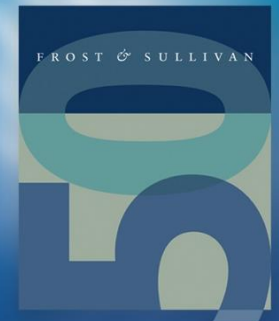


Strategic Assessment of the Smart Parking Market

Helping Inrix get a clear vision of the key drivers for smart parking information at a city level and understanding the consumer value associated with the same

Final Report



26th May 2015

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Source: Frost & Sullivan

OEM Interest in Parking Information

Automotive OEMs' Interests in Parking Industry

European automotive OEMs are more aggressive than North American OEMs in integrating parking as a service in their offerings.

Automotive OEMs	OEM Parking Product/ Technology	Integration with Parking Application	Business Strategy
Audi	Audi Connect	INRIX Park	In-car service partnership* to find, compare, navigate, and pay for nearby parking spaces.
BMW, MINI	MINI Connected	JustPark	Acquired strategic stake in JustPark (£250,000 investment from BMW i Ventures) to improve mobility in urban areas and offers in-car parking service in MINI cars in the UK to find, book, and navigate to a space.
BMW	ParkNow	Parkmobile	Investment deal with BMW Group to further expand the footprint of its “one-stop” ParkNow service to find, book, and navigate to a garage or on-street parking, with subsequent cashless payments and future integration into connected vehicles of all OEMs and BMW-connected vehicles.
Daimler	GottaPark	GottaPark	Daimler has a strategic partnership with the company and they co-work on strategic cooperation projects, including those in Europe. It also offers discounted parking for smart drivers around San Francisco.
	Park2gether	Park2gether	Daimler’s Mobility Services’ new online p2p parking platform will have future integration with mobility services like Car2Go etc. and seamless integration with available parking management systems.

*Service partnership: A collaboration without investment, typically through licensed services.

Source: Frost & Sullivan

Automotive OEMs' Interests in Parking Industry

Auto OEMs are enriching their portfolios through interests in smartphone-enabled parking and payment solutions.

Automotive OEMs	OEM Parking Product/Technology	Integration with Parking Application	Business Strategy
Ford	SYNC AppLink	Parkopedia	In-car, voice-activated parking spot discovery app to locate available nearby parking spots and get pricing information.
Jaguar Land Rover	justDrive	Parkopedia	In-car parking service in Europe and China in partnership with Bosch SoftTec.
PSA Peugeot Citroën	MirrorLink technology	Parkopedia	An in-car parking service for Peugeot 108, New Peugeot 208, New Peugeot Partner, Citroën C1, New Citroën Berlingo, and New DS 5.
Volvo	Park and Pay using Sensus Connect	EasyPark and Parkopedia	A service that helps to navigate to a parking space, pays the parking fee through an onboard system, and receives information or pays for additional parking based on car2car and car2infrastructure communication.
VW	Combined car navigation system with SAP	EasyPark	Piloting parking integration for intelligent cars for real-time information on a free parking space and point of interests.

Source: Frost & Sullivan

Consumer Interest in Parking Information

US

Key Takeaways

Telematics/Connected Services and Infotainment systems are not vehicle purchase drivers

Luxury Car and SUV segments expect parking and other connected services as standard

As an independent feature option, 14% US consumers are interested to pay for a real-time parking service

As a packaged feature within navigation systems, close to 30% interest from US consumers on a navigation system with real-time parking

Besides Luxury customers, compact SUV owners and mid size car owners show good interest in a parking service

There is high interest in the US with personalized nav systems that understand user habits and recommends routes/other important services automatically

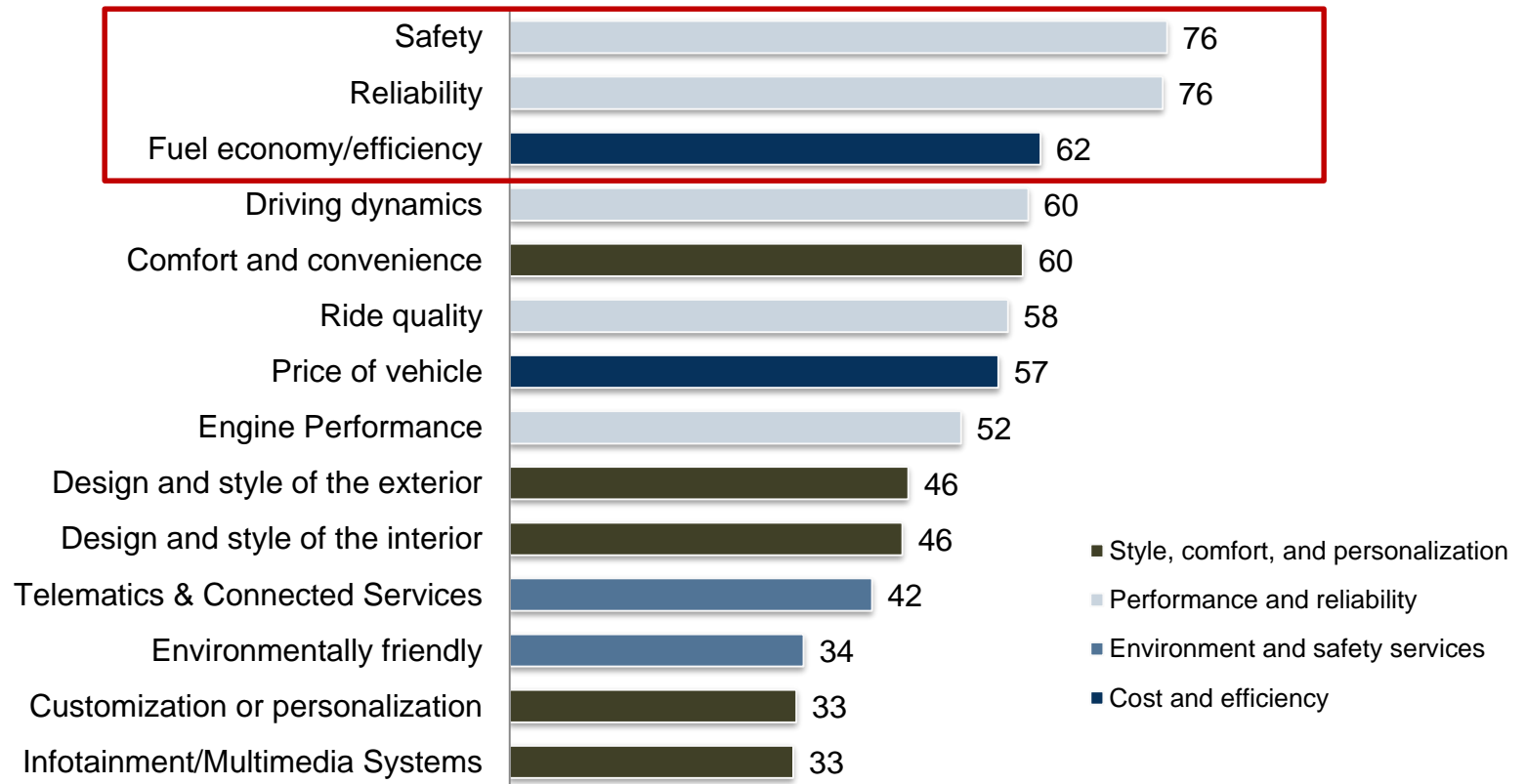
Key Takeaways

Source: Frost & Sullivan

US - Vehicle Purchase Drivers

Safety and reliability are most important to vehicle owners in the US. Connected services is not a direct purchase driver

Relative Importance of Vehicle Attributes and Features



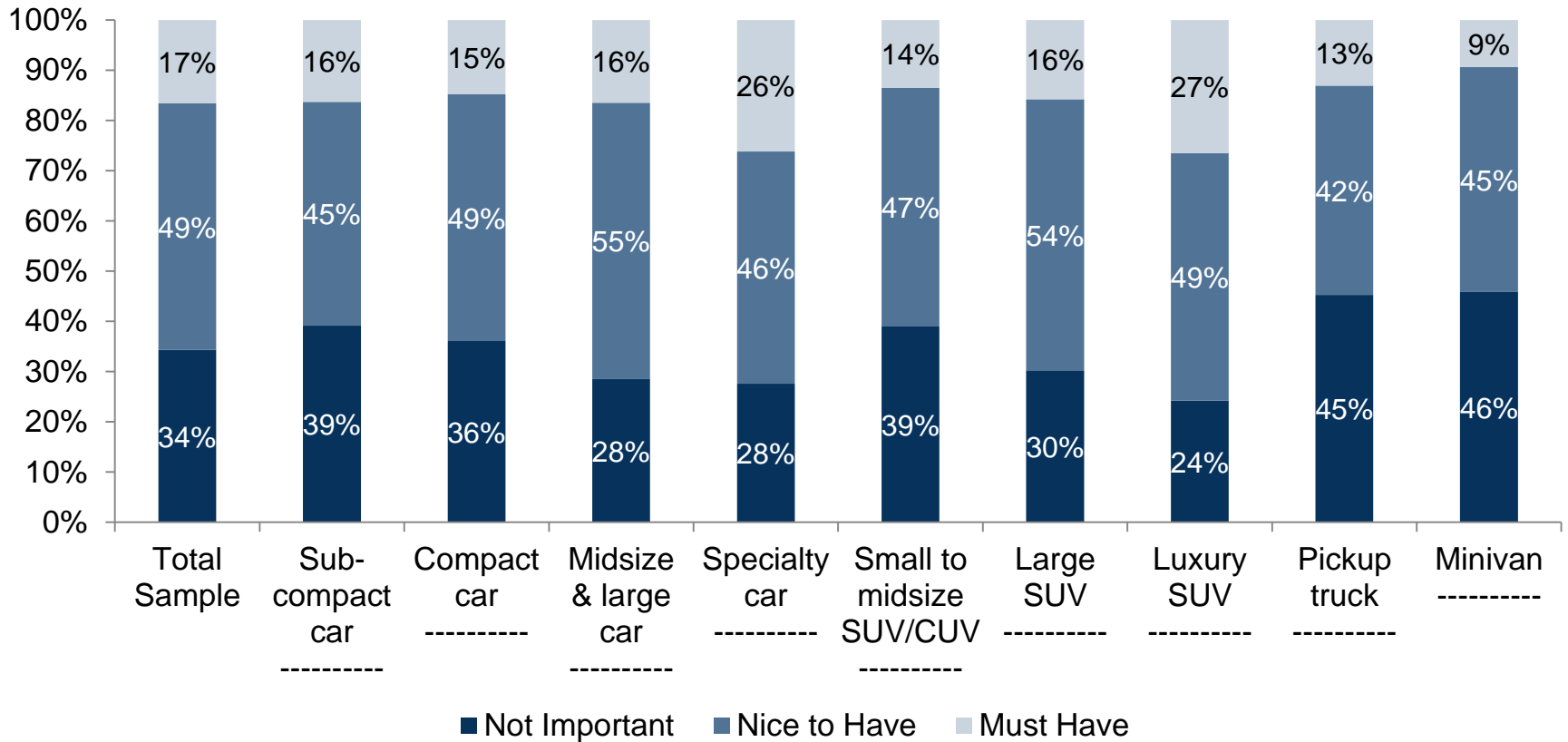
Base: All respondents (n=1,584).

MaxDiff

Source: Frost & Sullivan

For the Current Vehicle Consumers Own

Luxury vehicle segments expect parking as a standard feature for their current vehicle. Other interesting segments are Midsize cars and Large SUV's



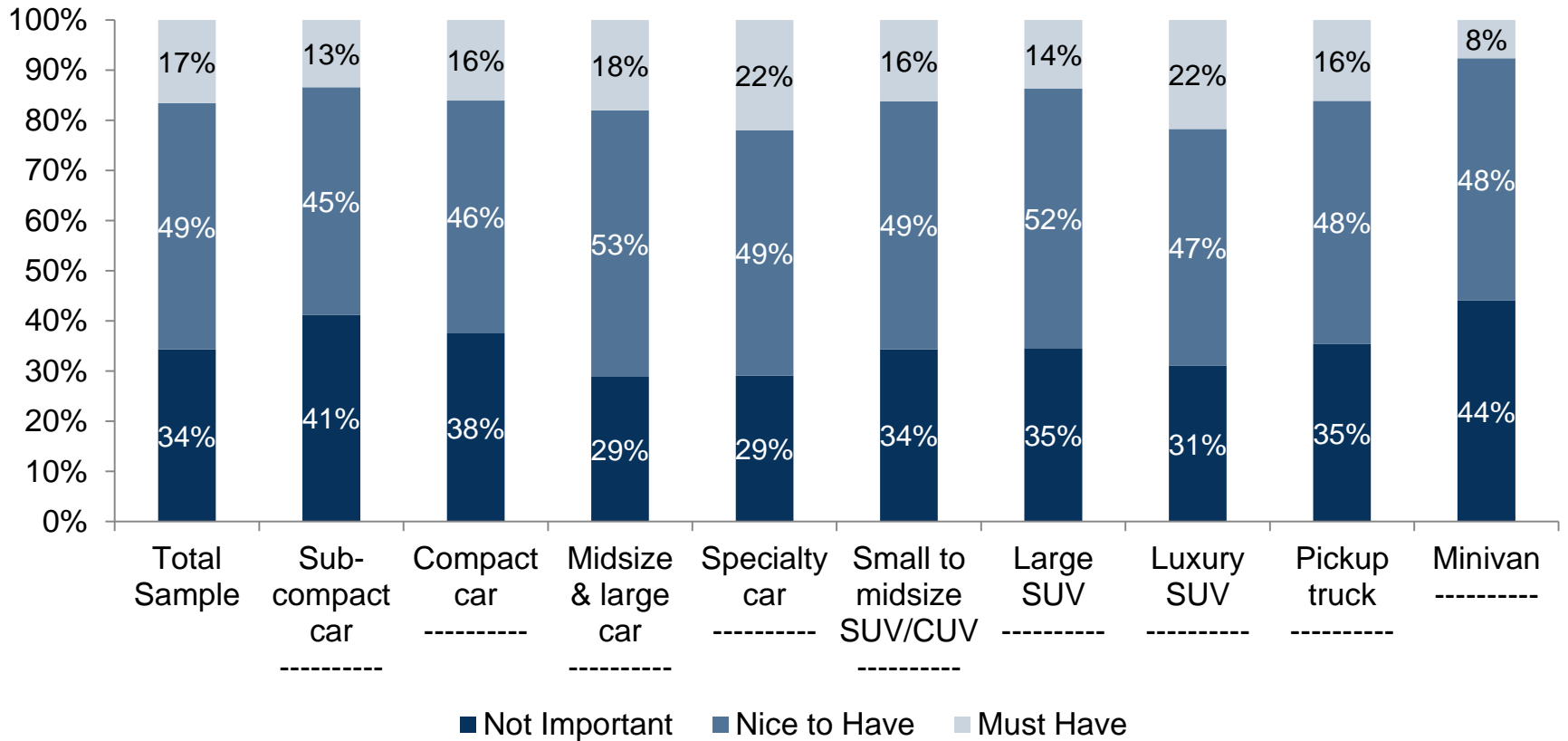
Base: All respondents (n=1,584).

