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➢ Evolução do Setor & Tendências da Mobilidade Urbana

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McKinsey & Company

Urban Mobility: evolution of the parking industry in Brazil

January 2020

McKinsey Center for Future Mobility

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We are passionate and curious about solving the world's mobility problems for society, industries, and individuals—bringing together McKinsey's expertise across sectors and continents to tackle issues no organization or government can solve on its own.

Our forward-thinking and integrated perspective—covering all mobility-related sectors across automotive, cities, tech, freight, infrastructure, last-mile delivery, utilities, and many others—helps industry leaders and policy makers lead change, navigate disruptions, and win in a future that is autonomous, connected, electrified, and shared.

Urban Mobility: evolution of the parking industry in Brazil

Executive summary

The parking industry in Brazil is sizeable and an important part of vehicle expenditure

- Parking produces BRL ~16B in yearly gross revenues, representing ~8% of vehicle spend
- The largest parking segments are shopping malls (BRL ~4B), commercial buildings (BRL ~3.5B) and hospitals (BRL ~2.5B), which account for 65% of the industry's gross revenues

In the short term, the demand for parking will continue to grow while the market experiments with transportation alternatives that will diversify the mobility ecosystem

- Economic expansion coupled with continued urbanization are key enablers of parking
- Private cars should remain as a primary method of transportation in the short term, given that alternatives are not widely available

In the longer term, the private vehicle business ecosystem (including parking) will evolve and industry players have the opportunity to capture growth from new business models

- Urbanization should continue to concentrate people and wealth in major urban areas
- Consumers might consider changing mobility habits and shift to alternatives that would replace the use of personal cars, given the availability of alternatives
- Demand and diversity in the use of real estate in urban locations will likely increase (e.g. last-mile delivery and mobility hubs)

Future trends offer great potential for parking operators that are able to evolve their capabilities

- Mobility management, real estate expertise and data analytics will become relevant capabilities
- Opportunities will emerge around car services and adjacencies, last-mile solutions, traffic management and customer-data monetization

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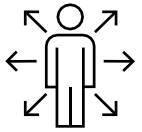
Demand for parking arises from the need individuals have to access places and their decision to use their vehicle for transportation

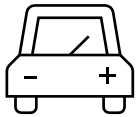
Preliminary



Need to go places…

Demand for parking originates from the need individuals have to **go to places for specific purposes**

The **level of economic activity** is one of the **key levers** that stimulates mobility and consequently drive shifts in parking demand



…decision to use vehicle…

The decision to use **personal vehicle** is associated with the availability of **mobility alternatives** and evaluation of aspects such as **convenience and flexibility**

Cars compete with public transportation, hailing services, micro-mobility, among others

…. availability of parking operations

In order for parking demand to **materialize** into a transaction, the **offer of parking** should be **available** and with an **adequate value proposition** for consumers

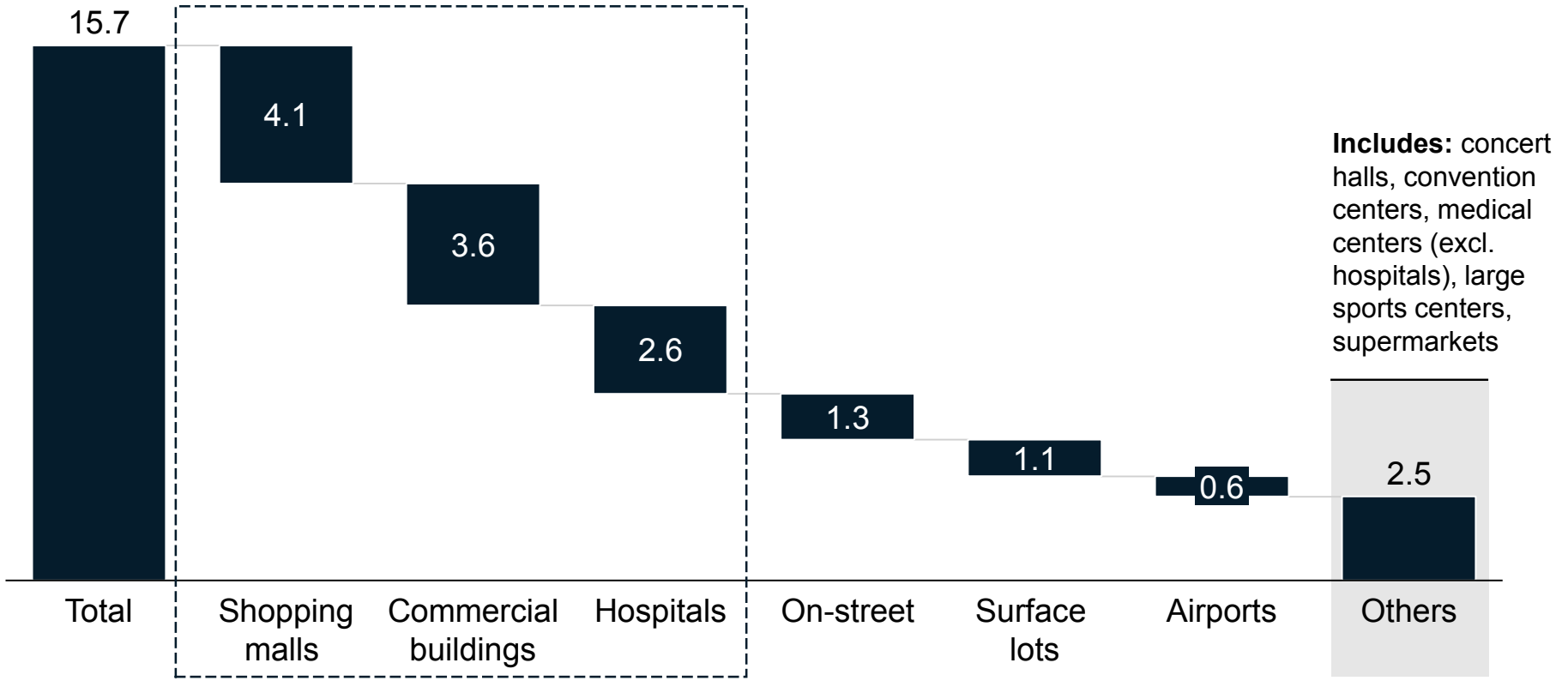
The parking market in Brazil is estimated to be worth BRL ~16B, mostly driven by malls, commercial buildings, and hospitals

Preliminary

Detailed next

Estimated market size of parking operations

Gross revenues 2019, BRL Billion



Includes: concert halls, convention centers, medical centers (excl. hospitals), large sports centers, supermarkets

Parking spend represents ~8% of the expenditure with vehicle goods and services in Brazil[1], which represents about BRL ~275 per car every year[2]

1. Includes expenses with fuel, maintenance, parking, spare parts, lubrications and cleaning
2. Parking expenditure BRL 15.7B and car fleet 56.7 million units

Source: McKinsey estimation, IPC Maps, DENATRAN

Shopping malls account for ~26%, commercial buildings account for ~23% and hospitals account for ~16.5% of the parking market

Preliminary

Shopping malls

Characteristics

Practical parking

- Panels or automated systems
- Digital payment methods
- Surveillance on-site
- Little or no competition given the distance to the mall

Availability of parking spaces

- Second largest segment in terms of number of parking spaces

Commercial buildings

Convenient parking

- Proximity to business facilities
- Surveillance on-site
- Convenience offerings such as reservation online, valet service, car wash among other

Availability of parking spaces

- Commercial buildings account for ~40% of all parking spaces

Hospitals

Convenient parking

- Convenient parking for emergencies and assisting the disabled
- Surveillance on-site
- Little or no competition given the distance to the hospital

Price per transaction

- Between private and public hospitals, prices vary up to 50%

Source: McKinsey estimation

Key trends affecting the parking industry in Brazil

Trend groups	Short-term trend	Long-term trend
1. Demand	Passenger car fleet should **grow 3-4% p.a.** driven by expansion of GDP per capita **Urbanization growth** continues, as seen in the past decades	Car penetration levels should **continue to grow** given gap from developed countries **Urbanization** should continue leading the increase in concentration of people and wealth in major urban areas
2. Mobility habits	Private cars should **remain a primary method of transportation** given that alternatives are **not widely available** E-hailing has been **expanding,** yet **not reducing** the use of personal cars	If Brazil adopts the smart city framework, **consumers could consider changing mobility habits** and shift to alternatives that would replace use of personal cars
3. Regulations	Current regulatory framework could be **modified** to further **restrict car circulation** if emission and car density in urban cities worsens	Cities that experienced higher fleet volume have shifted towards **policies that discourage circulation of private car fleet** and expanded alternatives for mobility
4. Auto technology	Availability of AV L3 will be limited given the **timeframe** required to achieve **relevant penetration** of the car fleet	Dissemination of AV L3 application is **likely to grow** and the evolution of L5 seems **yet uncertain**
5. Real estate infrastructure & logistics	Urbanization is fueling **real estate demand** in large cities New businesses within the **last-mile industry** are raising the **demand for centrally-located real estate** for their operations	**Demand and diversity** of use of real estate in urban locations will **likely increase**
Overall implication on the parking industry	**Demand for parking will continue to grow** while the market **experiments with transportation alternatives** that will diversify the mobility ecosystem	Private vehicle business ecosystem (including parking) **will evolve**, and industry players have the opportunity to **capture growth** from new business models

