
AD PUNCTUM | Automotive Strategy

May 2017

# Driverless On-Demand Mobility From First Principles (An Overview)

# BACKGROUND

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- **This presentation is a summary of a more detailed report (22,000 words)**
  - Published at the same time and available on www.adpunctum.co.uk
- **There are lots of forecasts about on-demand mobility being published but they often include sparse justification for the claims made**
- **This study is a first principles look into the factors behind on-demand mobility, reflecting actual travel patterns and human behaviours**
  - This identifies what factors really matter and disproves some intuition
  - Through this, we can create, model and explain some adoption scenarios
- **No one has a way to exactly predict the future (unless they are from it)**
  - This work is not definitive, it aims to better inform
  - Be very wary of those bearing single scenario forecasts

# EXECUTIVE SUMMARY

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- Passenger travel revenue pool attracts disruption from new entrants
- Majority of travel today is in private cars -- on-demand is a threat to ownership
- Operational challenges remain to achieve mass-transit with driverless vehicles (robo-taxis) but 15% profit margins with low fares is possible
- On-demand mobility using robo-taxis will become cheaper than car ownership and substantially reduce demand for new cars -- likely before 2030
- The above can be achieved with today's private vehicle occupancy rates
- Public transport customers are price-sensitive -- unless fares fall to $0.40 per mile they will not switch, sharing will enable prices to reach that level
- On-demand could increase travel by 5% to 10% -- on top of economic growth

# HUGE REVENUE POOL FOR NEW TRAVEL METHODS

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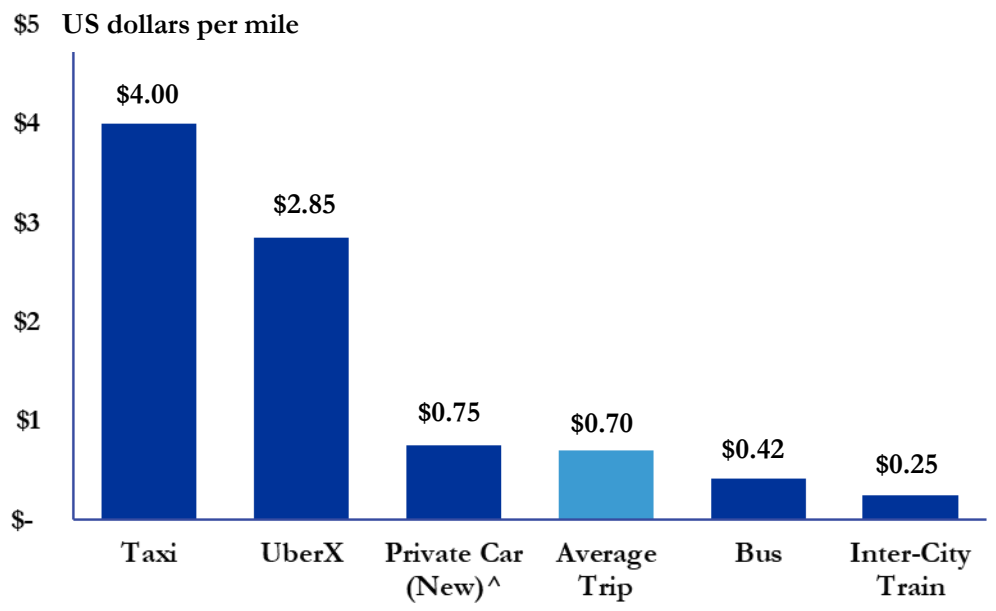
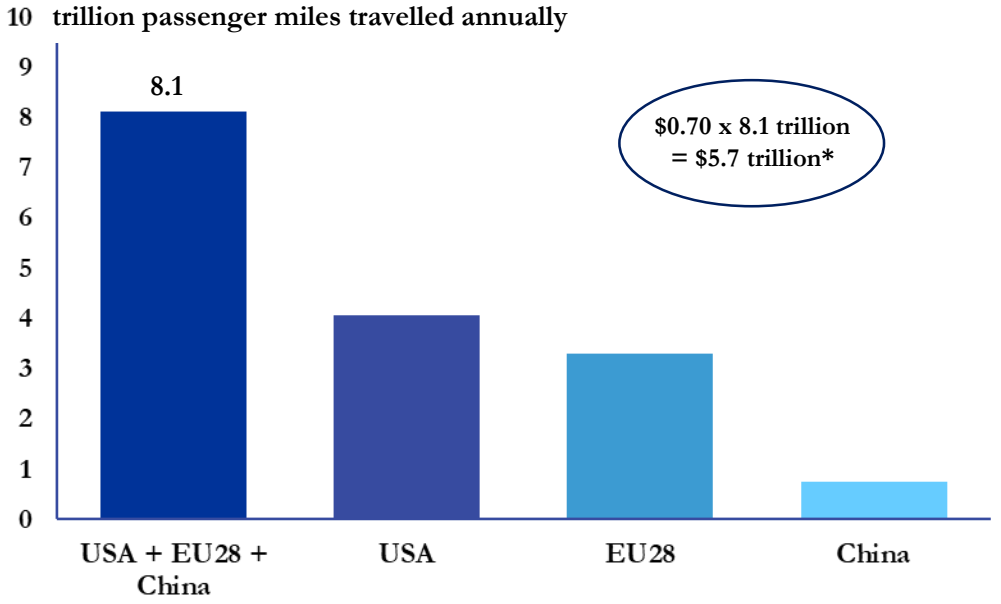
## PASSENGER FARES PER MILE




Source: Ad Punctum Research

^ excludes parking costs and tolls

## PASSENGER MILES -- 2014




Source: Ad Punctum Research, European Commission

* Global figure would be higher

**Average Travel Cost Today Is About $0.70 Per Mile.**
**Revenue Pool Of $6 Trillion (And Growing) For An All-Conquering Solution.**

# CAR IS ALREADY THE TRANSPORT OF CHOICE

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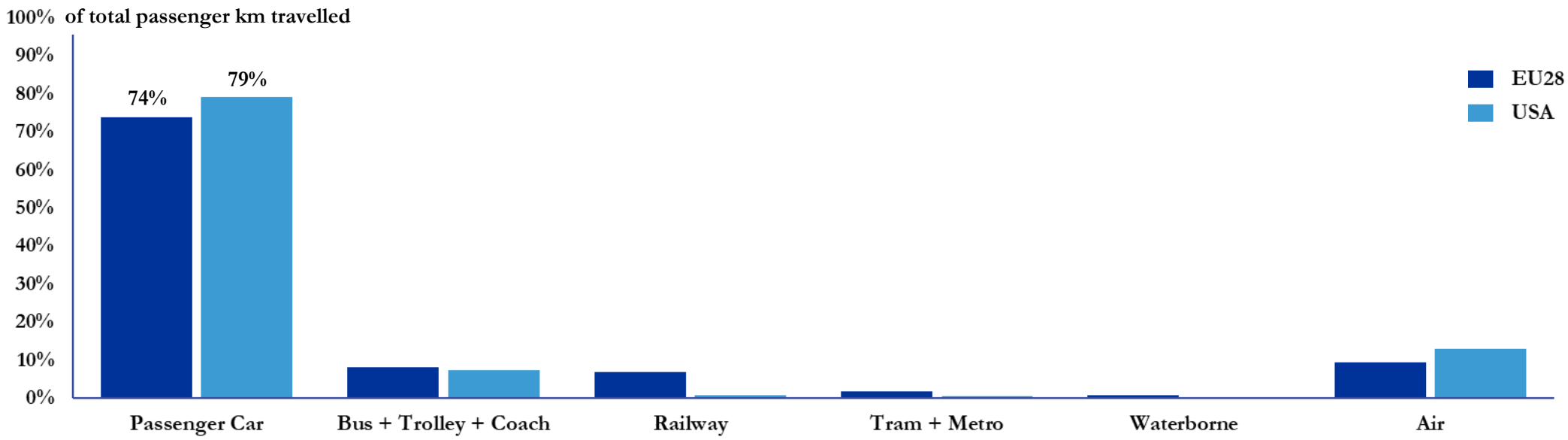
## SHARE OF TOTAL PASSENGER DISTANCE TRAVELLED -- 2014




