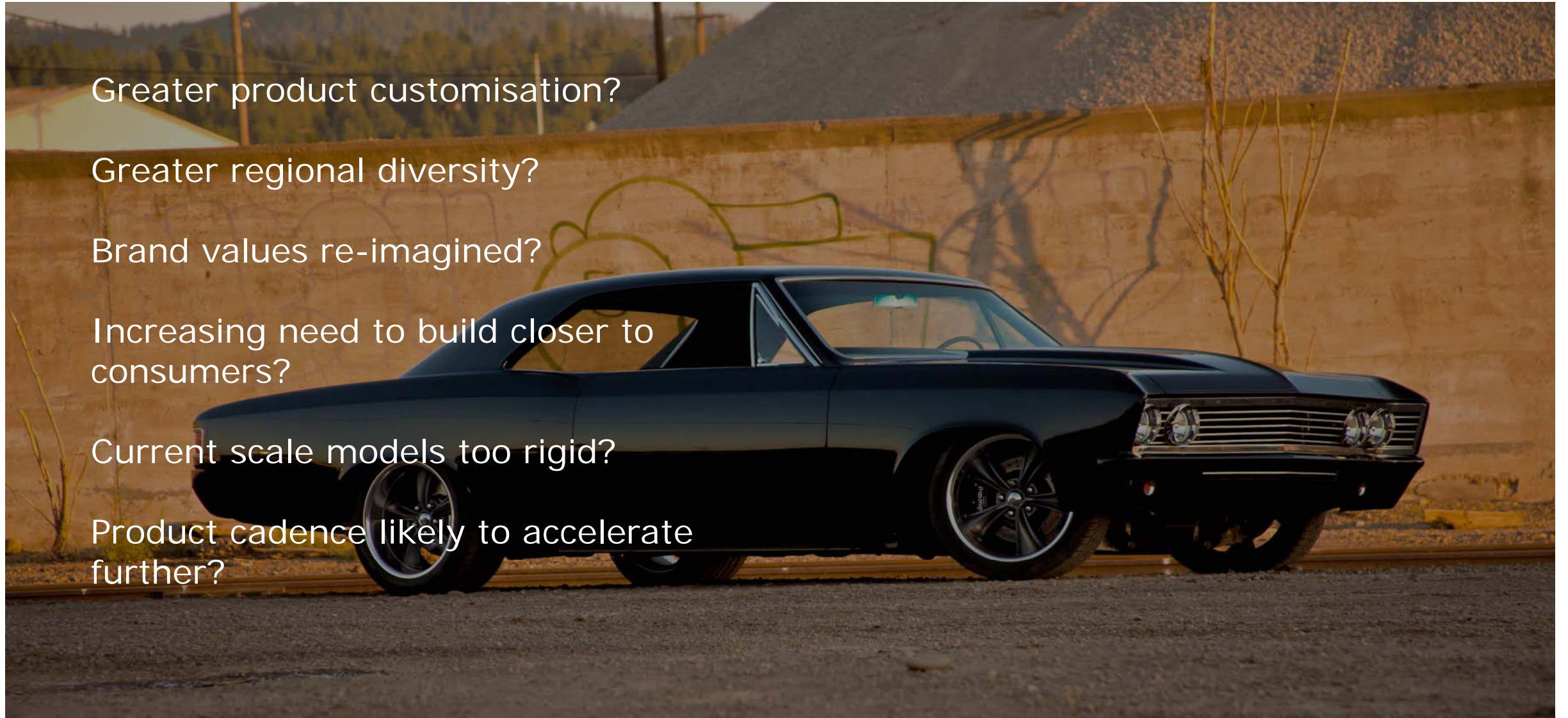
Greater regional diversity?

Brand values re-imagined?

Increasing need to build closer to consumers?

Current scale models too rigid?

Product cadence likely to accelerate further?



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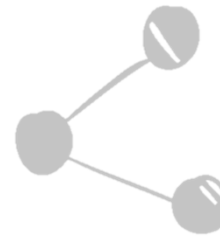
Age of the Mega Platform



Reduced purchasing costs and accelerated development times



Increased flexibility and product cadence compared to traditional floorpan and top hat