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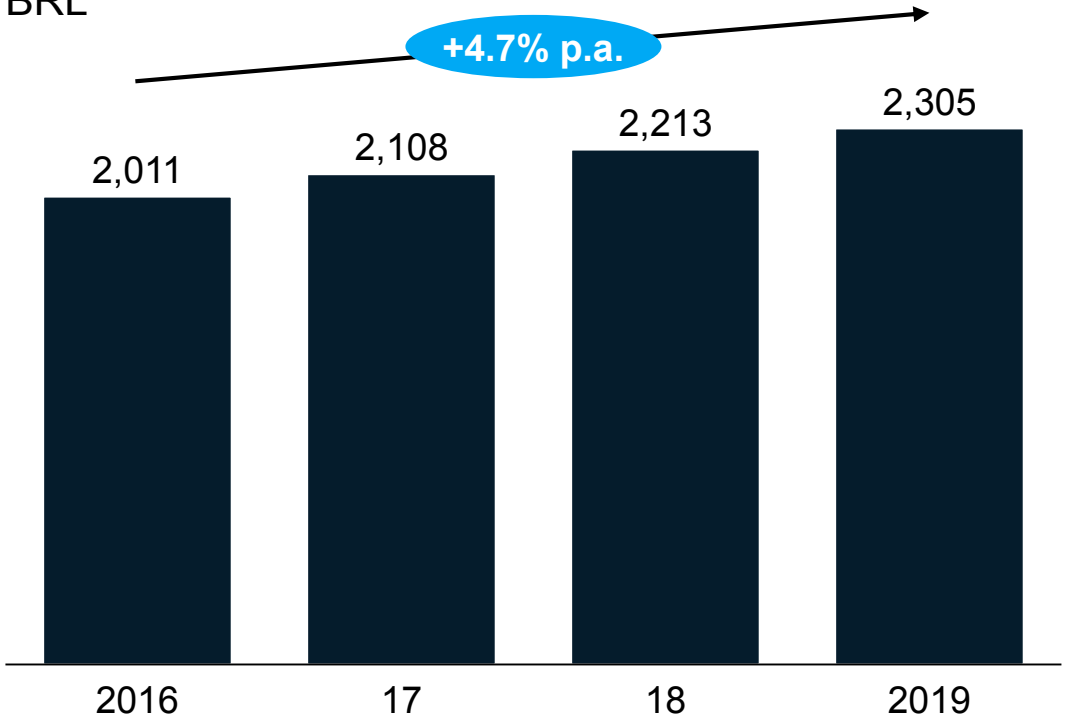
1. As average income increases, the size of the car fleet in circulation increases in Brazil

Preliminary

As average income increases…

Average monthly income[1]

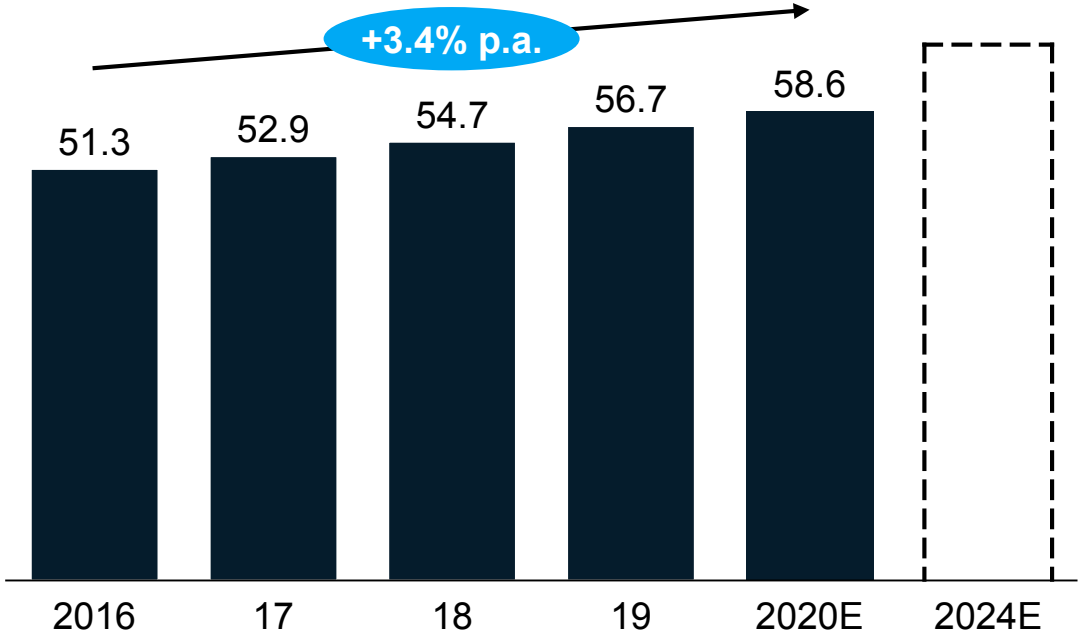
BRL



… the car fleet has increased 3.4% p.a.

Size of the car fleet in Brazil

Million



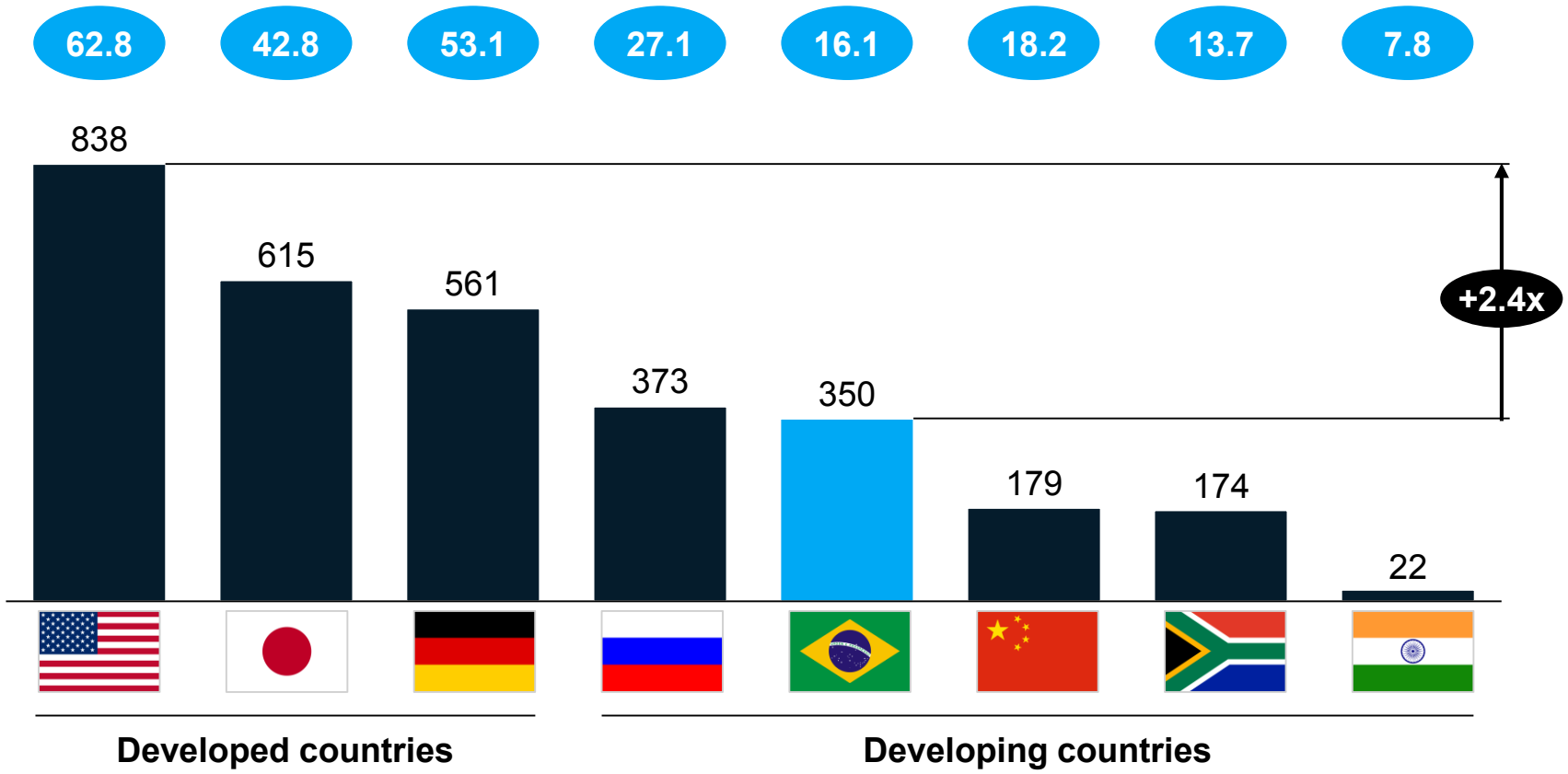
1 Average income received per month from the main job by people aged 14 and older in nominal terms