Source: Ad Punctum Research, European Commission

**On-Demand Mobility Will Take Share From Private Cars -- Other Modes Only Have A Small Share Of Miles Travelled In Rich Countries.**

# OPERATIONAL CHALLENGES FOR ON-DEMAND

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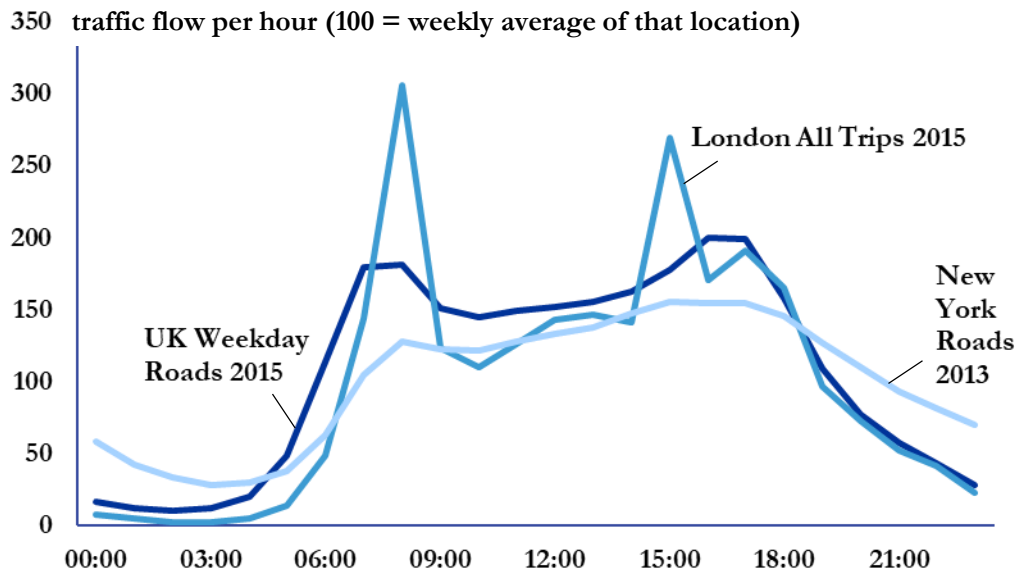
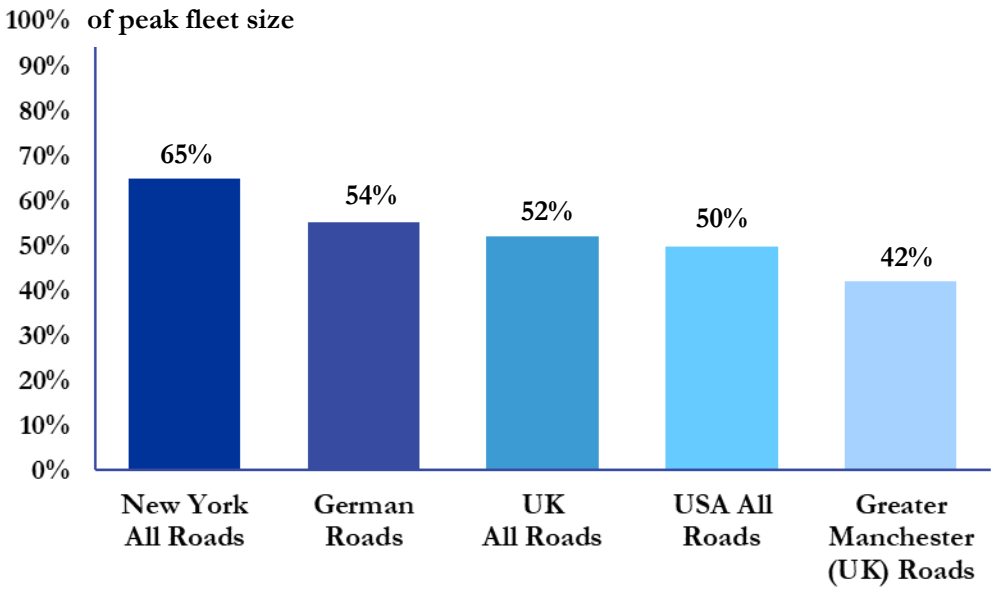
## TRIP DENSITY OVER 24 HOURS




Source: Ad Punctum Research, Department for Transport, TfL, City of New York

## POTENTIAL FLEET EFFICIENCY




Source: Ad Punctum Research, UK DfT, TfL, City of New York, BAST, US DfT, TfGM

**On-Demand Fleets Face A Trade-off -- Market Share Or Efficiency. Mass Transit Fleets Will Struggle To Get Utilisation Above 50%.**

# PRIVATE CARS ARE HIGHLY COST INEFFICIENT

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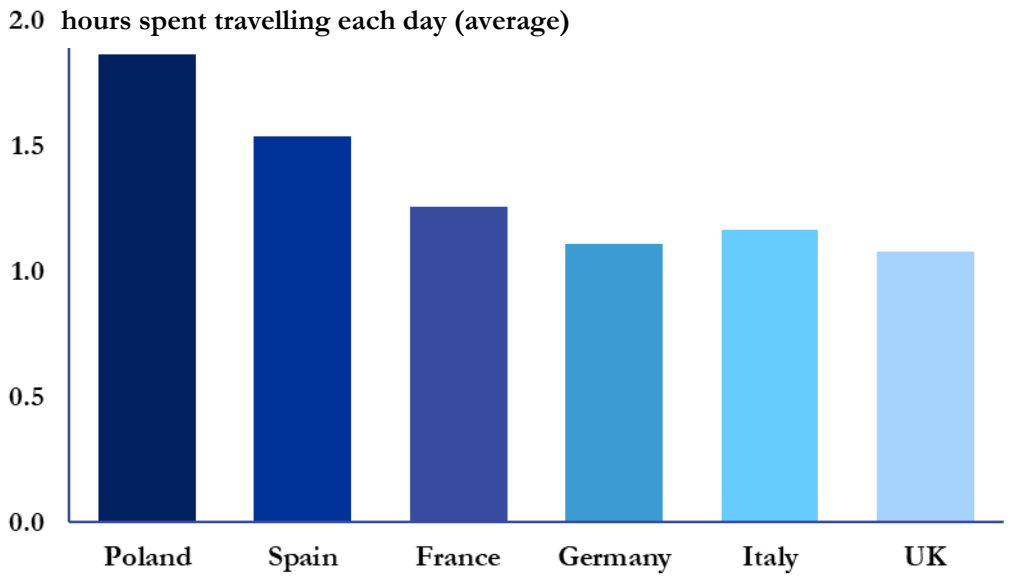
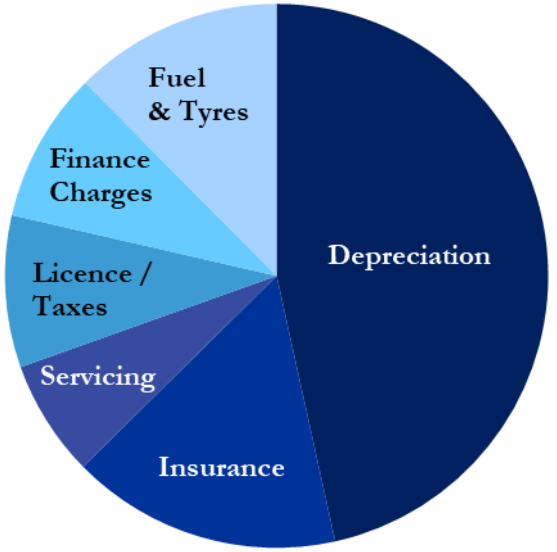
## DAILY TRAVEL TIME -- 2012




