EQUITY RESEARCH | June 4, 2019 | 6:25 AM EDT

The following is a redacted version of the original report. See inside for details.

Goldman Sachs

THE FUTURE OF MOBILITY

Ride-hailing and new businesses to fuel $7tn+ global mobility market

The next 10 years of mobility will bring more change in the way that people and products move than any decade since the invention of the automobile. Emerging technologies and business models like ride-hailing and sharing, autonomous driving and delivery, micro-mobility and even eVTOL (flying cars, finally) stand to disrupt profit pools that we estimate exceed $700bn, and venture backed startups and incumbents will attempt to address over $7tn in spending. Given the size of the opportunity, it should come as no surprise that access to capital has created a hyper competitive environment marked by massive operating losses driven by marketing, subsidies, incentives, and capital investment. As this environment matures and rationalizes, we expect consolidation that will lead to profitability, the establishment of category leaders, and significant opportunities for investors.

Heath P. Terry, CFA
+1 212 357-1849
heath.terry@gs.com
Goldman Sachs & Co. LLC

Daniel Powell
+1 917 343-4120
daniel.powell@gs.com
Goldman Sachs & Co. LLC

Piyush Mubayi
+852 2978-1677
piyush.mubayi@gs.com
Goldman Sachs (Asia) L.L.C.

Frank Jarman
+1 212 902-7537
franklin.jarman@gs.com
Goldman Sachs & Co. LLC

David Tamberrino, CFA
+1 212 357-7617
david.tamberrino@gs.com
Goldman Sachs & Co. LLC

Adam Hotchkiss
+1 212 902-3941
adam.hotchkiss@gs.com
Goldman Sachs & Co.LLC

The Goldman Sachs Group, Inc.

Table of Contents

Note: The following is a redacted version of "The Future of Mobility: Ride-hailing and new businesses to fuel $7tn+ global mobility market" originally published June 4, 2019 [74pgs]. All company references in this note are for illustrative purposes only and should not be interpreted as investment recommendations.

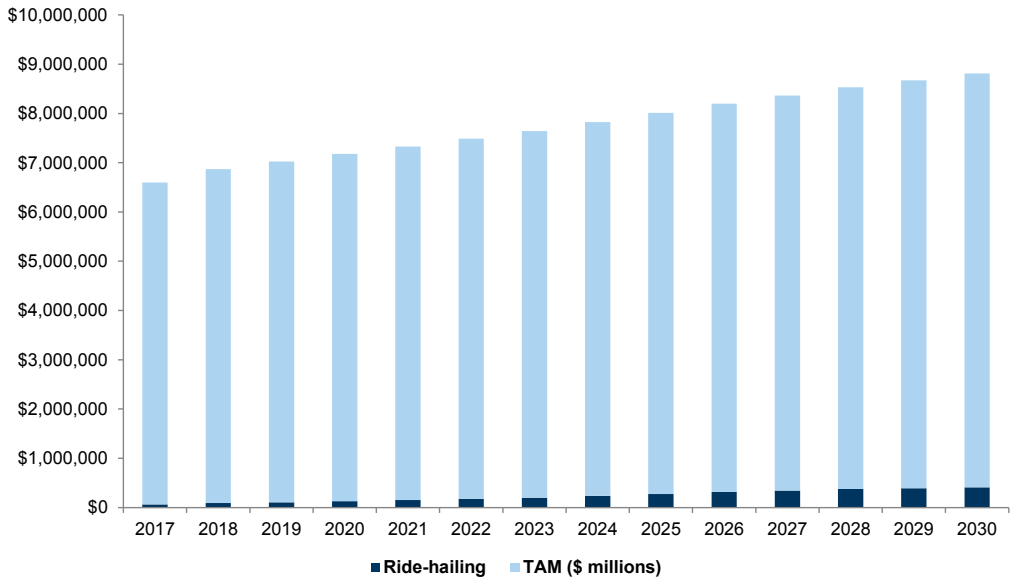
PM summary

The way people get around is poised to change more in the next decade than any time since the invention of the automobile. As emerging technologies and business models, like ride-hailing and sharing, are joined by autonomous vehicles, micro-mobility, and even eVTOL (flying cars, finally), we see massive new businesses being created, existing models disrupted, cities changed, and the way we all live impacted in ways big and small. While it's impossible to condense all of this into a single number, we see over $7tn in existing markets (Exhibit 1) impacted over the next 10 years creating opportunities for investors, existing businesses, governments and entrepreneurs alike in a "new mobility" market that we estimate generated over $90bn in gross revenues in 2018, growing to over $375bn in 10 years (+15% CAGR).