Suppliers will need to support volume and geographic requirements

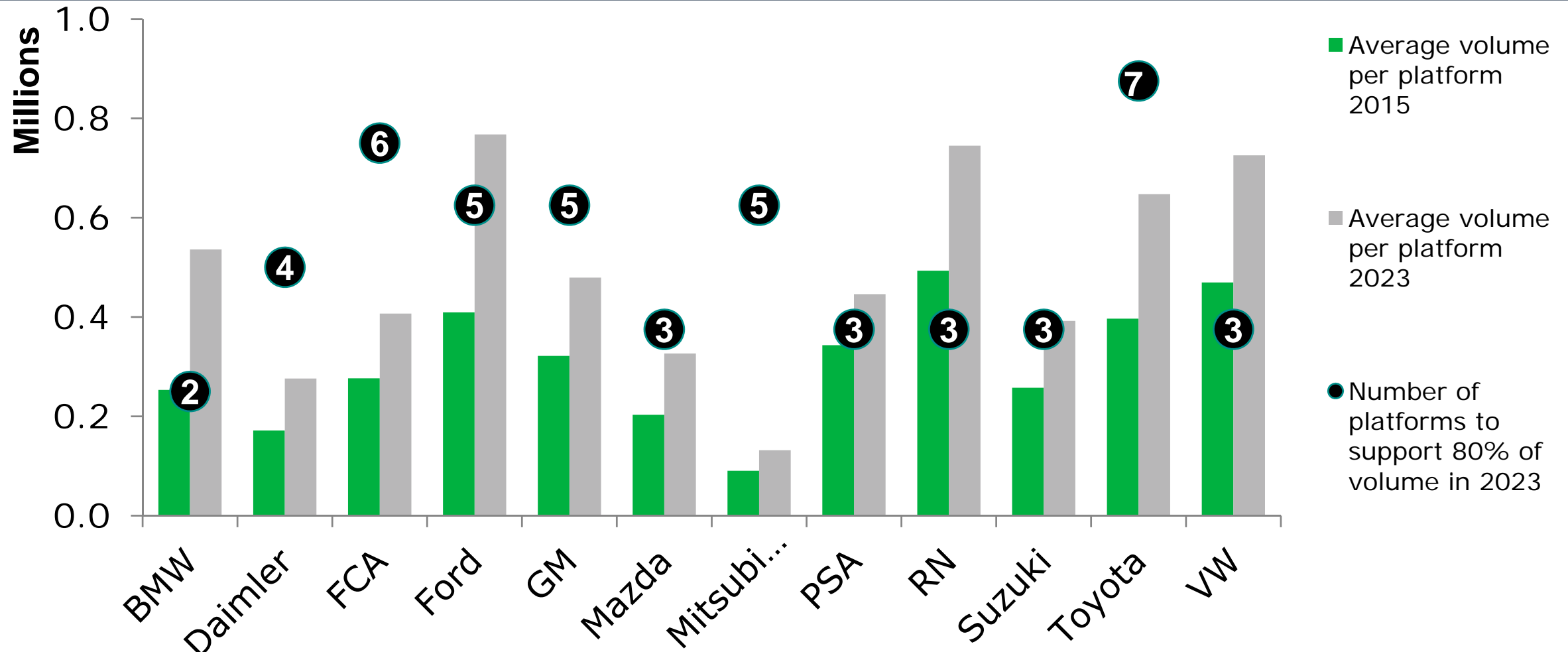


OEMs purchasing strategies have been driving consolidation in the supplier sector

Global platforms will support 69% of new light vehicle production by 2023

Age of the Mega Platform

New architectures drive greater efficiency short term



Source: IHS Markit

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Does the Volkswagen scandal reveal the next challenges in vehicle production?

“...Mercedes Is About to Unveil an Entire Fleet of Electric Vehicles”

Bloomberg August 2016

“...Electric powertrains will “reinvent the car” says Jaguar design chief”

Autocar April 2016

“...BMW revamps “i” electric car division to focus on self-driving tech”

Reuters June 2016

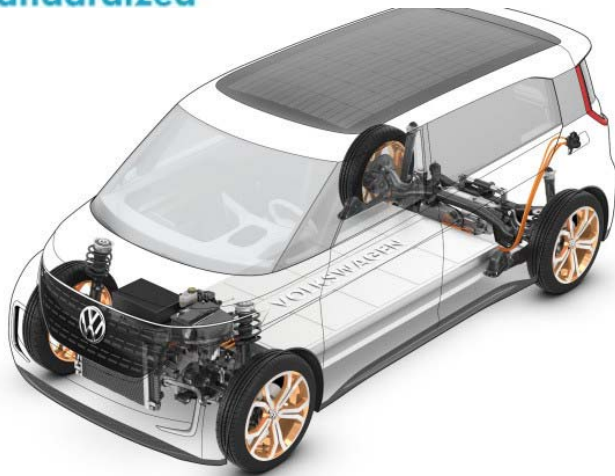
“...Ford making long-range EV to rival GM, Tesla”

Detroit News April 2016

New vehicle concepts challenge manufacturing efficiency – importance of flexibility