Source: IBGE, DENATRAN

1. Car penetration should near that of developed countries as Brazil's GDP per capita improves

Preliminary

Car penetration in Brazil should continue to grow
Number of cars per 1,000 inhabitants in 2018



Source: Research on "Urban transportation systems"; World Bank

Brazil's car fleet may continue to grow led by an increase in GDP per capita

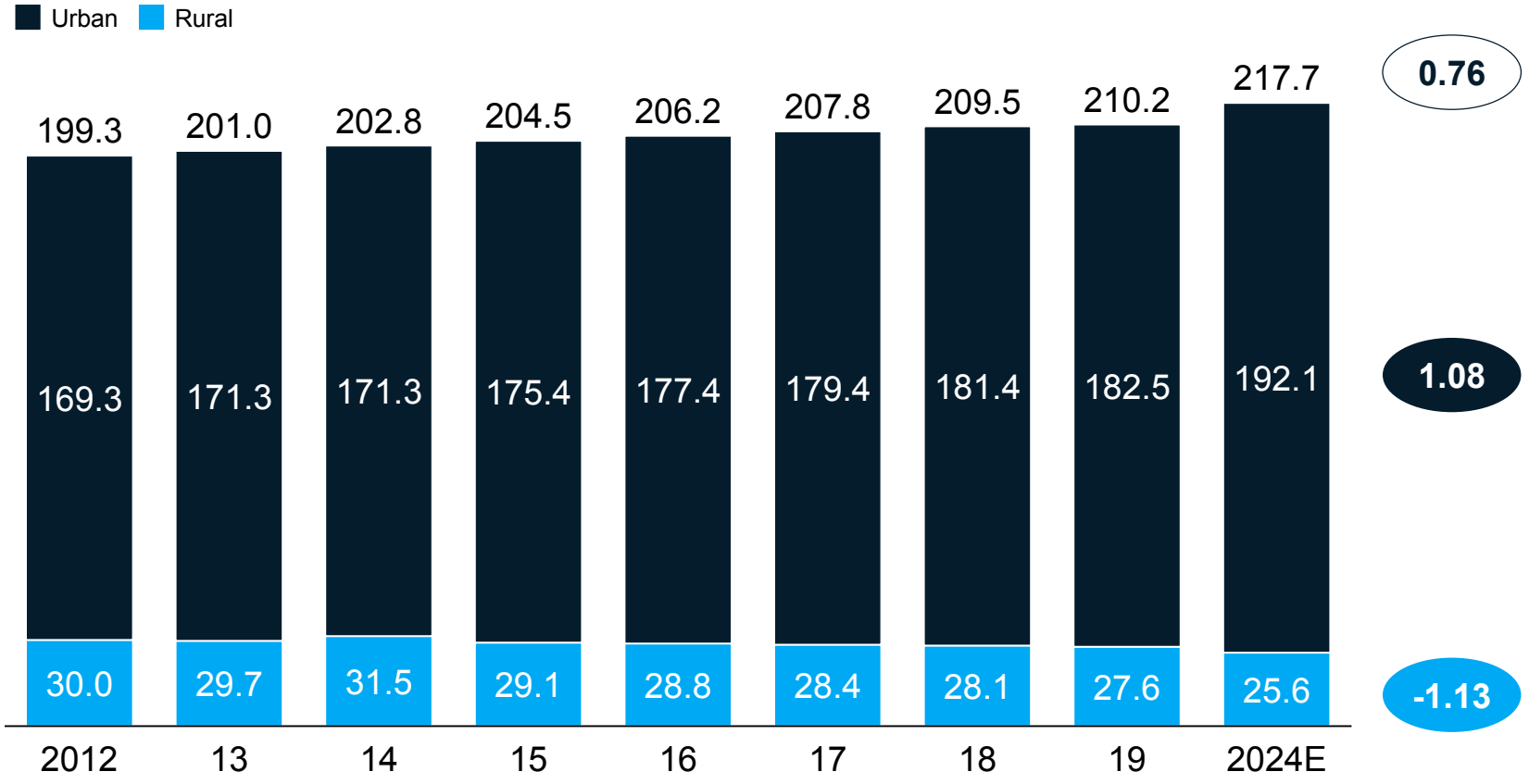
- Compared to Brazil, the United States has 2.4x more cars per thousand habitants and GDP per capita is 3.9 times higher
- As Brazil's GDP per capita increases, car fleet penetration is expected to near that of developed countries

1: Brazilian cities are urbanizing, the increased concentration of people and economic activity creates mobility challenges

Preliminary

Brazil's population split

Million



CAGR

12-19, %

Brazilians are leaving rural areas

- Urban population has been growing **~1%** for the past 7 years, while rural population has decreased **-1%,** and the trend is **expected to continue** over the next five years
- The increase in urban population increases density within the urban cities, which also leads to **concentration of the economy**

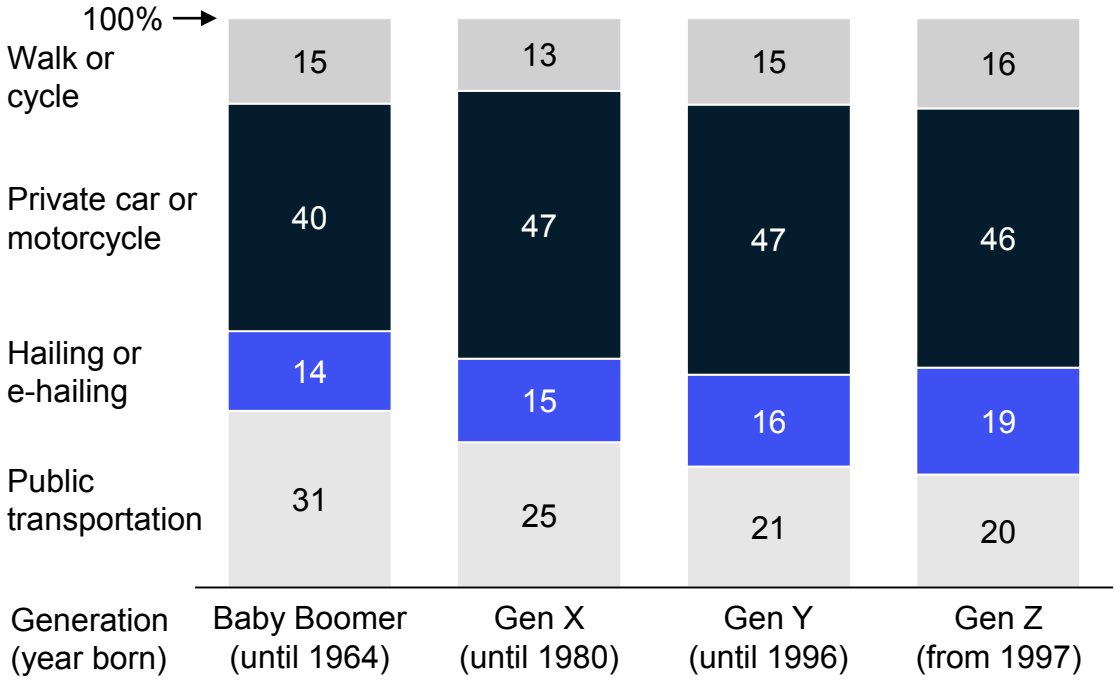
Source: World Bank, IBGE

2. Among urban transportation alternatives, private vehicle remains the preferred option across generations

Preliminary

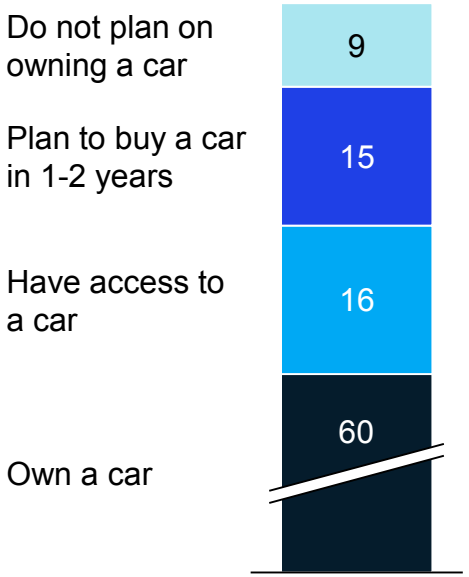
E-hailing services have not replaced the desire to use private vehicle for transportation in Brazil

Preferred transportation method for Brazilians
% of those surveyed, 1,789 respondents



