

Automotive: COVID-19 Analysis

Scenario analysis
VERSION 4, 22 April 2020



Discussion document being updated continuously based on latest developments and insights



Agenda

1. Implications of COVID-19 for the automotive industry
2. Overview of scenarios and assumptions
3. Global sales
4. Europe: Sales
5. Germany: Sales
6. Europe: Production
7. USA: Sales
8. China: Sales
9. Long-term recovery
10. Version Control

Structural analysis: After the shut-down in Q1, industry focus shifts to restart in Q2, and possible incentives in Q3

Short term (Q1)

Shutting down and closing

Market

Lack of demand

Sudden and complete drop in new car sales due to social restrictions and a lack of sales and financing staff

OEMs

Plant closures

Synchronous, complete shutdown to minimize variable costs - Avoiding permanent layoffs and closures as much as possible

Suppliers

Interrupted production

Extensive lack of demand impairs the production of suppliers in all regions and requires dedicated coordination

Finances

Cash flow effects

Lack of sales impairs the inflow of liquidity from April onwards, while structural costs remain largely unchanged

Medium term (Q2)

Restart and recovery

Online marketing

Easily accessible online on-demand marketing and interactive sales process, with a focus on B2B and digitally-savvy customers

Production ramp-up

Even where individual components are missing, strategies should be developed for building "incomplete" vehicles for later completion

Restoring supply chains

The demolition of the logistics chains will cause supply bottlenecks for another 2-6 weeks; failed suppliers will have to be replaced

Effects on profitability

Due to a lack of revenue and cash inflows, profitability is lost at all levels of the automotive value chain

Long term (Q3+)

Restructuring and implications

Decentralised marketing/ sales

Integration of digital and local marketing and sales processes in addition to stationary retail

Advanced mobility services

Development of models that go beyond mass transport to connect multimodal individual mobility scenarios

De-globalized supply chains

Extensive transparency and active management of cluster risks across all supplier levels and regions

Dissolving of rigid structures

Create multiple scalable, independent business units with resilient business models

Q1 2020: Production reductions almost synchronous with sales declines, with sales returning in China after shut-down

Country	Sales*	Decrease vs. Q1 19	Production**	Decrease vs. Q1 19	Comment
China	- 2.362,223	- 45.0%	- 2,103,372	- 42.0%	<ul style="list-style-type: none"> 23.01. Wuhan is quarantined, including plant closures and curfews 19.03. No new infections are reported; companies re-opened
Japan	- 130,752	- 10.3%	- 202,065	- 9.4%	15.04. State of emergency and voluntary contact restrictions imposed for entire country
South Korea	- 26,871	- 7.9%	- 221,589	- 25.3%	22.02. Nationwide closure of schools, universities and businesses until mid-March
USA	- 501.281	- 15,5%	- 301,258	- 15.4%	<ul style="list-style-type: none"> From 19.03. Automotive plants closed, re-start only expected in early May 31.03. 35 states impose curfews, contact ban until 30.04.
Rest of NA	- 114.418	- 19,6%	-175,422	- 14.1%	Plant closures in Canada and Mexico implemented from mid-March
Germany	- 178.887	- 20.3%	- 231,123	- 18.9%	22.03. Introduction of contact bans until 20.04.; schools and car factories already closed
UK	- 217.479	- 31,0%	- 62.957	- 17.0%	23.03. Imposition of curfews
France	- 188,656	- 34.1%	- 200.504	- 42.7%	15.03. Closure of non-essential businesses, including schools and factories
Italy	- 190,874	- 35.5%	- 36,171	- 25.2%	08.03. Lombardy region is quarantined, including school and factory closures
Spain	- 98.185	- -31,0%	- 87.294	- 15.2%	14.03. Imposition of a nationwide curfew, including school and factory closures
Remaining EU	- 151.277	- 18,9%	- 290,430	- 20.5%	Mid- March: Plant closures fully implemented
ROW	- 853.103	- 21,5%	- 708,815	- 20.1%	From March onwards: Factory closures & curfews occur all over the world
Total	- 5.085.253	- 27.1%	- 4.620.999	- 24.4%	31.03. More than 1/3 of the world population is restricted in their freedom of movement

* - partly estimated

** - estimated

In the **four scenarios** examined, a new scenario modelling incentive schemes in Q3 and 4 is introduced