Q: Please indicate whether real-time parking is a MUST HAVE, NICE TO HAVE, or NOT IMPORTANT feature for the current vehicle you own?

Source: Frost & Sullivan

For their Next Vehicle

The picture is pretty consistent even for next vehicle purchase considerations. Subcompact and compact car owners report lesser interest



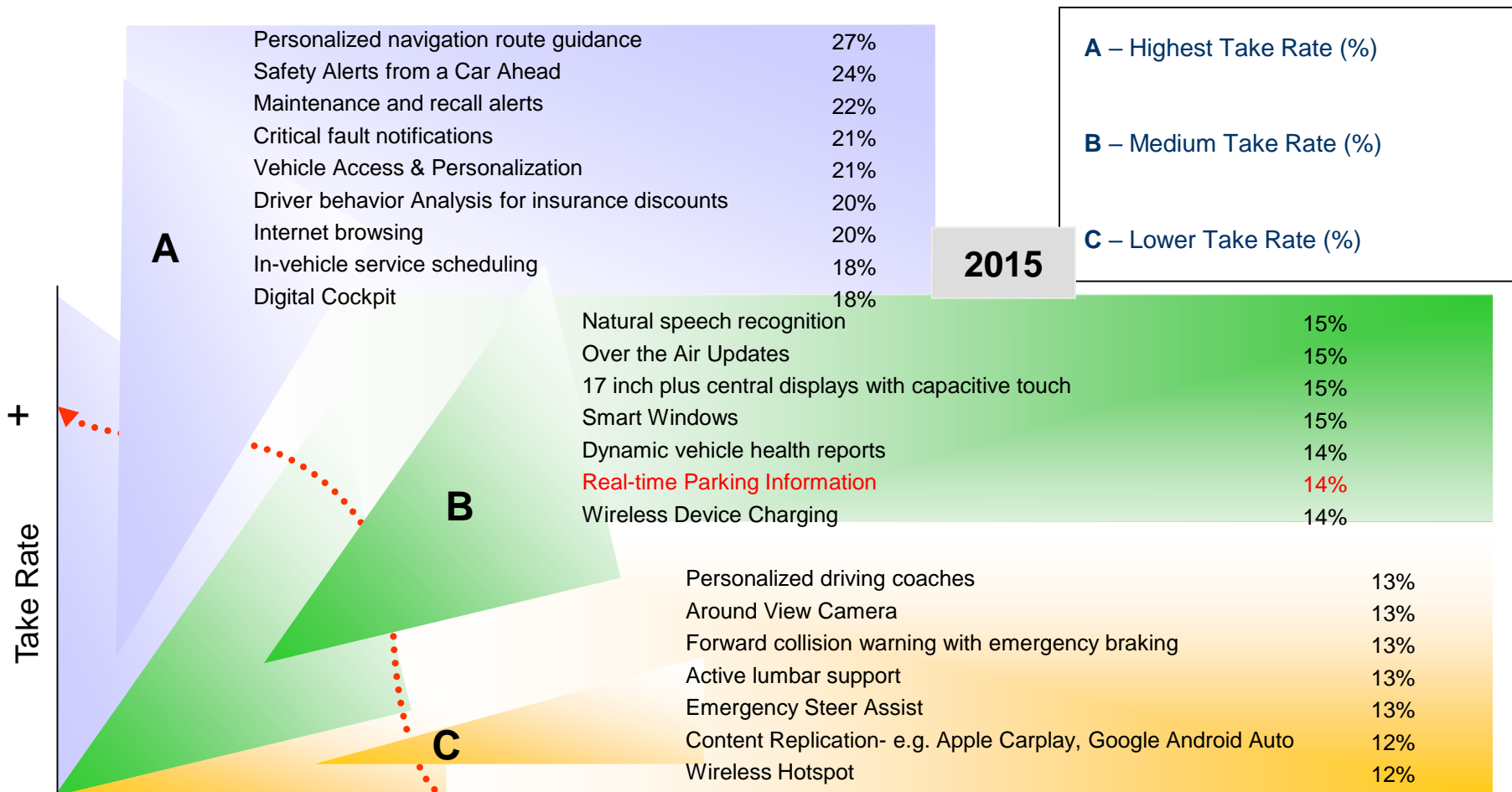
Base: All respondents (n=1,584).

Q: Please indicate whether real-time parking is a MUST HAVE, NICE TO HAVE, or NOT IMPORTANT feature for your next vehicle purchase ?

Source: Frost & Sullivan

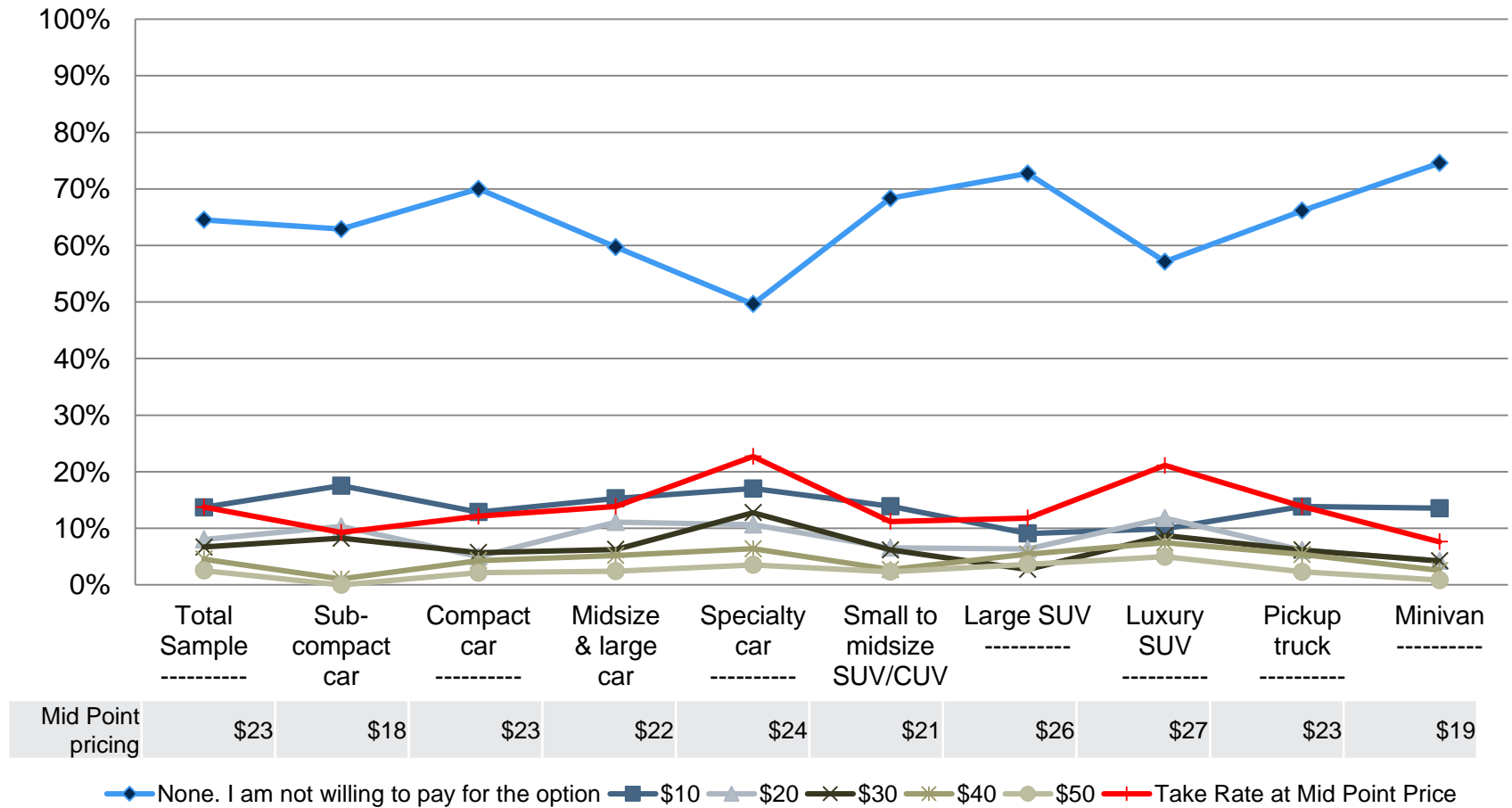
On the whole, Over 14% of the US Customers are interested in paying and acquiring a parking service for their next vehicle

Analysis of Top Advanced Features by Take Rates (Midpoint Test Price)



Source: Frost & Sullivan

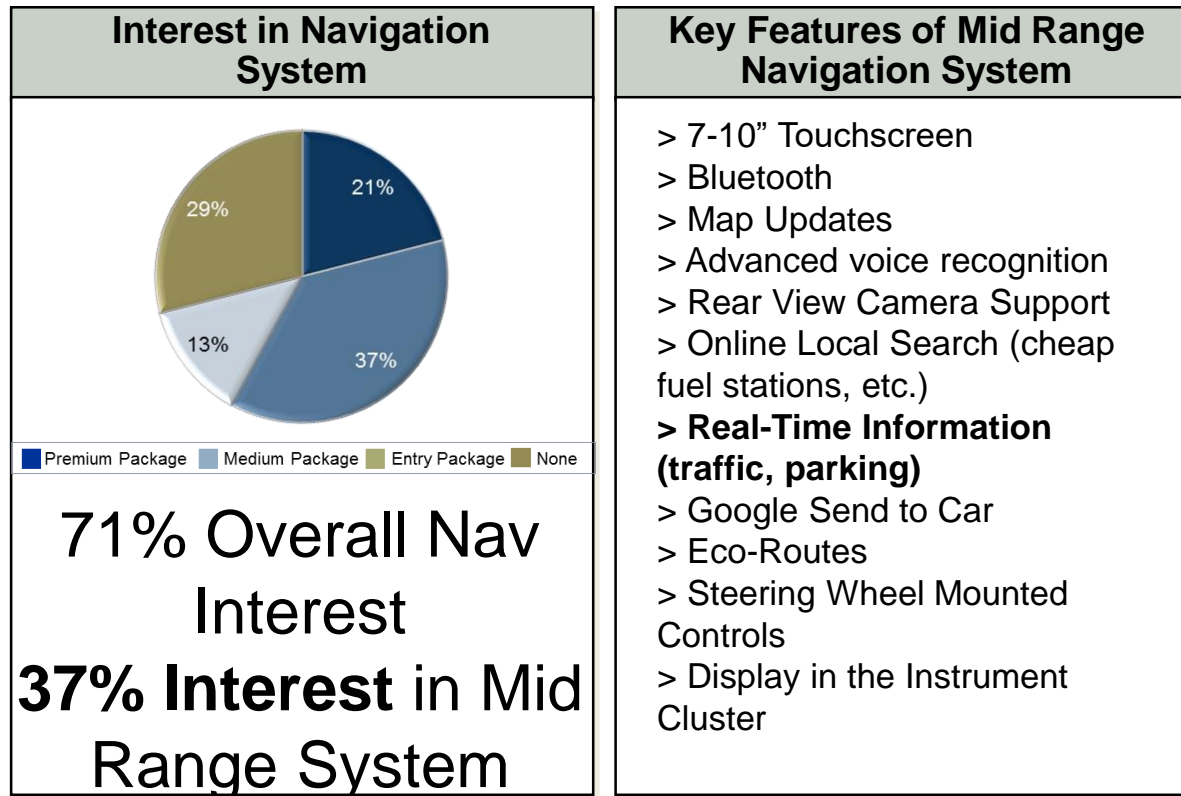
Luxury car segment shows the highest uptake rate at a higher median price point for real-time parking service in US for their next car



Base: All respondents (n=1,584).

Q: If real-time parking feature were offered as an option, what would be the maximum price that you would be willing to pay for it (one-time fee)?

As a package US consumers are interested in a mid level navigation system that adds parking information



Base: All respondents US (n=1,514), 2014 Study.

Menu-based conjoint.