In the US, younger generations are also inclined to own and use private vehicle

Preferred transportation method for Americans
% of those surveyed, 1,000 respondents



"Millennials are **altering life-choices that affect vehicle ownership** but the net effect of these choices reduces vehicle ownership by **less than 1%** […] they operate under **similar constraints** as prior generations, and still have **strong preferences for personal vehicles**"

Research on "Generational Trends in Vehicle Ownership and Use" conducted by MIT CEEPR

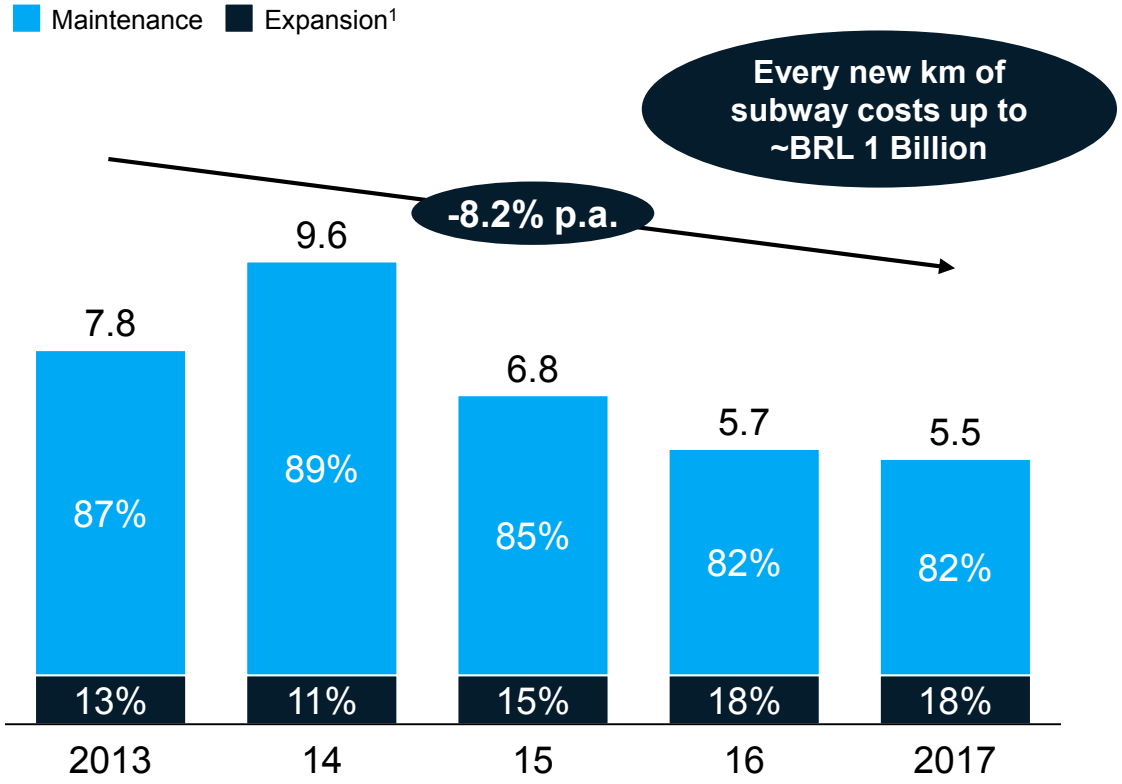
Source: ANFAVEA-spry; APTA Millennials & mobility research 2013, MIT CEEPR 2019

2. Investment in public transportation has slowed down and its utilization has been flat in recent years

Preliminary

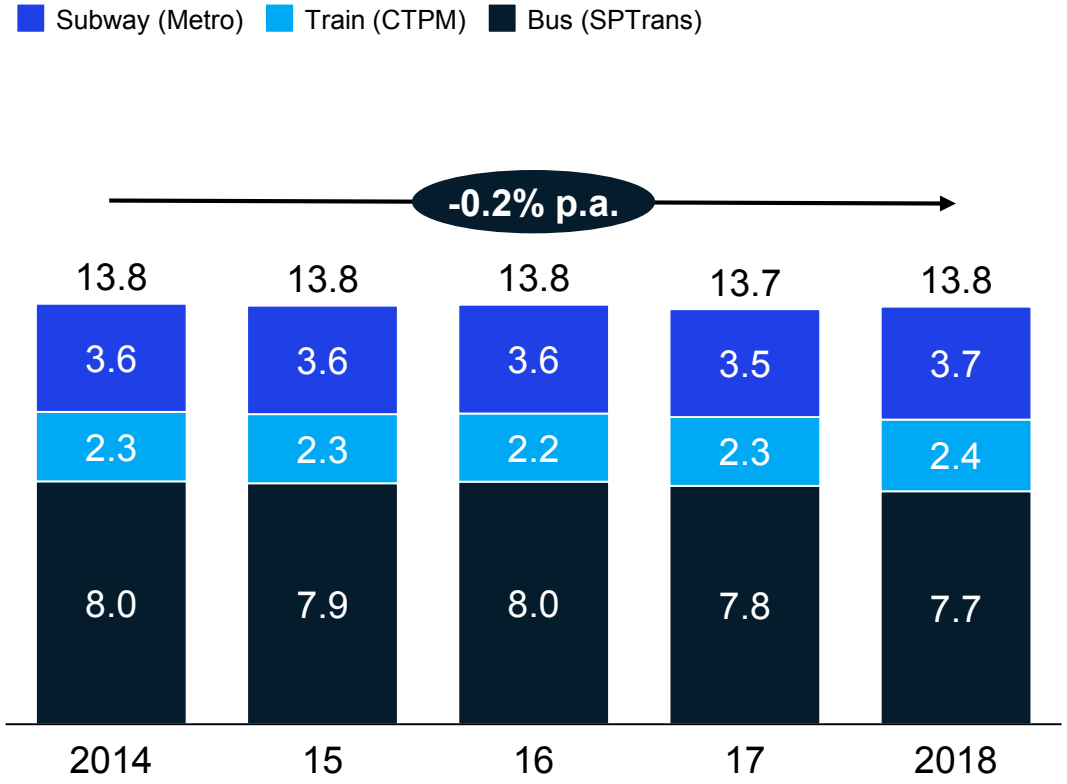
Investment in public transportation in São Paulo city has been shifting downwards

BRL Billion



Number of daily trips in São Paulo's metro, train, and bus network has largely been flat

Million



1. Expansion investment refers to BRL 10Bn spend between 2007-2017, distributed evenly throughout the period

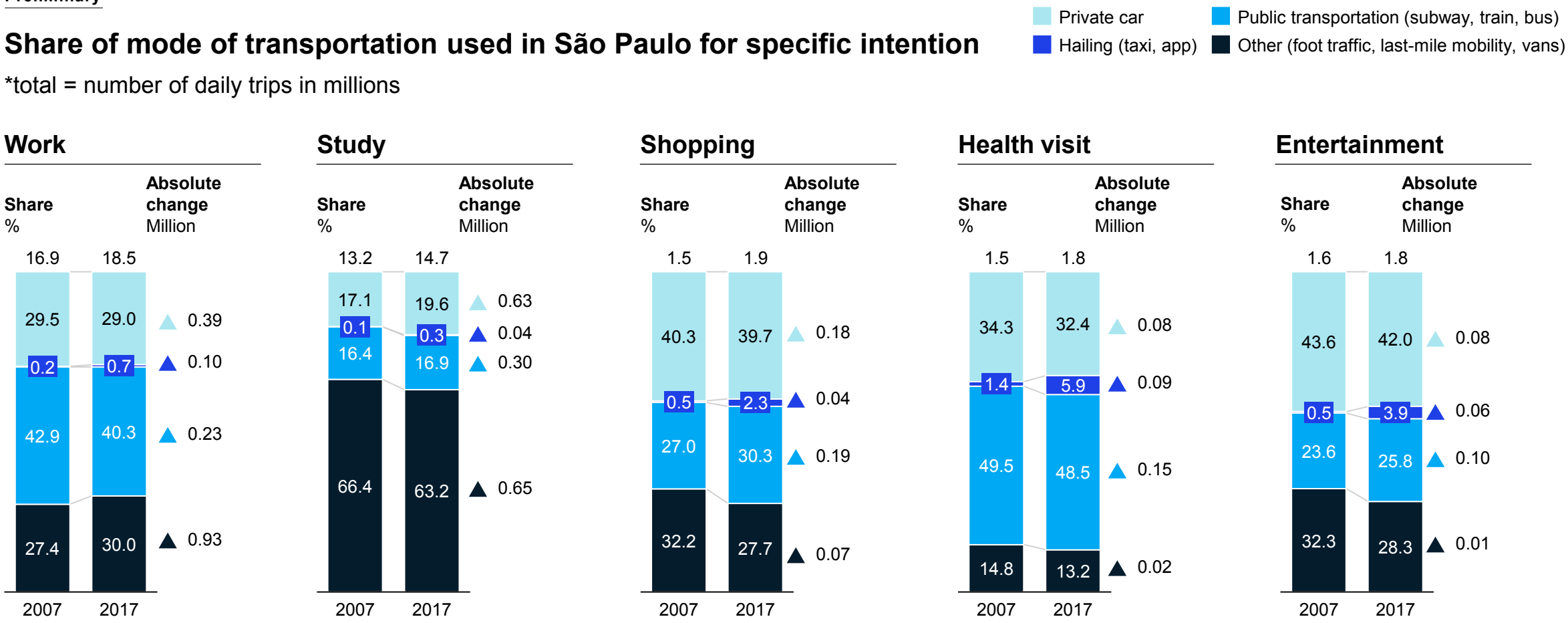
Source: Metro, CTPM, SPTrans, Pesquisa OD Metro de São Paulo, clipping (Mobilize)