Source: Ad Punctum Research, European Commission

## BUILD-UP OF OWNERSHIP COSTS

**TOTAL COST = $0.75 PER MILE***




Source: Ad Punctum Research, AAA Your Driving Costs 2016 * Excludes tolls, parking etc

**Private Cars Are Used 1 - 2 Hours Per Day, Less Than 10% Utilisation.**
**Almost Half The Annual Cost Of A New Car Is Depreciation.**

# COMPONENTS OF A CHEAPER SOLUTION

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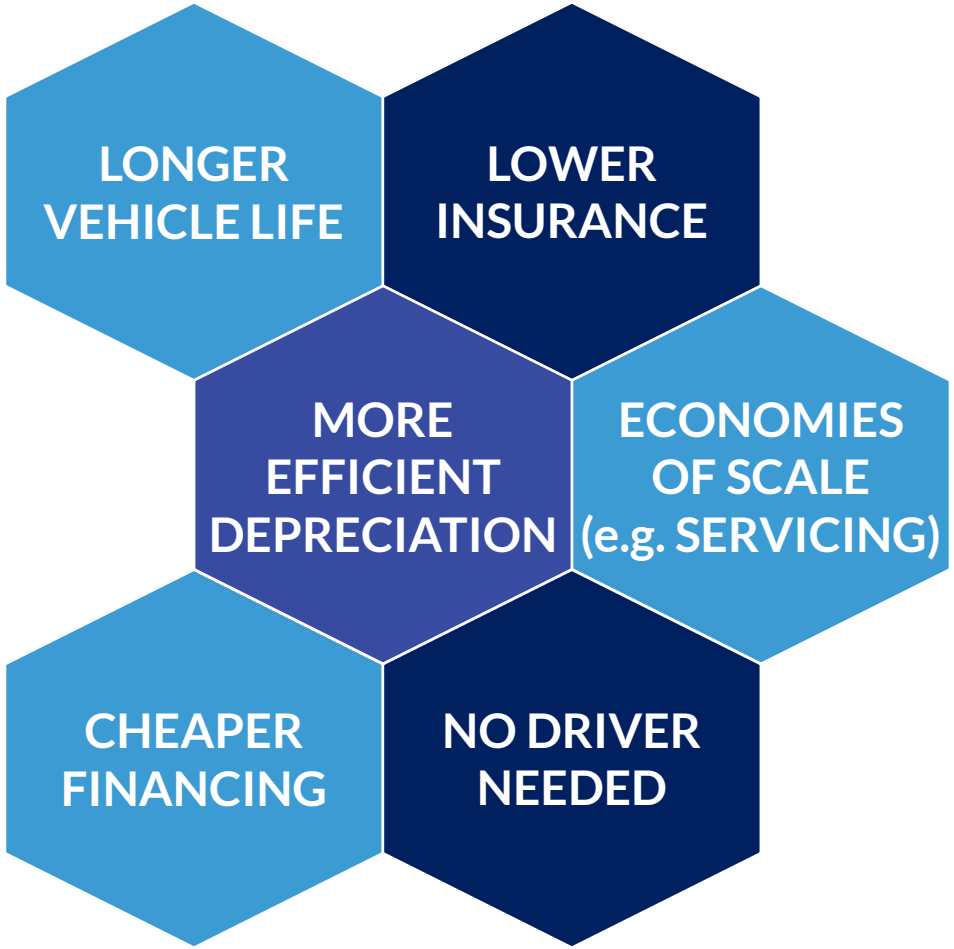


- By implementing driverless technologies, robo-taxis will become cheaper than owning a car
  - Even with cost additions for vehicle technology, overhead and operator profit
- Savings come through higher fleet utilisation and longer vehicle life
  - More miles, but in fewer years
- The vehicles will also crash less

# AFFORDABLE TRAVEL BECKONS…

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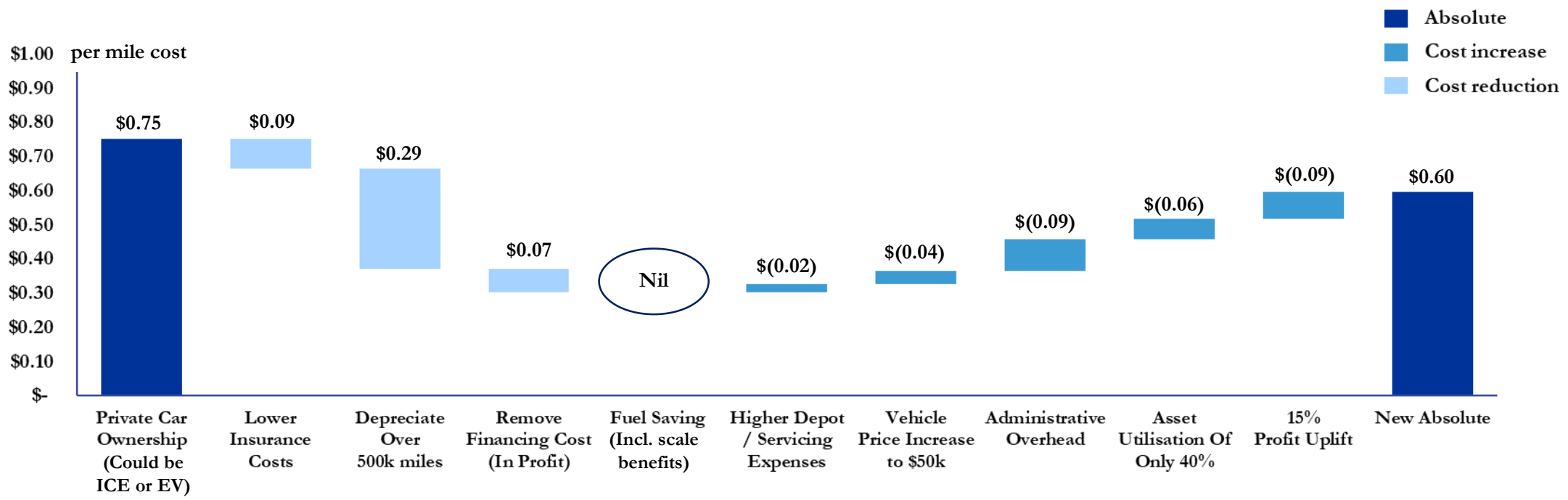
## COST PER MILE FOR A DRIVERLESS VEHICLE IN OPERATION