Scenario	Impact/ V-Shape	Incentive/ Short V	Deep Impact/ U-Shape	Double Dip/ L-Shape
Assumptions on demand	Collapse of consumer confidence over 4 weeks, in February in China (-86% sales), from mid-March in Europe (-50%), from the end of March in the USA (-30%); rapid recovery to original level in Q3 and Q4	Starting like „Deep Impact“, governments are assumed to launch synchronous sales incentive programs like 2009. Effectiveness in countries varies, but achieves a partial compensation of sales losses	Collapse of consumer confidence as well as curfews and closures lead to losses of 80% over 6 weeks from March into May. Permanent reduction in demand also in the second half of the year in line with the financial crisis 2008/2009	Like "Impact"; weakened recovery until September; due to second wave of infection renewed containment measures with demand in China weakening by 30% in September, 40% in October 2020, in EU/ USA one month later
Assumptions on production	Synchronous plant closures in February in China (-80%), over 4 weeks in EU lead to 55% losses in March, 60% in April. Rapid recovery in the supply chain leads to -10% in May, -5% in June; recovery to originally expected level from July 2020	After „Deep Impact“ on production, incentive programs show little effect on production as OEMs mostly sell off existing stock at high discounts. Exception is China due to pent-up demand from 2017-2018 and significant overcapacities, especially at Chinese brands	Voluntary and officially ordered plant closures over 6 weeks reduce global production by 30% in March, 85% in April. Reorganisation of supply chains and possible reassignment to alternative suppliers reduce production by 55% in May and 35% in June compared to plan	As "Impact"; 5% less recovery in June and August, in autumn new closures limit production in China in September by 45%, in October by 20% compared to plan, in other regions 1-2 months later
Consolidation to sales	Restrictions in demand lead to a global oversupply of approx. 2.7 million units	Sales of stock vehicles lead to a global undersupply of approx. 2.1 million units	Restrictions in demand lead to a global oversupply of approx. 1.2 million units	Restrictions in demand lead to a global shortage of approx. 2.5 million units

COVID-19 measures have converged into the „Deep Impact“ scenario with severe effects, but different recovery paths

Key assumptions:

- **Demand** is returning to the end of local restrictions at different rates, with labour market effects amplifying the impact
- **Production** bottlenecks caused by logistical and financial problems of global suppliers determine the production ramp-up in Q2 2020

Current situation: Demand slumps sharply in February and March 2020, due to measures to contain COVID-19. China, the world's most important market, is already visibly recovering in March and is aiming for 90% capacity utilization by May. Global governments, including the USA, are implementing strong containment measures from March onwards, which are increasingly extended until the end of April. In the "Incentive" scenario, governments synchronise efforts to strengthen sales.

Effects:

China: After a strong recovery to -40% in March, the peak of the crisis has been overcome and the containment of the pandemic as well as the financial aid by the government (e.g. reduction of purchase tax, NEV subsidies) have a positive effect.

EU Top 5: The Italian market experiences a strong slump in March (~-80%), Germany and France follow with a slight delay (approx. 2 weeks). Recovery is not expected until May, while April is the most critical month.

USA: The US market falls later in the global comparison (~-50% March), social restrictions are announced until the end of April.

New York Times, 7 February Chinese Car Factories Idled

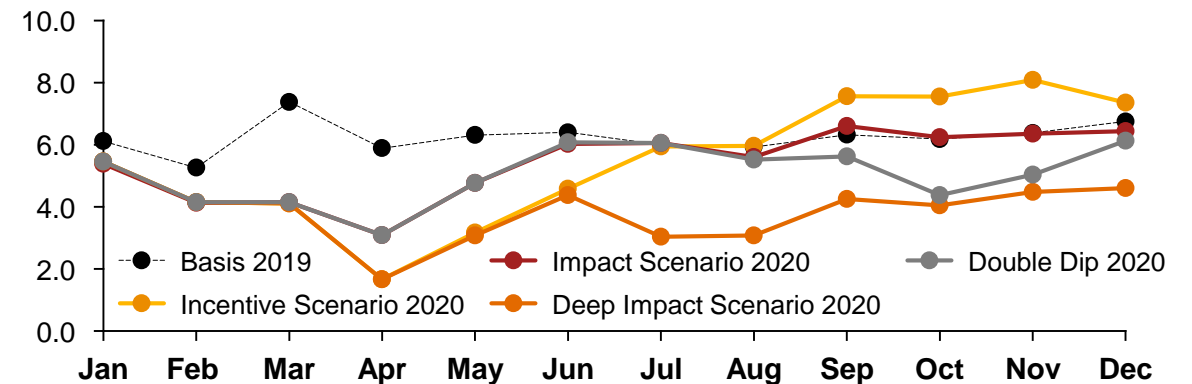
As the coronavirus spreads, assembly lines may take longer than expected to restart, causing a chain reaction around the world.