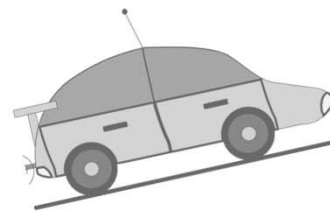
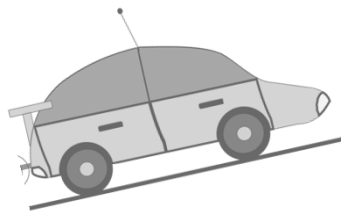


standardized



New vehicle usage concepts challenge manufacturing efficiency – importance of flexibility

Personal mobility,
short commutes,
delivery vehicles
High EV
penetration



Longer distance,
family mobility,
outside of city or
urban areas,
hybridisation still
likely to dominate

The view from Asia

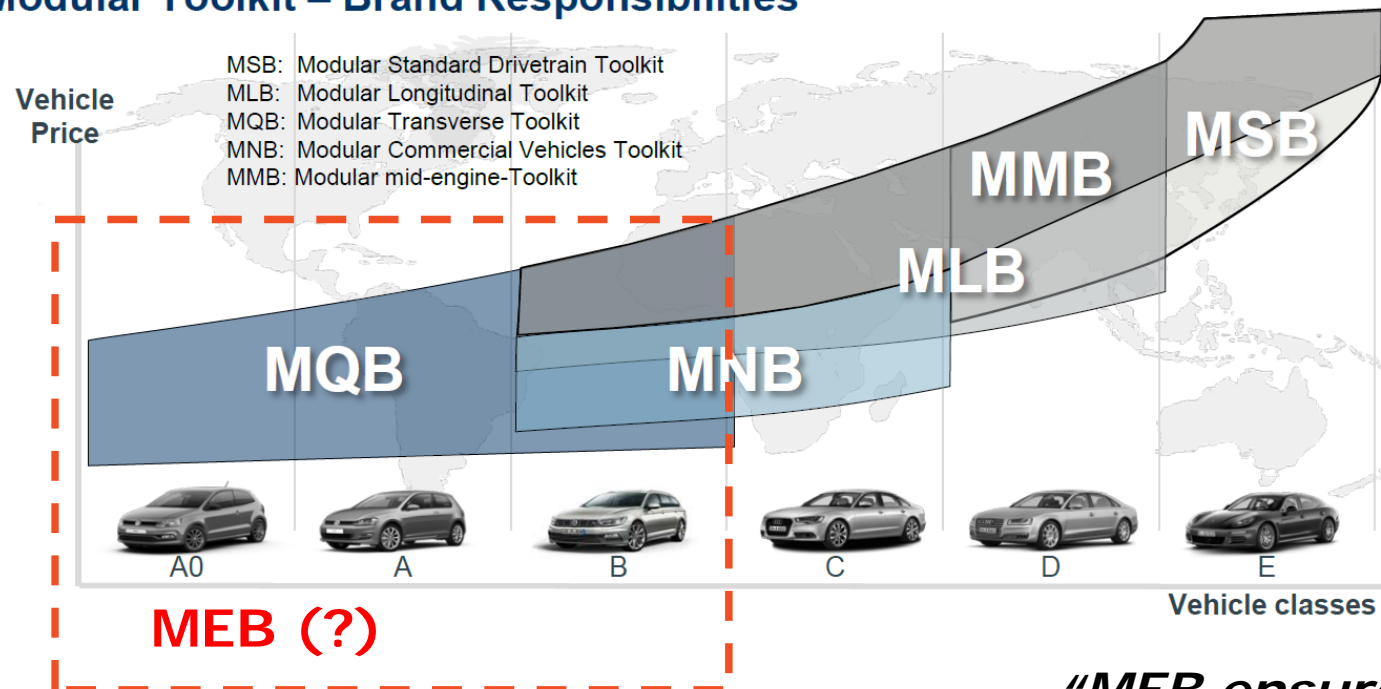
Definition : ◎=most dependent, ○=dependent, △= less dependent, × = optional or no development

OEM	Target Year	HEV	PHEV	FCV	EV	Electrification Strategy
Toyota	2050	○	◎	△	×	PHEV is a mainstay, based on the deeply-evolved and widely-spread HEV technology, followed by FCV.
Nissan	2050	△	×	○	◎	Battery EV and range-extender EV are mainstays, followed by the e-Bio Fuel-cell vehicle.
Honda	2050	×	◎	○	△	PHEV is a mainstay, evolved by the i-MMD hybrid system, followed by FCV (without HEV).
Hyundai	2020	◎	○	×	△	HEV is a mainstay, but the dedicated models will offer other electrified models such as PHEV and EV.

Can modular architectures support greater electrification?