Source: Frost & Sullivan

Background Information for US Findings Vehicle Segments, Demographic Information

Methodology : 1584 Vehicle Owner Interviews in US

Methodology:	Panel based online survey in US
Field time:	January to February 2015
Sample:	N=1584 in total The detailed sample structure is provided on following slide
Overall Quota:	On vehicle segment, age group, gender and living areas
Respondent:	Car owners Current car had to be purchased new Current car model not older than 5 years old (2010 model or younger) or planning to buy a new car within 3 years Primary decision maker or joint decision maker with 50% or more involvement in vehicle purchase
Reporting notes:	Due to rounding percentages in charts, tables, etc. may not sum up to 100

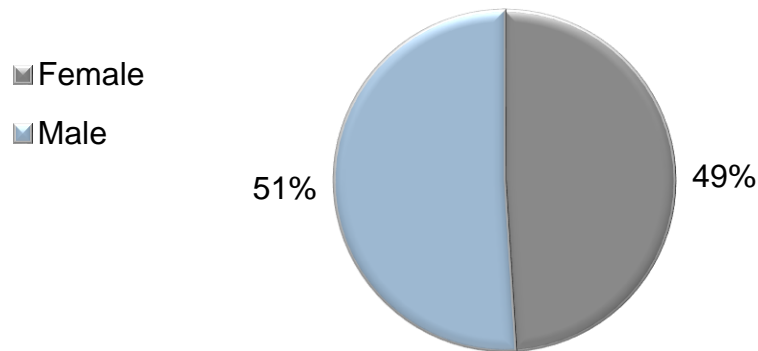
Source: Frost & Sullivan

Sample Structure

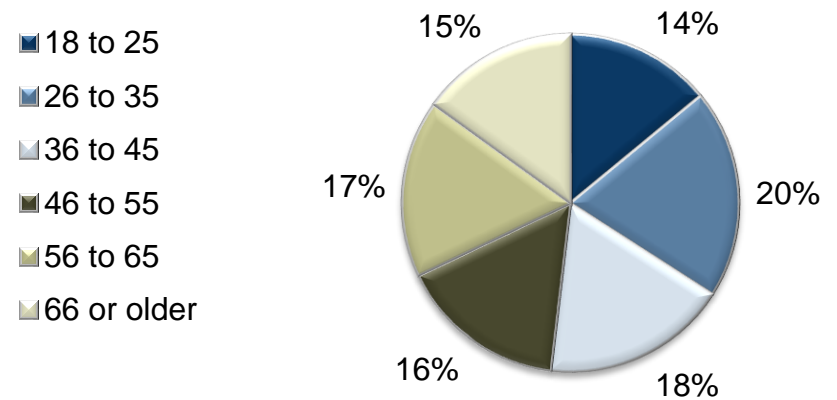
Across countries vs vehicle segments, age groups, gender and living areas

Number of Respondents	Total Sample	Next Vehicle Segment								
		Sub-compact Car	Compact Car	Midsize & Large Car	Luxury Car	Small to Midsize SUV/CUV	Large SUV	Luxury SUV	Pickup Truck	Minivan
Northeast	395	27	70	70	36	65	27	42	25	33
South	400	35	70	71	33	61	27	36	37	30
Midwest	395	18	70	67	33	62	32	38	34	41
West	394	17	70	80	39	71	24	45	34	14
Total	1,584	97	280	288	141	259	110	161	130	118

Gender: United States, 2015



Age: United States, 2015



Source: Frost & Sullivan

Current Vehicle Segment Owned and Future Segment Interest

SUV/CUV owners show the highest loyalty to the segment in terms of future interest

Current Vehicle Segment	Total Sample	Next Vehicle Purchase Segment								
		Sub-compact car	Compact car	Midsize & large car	Spec. car	Small to midsize SUV/CUV	Large SUV	Luxury SUV	Pickup truck	Minivan
Sub-compact car	6%	40%	6%	3%	4%	2%	4%	3%	2%	4%
Compact car	22%	21%	49%	17%	17%	18%	16%	11%	17%	13%
Medium and large car	20%	12%	18%	47%	25%	14%	7%	11%	10%	8%
Specialty car	9%	9%	6%	9%	30%	3%	5%	12%	8%	5%
Small to midsize SUV/CUV	19%	8%	13%	10%	6%	51%	18%	20%	11%	14%
Large SUV	5%	-	2%	3%	1%	2%	36%	3%	4%	4%
Luxury SUV	8%	4%	3%	8%	13%	2%	4%	35%	5%	-
Pickup truck	5%	2%	2%	2%	4%	2%	5%	1%	41%	1%
Minivan	6%	3%	1%	1%	1%	5%	5%	2%	2%	51%

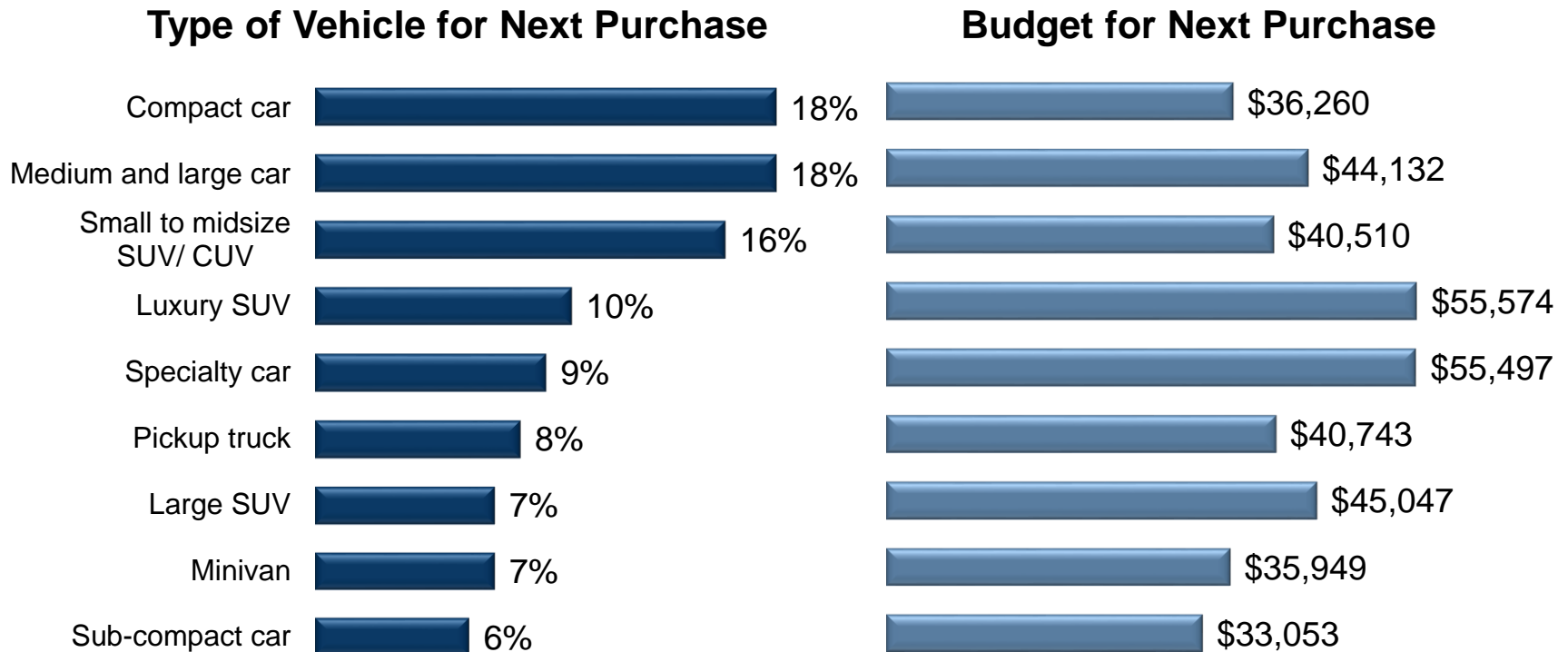
Base: All respondents (n=1,584).

Vehicle segment

Source: Frost & Sullivan

Next Vehicle Purchase Segment and Budget

Compact car, medium/large car, and small to midsize SUV/CUV comprise over half (52%) of next vehicle purchases by vehicle owners. Combined together, large SUV and luxury SUV account for 17% of planned next vehicle purchases. Luxury SUV and specialty cars have the highest budget for their next vehicle at \$55.5K.



Base: All respondents (n=1,584).

Q4. What type of vehicle are you most likely to purchase next?

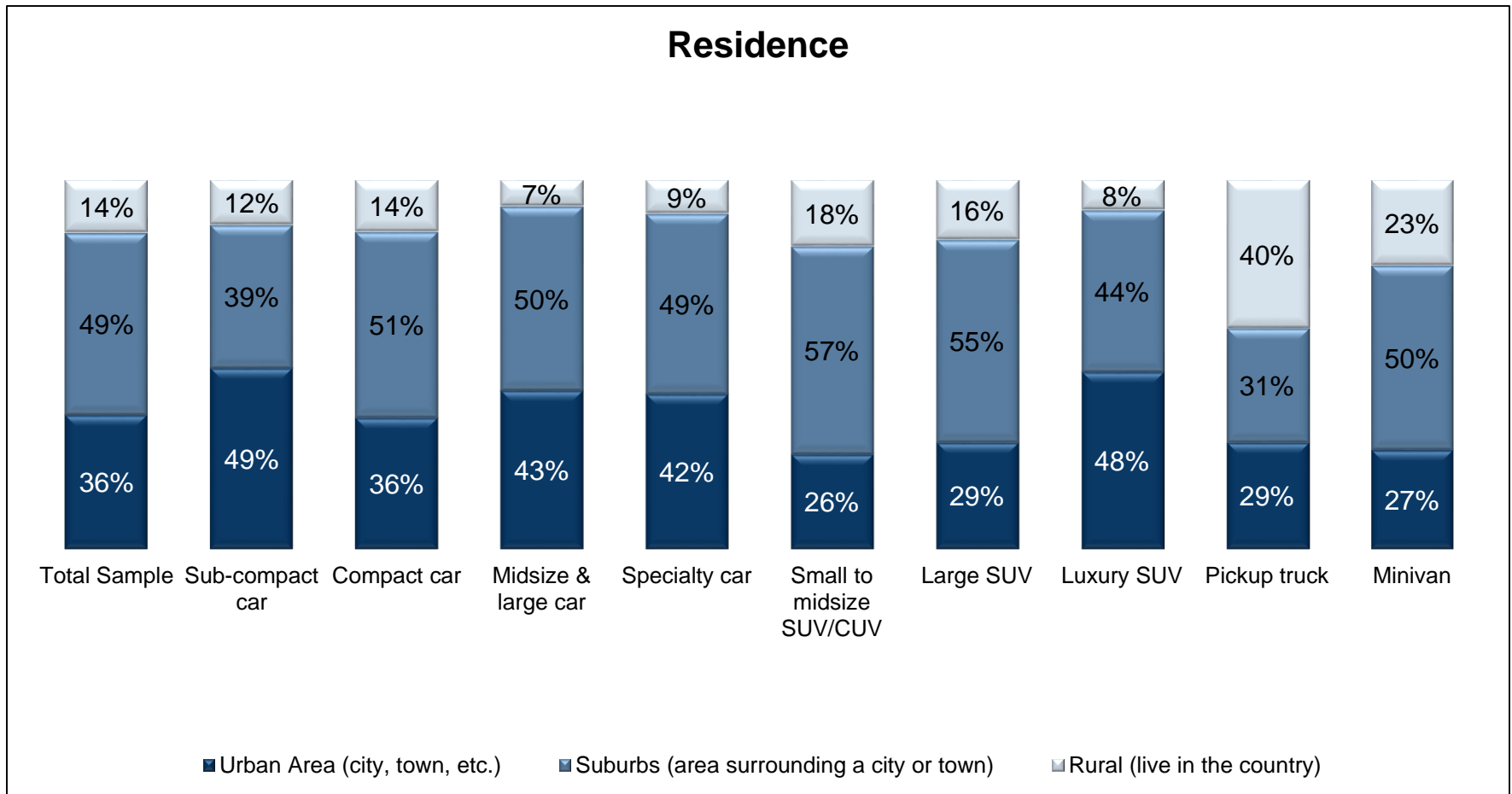
Base: All respondents (n=1,584).

QC3. About how much is your budget for your next vehicle purchase (total out the door)?

Source: Frost & Sullivan

Residential Information

Suburbs dominate the area of residence

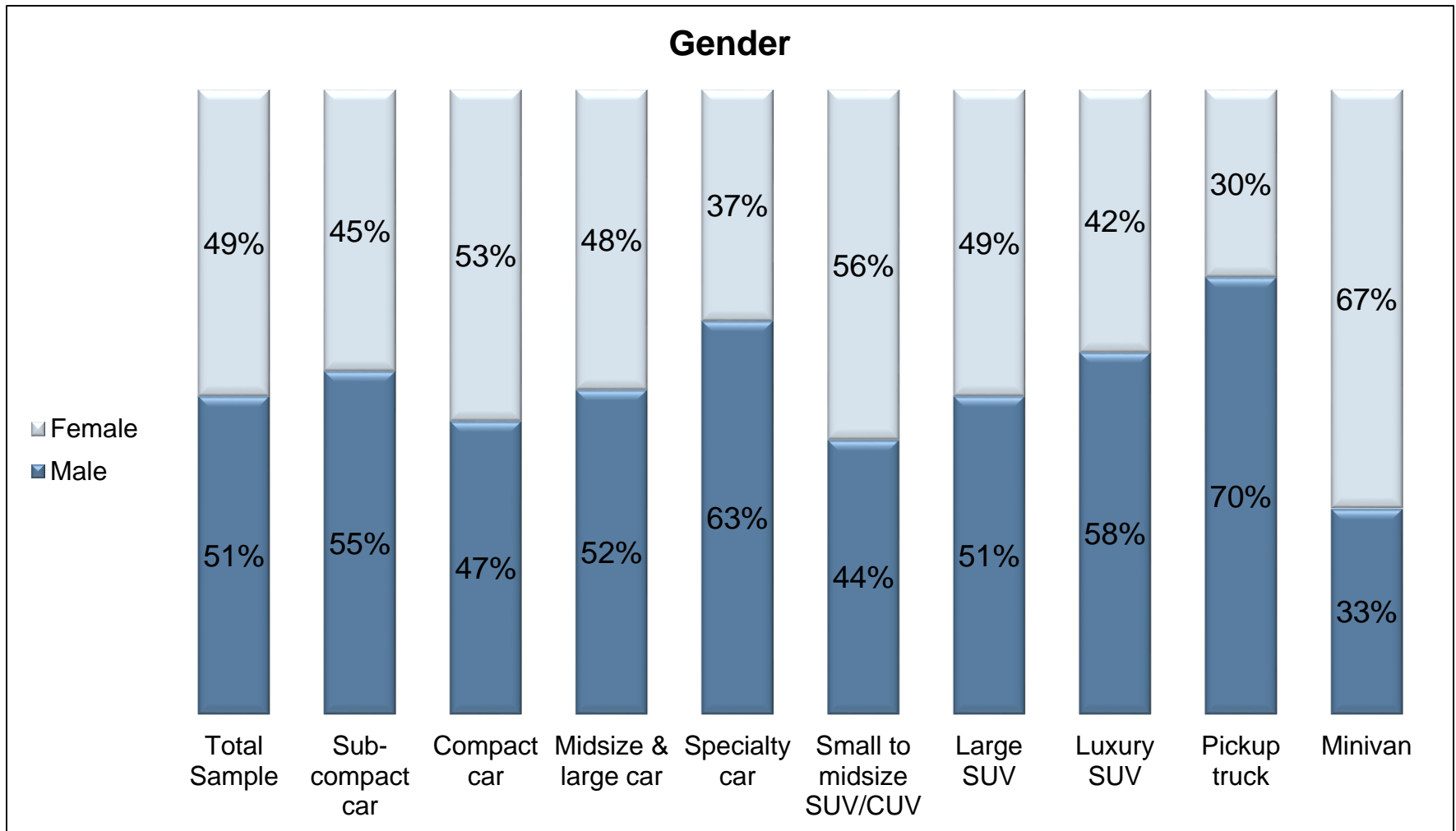


Base: All respondents (n=1,584).

S9. What type of area do you live in?