2. The e-hailing market is growing, but so is the private car segment while public transportation trips have dropped in most cases

Preliminary

Share of mode of transportation used in São Paulo for specific intention

*total = number of daily trips in millions



While hailing has grown to take a portion of the mobility market share, the **private car segment is still growing,** specially in the most representative markets

Source: Pesquisa OD Metro de São Paulo

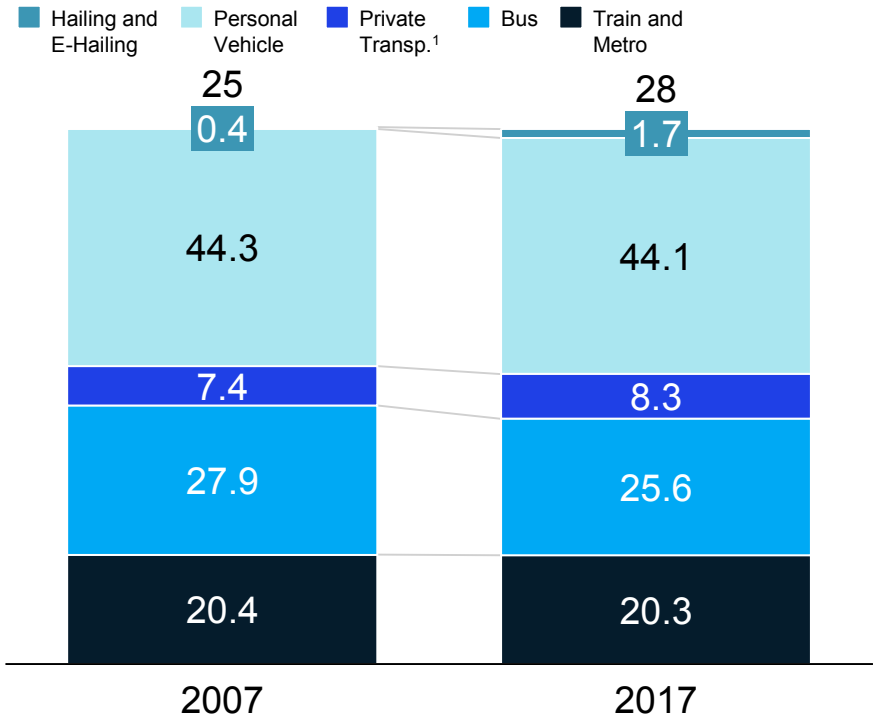
2. Although hailing has become a trend in the past decade, its scale is still limited and there are indications that it is saturating

Preliminary

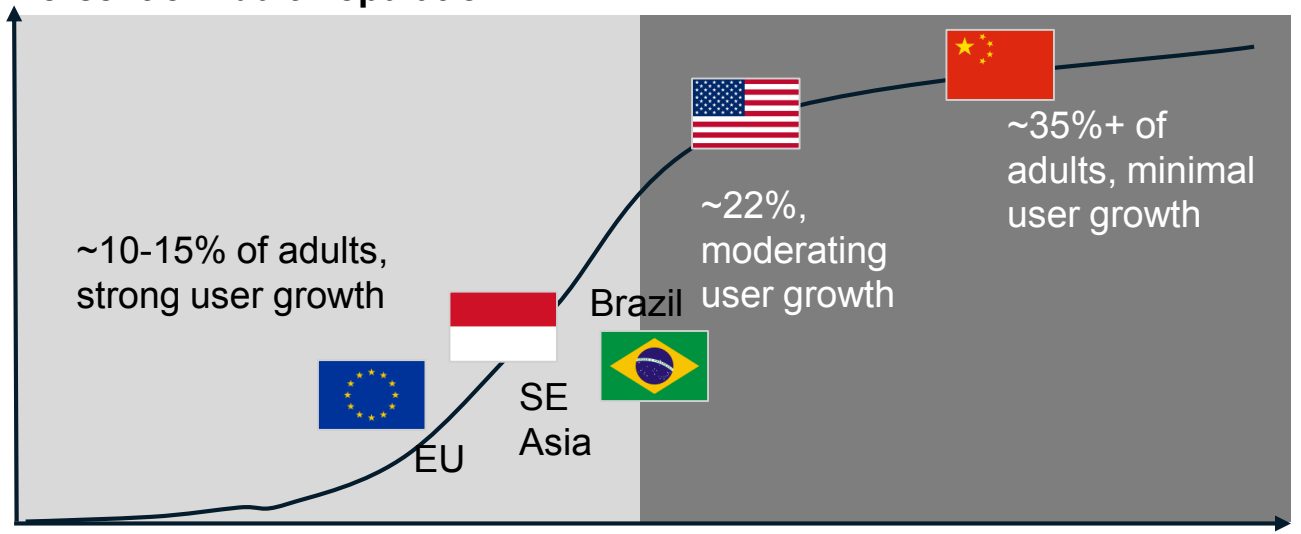
Size of the market is small compared to other types of transportation modes

Daily trips by transportation mode in São Paulo

%, millions of daily trips



Even with a sub-scale market, e-hailing in Brazil may already be in the path of early saturation



Nascent and regulated markets

Mixed availability, stronger regulations; heavy investment ‘16-’19

Mature markets

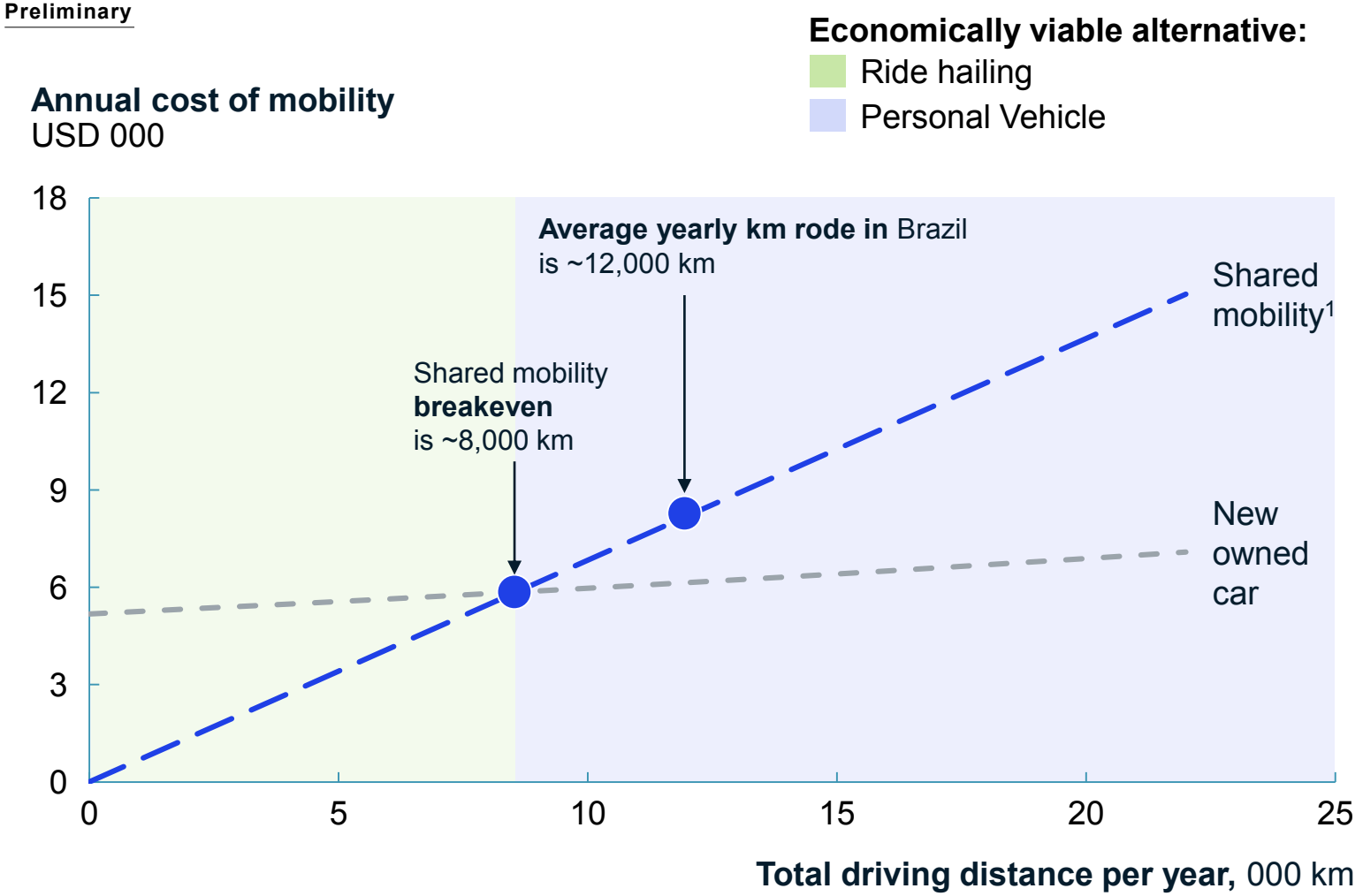
Early market launches; heavily funded early (‘10-’13)