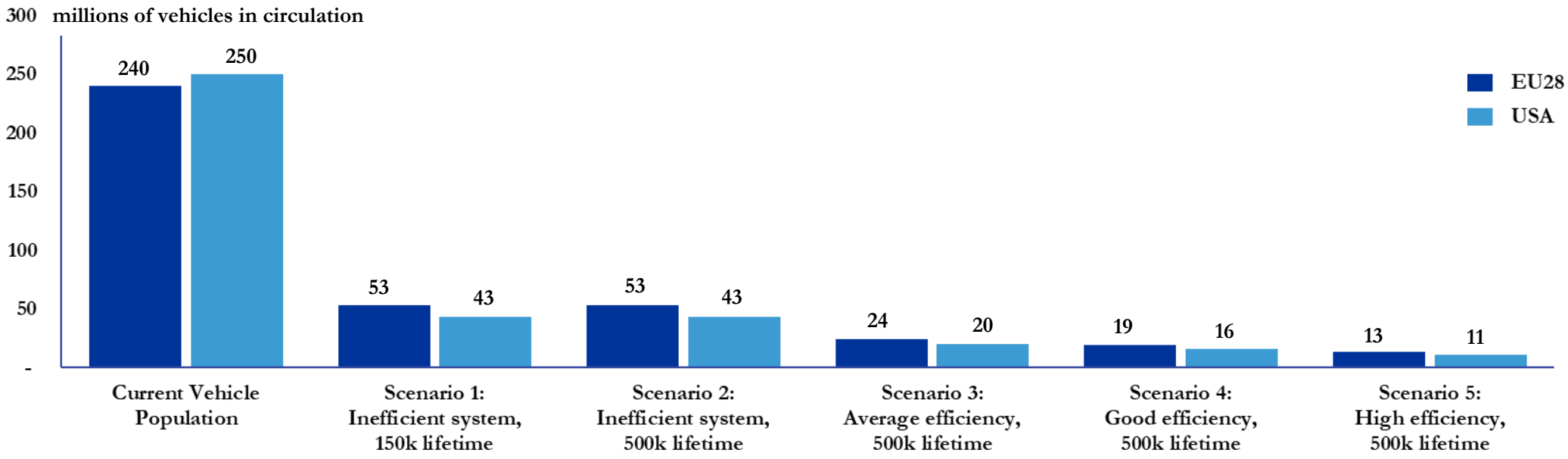



Source: Ad Punctum Research

**Robo-Taxi Operating Costs More Than Offset By Savings That Result From Using A Shared Fleet And A Vehicle With A Longer Lifespan.**

# …AND REQUIRES FAR FEWER CARS…

## PASSENGER VEHICLE STOCK IN DIFFERENT ON-DEMAND SCENARIOS




Source: Ad Punctum Research, European Commission

**Due To Low Utilisation Of Private Cars, Even Scenarios With Relatively Low Efficiency (40% Utilisation, Low Occupancy) Need Fewer Cars.**

# THE RESULT? REALLY BAD NEWS FOR ANNUAL SALES

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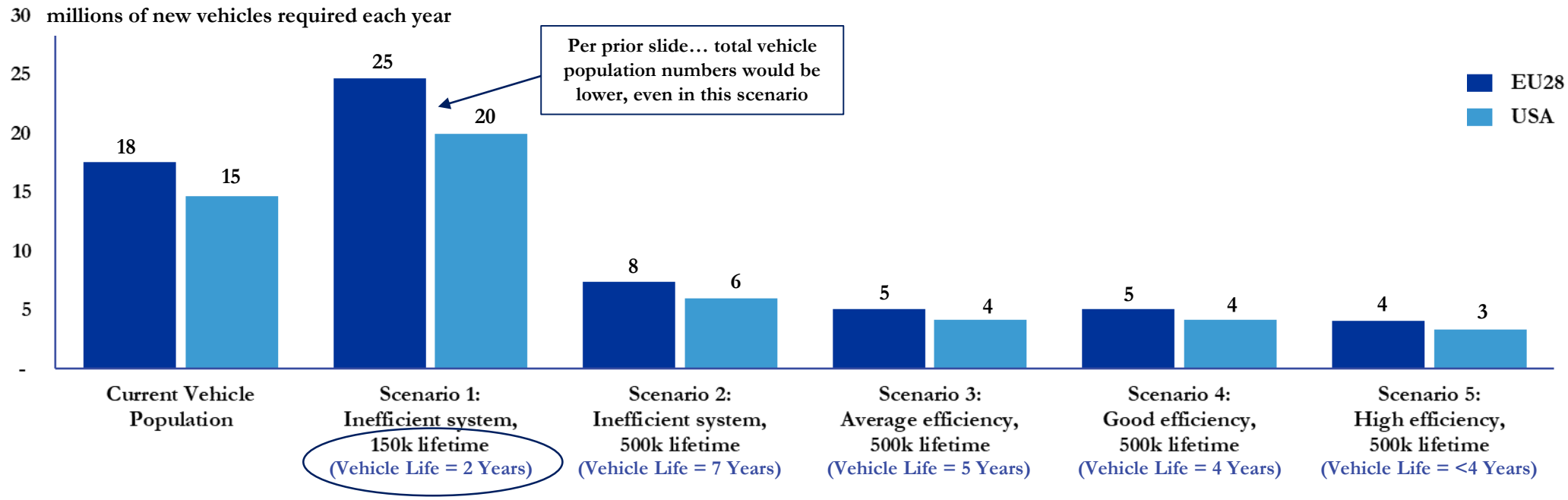
## ANNUAL PASSENGER VEHICLE SALES IN DIFFERENT SCENARIOS




Source: Ad Punctum Research, ACEA, Business Insider

**Unless Fleets Decide To Have Vehicles With Very Short Lives, Demand For New Vehicles Will Be Less Than Half Today's Levels.**

# Question:
# But will we ever see driverless cars on the road in our lifetime?

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# Answer:

# Oh yes.

# Driverless cars will be capable of most road mileage by the early 2020s.

# TRAVEL IS MORE PREDICTABLE THAN WE THINK

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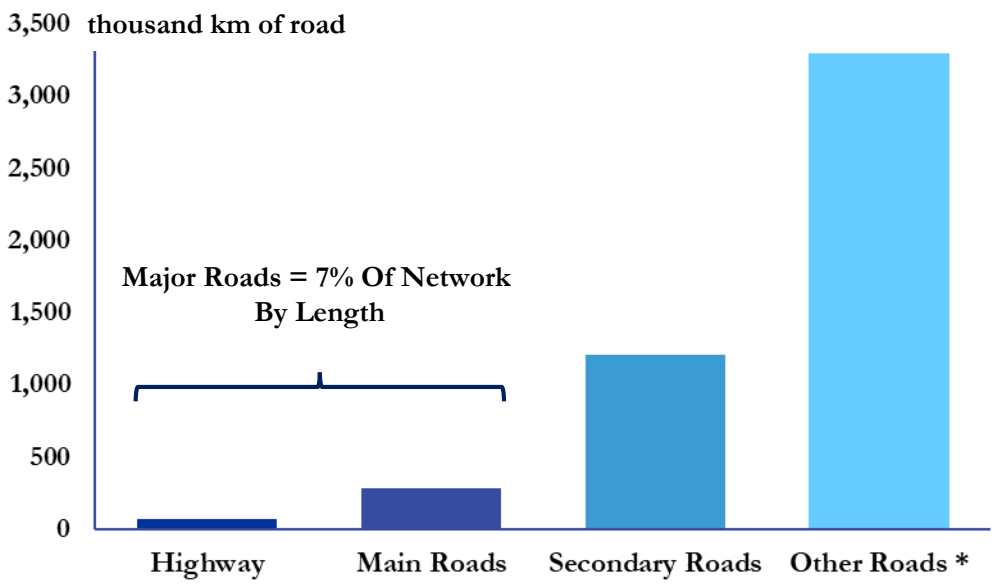
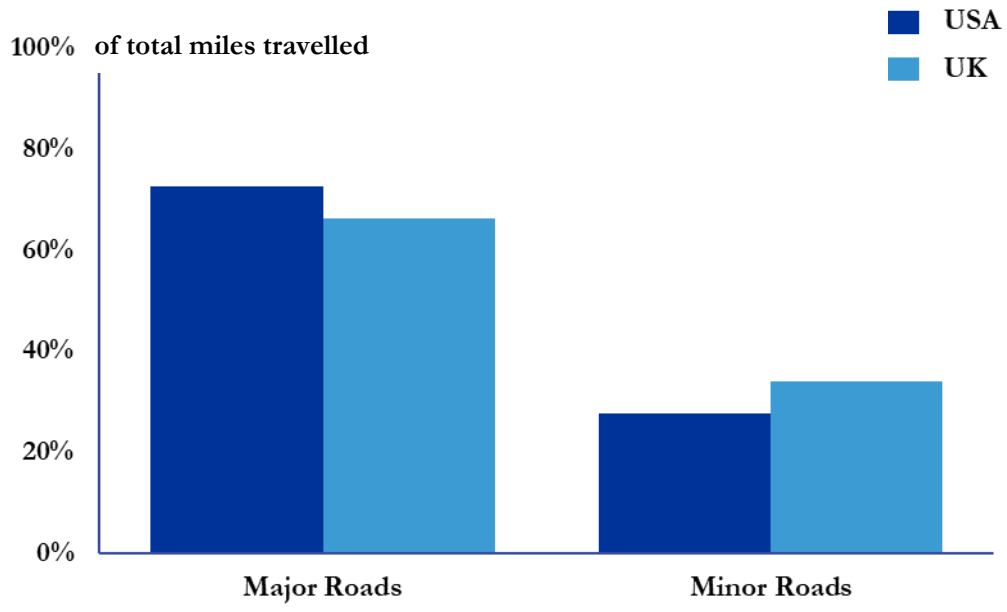
## EU28 NETWORK BY ROAD TYPE




Source: Ad Punctum Research, European Commission

* includes unpaved roads

## TRAVEL BY ROAD TYPE -- 2016




Source: Ad Punctum Research, Federal Highway Administration, UK DfT

**Major Roads Are A Fraction Of Network Length But Most Of The Usage. Driverless Technology Will Soon Be Capable On These Arterial Routes.**

# Question:
# But won’t the authorities discourage driverless vehicles?

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# Answer:

# Many will be in favour. Taking a look at how good humans are at driving will help to explain why…

# ROADS ARE BETTER OFF WITHOUT US

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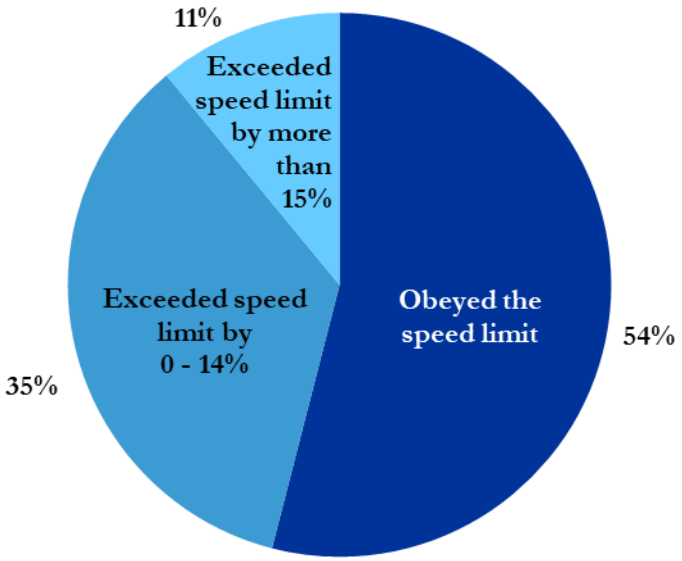
## OBEYING SPEED LIMITS -- UK 2015

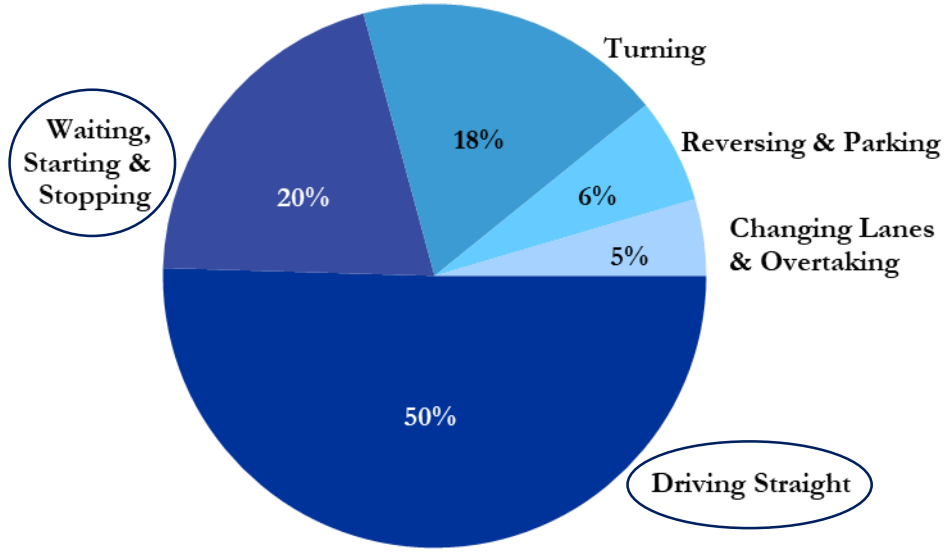
### UK MOTORWAY SPEED LIMIT = 70 MPH




Source: Ad Punctum Research, UK Department for Transport

## ACCIDENTS BY MANOEUVRE

### UK ACCIDENT CLASSIFICATION -- 2015




Source: Ad Punctum Research, UK Department for Transport

**Almost 26,000 People Killed On Roads In The EU Each Year.**
**Most People Ignore Safety Guidance And Crash In Simple Situations.**

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# Question:
# How quickly will people take up on-demand mobility usage?