Source: Frost & Sullivan

Gender

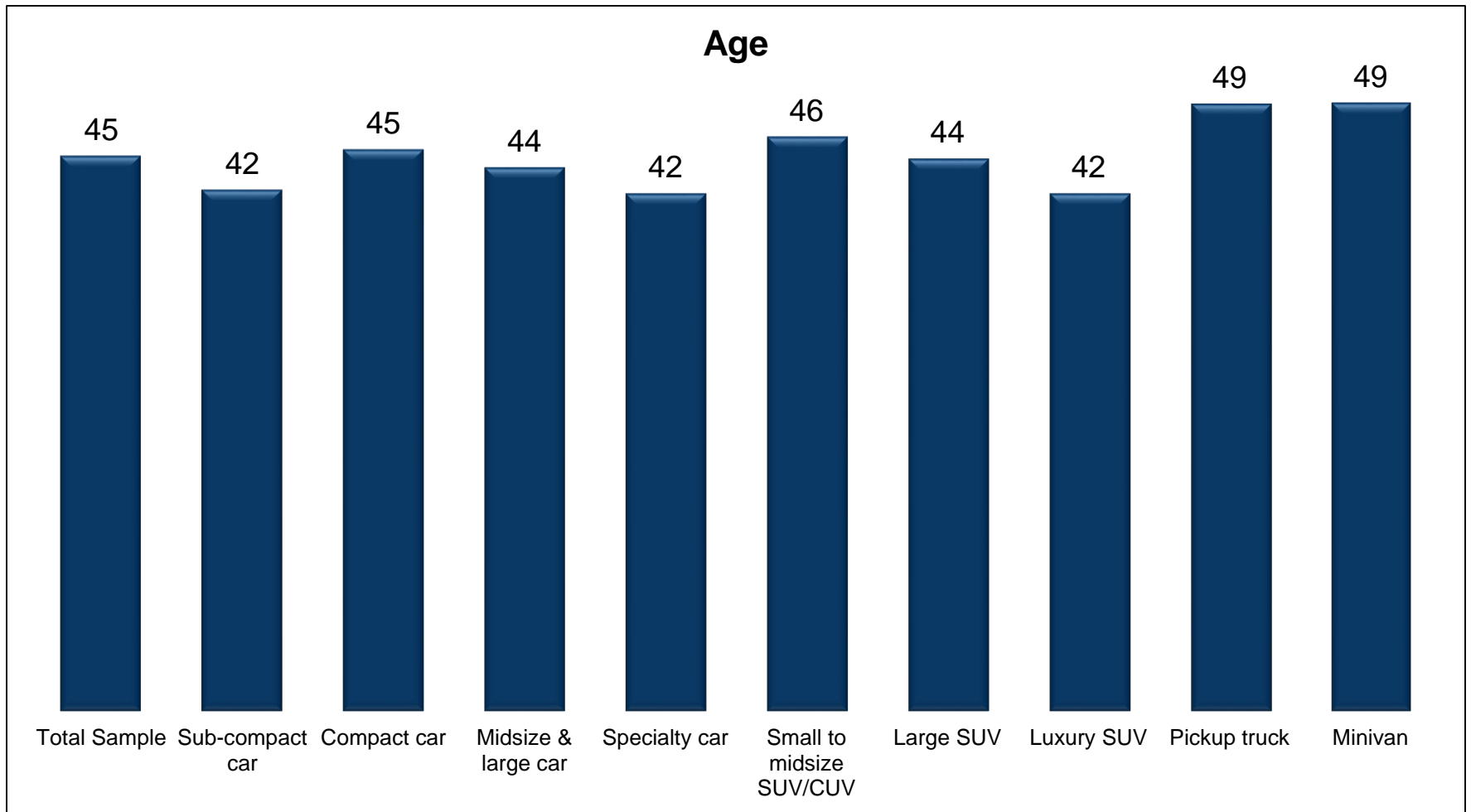


Base: All respondents (n=1,584).

S10. And are you...

Source: Frost & Sullivan

Consumers Age Mix

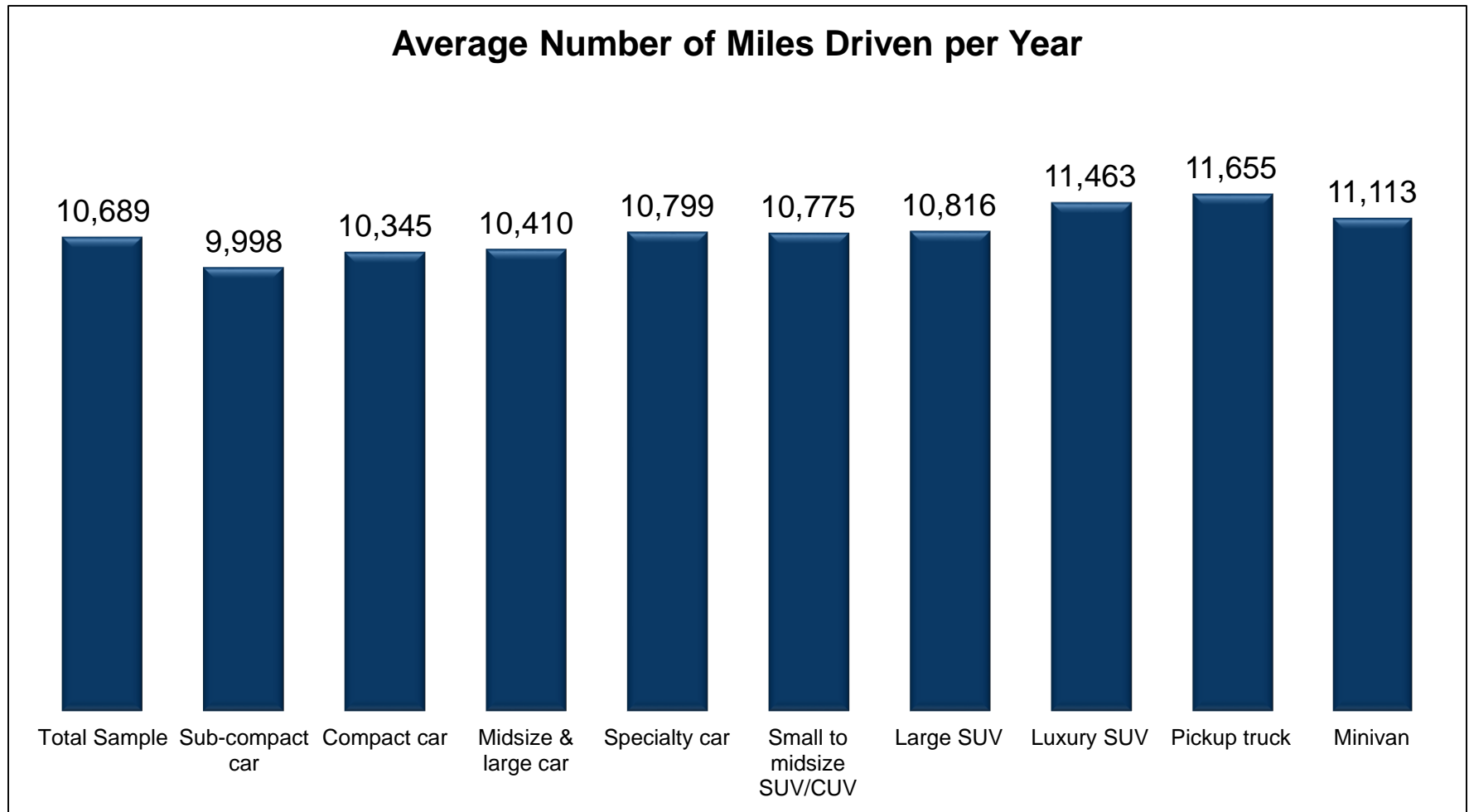


Base: All respondents (n=1,584).

S11. Please select your age range...

Source: Frost & Sullivan

Average Number of Miles Driven per Year



Base: All respondents (n=1,584).

C5. On average, how many miles do you drive in a year?

Source: Frost & Sullivan

Europe

Key Takeaways

Telematics/Connected Services and Infotainment systems are not vehicle purchase drivers across Europe

Compact cars, luxury cars and large SUV segments expect parking and other connected services as standard

26% of European consumers are willing to pay for a mid range navigation system with access to real-time services like parking and traffic

Even A&B segment owners show moderate interest in acquiring a navigation system with real-time services like parking and traffic

European OEMs are using their mobility brand to integrate real-time parking service and invest in innovative parking companies, e.g. BMW

European consumers still value safety and reliability of the vehicle as key purchase drivers compared to other technology features

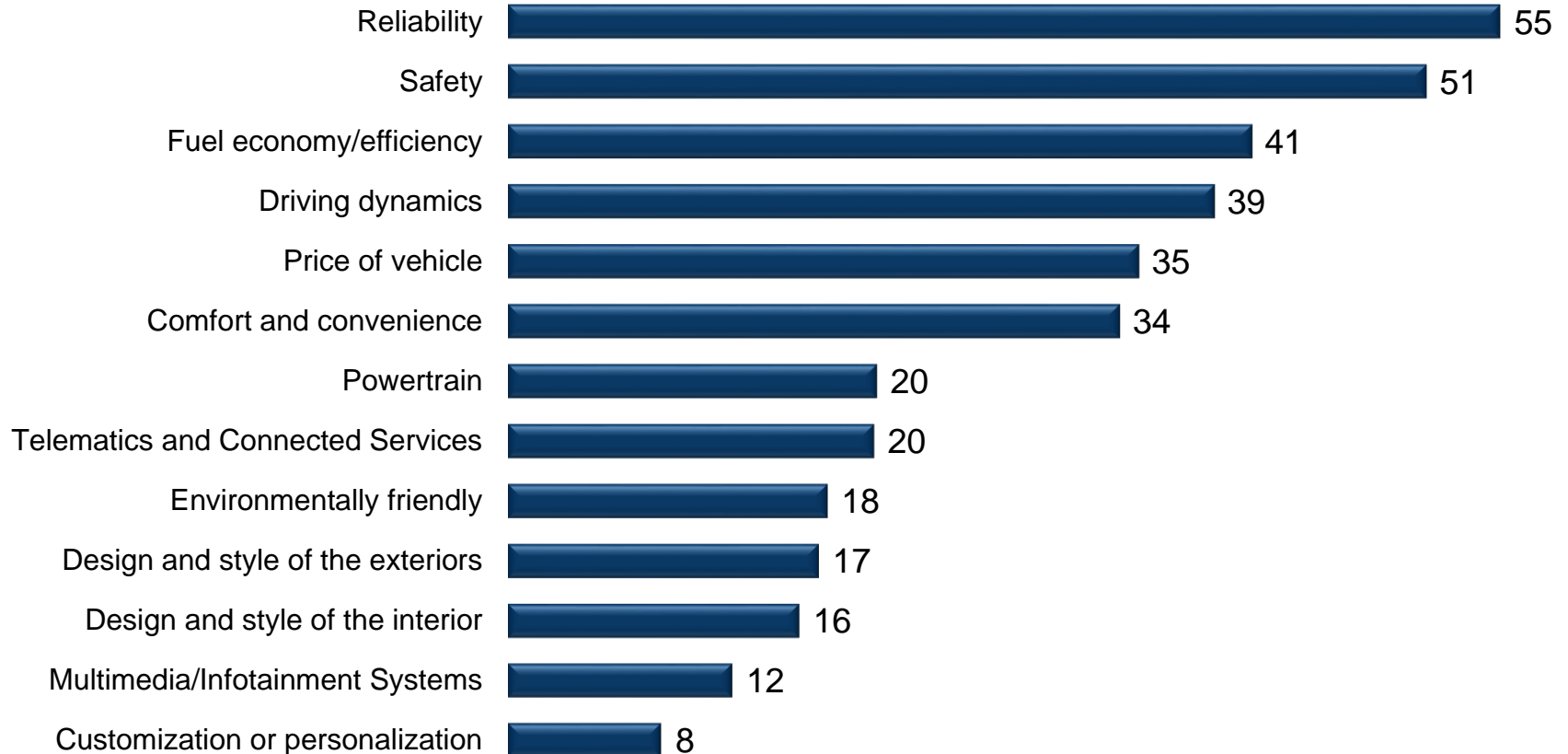
Key Takeaways

Source: Frost & Sullivan

Europe - Vehicle Purchase Drivers

The general perception of safety ranks very highly in the next vehicle purchase attributes list

Relative Importance of Vehicle Features

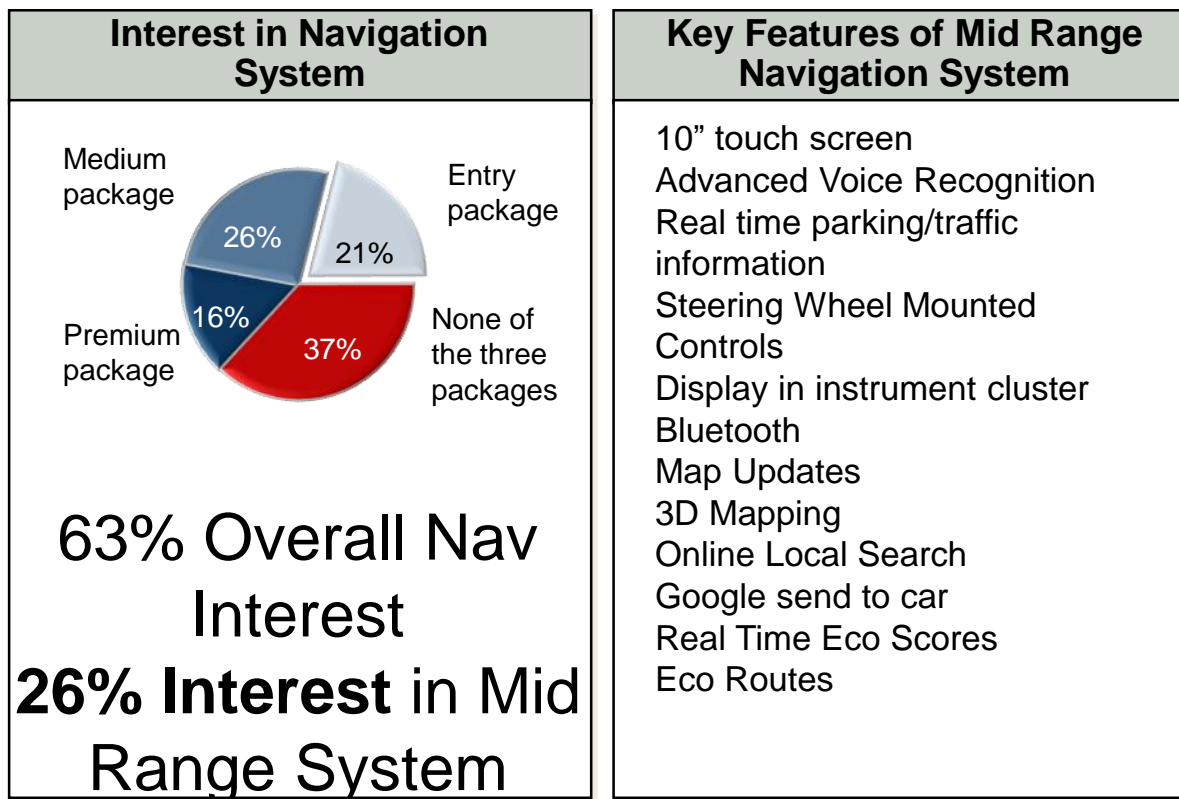


Base: All respondents (n=2,869).