Growth Stage

Source: Pesquisa OD Metro de São Paulo, MCFM Proprietary Annual Global Consumer Survey

2. Even with the growth of e-hailing, owning a car remains a cheaper alternative for the average population

Preliminary



Average Brazilian car owners drive between **~12,000 km a year**, which makes using the personal vehicle a more cost effective alternative than ride hailing

Driving private cars will continue to be relevant for majority of the population to keep their mobility cost lower

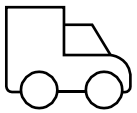
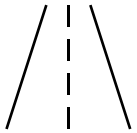
Additionally, the current price point of e-hailing might be pressured by governments due to low return to shareholders and minimum wages for drivers

1. Standard service (e.g. UberX)

Source: McKinsey estimation, Kelley Blue Book Brasil

3. The legislation framework is still in favor of private cars, but legislators are increasing their attention to mobility alternatives

Preliminary

Topic	Example of recent legislation
 **Micro-mobility**	• Scooters may only be **parked in designated areas** • **Scooter traffic** is only allowed on **bike lanes** and **roads** where speed is limited to 40km/h
 **Motorcycles and trucks**	• **Trucks** and **motorcycles** face **restricted access** to roads and zones within cities, either entirely or during part of the day, in order to ease vehicle **congestion**
 **General mobility**	• E-hailing services may see **restrictions** related to **limitation on the amount of drivers**, circulation of vehicles **without passengers,** and **complete ban** of the service in municipalities

Future implications for Brazil

- As demand for curbside increases from a variety of users, legislators **may increase their oversight on mobility alternatives**
- Legislators may **continue to scrutinize e-hailing** as demand becomes a regular part of urban mobility
- Currently, **no disruptive legislation is planned for passenger cars** as Brazil continues to rely heavily on passenger cars as the primary method of transportation

Source: São Paulo Municipal legislature

3. Cities may move to increase restrictions for private vehicles as car-fleet traffic intensifies over next few years

Preliminary

Expansion of the *rodizio* model

Jakarta, Indonesia

'Odd-Even' traffic restriction

'Odd-Even' restriction refers to **movement restriction based on car license plates and the date of the day**

- Car plates ending in odd numbers can only drive in designated areas on odd days (e.g. car plate 2357 can drive on the 23rd, but not on the 24th), likewise for even-number license plates **(forcibly removing 50% of traffic each day)**

Car drivers can either take a different route (if possible) or take an alternative mode of transportation (e.g. public transportation or hailing)

Since implementation of the initiative in late 2016, **Jakarta went from #4 (2017) to #7 (2018) in the ranking of the most congested cities in the world** (TomTom traffic index)

Introduction of cost as negative nudge

London, UK

Congestion Charge

Congestion charge refers to **a fee charged on most motor vehicles for entering a designated congested area or congestion charge zone (CCZ)** in Central London during weekdays

Cars are charged GBP 11.5 per day, and non-payment will incur a penalty fee between GBP 65 and GBP 195

London uses **Automatic Number Plate Recognition (ANPR)** to record fleet and enforce payment

Since implementation of the initiative**, traffic has dropped 25% over the last 10 years within the CCZ**

Future implications for Brazil

- Passenger vehicle is a **central mode of transportation** in Brazil´s urban mobility
- Cities in Brazil may **operate some kind of vehicle circulation regulation** (e.g. São Paulo already operates "rodizio"), nevertheless the car fleet will continue to grow
- Large and dense urban cities **may introduce heightened restrictions**, but they will need to ensure **alternatives are in place** to facilitate urban movement currently serviced by private cars

Source: Press search, TomTom, Transport for London (TfL)

3. In the long term, dense cities should shift towards a more-sustainable smart-city model to significantly reduce congestion

Preliminary

US has developed a blueprint for future mobility in its smart cities to develop a more-sustainable urban lifestyle

National Association of City Transportation Officials (NACTO) has defined six key principles for autonomous urbanism in US cities

Design for Safety
Prioritize the safety of pedestrian and bike users, by requiring autonomous vehicle to have lower speed

Move People Not Cars
Reallocate street spaces for more autonomous transit systems, pedestrian, and micro-mobility users

Distribute Benefits Equitably
Benefits of autonomous mobility should be accessible for all people and communities (mass accessibility)

Data-driven Decision Making
Cities should be able to harness information from more connected vehicles and cities should leverage data to push information towards street users

Technology is a Tool
Policy should be centered on people, and not on the technology (e.g. AV)

Act Now!
Cities should craft policies based on the future, not on the limits of current technology

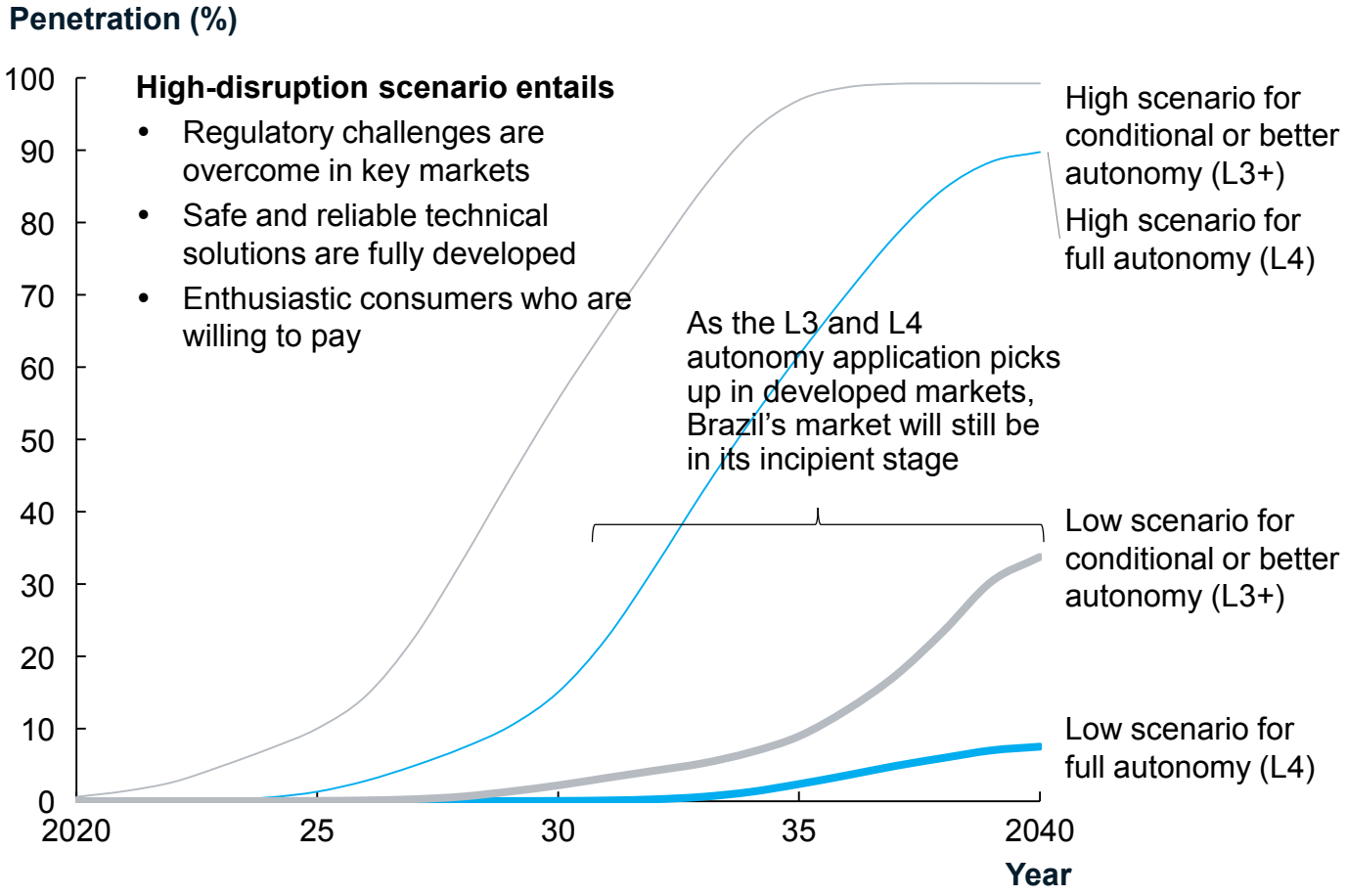
The six principles have led to a blueprint design that puts less emphasis on cars, and more emphasis on mass transit and micro-mobility