AbcNews, 19 March 2020 Automakers shut N. A. plants

Concerns about the spreading coronavirus has forced most of North America's auto plants to close temporarily

PC* Sales: Risk assessment for 2020 sales

(in millions, global)



Scenario	Sales (in millions)	Effect	Result
2019	75		• Basis of comparison
Incentive	64.5	-14.3%	• -72% in April vs. 2019 • +7% in H2 vs. 2019
Impact	64.7	-13.7%	• -48% in April vs. 2019 • Recovery in the 2nd HY
Deep Impact	47.3	-36.8%	• -72% in April vs. 2019 • 2nd half year -37% vs. 2019
Double Dip	60.3	-19.5%	• -48% in April vs. 2019 • -29% in October vs. 2019

*PC: Passenger Cars = Car

22 April 2020

Focus on Europe: Corona measures are showing a scalable impact on demand, with countries following individual paths

Key assumptions:

- **Demand** fails completely during lock-down periods, but returns differently according to depth of overall economic impact
- Bottlenecks in **production** due to delivery restraints of local suppliers slow down production ramp-up in Q2 2020

Current situation: European demand was increasingly stopped in March 2020, as a direct effect of the measures to contain COVID-19. On the basis of available data, new car registrations in Western Europe in March fell by about 53% compared to the previous year, the quarter by 27%. State **incentive schemes** if repeated from 2009 will create significant market distortions and mostly sell pre-produced vehicles; incentives on eco-cars only would fail to create significant volume effects.

Effects:

France: For March, France reports a 72% drop in new registrations, which means that only one week of sales was actually registered in that month. The future effects of the crisis will depend strongly on the duration of the measures.

Italy and Spain: As severely affected pandemic countries, new registrations in March fell by 85% and 69% respectively, as expected. Protective measures have been extended into May, deepening the expected sales effect.

UK: Delayed government measures (e.g. school closures) lead to an overall later decline in demand (April:~- 40%, May:~-20%) followed by a slow recovery in Q2.

Mercury, 17 March 2020 Ban on entry into EU countries

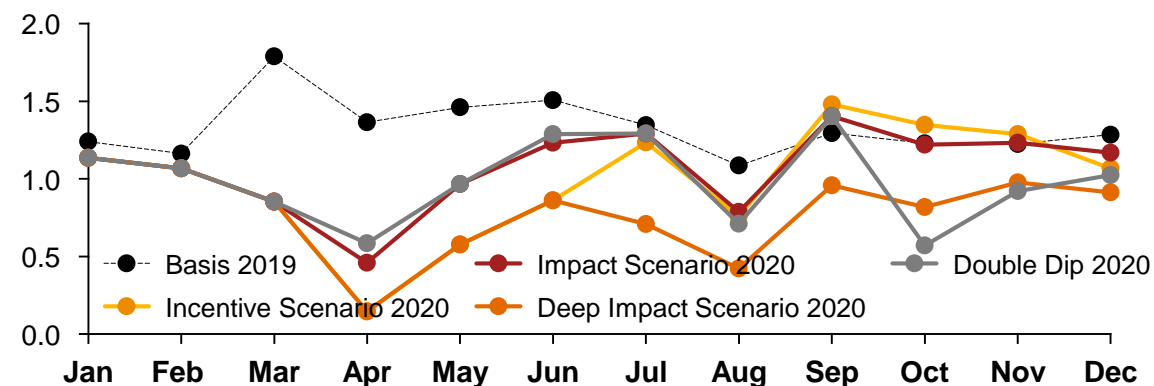
The EU imposes "basically a 30-day entry ban" on non-EU citizens, Chancellor Merkel said.

News, 22 March 2020 Increased curfew

Italy has to mourn 800 corona deaths in one day - and immediately tightens the rules. All non-essential businesses must close down ...

PC* Sales: Risk assessment for 2020 sales

(in millions, Europe incl. UK)



Scenario	Sales (in millions)	Effect	Result
2019	15.9		• Basis of comparison
Incentive	10.8	-32.2%	• -89% in April vs. 2019 • -18% in H2 vs. 2019
Impact	12.6	-20.8%	• -66% in April vs. 2019 • Recovery in second HY
Deep Impact	9.8	-38.5%	• -89% in April vs. 2019 • 2nd half year -36% vs. 2019
Double Dip	11.8	-26.4%	• -57% in April vs. 2019 • -54% in October vs. 2019

*PC: Passenger Cars = Car

22 April 2020

Focus on Germany: Based on the example of 2009, a visible effect of a generous incentive scheme is possible in H2

Key assumptions:

- Demand fails completely during lock-down periods, but returns at different rates after local restrictions expire
- Bottlenecks in production due to delivery restraints of local suppliers slow down factory ramp-ups in Q2 2020

Current situation: New registrations in Germany already slumped by 38% in March, and production by 37%. The declines correspond almost exactly to the duration of the isolation measures and show that these have brought the car market to a virtual standstill. A government-funded **incentive scheme** could mitigate the crisis effects visibly. While the size of the scheme would have to be considerable, it should be focused on ecological and first-hand cars rather than scrappage.