Q12. Maxdiff - Mean scores

Source: Frost & Sullivan

As a package European customers are interested in a mid range navigation system with real-time information on parking and traffic



Base: All respondents US (n=1,514), 2014 Study.
 Menu-based conjoint.

Source: Frost & Sullivan

Background Information for European Findings Vehicle Segments, Demographic Information

Methodology : 2869 interviews in G4 countries and Russia

Methodology:	Panel based online survey in Europe G4 (France, Germany, Italy, UK) and Russia
Field time:	February to March 2014
Sample:	N=2,869 in total The detailed sample structure is provided on following slide
Overall Quota:	On vehicle segment, age group, gender and living areas
Respondent:	Car owners Current car had to be purchased new Current car model not older than 5 years old (2009 model or younger) or planning to buy a new car within 3 years Primary decision maker or joint decision maker with 50% or more involvement in vehicle purchase
Reporting notes:	Due to rounding percentages in charts, tables, etc. may not sum up to 100

Source: Frost & Sullivan

Sample Structure

Across countries vs vehicle segments, age groups, gender and living areas

	Total		France		Germany		Italy		UK		Russia	
Total	2,869		596		599		619		590		465	
<u>By segment</u>												
A&B	562	20%	124	21%	105	18%	118	19%	113	19%	102	22%
C	570	20%	121	20%	115	19%	119	19%	110	19%	105	23%
D	562	20%	132	22%	112	19%	127	21%	120	20%	71	15%
E&F	360	13%	58	10%	110	18%	73	12%	82	14%	37	8%
MPV	289	10%	97	16%	57	10%	70	11%	57	10%	8	2%
SUV – S (small/medium)	307	11%	51	9%	54	9%	59	10%	55	9%	88	19%
SUV – L (large)	219	8%	13	2%	46	8%	53	9%	53	9%	54	12%
<u>By age</u>												
18 to 24	195	7%	25	4%	53	9%	39	6%	35	6%	43	9%
25 to 34	711	25%	114	19%	138	23%	131	21%	160	27%	168	36%
35 to 44	840	29%	170	29%	153	26%	238	38%	139	24%	140	30%
45 to 54	657	23%	144	24%	165	28%	139	22%	122	21%	87	19%
55 or older	466	16%	143	24%	90	15%	72	12%	134	23%	27	6%
<u>By gender</u>												
Male	1,751	61%	365	61%	375	63%	358	58%	362	61%	291	63%
Female	1,118	39%	231	39%	224	37%	261	42%	228	39%	174	37%
<u>By area</u>												
Urban area	1,896	66%	354	59%	357	60%	462	75%	283	48%	440	95%
Suburbs	609	21%	116	19%	145	24%	112	18%	223	38%	13	3%
Rural	364	13%	126	21%	97	16%	45	7%	84	14%	12	3%

Source: Frost & Sullivan

Prevalence of Vehicle Segment Switching: Likely Next Vehicle Segment

More vehicle owners currently in the sub-compact car segment are likely to switch to a compact car with their next vehicle purchase. The compact, and medium to large car segments are expected to be competitive with the MPV segment.

Current Vehicle Segment Owners:	Sub-compact Car	Compact Car	Medium and Large Car	Executive and Luxury	MPV	Small SUV	Large SUV
<i>Segment likely to purchase next...</i>							
Sub-compact car	24%	8%	2%	2%	7%	4%	2%
Compact car	53%	40%	16%	11%	22%	13%	10%
Medium and large car	9%	26%	45%	18%	24%	19%	12%
Executive and luxury	2%	7%	21%	48%	8%	16%	25%
MPV	2%	4%	3%	3%	24%	1%	1%
Small SUV	9%	13%	7%	6%	7%	25%	11%
Large SUV	1%	2%	6%	13%	7%	22%	38%
Expected spend on next vehicle (mean, Euros)	€ 19,234	€ 24,864	€ 32,255	€ 42,840	€ 26,617	€ 34,918	€ 46,849

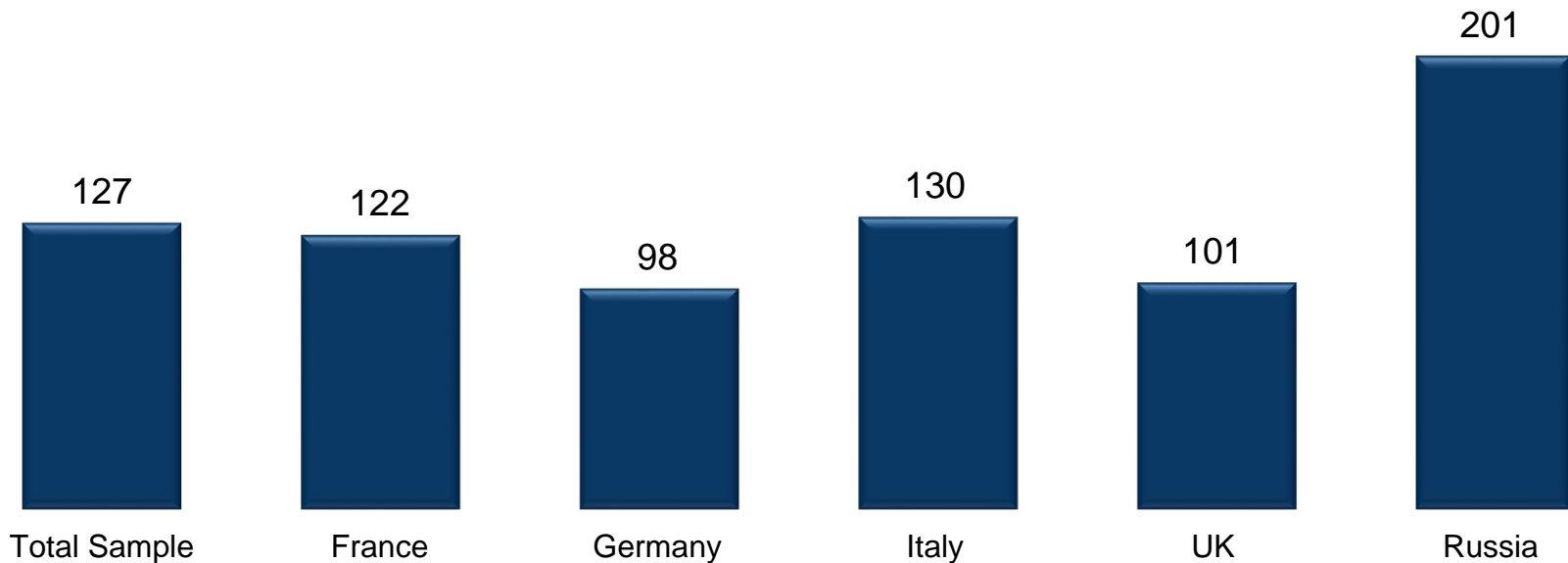
Base: All respondents (n=2,869).

Q1. Which segment of vehicle are you most likely to acquire next? Q2. How much do you expect to spend on your next vehicle (in Euros)?

Source: Frost & Sullivan

Mean Minutes Spent in Vehicle During Weekdays

**Mean Minutes Spent in Vehicle During Weekdays by Country
(Interpolated Means)**

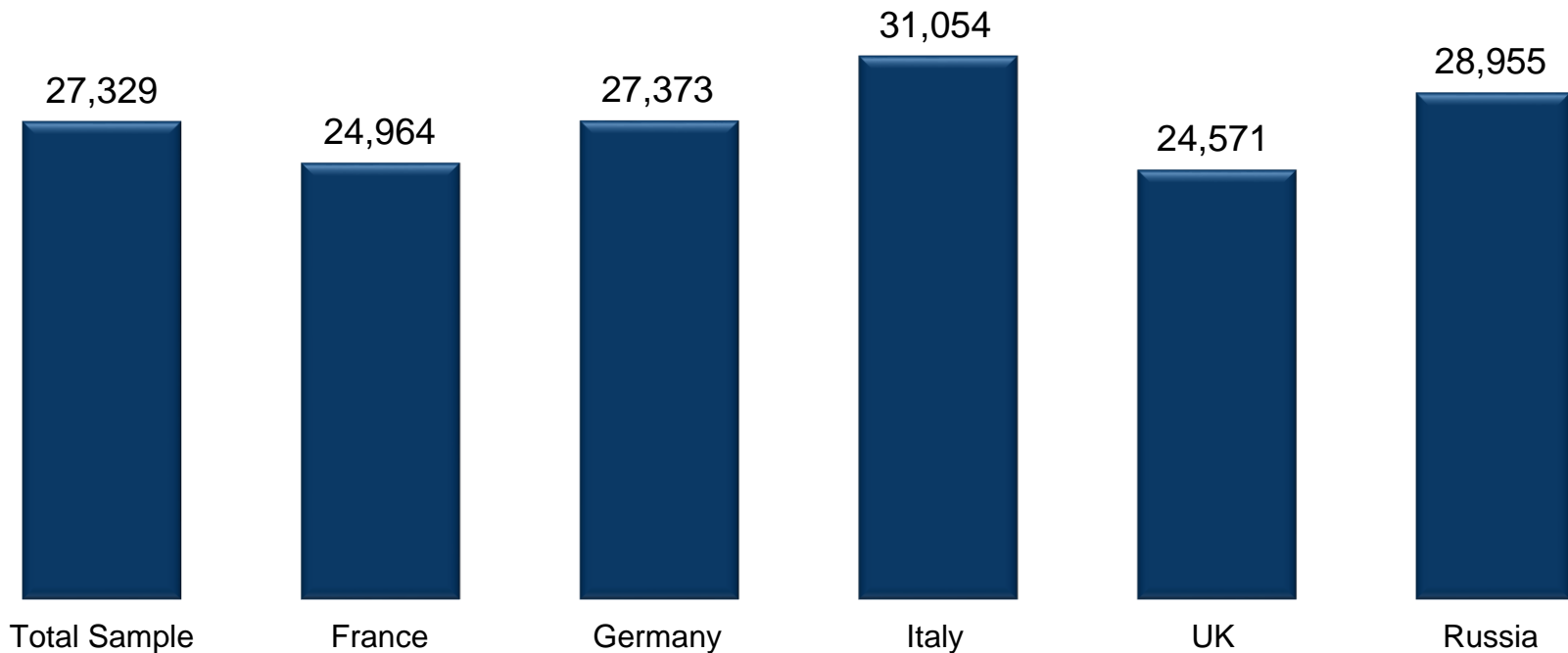


Base: All respondents (n=2,869).

Q35_1. On average, how much time do you typically spend in your vehicle? - Average time spent per day on weekdays (Monday to Friday)

Mean Annual Mileage (Kilometers)

Mean Annual Mileage by Country (Kilometers, Interpolated Means)

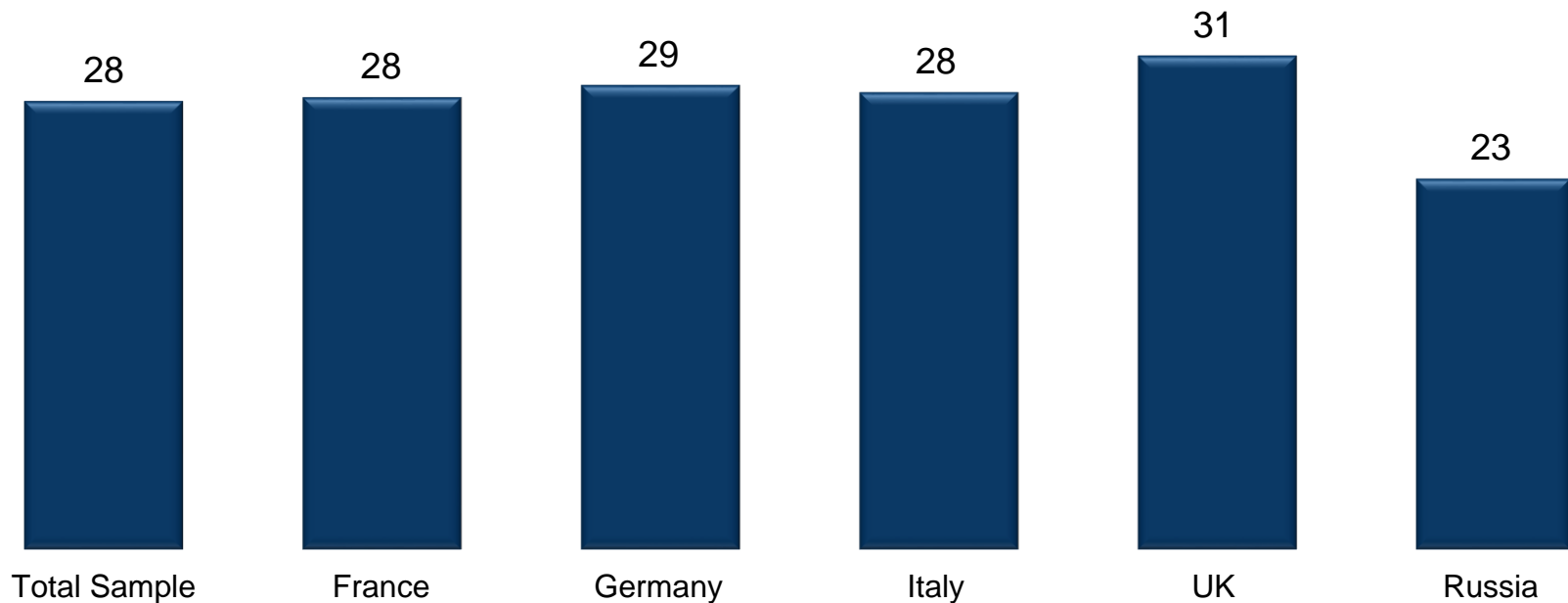


Base: All respondents (n=2,869).

Q34. On average, how many miles/kilometers do you drive in a year?