Source: National Association of City Transportation Officials (NACTO)

4. Autonomous vehicles will still be incipient in the next twenty years and application of full-self driving (L4) will be limited

Preliminary

Global view of New-vehicle market share of fully autonomous vehicles, Percent



Levels of Automation

L1: Function-specific: one or more control functions are automated, requires driver

L2: Combined Function at least two primary control functions are automated, requires driver

L3: Limited Self-Driving: full control of vehicle automated under some conditions, requires driver

L4: Full Self-Driving: fully autonomous vehicle, does not require driver

Application of L4 (driverless autonomy) **will likely not be available at scale within the next 30-40 years**

When the L4 application becomes widespread, then the **market dynamic may shift dramatically** for driving, e-hailing, and parking

Adoption of **automated vehicle in Brazil** would likely follow the **"low scenario"** curve considering the country´s infrastructure challenges

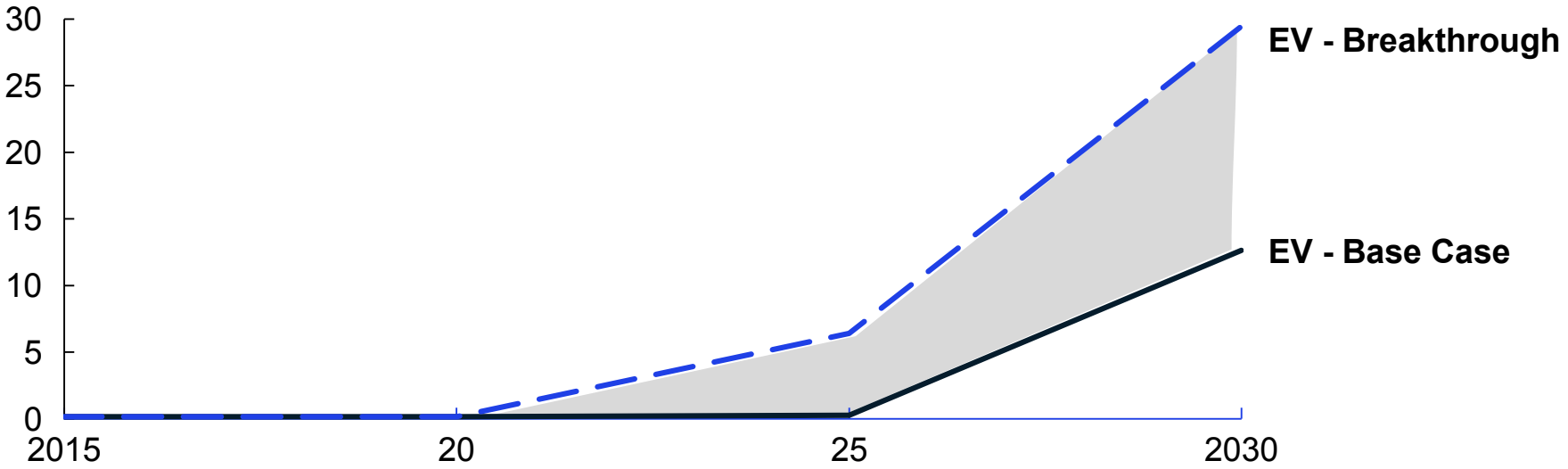
Source: McKinsey Center for Future Mobility

4. The implication at scale of Electric Vehicle for the parking industry may be limited and will likely be observed only in the longer term

Preliminary

Share of Electric Vehicles sales in Brazil (includes all types of Electric Vehicles[1])

Light vehicle sales, in percent



The effect EV will have on the parking industry will likely be limited to **offering charging services**

This should become a scale service when EV fleet penetration increases, which should happen beyond 30 years

EV- Base-case scenario assumptions

	CO_2	
~90 USD/kWh Battery cost	95 g/km CO_2	~10% shared vehicle sales

EV- Breakthrough scenario assumptions

	CO_2	
~55 USD/kWh Battery cost	78 g/km CO_2	~15% shared vehicle sales

1. Baterry Electric Vehicles (BEV), Hybrid Electric Vehicles (HEV) and Plug-in-hybrid Electric Vehicles

Source: McKinsey Center for Future Mobility

5. The diversification of street, curbside and sidewalk uses will require seamless integration into a mobility hub

Preliminary

Across large cities worldwide, mobility hubs will be required to seamlessly manage the demand of all future street and curbside users

Private mobility

Still the back-bone of urban mobility in most cities, which will require spaces for parking and curbside

Public transportation

Will continue to play a strong role in urban mobility and will need to be **100% integrated in all holistic concepts**

SPTrans

METRÔ

Car rental

Large number of fleets in each large city, and need for space for inventory

Car rental will also need to compete with car-sharing company by establishing flexible hubs

Localiza Hertz

movida aluguel de carros

Taxi/licensed driver services

Facing tremendous onslaught from E-hailing and will need to **integrate even better** into urban mobility solutions

SP TAXI

E-hailing

Is growing, albeit slowing down in Brazil, and will continue to **require frequent circulation around curbsides**

99

Uber

Dynamic shuttle services/ pooled e-hailing

New technologies have enabled dynamic shuttle services that will **change commuting and event shuttles**

uberPOOL

Car sharing

Key for car-based mobility innovations with **great growth potential**

Most providers strive to provide **flexible hubs along cities**

Parking operations are an enablers of car sharing solutions

zipcar

Peer-to-peer car sharing and ride sharing

Might remain a **niche phenom** compared to car sharing, also gradual convergence with e-hailing expected with autonomous driving

waze CARPOOL

Shared micro mobility

Increasing popularity in major cities like São Paulo and Rio, and **the need to manage its inventory and docking stations** will become very critical

Lime

JUMP by Uber

bike sampa

Urban aerial mobility

Mobility in the 3rd dimension (far future), which will **demand large dedicated spaces**

VOLOCOPTER

EHANG

LILIUM

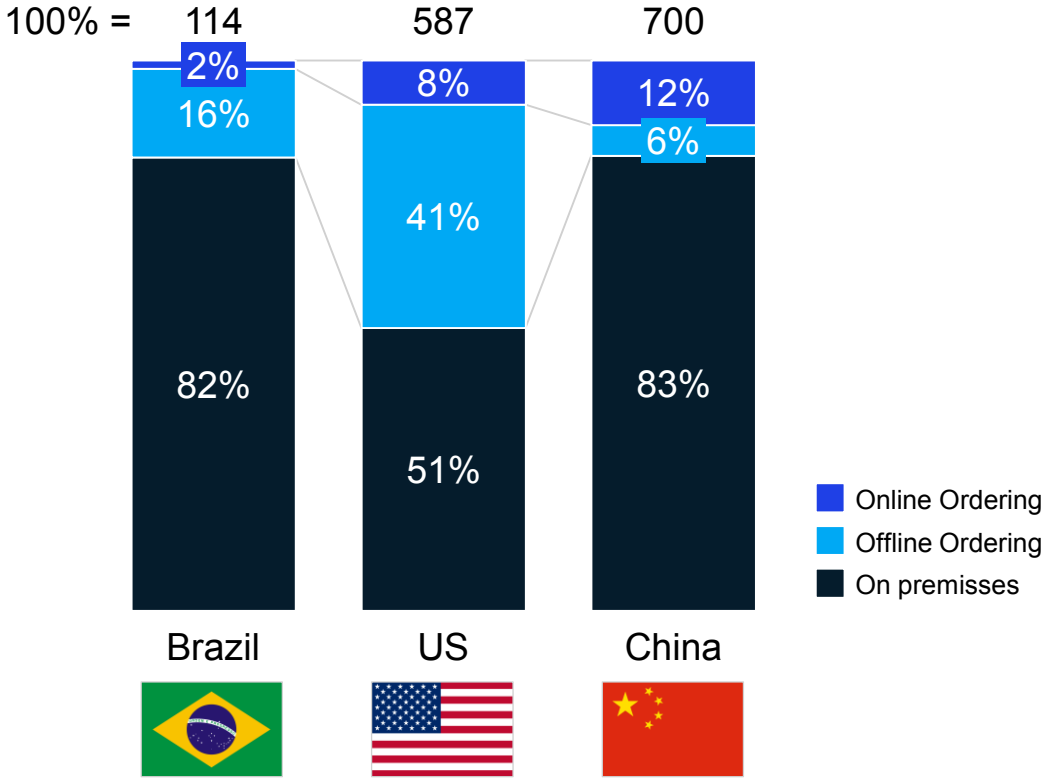
Source: Press Search

5. As on-demand food delivery grows rapidly in the next few years, businesses will start to build dark kitchens to keep up with demand