Effects:

Demand: The future development of demand is largely determined by the duration of social measures. No demand is to be expected during the period when public life is suspended; online sales will also have only a minimal effect. Depending on the developments on the labor market, long-term effects will occur.

Production: The synchronous closure of all vehicle plants in Germany from 13-18 March has so far been planned to continue through April, with varying dates of resumption. The Deep Impact/ U scenario assumes a complete closure over April, with significant effects on liquidity and supplier availability in Q2.

FNP, 23 March 2020
No contact in Germany

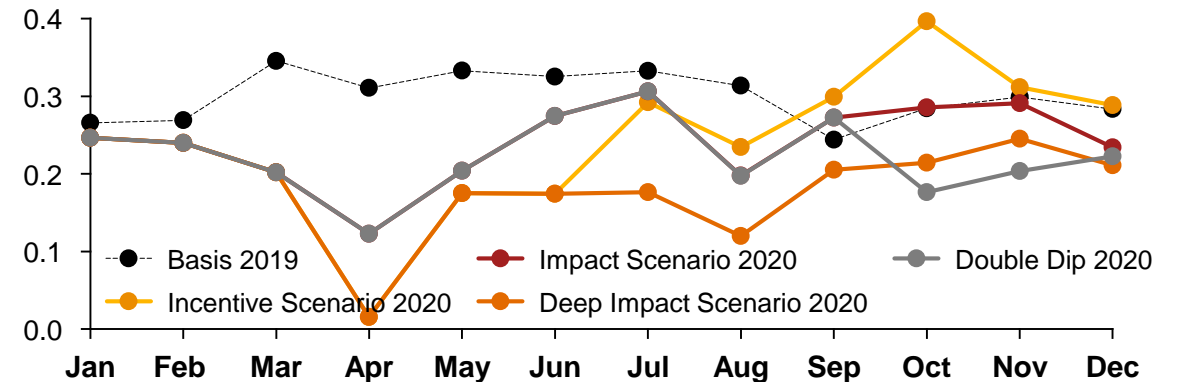
A general curfew will not be introduced in Germany for the time being. But the federal and state governments have decided to ban all contact...

N-tv, 03 April 2020
No deadline for the end of measures in sight yet

The Chancellor said in her video podcast published on Friday that she could not name an end to the measures...

PC* Sales: Risk assessment for 2020 sales

(in millions, Germany)



Scenario	Sales (in millions)	Effect	Result
2019	3,6		• Basis of comparison
Incentive	2,9	-20.3%	• -95% in April vs. 2019 • +4% in H2 vs. 2019
Impact	2,9	-20.2%	• -60% in April vs. 2019 • Recovery in the second HY
Deep Impact	2,2	-38.3%	• -95% in April vs. 2019 • 2nd half year -37% vs. 2019
Double Dip	2,7	-26%	• -60% in April vs. 2019 • -38% in October vs. 2019

*PC: Passenger Cars = Car

22 April 2020

Production Europe: Vehicle production will be affected by the disruption of value chains and may not profit from incentives

Key assumptions:

- European **production** largely shut down from mid-March, resumption of production varies according to scenario
- Restrictions in production due to **delivery difficulties of suppliers**, especially from Asia, into the 2nd quarter

Current situation: From 16 March onwards, a synchronized shutdown of vehicle production in Western Europe set in, correspondingly also at Tier 1 suppliers. Suppliers at other levels do not have sufficient market power to enforce closures and are faced with unchanged high costs. A government-funded incentive scheme could have only limited effect on same-time production due to quick sales of available vehicles out of stock – if not set up differently from 2009

Effects:

Short-term: Based on available information, we expect production to fall by about 35% in March compared to 2019, and to literally be at a complete standstill at the beginning of April.

Medium-term: Due to dramatic pandemic effects, Italy decreed the closure of all factories on 22 March after FCA had already stopped vehicle production, as well as in **Spain**.

UK: Delayed policy measures (such as school closures) lead to a delayed but all the stronger impact on production and logistics.

News, 17 March 2020

Volkswagen stops production

Due to the coronavirus, Volkswagen is closing plants in Spain, Portugal, Italy and Slovakia for 2 weeks, starting on 20.03.20....