‘Mainstream’ offerings likely to develop concept of complimentary platform structures

Modular Toolkit – Brand Responsibilities



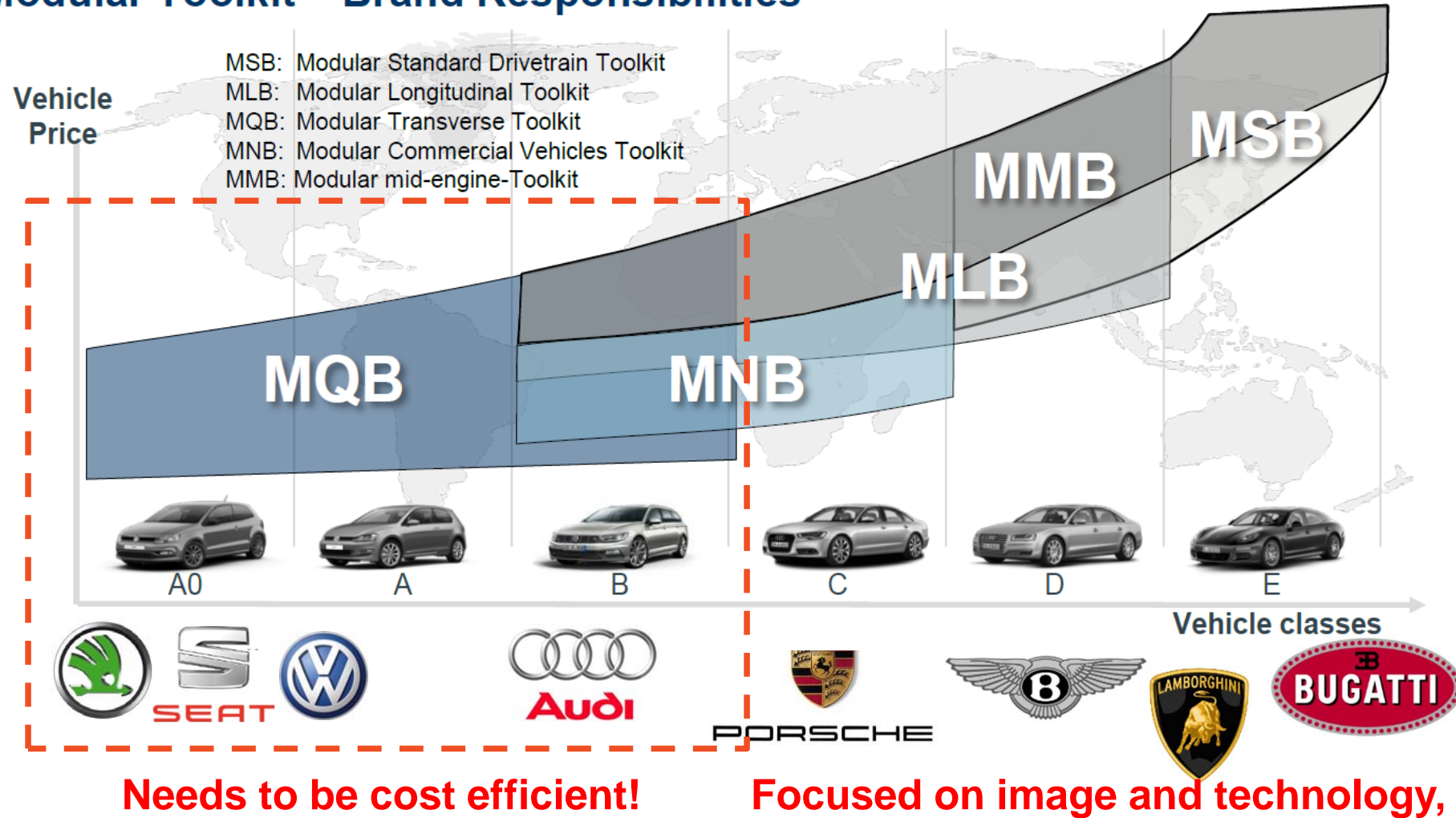
- It is expected that MQB and MEB will operate hand in hand.
- This “complimentary” platform structure ensures flexibility and planning reliability in either case:
BEV boom vs. BEV flop
- Allows OEM to switch or re-balance the production mix of BEV models and more conventional products

“MEB ensures to produce pure electric vehicles, hybrid cars and conventional powertrains, cost efficiently on a single production line!”

Frank Welsch
 Head VW brand R&D, Volkswagen AG

Can modular architectures support greater electrification?

Modular Toolkit – Brand Responsibilities



Summary

- Extraneous shocks and gathering pace of change forcing genuine re-evaluation of outlook: what will it mean to be in the automotive sector in early 2020s?
- New ownership, operation and usage patterns expected to be a major determining force alongside already identified move to greater fuel efficiency and reduced green house gases
- Customer facing business models changing with balance of power shifting to less 'core-automotive' experiences
- Changes will have a tangible effect on manufacturing as OEMs respond to new requirements; greater importance of flexibility over efficiency during transitional steps
- OEM responses will vary challenging existing consensus

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