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# Answer:

# Research indicates that it is heavily dependent on price and income level.

# QUALITATIVE ON-DEMAND ADOPTION ASSESSMENT

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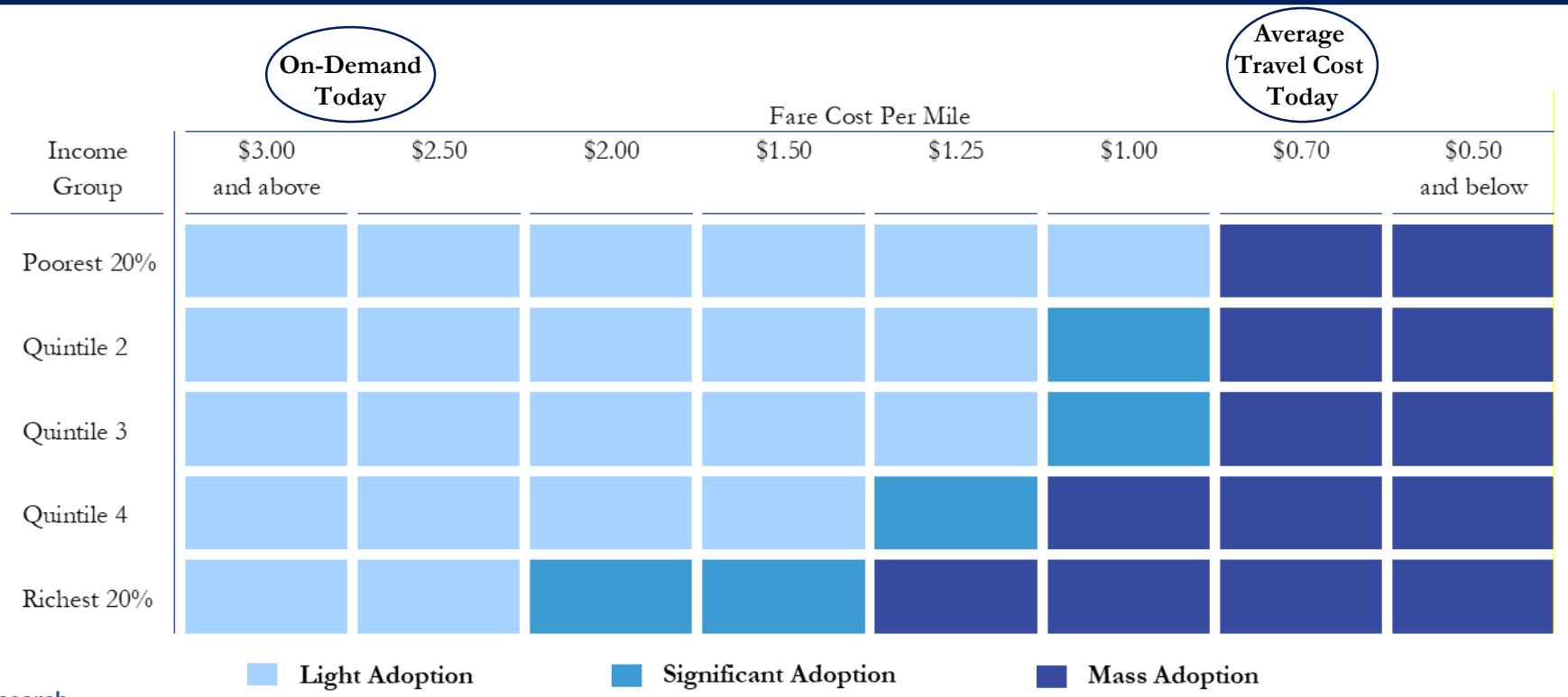
## INTEREST IN ON-DEMAND BY INCOME GROUP AND FARE LEVEL




Source: Ad Punctum Research

**Even Among The Richest Groups, Mass Adoption Requires Price To Fall Significantly From Today -- Poorest Groups Highly Budget Conscious.**

# HOW TO MODEL THE ADOPTION OF ON-DEMAND?

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1

- Set different conditions for consumer preference and regulator burden -- both reduce potential miles served
- Create different scenarios for technology capability and cost improvement over time
- Create input variables such as operating cost, profit margin and willingness to invest upfront

2

- Create travel forecasts by income group
- Create price sensitivities and elasticity by income group
- The result is a set of maximum miles travelled for a given price by income group

3

- Create on-demand fleet size and minimum selling price in any given year
- Run a bid/ask analysis to see the highest price that the fleet can command in order to be fully utilized
- Flow the results into the following years to model fleet growth

# HOW THE MARKET MIGHT DEVELOP…

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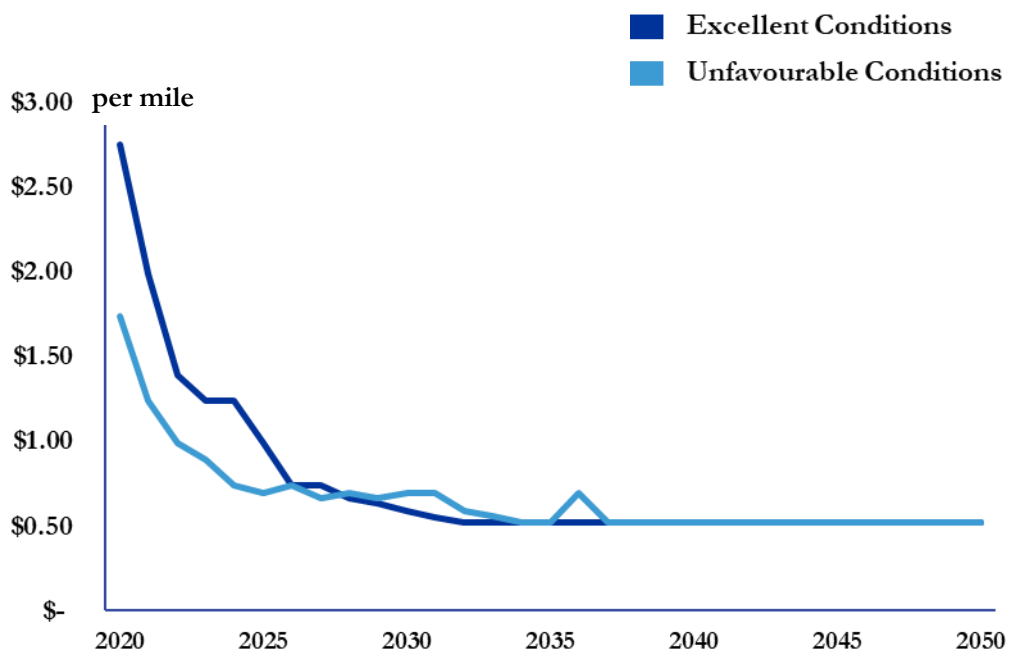
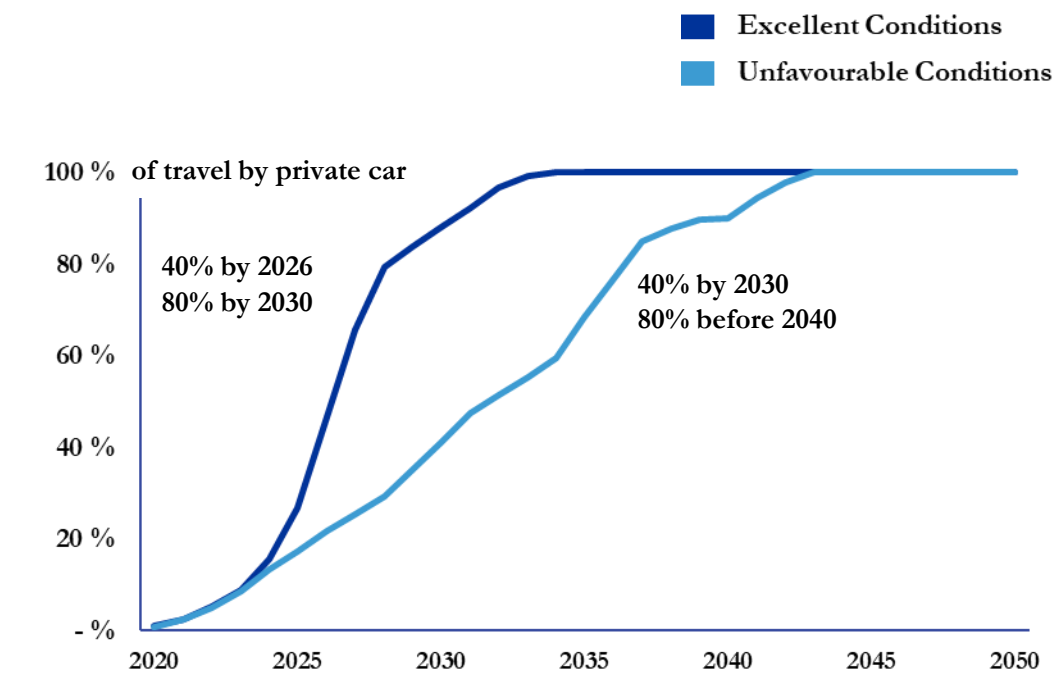
## PRICE PER MILE OVER TIME