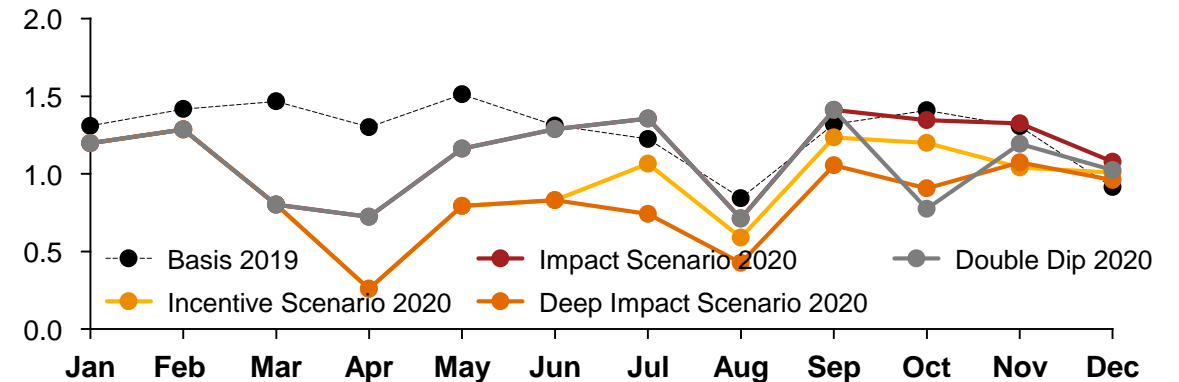
ManagerMagazine, 16 March 2020

FCA closes 8 plants in Europe

FCA is closing most of its production in Europe due to the impact of the pandemic. This affects 6 plants in Italy alone ...

PC* Production: Risk assessment for production 2020

(in millions, Western and Central Europe including UK)



Scenario	Production (in millions)	Effect	Result
2019	15,3		• Basis of comparison
Incentive	11.3	-26.3%	• -86% in April vs. 2019 • +2% in H2 vs. 2019
Impact	13,7	-10.7%	• -54% in April vs. 2019 • Recovery in the second HY
Deep Impact	10.3	-32.6%	• -86% in April vs. 2019 • -32% in the 2nd HY vs. 2019
Double Dip	13,0	-15.7%	• -54% in April vs. 2019 • -37% in October vs. 2019

*PC: Passenger Cars = Car

22 April 2020

Focus on USA: Extended containment measures follow the Deep Impact scenario path, with limited incentive effects

Key assumptions:

- **Demand** is affected to varying degrees by state-level measures and escalating unemployment
- Bottlenecks in **production** due to failures and closures of suppliers and logistics chains from Mexico and South Asia/ China

Current situation: After initial hesitation, the US government put massive restrictions on public life into effect at the end of March and initially set a deadline of 30 April. The implementation of the measures at state level is varied and inconsistent, and is additionally overlaid by election campaign maneuvers. An **incentive scheme** following the “cash-for clunkers” example of 2009 will only have a temporary effect but lift the market by about 5% points.

Effects:

Demand: After initial slumps in California and New England (New York, Boston), vehicle retail has now come to a standstill. The sharp rise in unemployment - together with a collapse of stock markets - is further dampening purchasing power.

Production: While global car manufacturers shut down their US plants partially in line with global strategies (Hyundai, Volkswagen, Daimler, BMW), the US manufacturers initially tried to implement short closures only until the end of March. In the meantime, we don't expect a restart before May (Deep Impact Scenario), so that a catch-up process lasting several years is to be expected, as after 2008/09

ARD, 01 April 2020

Setback in the US auto market

Devastating consequences of the corona pandemic for the business of manufacturers. Mazda and Mitsubishi suffered losses of 42% and 52% respectively in March (US market) ...

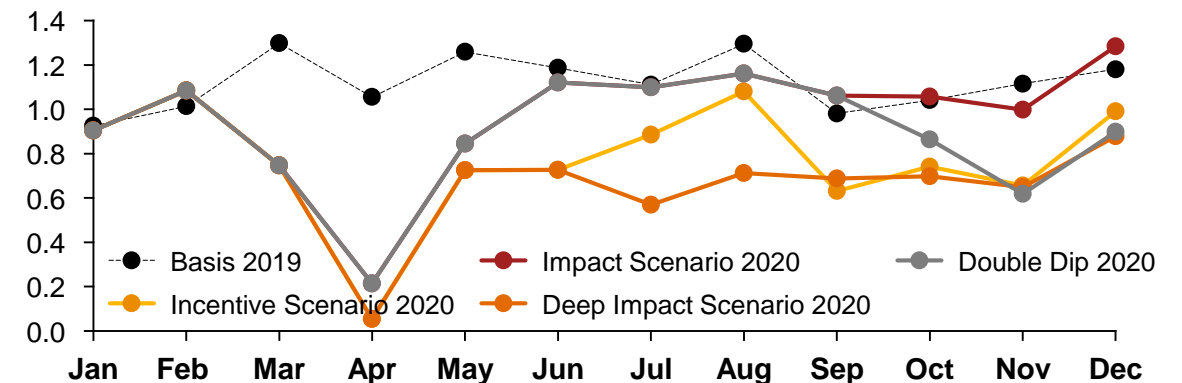
NTV, 01 April 2020

US market: VW suffers

March: Sales in the USA slumped by 42% for Volkswagen. The focus is now on the greatest possible stability for customers, employees ...