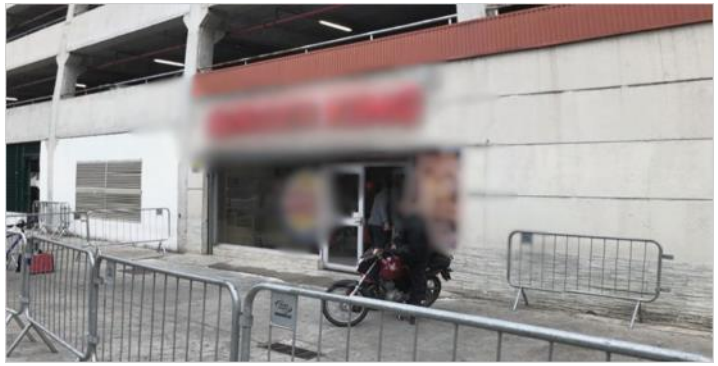
Preliminary

Online food delivery in Brazil has been growing and shows potential to continue expanding

USD Billion, current, 2018



Parking lots are ideal locations for dark kitchens as they fit the need at an efficient cost



Built-in kitchens

Kitchens constructed in garages with ceiling, using mainly dry-wall and infrastructure already available

Container kitchens

Kitchens constructed in open space places using containers or brickwork

Source: Euromonitor passport, Qualibest 2018

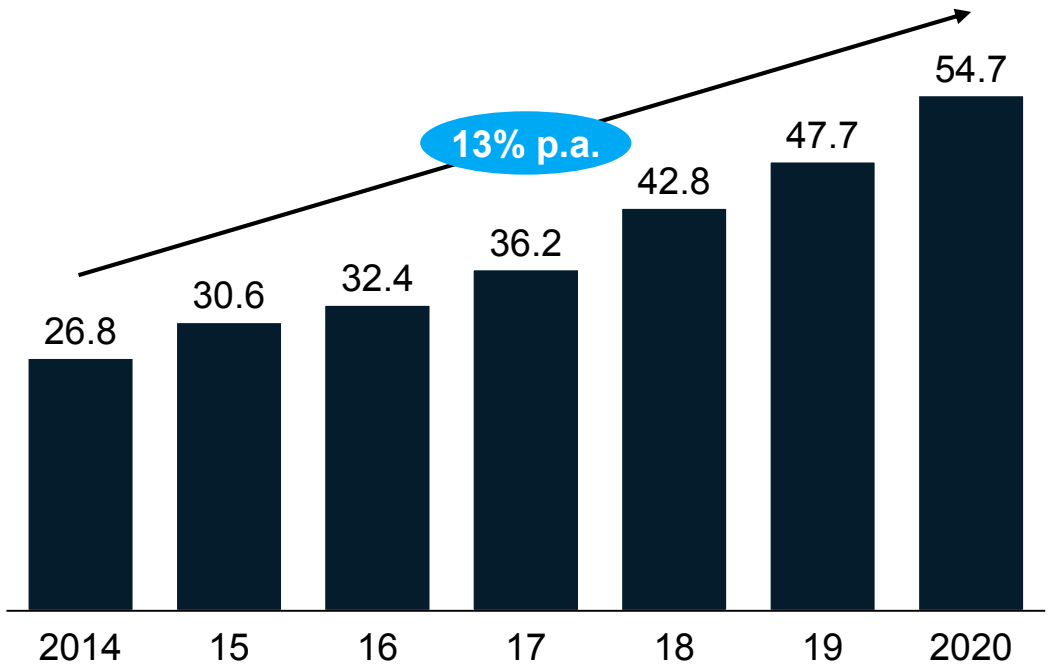
5. Online shopping in general is also expected to grow at an unprecedented pace, which demands more delivery points

Preliminary

Last-mile transportation grows fueled by shifts in consumer behavior towards online shopping…

Internet retailing in Brazil[1] 2014-2020

BRL Billion



…and providers should overcome mobility hurdles to sustain competitive costs and service levels

- **New categories** move online, **new business** models emerge and online **consumer base keeps growing** rapidly
- Space in urban locations is an **evermore scarce resource** that is disputed and costly
- Faster delivery is the **new normal**
- Technology is **transforming the delivery** of last-mile

1. Includes categories: apparel/footwear, beauty, gardening, home improvement, accessories, pet products, toys/games, electronics, appliances

Source: Euromonitor passport, WEF study on Future of the last mile ecosystem

5. In light of mobility trends, parking-service providers may evolve into more diverse business lines

Business type	Business line	Competitive edge as parking service providers
Car services and adjacencies	**1. Car wash and car repair:** provision of basic services in designated areas within a parking lot	Capture of additional revenue uplift when the passenger car is idle
	2. Car rental: partnership with car rental companies to provide rental hubs	Availability of parking lots across different parts of the cities to set up flexible hubs for rental pickup and drop-off
	3. Car sales: partnership with brokerage or management of C2C car sales	Safe public spaces to consign cars and transact first-hand and second-hand vehicles
	4. Micro-mobility hubs: set up docks for e-bike and e-scooters	Availability of parking space in central commercial areas
Last-mile solution	**5. Dark stores / kitchens:** conversion of idle spaces in key residential or commercial hubs as dark stores (sales centers designed for delivery without any physical direct customer interaction)	Ready open spaces for quick construction of dark stores / kitchens (no tear-down and flexible lease)
	6. Pick-up and drop-off points: setup of delivery hubs for e-commerce (from lockers to manned booths)	Central location in commercial and residential areas increases convenience for both businesses and customers
	7. Delivery hub: setup of micro-logistics operation as an extension of larger regional hubs	
Traffic management	**8. Curbside management:** solution design and management of vehicle flow and curbside for real estate and cities	Technical expertise in management of vehicle flow during peak and down time to maximize curbside utilization
	9. Park-and-ride: parking lots connecting public transportation (i.e. bus, metro) with passenger cars, which can be marketed to governments as a new service to manage seamless mobility	Availability of real estate and technical expertise in managing passenger flow
Digital / data monetization	**10. Customer data monetization:** leveraging consumer data to provide end-to-end mobility solutions, from car maintenance, insurance, parking, toll, and other services	Access to data on movement patterns and technical mobility expertise would help drivers optimize their car journey

Urban Mobility: evolution of the parking industry in Brazil

The parking industry in Brazil is sizeable and an important part of vehicle expenditure

- Parking produces BRL ~16B in yearly gross revenues, representing ~8% of vehicle spend
- The largest parking segments are shopping malls (BRL ~4B), commercial buildings (BRL ~3.5B) and hospitals (BRL ~2.5B), which account for 65% of the industry's gross revenues

In the short term, the demand for parking will continue to grow while the market experiments with transportation alternatives that will diversify the mobility ecosystem

- Economic expansion coupled with continued urbanization are key enablers of parking
- Private cars should remain as a primary method of transportation in the short term, given that alternatives are not widely available

In the longer term, the private vehicle business ecosystem (including parking) will evolve and industry players have the opportunity to capture growth from new business models

- Urbanization should continue to concentrate people and wealth in major urban areas
- Consumers might consider changing mobility habits and shift to alternatives that would replace the use of personal cars, given the availability of alternatives
- Demand and diversity in the use of real estate in urban locations will likely increase (e.g. last-mile delivery and mobility hubs)

Future trends offer great potential for parking operators that are able to evolve their capabilities

- Mobility management, real estate expertise and data analytics will become relevant capabilities
- Opportunities will emerge around car services and adjacencies, last-mile solutions, traffic management and customer-data monetization

The parking industry holds promising potential for operators capable of evolving their business strategies and capabilities

Opportunities

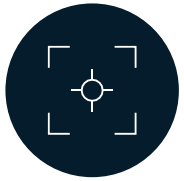
Short term

Parking operators may **capture value** by ensuring that the **business core is done right, expanding adjacently to where value is** and **testing new business models** through trial and error of new solutions

Long term

Parking operators will need to **thoughtfully design strategies, build capabilities** and **scale up solutions** such as mobility management, efficient use of real estate and data monetization to fully capture value from **emerging trends**

Capabilities required



Granularity of growth: explore emerging demands and profit pools by deploying robust market intelligence capabilities

Margin optimization: accurately price shifts in demand and own real estate expertise to take advantage of evolving market changes

Institutional management: develop collaboration and gain voice in the discussion of urban-mobility solutions

Urban mobility insight and foresight: own data, analytic capacity and operations that enable mobility solutions

Real estate insight and foresight: own market intelligence and operations to deploy core and adjacent real estate uses

Data and information management: convert data into a valuable business asset monetized through partnerships

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