Mean Kilometers Driven to Work

Mean Miles Driven to Work by Country (Kilometers, Interpolated Means)

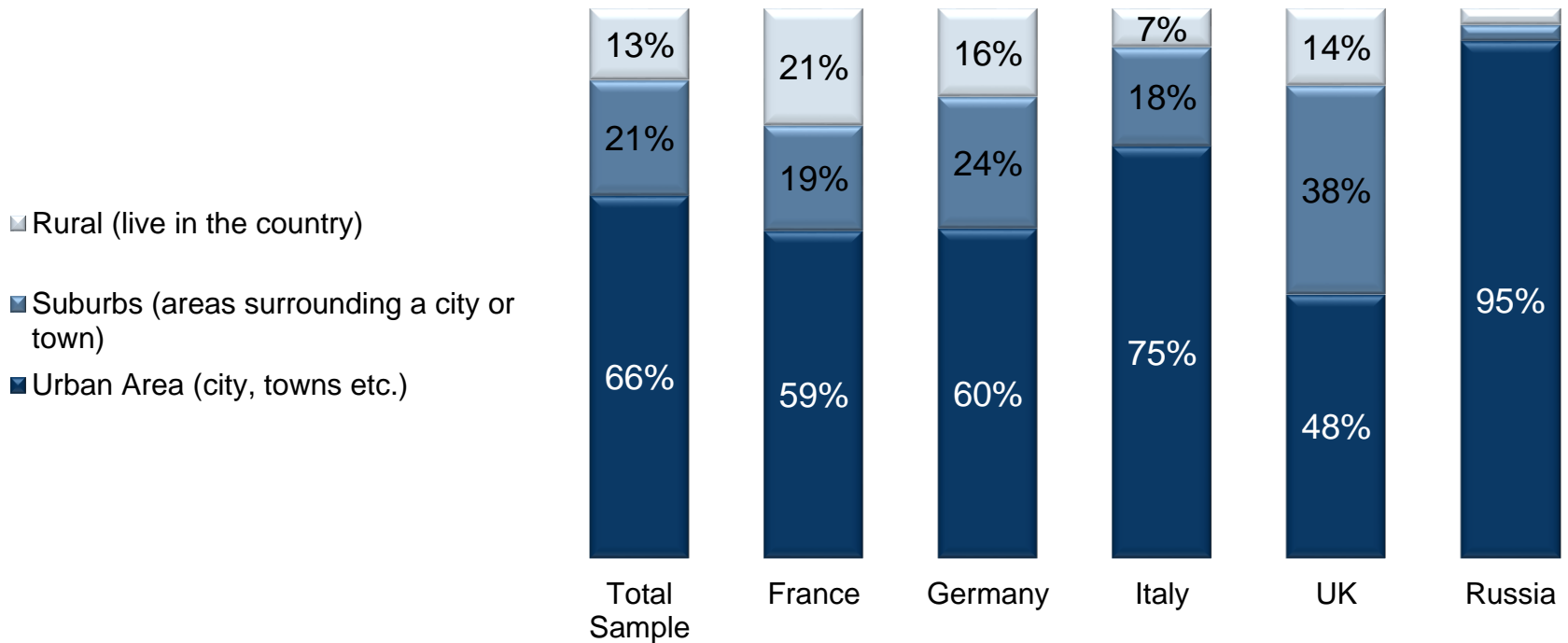


Base: All respondents (n=2,869).

Q36. Approximately what distance do you drive (one way) to your place of work?

Location of Residence

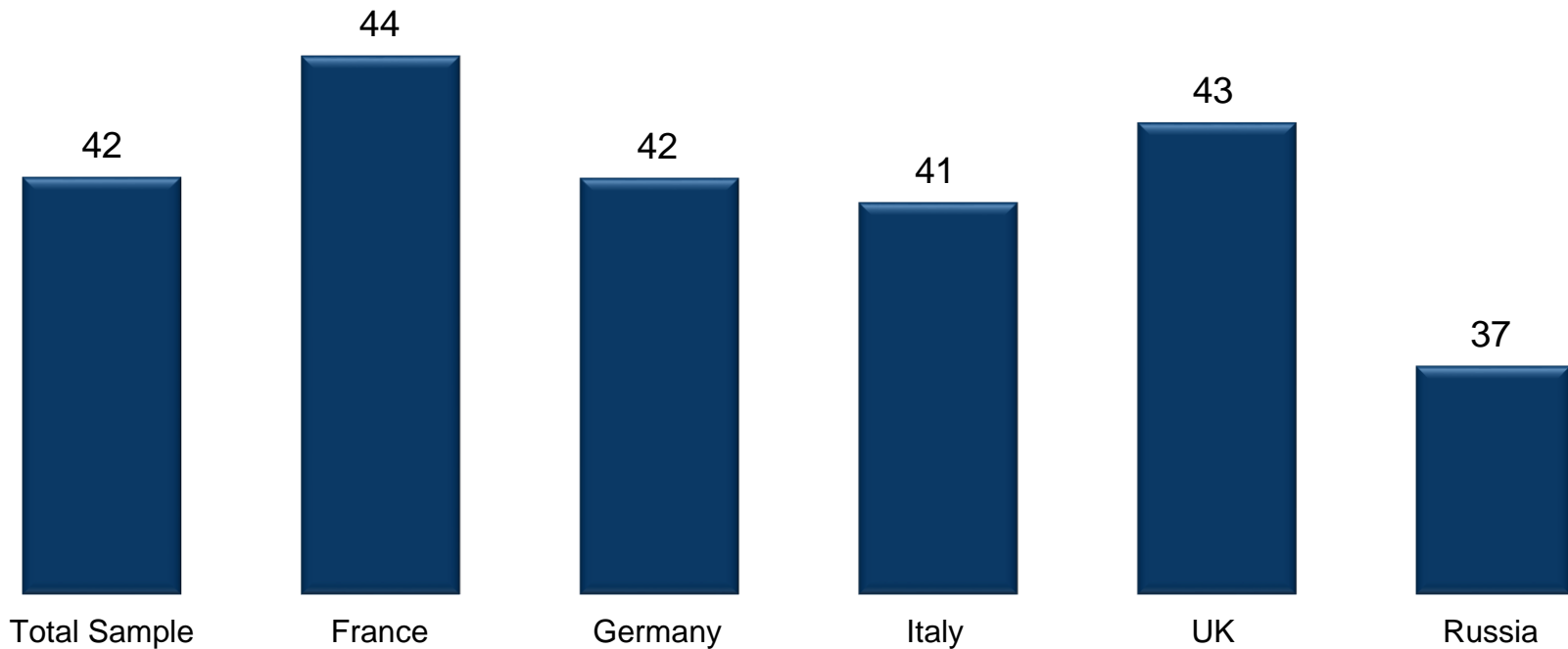
Location of Residence by Country



Base: All respondents (n=2,869).
S2. What type of area do you live in?

Age

Age by Country (Interpolated Means)

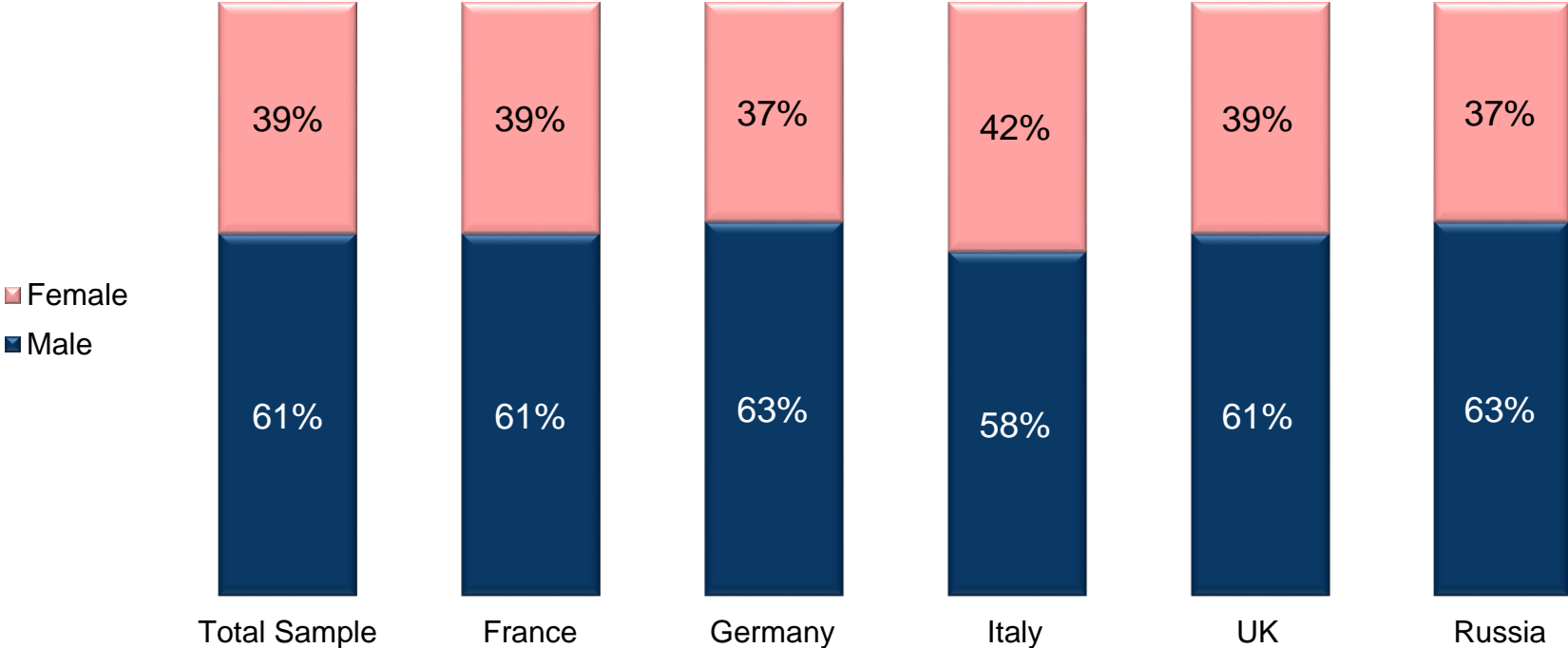


Base: All respondents (n=2,869).

S3. Please select your age

Gender

Gender by Country



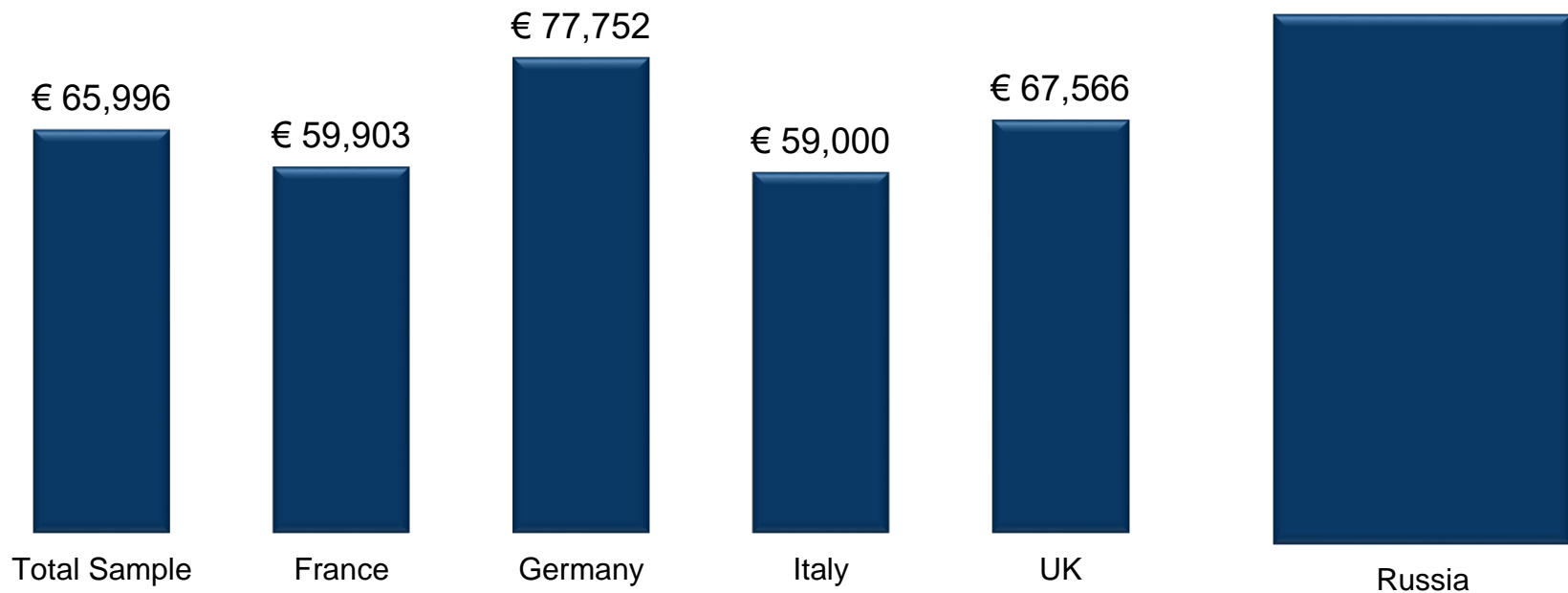
Base: All respondents (n=2,869).

S4. What is your gender?

2013 Mean Household Gross Income

**2013 Mean Household Gross Income by Country
(Euros, Interpolated Means)**

Russia (Rubles)



Base: All respondents (n=2,869).