PC* Sales: Risk assessment for 2020 sales

(in millions, USA)



Scenario	Sales (in millions)	Effect	Result
2019	13,4		• Basis of comparison
Incentive	9,2	-31.8%	• -95% in April vs. 2019 • Up to -26% in H2 vs. 2019
Impact	11,6	-14.0%	• -80% in April vs. 2019 • Recovery in the second HY
Deep Impact	8,4	-37.3%	• -95% in April vs. 2019 • 2nd half year -38% vs. 2019
Double Dip	10,6	-21.1%	• -80% in April vs. 2019 • -17% in October vs. 2019

*PC: Passenger Cars = Car

22 April 2020

Focus on China: Demand shows surprising resilience while mere financial incentives may have a substantial effect

Key assumptions:

- **Demand** is returning rapidly even before the expiry of local restrictions and continues to be politically supported
- Continued measures in **production** reduce capacity utilisation, but are to be phased out quickly with strict government control

Current situation: After the almost complete loss of demand in February, car retailers quickly switched to online processes and were able to continue to meet part of the demand. Outside of Hubei/ Wuhan, production has restarted in all plants, both at OEMs and suppliers. Judging from the example of 209, **incentives** on car taxations and financing can unleash pent-up demand from 207-18, while installed capacity allows for production of up to 5 million units per month

Effects:

Demand: The pent-up demand for new and replacement vehicles is already high as a result of the 20018/ 2019 downturn, and will be further supported by the reduction of registration restrictions and the extension of NEV subsidies. However, the reduction of VAT on used cars may have a reverse effect on new vehicle sales.

Production: The release of the supplier and manufacturer plants allows a rapid start of production; however, JV plants of foreign brands still suffer in part from a lack of supply from international suppliers. A return to planned volumes is foreseeable (scenario Impact/ Recovery), if no second wave of infection occurs (scenario Double Dip).

Bloomberg, 04 March 2020
China Car Sales Drop 80%

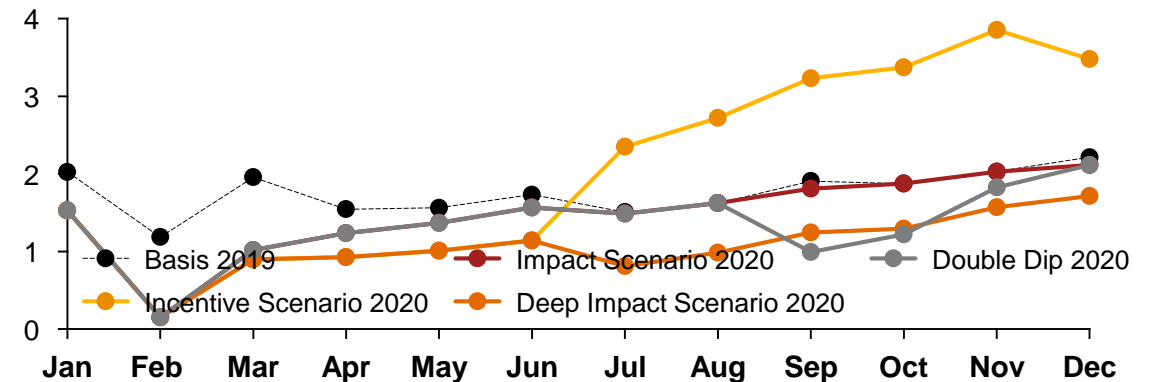
China's car sales had the biggest monthly plunge on record as the coronavirus kept shoppers away...

China Daily, 05 April, 2020
China to invigorate car market

A State Council...decided to extend subsidies and tax exemptions for new energy vehicle purchases by another two years ...

PC* Sales: Risk assessment for 2020 sales

(in millions, China)



Scenario	Sales (in millions)	Effect	Result
2019	21.1		• Basis of comparison
Incentive	24.6	+16.6%	• -40% in April vs. 2019 • +70% in H2 vs. 2019
Impact	17.7	-16.2%	• -20% in April vs. 2019 • Recovery in the second HY
Deep Impact	13.3	-37.3%	• -40% in April vs. 2019 • 2nd half year -32% vs. 2019
Double Dip	16,0	-24.1%	• -20% in April vs. 2019 • -35% in October vs. 2019