Source: Ad Punctum Research

## SHARE OF TRANSPORT OVER TIME




Source: Ad Punctum Research

**Driverless On-Demand Services Spread Quickly In Various Scenarios Of Technology Capability, Consumer Attitude And Regulatory Openness.**

# Question:

# So by 2040, everyone is using on-demand instead of cars?

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# Answer:

# Not necessarily. Public transport users are highly price conscious. Many cannot afford more than $0.40 per mile.

# EVEN CHEAPER TRAVEL WITHIN REACH…

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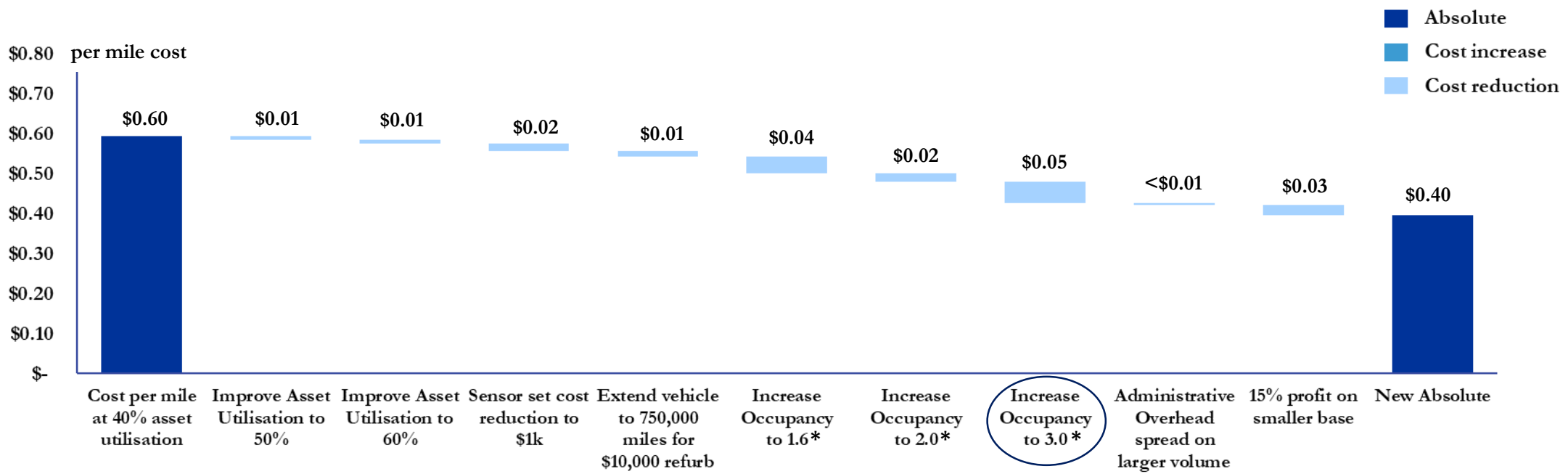
## COST PER MILE FOR A DRIVERLESS VEHICLE IN OPERATION




Source: Ad Punctum Research

* This is average occupancy, peak occupancy would be higher

**By Taking More Passengers In The Vehicle, $0.40 Per Mile Is Possible. Not Everyone Will Want To Travel With Others -- They Can Pay More.**

# DIFFERENT CUSTOMER GROUPS EMERGE

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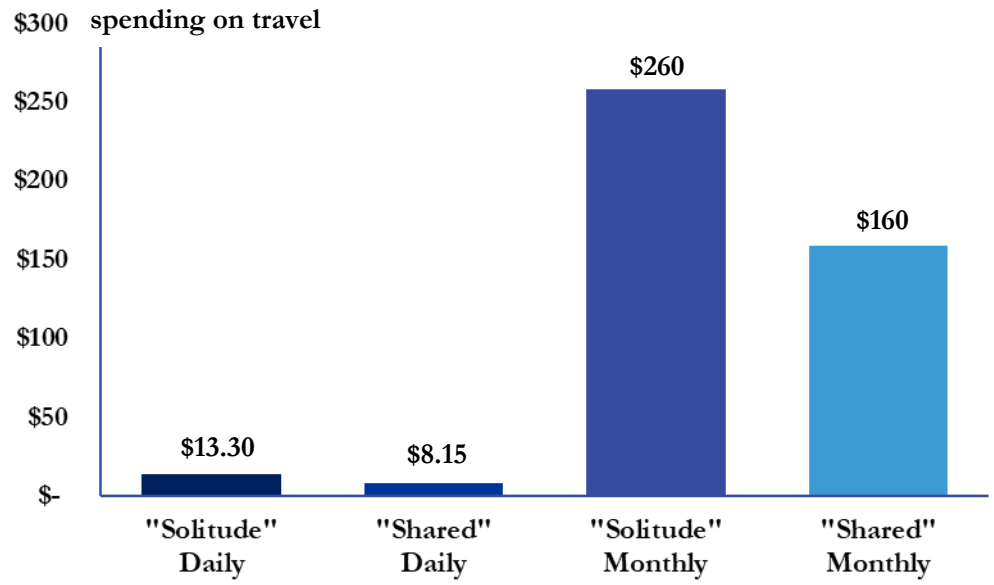
## INDICATIVE COMMUTING COSTS