Q46. What was your gross household income in 2013 (in Euros)? - France, Germany, Italy, and United Kingdom, Russia (Rubles)

Parking City Profiles

Methodology for Calculating Economic Impact of Parking

Data points:

1. Congestion time wastage hours/ year is obtained mostly from TTI's 2012 Urban Mobility Report and sourced from INRIX traffic survey
2. Planning Time Index of 3.09 is kept constant for US and Europe and applied to all cities
3. Fuel consumed in liters in congestion per vehicle is obtained from CEBR report and assumed country average for cities wherever data was not available
4. Average fuel cost is obtained from CEBR report and from secondary sources wherever data was not available
5. Average Fuel economy of a vehicle is considered for US and EU cities respectively. US(15.3 km/liter); EU(18.9 km/liter)
6. Considered average speed maintained to search for parking as 20km/hour

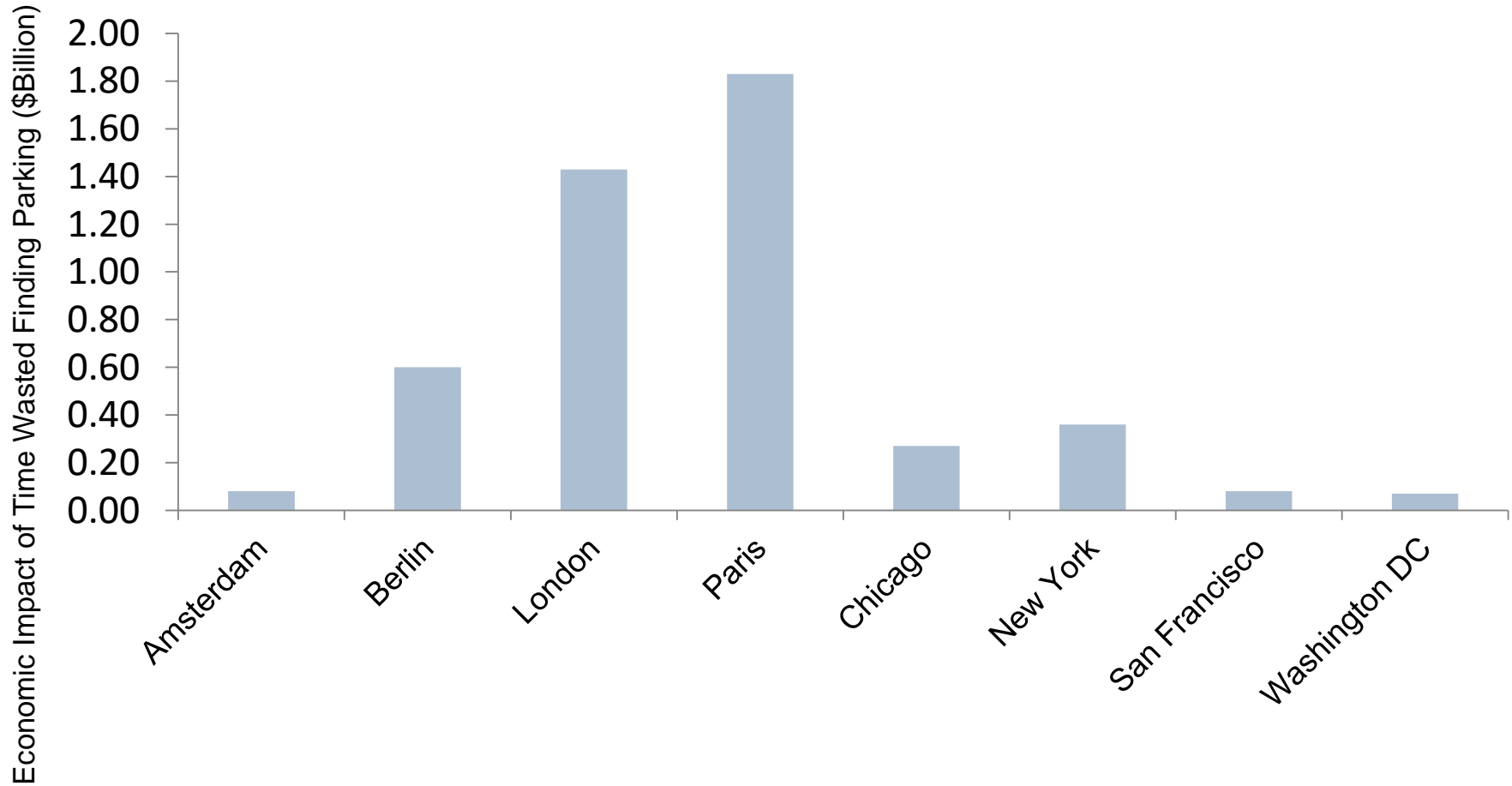
Sample Economic Impact Calculation for London:

- Fuel cost = \$2.10/ltr
- Fuel economy of a vehicle = 18.9 km/liter
- Cruising cost = fuel cost/fuel economy= $(\$2.10/\text{ltr}) / (18.9\text{km}/\text{ltr}) = \$0.11/\text{km}$
- Assumed parking speed = 20km/hr
- Fuel cost per hour of searching for parking= parking speed*cruising cost = \$2.2/hr
- Annual Hours wasted in congestion = 252.1 hours
- Economic \$ value impact parking/vehicle/year = Fuel cost per hour searching for parking * Annual Hours wasted in congestion = **\$561**

Annual Hours Wasted For Parking and Economic Impact

Cities	Annual Hours Wasted for Parking	Economic Impact
London	76 hours/year	\$561 /vehicle/year \$1.43 Billion/Year
Berlin	43 hours/year	\$ 531 /vehicle/Year \$604 Million/Year
Amsterdam	62 hours/year	\$ 319/vehicle/Year \$84 Million/Year
Paris	51 hours/year	\$ 368/vehicle/Year \$1.83 Billion/Year
San Francisco	52 hours/year	\$213/Vehicle/Year \$82 Million/Year
New York	49 hours/year	\$201/Vehicle/Year \$362 Million/Year
Chicago	48 hours/year	\$197/Vehicle/Year \$266 Million/Year
Washington D.C.	63 hours/year	\$258/Vehicle/Year \$74 Million/Year

Top Level Comparison – Based on City Profiles





European Cities

City ID - London

London is divided into 33 boroughs, with the local authorities handling parking issues. 2013-14 shows a fall in tickets for low-level offences, even though the total ticket numbers have increased.

Metrics	Data
Population	8,416,535 (2013)
Number of Cars	2,549,300 (2013)
Number of parking spaces	10 million (2013)
Parking income (on- and off-street) – Councils in London	£565.1 million (2013)
Parking fines On-street Councils in London	£242million – 71% of the national total of £343m
Parking tickets issued for high level offences	3,087,186 (2013)
Parking tickets issued for lower level offences	992,516 (2013)
Congestion charging	£11.50 (\$17.80) a day for vehicles entering the inner-city area.
Degree of motorization	307 cars per 1000 residents (2013)
Congestion time wastage (incl. planning time index)	252 hours/year (2013)
Time wasted for parking	76 hours/year (2013)
% of urban traffic for finding parking	30% (2013)
Economic Impact	\$561 /vehicle/year \$1.43 Billion/Year

Source:

<http://www.lbc.co.uk/london-councils-make-293m-from-parking-fines-101859>

<http://tribune.com.pk/story/854058/dubai-tops-new-york-london-for-cars-per-person/>

Key Insights

- The UK's richest parking authority, Westminster, issued 449,139 tickets, compared to 456,000 last year.
- Top five councils for parking fines are all in London, with Westminster making £51m in the year 2013/14.
- Kensington & Chelsea were the second with £33m, Camden earned £24.8m, Hammersmith & Fulham £22.9m and Wandsworth £19m. Tower Hamlets and Islington also make the Top 10.
- Contributes 44% to the £667m of the overall total raked in by local councils across the UK. The total figure has surged 12% from last year's already sizeable amount of £596m.
- Parking penalty charges (high + low level offences) issued to London drivers hit £4.08m
- 40% of total income comes from London, although Londoners own only 10% of the cars in the UK but, of course, incoming commuters will also contribute to parking income and penalties

Note:

- High level offences: parking on double yellow lines, stopping at a bus stop or pedestrian crossings or double parking)
- Lower level contraventions: overstaying time on a parking meter or not parking within markings of a bay

Parking Enforcement 2013-14

Enforcement Activity 2013-14											
Enforcing Authority	Higher Level Parking PCNs	Lower Level Parking PCNs	Total Parking PCNs	Bus lane PCNs	Moving Traffic PCNs	London Lorry Control Scheme (Operators)	London Lorry Control Scheme (Drivers)	Total PCNs	London Lorry Control Scheme (Observations)	Total Vehicles clamped	Vehicles removed to pound
London Councils						4,337	1,000	5,337	13,286		
Barking & Dagenham	50,403	5,202	55,605	19,708	18,641			93,954			
Barnet	107,278	43,178	150,456	16,577				167,033			
Bexley	39,766	9,035	48,801					48,801			
Brent	75,457	37,352	112,809	5,681	24,029			142,519			3,085
Bromley	58,280	30,180	88,460	4,439				92,899			
Camden	146,783	88,581	235,364	13,562	28,980			277,906		10	3,058
City of London	51,482	6,281	57,763		4,508			62,271			293
Croydon	68,237	26,628	94,865	282	12,010			107,157			2,637
Ealing	77,804	29,839	107,643	24,171	19,509			151,323			483
Enfield	58,450	20,663	79,113	1,899	13,069			94,081			1,412
Greenwich	19,409	11,187	30,596					30,596			
Hackney	65,928	16,793	82,721	635	7,586			90,942			2,973
Hammersmith & Fulham	114,894	44,179	159,073	11,503	99,197			269,773			1,373
Haringey	148,400	23,415	171,815	3,125	13,776			188,716			2,961
Harrow	55,855	13,227	69,082	7,426	38,305			114,813			
Havering	27,817	8,194	36,011					36,011			
Hillingdon	37,175	26,532	63,707	1,605	8,409			73,721			
Hounslow	76,597	29,189	105,786	18,706	5,477			129,969			536
Islington	115,606	51,049	166,655	9,699	33,610			209,964		34	128
Kensington & Chelsea	115,050	75,792	190,842					190,842		1,611	6,465
Kingston	39,683	19,398	59,081	25,051	16,271			100,403			
Lambeth	112,717	20,530	133,247	30,030	23,172			186,449			2,890
Lewisham	28,448	19,159	47,607	8,623	7,234			63,464			
Merton	39,158	20,392	59,550	14,579	12,269			86,398			
Newham	135,189	24,178	159,367	2,833	20,415			182,615			5,581
Redbridge	76,458	36,264	112,722		7,018			119,740			
Richmond	39,951	29,554	69,505	3,035	597			73,137			
Southwark	74,250	15,690	89,940	564	11,265			101,769			8
Sutton	27,500	8,446	35,946					35,946			
Tower Hamlets	113,424	19,161	132,585	1,346	1,947			135,878			2,484
Waltham Forest	81,214	11,340	92,554	9,261	28,993			130,808		1	2,526
Wandsworth	124,056	40,054	164,110	88	9,434			173,632			1,333
Westminster	302,032	131,854	433,886		15,253			449,139			
Transport for London	382,435		382,435	20,249	169,233			571,917			
TOTAL	3,087,186	992,516	4,079,702	254,677	650,207	4,337	1,000	4,989,923		1,656	40,226

Source: <http://www.londoncouncils.gov.uk/services/parking-services/parking-and-traffic/parking-information-professionals/information>

Smart Parking Initiatives in London

The trial generated £4,000 over four locations (=£16,000 annually) from the 104 paid space in four streets. With 11,000 paid spaces in the city, and the evaluation demonstrated a real ROI of £2.8 million over five years.

Project Background

- Westminster has 11,000 paid spaces in the city. Around 15% of spaces are unoccupied because drivers are unaware of their location.
- The "smart parking" pilot with company "Smart Parking" involves sensors which detect when a parking space on the street lies empty. This data is then released to the public through a mobile device app, which allows drivers to find these spaces.

Parking Challenges

Westminster faced ongoing challenges including:

- Significant demand for parking spaces
- Theft from the council's on street parking metres of £50,000/ week
- Loss of other income to organized crime estimated at £70,000 /week
- Significant maintenance costs for 4,400 ageing and outdated parking meters
- Significant operational costs including the collection and management of cash money

Fiscal Impact

- The scheme costs <=\$1 million, for 10,000 spaces
- SmartEye sensors detect whether a parking space is available or in use and send the information to a central database.
- The ParkRight API provides real time availability on over 3,000 parking spaces around the West End and static data on over 40,000 parking spaces across the City of Westminster.

Project phases

1st Phase: Sep'12 to Nov'12

Successful trial operation, installing 189 SmartEye sensors in several Westminster streets

2nd Phase: Nov'12 to Jul'14

Next phase of deployment led 3,500 sensors operational

3rd Phase: Jun'14 to May'15

Additional 7,000 sensors installation by May 2015

Source: <http://www.local.gov.uk/documents/10180/6360115/Westminster+Parking+case+study+-+FINAL.pdf/2a56ddb9-bf77-416c-abff-83893a680521>

Smart Parking Initiatives in UK

Other projects

- The Birmingham/Amey trial is piloting systems from a Streetline/IBM partnership and the UK companies Deteq and Smart Parking.
- Smart Parking trialed SmartPark for the London Borough of Camden. It involves installation of 282 SmartEye sensors alongside SmartLink zone controllers (March 2014)
- Smart Parking's bay sensor technology and its associated real-time reporting platform, SmartRep will assist Barnet Council in achieving an increase in occupancy and turnover in their town centres (2015)
- Transport for London (TfL), has chosen Smart Parking for 31 of its off-street car parks in London Underground network – Uses 1,500 of Smart Parking's RFID-equipped SmartEye vehicle detection sensors, linked via SmartLink (2015). The five-year agreement, which will include the provision of equipment, maintenance and hosting, will enable car park users to park, pay, and walk away, with no need to return to their vehicle to display a ticket.
- Parking Apps aid drivers in London search, reserve and pay for parking online. Few of the app providers are –
 - ✓ JustPark
 - ✓ ParkJockey
 - ✓ Parkmobile
 - ✓ Paybyphone
 - ✓ Parkright
 - ✓ RinGo
 - ✓ AppyParking
 - ✓ Park-up

Sources:

<http://www.parking-net.com/parking-news/smart-parking-ltd/tfl-london-underground;>

<https://www.tfl.gov.uk/cdn/static/cms/documents/rup-20150520-part-1-item08-car-park-strategy.pdf>

City ID- Berlin

City ID

Metrics	Data
Population	3,421,829(2013)
Number of Cars	1.14 million (2013)
Number of parking spaces	94,350 (2013)
Revenue (traffic, driving and parking fines)	€ 70,607,050 (2013)
Parking revenue from fines	€ 14,121,410(Assuming 20% of the total fines revenue)
Congestion Charging	None
Degree of motorization	324 cars per 1,000 residents (2013)
Congestion time wastage (incl. of planning time)	108 hours/year (INRIX)
Time wasted for parking	43 hours/year (2013)
% of peak hour traffic for finding parking	40% (2013)
Economic Impact	\$ 531 /vehicle/Year \$604 Million/Year

Key Insights

- Number of registered motor vehicles on 01/01/2014: 1,154,106
- 42 parking areas and 2500 ha parking zones (existing) and planned extension
- On-street parking rates – City Centre (Mon-Sat): € 0,75 /15 min (€ 3,00/hour)
- On-street parking rates – Around City Centre (Mon-Sat) : € 0.25-0,50 per 15 min.
- **Potsdam, the state capital of Brandenburg near Berlin**, collected around 1.2 million euros in parking fines last year and issued around 120,000 parking tickets
- A driver wastes €1.35 in fuel and generates an extra 1.3 kilograms of CO₂ emissions.
- Effective parking management is an inevitable measure within the urban transport toolbox and it has led to a 10% reduction in parking demand in the managed area in Berlin
- Berlin only permits low-emission vehicles to enter its city center