*PC: Passenger Cars = Car

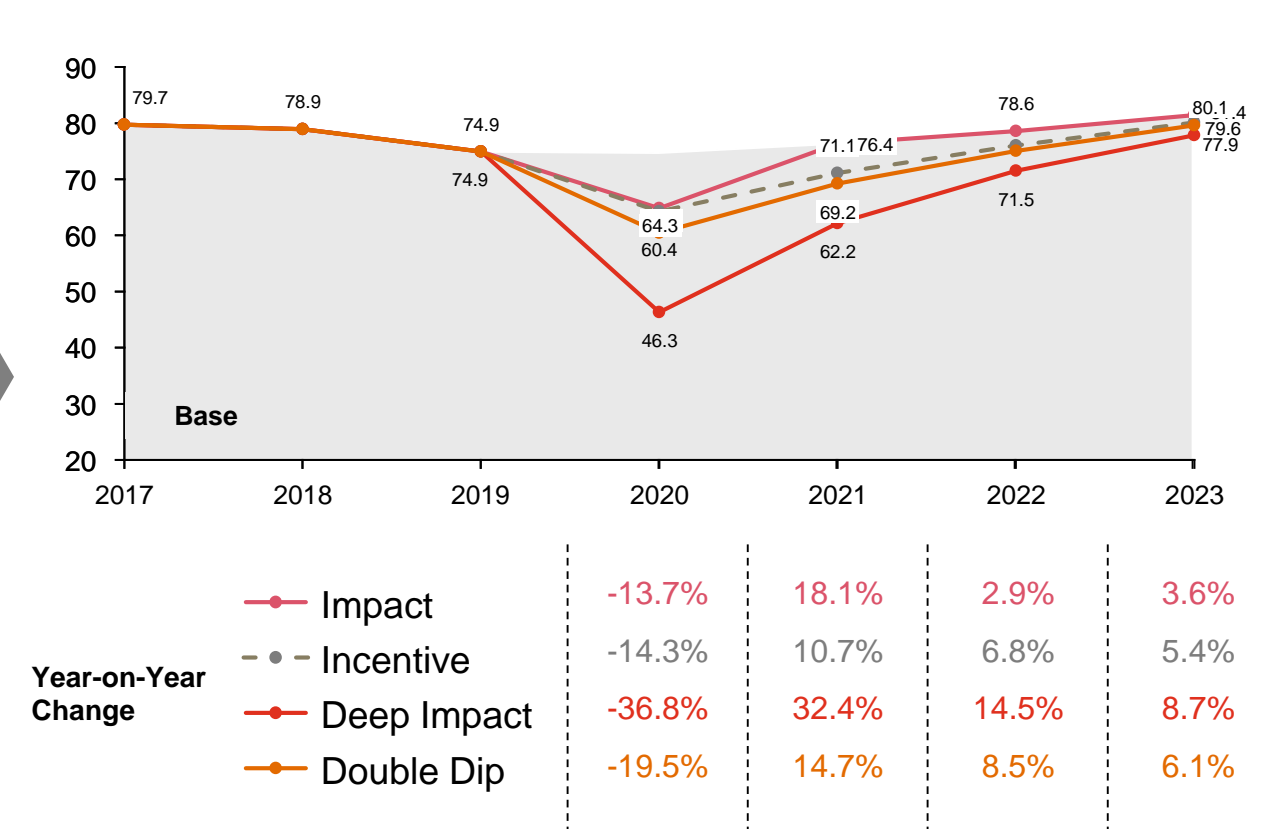
22 April 2020

Long-term Global Sales: Based on learnings from 2008/09, our analysis expects a quicker recovery in all scenarios

Key assumptions

- 1 Impact**
 - After a decline in production due to **plant shutdowns** that have already been **announced**, production can be **resumed without restriction for the most part**
 - Production** shortfalls in the first and second quarter will not be made up but merely return to expected rates. This assumes no structural damage to supplier and logistics networks
- 2 Incentive**
 - After the setback of Q2, **supply chains** and also demand are **recovering** rapidly - initially in China due to the time lag
 - Synchronized **government sales incentives** create short-term sales peaks without significant effect on production, exc. China
- 3 Deep Impact**
 - Extending current announcements, April will be marked by **continuing shutdowns** - production is recovering only slowly due to **damaged supplier networks**
 - Disruptive effects on the economy and suppliers lead to a gradual recovery **over several quarters**
- 4 Double Dip**
 - First wave of infections** can be **quickly contained** due to strict measures (see 'Impact' scenario)
 - After the summer, a **second COVID-19 wave** will follow, which can be **contained more effectively** with more targeted measures
 - Overall effect is structural and extends **into the following year**

PC* Sales: Risk assessment for sales until 2023
(in millions, global)