Source: Ad Punctum Research, APTA

- **Two services likely to be available**
  - **Solitude** -- like today's private car ownership; you only share with friends and family
  - **Shared** -- share with strangers (far less than public transport today) and travel door to door
- **No forced one-size-fits-all service**
  - Cars are 85% of the market today, solitude is the mainstream
  - Can serve both with a single vehicle type (still efficient)

**On-Demand Mobility Without Sharing Is Cheaper Than Car Ownership. Sharing Achieves Cost Parity With Public Transport.**

# HOW SERVICES WILL EVOLVE OVER TIME

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## Today

## Nearing Maturity "Solitude"

- Service operates a mixture of human-driven and robo-taxis
- Robo-taxi used if the route is driverless-ready
- Passengers may get a discount to use robo-taxis
- Used on ad-hoc basis

## Nearing Maturity "Solitude"

- Almost zero human taxi drivers left
- Robo-taxi can drive almost all journeys
- If trip is too hard for robo-taxi (very rare), passenger helps to drive
- Travel purchased via monthly subscription -- few private cars

## Fully Mature "Solitude"

- Robo-taxi can drive all journeys
- Used widely by groups with previously restricted mobility (elderly, children)
- Users can opt into "shared" travel to receive a discount
- Family travel subscriptions

## Fully Mature "Sharing"

- Same vehicles as "solitude" service
- Travel with up to 4 other strangers
- Trip times only marginally longer
- Travel cost lower than "solitude" or public transport
- Subscription may include some "solitude" miles

**As Technology Progresses, Nearly Effortless Services Will Arrive First With Completely Effortless Experiences Being Offered Later On.**

# HOW DOES MY MARKET GROW?

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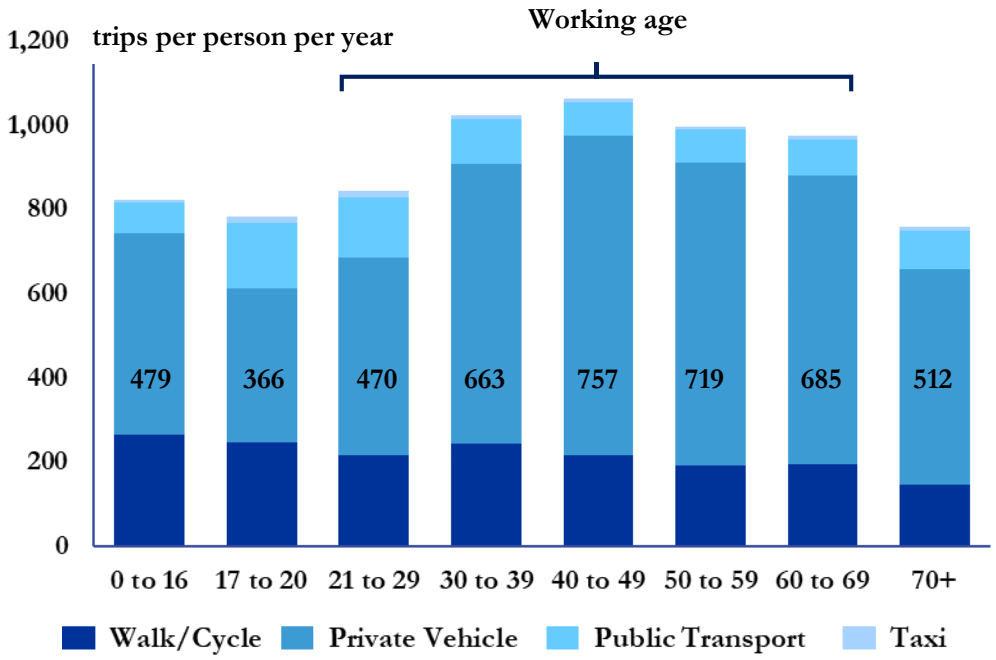
## TRIPS BY MODE AND AGE GROUP




Source: Ad Punctum Research, UK DfT

- **UK government forecasts that road traffic will grow by 2040, even without on-demand services**
  - **Low** -- 19% higher than 2010
  - **High** -- 55% higher than 2010
- **On-demand mobility will help those with restricted mobility**
  - About 10% of the population, travel 50% less than average
- **Working age groups use cars more than the rest -- for good reason?**

**Natural Demand For Travel Should See Growth Of 20% To 50% By 2040. Greater Travel By Restricted Users Increases Market 5% To 10%.**

# WHAT DOES IT ALL MEAN?

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## CUSTOMERS

- Work out what to do with the extra time and saved money
- Decide when to switch -- don't want to get caught with a car no one wants as used vehicle demand evaporates
- Will this just change the way you travel or might it cause you to make different lifestyle choices?

## COMPANIES

- Decide on your core business
- Don't assume you can become a monopoly
- Face up to lower car demand
- Be adaptable to different regulatory decisions by region and for adoption to vary by a few years
- Find ways to get early insights into customer behaviour

## REGULATORS & GOVERNMENTS

- How to encourage on-demand in a safe and innovative way?
- Co-ordination with others vs territory-specific approach?
- How to identify monopolies early on and defeat them?
- Decide how to cope with impact of on-demand being cheaper than public transport
- How do public spaces change?

# IN CONCLUSION…

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- Passenger travel revenue pool attracts disruption from new entrants
- Majority of travel today is in private cars -- on-demand is a threat to ownership
- Operational challenges remain to achieve mass-transit with driverless robo-taxis but 15% profit margins with low fares is possible
- On-demand mobility using robo-taxis will become cheaper than car ownership and substantially reduce demand for new cars -- likely before 2030
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- Public transport customers are price-sensitive -- with fares above $0.40 per mile they will not switch, sharing will enable prices to reach that level
- On-demand could increase travel by 5% to 10% -- on top of economic growth

# WANT MORE? HOW TO FIND THE DETAILED REPORT

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EITHER

Type “Ad Punctum chauffeurs for all” into a reputable search engine

OR

Visit www.adpunctum.co.uk/research and look in the on-demand mobility section

OR

Email info@adpunctum.co.uk and ask us for a copy, we’ll send it right away

# OUR OTHER ON-DEMAND MOBILITY RESEARCH

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- **How carmakers can participate in on-demand mobility**
  - How the value stream will change versus today
  - Why OEMs can't do everything they are currently trying
  - What OEMs can learn from other sectors
  - Type “Ad Punctum choosing a model” into a search engine or visit www.adpunctum.co.uk/research

- **The strategy problems that on-demand mobility creates for carmakers**
  - Why the strategy challenge is different to current OEM core business
  - What to look at to assess the robustness of an OEM's approach
  - What it means if the answers are unsatisfactory
  - Type “Ad Punctum 10 key questions” into a search engine or visit www.adpunctum.co.uk/research

# ABOUT AD PUNCTUM

- Consultancy and research firm founded by an ex-automotive OEM insider
- Ad Punctum researches emerging trends and key issues ranging from the disruptive impact of on-demand mobility to Brexit
- Periodically publishes relevant research to make it freely available and drive understanding and debate on interesting topics
- Please contact sales@adpunctum.co.uk or visit www.adpunctum.co.uk to learn more about us and discuss any specific queries you might have

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