Source: http://www.stadtentwicklung.berlin.de/verkehr/politik_planung/strassen_kfz/index_en.shtml

Smart Parking Initiatives in Berlin

Key projects

City2.e

Key Objectives:

- ✓ Practical demonstration of an intelligent parking space monitoring and control, including the parking of charging stations for electric cars.
- ✓ Development of a test pattern of a holistic parking detection, subsequent field testing and the development of a system architecture for monitoring and controlling the detected locations.
- ✓ Solution to demonstrate the traffic information center Berlin along with the German Research Center for Artificial Intelligence (DFKI) for adaptive forecasting models, which will enable the prediction of the offer of parking and loading spaces

Radar based Smart Parking System (by Siemens AG):

Key Objectives:

- ✓ Develop a radar system informing drivers via smartphone where to look for a free spot.
- ✓ Started test in April 2015 of about 40 radar sensors mounted on street lamps.
- ✓ Each detector, about half a shoebox in size, scans 30 meters (100 yards) of road and uses an app to transmit information about potential spaces matching the car's size.
- ✓ The network also alert parking patrols when meters run out or a driver has failed to pay a fee

Parking Apps: ParkTag, Parkopedia, Mobil-parken.de

City ID—Amsterdam

City ID

Metrics	Data
Population	805,166 (2013)
Number of Cars	263,000 (2013)
Number of parking spaces	250,000 (156,843 paid parking places)
Parking Permits Issued	190,000
Parking Revenue	€250 million (parking ticket rate increased by 6% in 2014)
Parking revenue from fines	€166 million (2013)
Time wasted for parking	62 hours/year
% of urban traffic for finding parking	40% (2013)
Time wasted during congestion (incl. of planning time)	154 hours/ year (INRIX)
Degree of motorization	247 cars per 1000 residents (2014)
Parking rates	Inner center: €5 per hour Parking day rates from 0900, : Mon-Sat cost €30 (until 1900), €36 (until 2100) and €45 (until midnight). Sunday rates are €21, €27 and €36 respectively
Number of Bikes	880,000
Economic Impact	\$ 319/vehicle/Year \$84 Million/Year

Key Insights

- 63% of commuters in Amsterdam use their bike on a daily basis. 32% of traffic movement in the city is by bike compared to 22% by car and 16% by public transport.
- In the city centre, 48% of traffic movement is by bike. City has run out of bike parking space, hence increasing the number by 40,000 by 2030
- **Official bike ‘parking’ places near Amsterdam Central Station** – Parking facilities in public space: 250.000 racks
Supervised storage (paid): 13.000 racks
Municipal supervised storage (free): 4.000 racks
- In the year 2013, due to illegally parked bicycles, authorities removed 73,000 bikes from the streets.
- Parking Centrum Oosterdok charges fixed €10 for 5-24 hours; P1 Amsterdam centre has pre-booked online rate of €20 for 24 hours.
- Revenue from parking fines in Amsterdam totaled €166 million in 2013 or €9 million more than in 2012.

Smart Parking Initiatives in Amsterdam

Key projects

MobyPark: A Parking App in in collaboration with Amsterdam Smart City

- Mobypark offers all the available places on a platform where it's possible to see real time availability and book these parking spots ahead.
- Mobypark aims to, among others in collaboration with Amsterdam Smart City, enlarge the amount of parking places and partner up with different with public and private organizations. The service of Mobypark consists of a website and an app (Android and iOS).
- City's parking application is algorithm- and predictive modeling-based. The system keeps track of payments and parking sessions. Based on this information, it indicates the availability of parking in areas throughout the city

Schiphol Smart Parking:

- Most economical parking option at Amsterdam Airport Schiphol - Schiphol Smart Parking.
- Customers can park their cars for 8 days at cost of only EUR 49.50; reservation for three days or mor
- Advance online reservation with camera based parking monitoring
- Connected shuttle to the terminal in less than five minutes(run every 10 minutes, 24 hours a day, 7 days a week)

Other Parking Apps:

- Parkmobile; ParkShark; SMSParking

City ID— Paris

City ID

Metrics	Data
Population	2.34 million (2013)
Number of Cars	4,985,715 (2007); 35 million cars in France (2013)
Number of parking spaces	755,000 (on-street: 165,000; off-street: 590,000)
Number of bicycle parking spaces	30,000
Revenue earned from parking fines	60 million euros (2011)
Time wasted for parking	51 hours/year(2013)
% of urban traffic for finding parking	30% (2013)
Congestion time wastage (incl. of planning time)	170 hours/year (2013 from INRIX)
Degree of motorization	287 cars per 1000 people (2013)
Parking rates	Curbside Fees: €1, €2 or €3 per hour depending on zone, €0.5 per day for residents
Economic Impact	\$ 368/vehicle/Year \$1.83 Billion/Year

Key Insights

- Paris removed 4000 parking spaces from its city centre to accommodate new Velib cycle sharing system stations, cycle parking, disabled parking and public transport access even on narrow streets
- On-street parking supply was reduced by 9% (14,300 spots), while 95% of free spots were turned into paid parking.
- Space was also reallocated to motorcycle, bicycle, disabled parking, and tramway corridor access.
- The city enabled cashless parking for 155,000 parking spaces.

Smart Parking Initiative in Paris

Other projects

- Smart Park offers a **Meet and Greet service** at the Airport, in the drop-off zone at departure terminal. Customers are taken to an indoor or outdoor parking lot, **fully enclosed, secure, monitored 24/7**. The vehicle will then be delivered directly to the customer's arrival terminal
- Rates are varied and range between 80 and 110 € round trip to Orly Airport, and between 100 and 140 € for the airport of Roissy Charles de Gaulle for customers who live in or near Paris suburb
- The consortium of companies VINCI Park and PayByPhone won the tender of the City of Paris for the establishment of payment by mobile street parking. This service will give motorists the ability to manage their mobile or internet parking, avoiding handling coins or cards on public roads
- **Parking City Pass" parking passes** – Customers can select their preferred car park from the list or from on the map of Paris, for their vehicle category. Once done, on completion of the reservation form and payment via our secure payment service, customers can directly access the parking area



US Cities

City ID—San Francisco

City ID

Metrics	Data
Population	837,442 (2013)
Number of Cars	385,442 (Dec 2012)
Number of parking spaces	442,000 (2014)
Revenue earned from parking fines	\$83,290,024 (2012) \$88,889,809 (2013) \$88,034,218 (2014)
Revenue from parking	\$38,927,280 (2012) \$49,320,147(2013) \$59,155,385 (2014)
Total Parking tickets issued	1,549,518 (2013)
Degree of motorization	562 cars per 1000 residents
Congestion time wastage (incl. of planning time)	173 hours/year (2013)
Time wasted for parking	52 hours/year (2013)
% of urban traffic for finding parking	30% (2013)
Economic Impact (congestion)	\$3.3 billion (2011)
Economic Impact (parking)	\$213/Vehicle/Year \$82 Million/Year

Key Insights

- SF's revenue from parking in 2014 was \$59 million, that's an average revenue of \$1,839 per meter
- Top 3 parking violations in SF are
 - Street Cleaning
 - Parking Meter Violation
 - Residential Permit Parking
- SF releases 7 metric tons of greenhouse gasses per day.
- Approximately 1.5 million parking and transit citations issued annually generated approximately \$95 million in revenue

Smart Parking Initiatives in San Francisco

Other projects

SF Park

- ✓ SF Park is a pilot project by the SF Municipal Transport Authority started in April 2011
- ✓ SF Park covers 8,228 of San Francisco's 28,800 metered spaces and 12,250 spaces in 15 of the 20 parking garages that the SFMTA manages.
- ✓ Funding for SF *park* project comes primarily from a \$19.8 million grant from the U.S. Department of Transportation's Urban Partnership Program.
- ✓ Uses in-ground parking sensors that detect when vehicles enter and exit a parking space and credit card enabled parking meters.
- ✓ Demand responsive parking fares. Increases, Decreases parking fee based on parking demand in that locality.
- ✓ Time to find parking decreases 43% with SF Park, down by 5 mins
- ✓ Monthly meter related citation revenue dropped from \$82 to \$61 per meter—a 26% decrease.

- ✓ Other market participants are – Streetline, ParkMe

City ID—New York City

Divided into 5 boroughs, with the local authorities handling parking issues.

City ID

Metrics	Data
Population	19,651,127 (2013)
Number of Cars	1.8 Million (2013)
Number of parking spaces	~3.4 million
Number of Off-Street Public Parking Spaces	102,000 spaces (Manhattan CBD)
Revenue earned from parking fines	2014 – \$587,623,500 2013 – \$508,165,050 Uncollected parking violation fines – 2014 - \$228M, 2013 – \$217M, 2012 - \$234M
Parking meter revenues	2014 – \$825,930 2013 - \$670,966
Degree of motorization	305 cars per 1000 residents
Congestion time wastage (incl. of planning time)	164 hours/year (2013 INRIX)
Time wasted for parking	49 hours/year (2013)
% of urban traffic for finding parking	30% (2013)
Economic Impact	\$201/Vehicle/Year \$362 Million/Year

Key Insights

- New York City (NYC) earns ~\$600 million yearly revenue from parking tickets.
- The city has the largest parking market in the United States, with nearly \$2 billion spent per year.
- NYC DOT (Department of Transportation) used on-street parking to create a low-cost, protected bicycle lane at Lower Manhattan’s Grand Street.
- Launched PARKSmart to make parking easier, while reducing congestion and improving safety.
- Dynamic pricing - The meter rate is higher when demand for parking is greatest and decreases when demand is lower.
- The city has 86,000 networked parking spaces supported by a 100% pay-and-display meter.
- New York Has 81,875 Metered Parking Spaces

Smart Parking Initiatives in New York

Other projects

PARK Smart

- ✓ PARK Smart is a program to make parking easier while reducing congestion and improving safety. DOT is conducting six-month pilots in neighborhoods across the City to evaluate how the program works in different settings.
- ✓ PARK Smart Areas
 - Greenwich Village, Manhattan
 - Park Slope, Brooklyn
 - Jackson Heights, Queens
 - Atlantic, Smith and Court in Brooklyn

PARK Smart Program:

- ✓ Progressive parking rate
- ✓ Extended meter time limits
- ✓ Value parking areas
- ✓ Delivery windows
- ✓ Paid commercial parking

Preliminary Results:

- ✓ Occupancy declined 2% in
- ✓ progressive rate area, from 80%
- ✓ to 78%
- ✓ Average duration declined by 20%

Smart Parking Companies

Streetline – parking location aggregator.

Parkwhiz – parking location aggregator, multiple cities

Spothero - parking location aggregator; currently in 12 cities

Bestparking.com - parking location aggregator including airports

Parkingpanda.com – parking location aggregator, currently in 39 cities

Xerox – consultants for effectively managing parking and parking related technologies

City ID—Chicago

City ID

Metrics	Data
Population	2,718,782 (2013)
Number of Cars	1,349,935 (2010)
Number of parking spaces	36,000 metered parking spaces (2013)
Revenue earned from parking fines	Parking Tickets - \$1,3 billion (2011) Unpaid red-light camera fines - \$205 million Unpaid speed camera fines - \$27 million
Parking meter revenue	2014 - 130,508,353 2013 - 135,640,357
Total Parking tickets issued	2.4 million (2013)
Degree of motorization	591 cars per 1,000 people
Congestion time wastage	161 hours/year (2012) (Texas A&M)
Time wasted for parking	48 hours/year (2012)
% of urban traffic for finding parking	30% (2012)
Economic Impact (Congestion)	\$8.2 billion (2010)
Economic Impact (Parking)	\$197/Vehicle/Year \$266 Million/Year

Key Insights

- Chicago Downtown has 9,176 parking spaces which earned a revenue of \$29.7 million
- CO2 per peak commuter 434 pounds in 2011
- Chicago has the highest curbside meter rates in the United States due to the city's parking privatization deal.
- The city has leased its 34,500 curbside parking meters to Morgan Stanley for the next 75 years, trading meter revenues for an upfront payment of ~\$1.16 billion.
- 13 percent of Chicago's traffic congestion occurs when the weather is wet, snowy or icy
- Chicago-area roads lost more than \$6 billion in wasted time and fuel in 2011, according to the Texas A&M Transportation Institute.

Smart Parking Initiatives in Chicago

Other projects

- ParkChicago, a pay-by-cell parking service, is appearing at 42,000 street parking signs and all 36,680 metered parking spaces across the city.
- The city of Chicago has given control of the parking meters in the city to 'Chicago Parking Meters LLC' (CPM) on a 75 year lease for \$1.15Bn
 - CPM has a mobile payment app for parking called ParkChicago and collaborates with Passport Parking for payments.
 - Revenue 2014 – \$ 130.5 million
 - Revenue 2013 – \$ 135.6 million
- SpotHero, Parkwhiz, ParkChicago are smart parking app that operates in Chicago

City ID—Washington D.C.

City ID

Metrics	Data
Population	6,971,406 (2013)
Number of Cars	286,715 (2013)
Number of parking spaces	17,000 metered spaces around Washington, D.C (2011)
Revenue earned from parking fines	2013 – \$84.4M; 2012 – \$92.6 Million
Parking meter revenue	\$40 million (2013)
Total Parking tickets issued	1,803,587 (2013)
Parking cost	2.00/hour (premium demand zones); \$0.75/hour (normal demand zones) \$19 a day to park or \$270 a month
Degree of motorization	870 per 1000 people
Congestion time wastage	210 hours/year (2012)
Time wasted for parking	63 hours/year (2012)
% of urban traffic for finding parking	30% (2012)
Economic Impact (Parking)	\$258/Vehicle/Year \$74 Million/Year

Key Insights

- Approximately 17,000 metered parking spaces, \$40 Million in ticket sales
- 400,000 drivers are everyday looking for parking.
- 2012 – \$92.6 Million in parking fines, 1.8 Million tickets, 2013 – \$84.4M. Most of those tickets went to drivers who live outside of D.C.
- About 71.3 percent of those parking tickets went to drivers in Maryland and Virginia

Smart Parking Initiatives in Washington D.C.

Other projects

- ParkedIn is an enterprise booking tool for parking management - **on demand mobile application**
- Washington DC's Colonial Parking has today partnered with ParkMe to provide real-time occupancy information for more than 100 of their parking facilities in DC in a move seen to make Washington, D.C. a world leader in off-street smart parking.