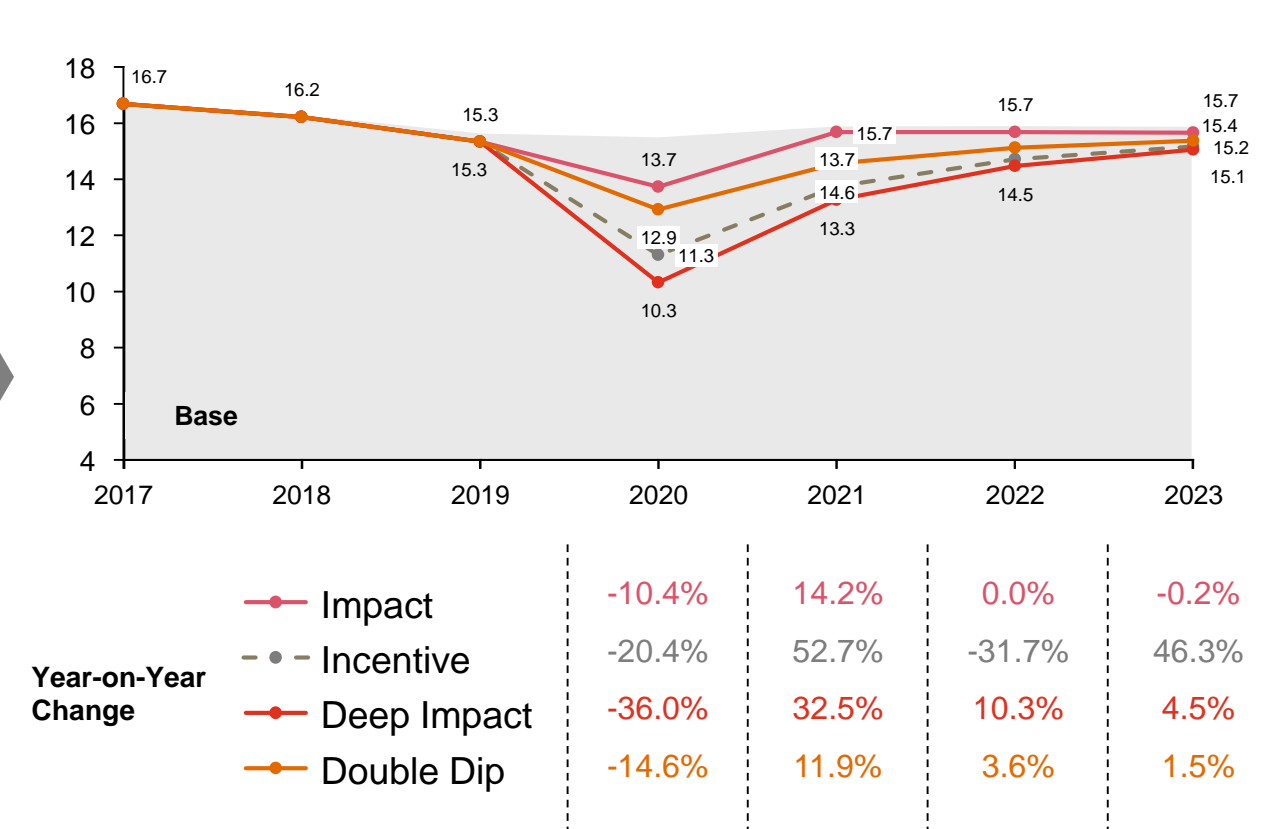
*PC: Passenger Cars = Car

Long-Term Production Europe: Sales incentives will only have a limited effect but help mitigate demand impacts

Key assumptions

- 1 Impact**
 - After a decline in production due to **plant shutdowns** that have already been **announced**, production can be **resumed without restriction for the most part**
 - Production shortfalls in the months February to April will not be made up but return to expected rates as demand recovers and new product offer creates sufficient buyer interest
- 2 Incentive**
 - After lifting lock-down measures, European governments quickly agree on coordinated **sales incentives** which help OEMs and retailers sell off existing vehicle stocks
 - Immediate effects of incentive schemes on **production volumes** are limited at best, if not tuned towards eco-vehicles and first hand vehicles inducing immediate new car replacement demand
- 3 Deep Impact**
 - Extending current announcements, April will be marked by **continuing shutdowns** - production is recovering only slowly due to **damaged supplier networks**
 - Disruptive effects on the economy and suppliers lead to a gradual recovery **over several quarters**
- 4 Double Dip**
 - **First wave of infections** can be **quickly contained** due to strict measures (see 'Impact' scenario)
 - After the summer, a **second COVID-19 wave** will follow, which can be **contained more effectively** with more targeted measures
 - Overall effect is structural and extends **into the following years**

PC* Production: Risk assessment for production until 2023
(in millions, Europe)



*PC: Passenger Cars = Car

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