Key issues

$7tn+ Addressable Market. Broadly defined, we consider the new mobility market a combination of several existing markets, use cases, and services, as well as yet to be established versions of the same (Exhibit 1). While the earliest addressed of these is taxi and rental car replacement, we estimate that public transportation substitution, car ownership replacement, and micro-mobility will all combine to account for ~5% of a $7tn+ transportation market by 2030 (Exhibit 1). More broadly, food delivery services, freight, and last mile logistics are also being addressed.

Exhibit 1: Large TAM with significant runway for growth
$ millions



Source: Company data, Goldman Sachs Global Investment Research, FHWA, iResearch, OECD, IHS

Time to grow up? Over $120bn in venture capital has been invested in addressing these markets over the past 10 years, with $100bn in the last 4 years alone. Venture-backed entrepreneurs see opportunity in the $700bn+ in profit pools generated by these markets. We estimate that venture backed companies burned nearly $10bn

competing with each other in 2018, as incumbents tried to capture share in these profit pools. While capital in both the private and public markets remains readily available, we do believe recent and expected public offerings in the space will serve as a catalyst for companies to begin to move toward profitability.

Pricing. We do believe that much of this maturity will come from raising price, driving operating efficiencies, and ending venture funded subsidies to riders, drivers, and diners that have fueled much of the adoption of these services. For many users, ride-hailing or food delivery services are a luxury rather than a utility. We believe recent price increases (Exhibit 9) in major markets, partly regulatory, partly a function of higher costs and tighter supply, have already served to materially slow growth in the category. While higher priced/less subsidized services will naturally grow slower, we see it as an inevitable process in the move towards a more rational competitive environment and sustainable growth/profitability.

Competition. We identify more than 7 ride-hailing companies and 8 food delivery companies that have raised over $1bn in venture capital in the last 5 years (Exhibits 25, 26). There are also more than 6 other micro-mobility companies that have raised over $250mn, 8 autonomous vehicle companies that have raised over $250mn, and 5 companies that have raised $25mn focused on some other emerging form of transportation (eVTOL, Hyperloop, Jetpacks, etc.). Along with efforts from existing companies like GM's Cruise or BMW and Daimler's ride-hailing joint venture, this has created a hyper-competitive environment around a massive addressable market with each subset of the market in a different stage of competition. While we believe that the advantages of scaled platforms are significant enough to drive the "winner take most" dynamic that we see in other areas of technology, we believe it will be a process of several years before a winner reaches that point.

Investments. While we see new mobility as a massive long term opportunity, the path to reaching it is far from a straight line. Though there are already very large companies across the various markets and services, we see the long-term leadership in the space as far from settled and believe the risks in ownership across the space, as both the services and the competitors within them mature, are significant. Near term, competition, regulation, rising labor costs, and macro issues all stand out as major risks, while longer term technology developments could serve to alter market growth and competitive positioning.

Mobility

$7tn+ Addressable Market

The global mobility market is set to change dramatically in the coming years. In an attempt to size the potential for disruption we've leveraged input from our global transportation and technology analysts to size the opportunity for ride-hailing as a category through multiple lenses. We recognize a high degree of uncertainty exists in sizing the impact of new technologies, particularly ones as globally relevant and complex as ride-hailing, that will impact multiple existing markets (car ownership, taxi services, public transportation, etc.) as well as create new ones (autonomous driving and delivery, micro-mobility, eVTOL, etc).

Exhibit 2: Global mobility model
$ millions

millions of miles																	
VMT	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
US	**3,095,372**	**3,174,407**	**3,212,670**	3,224,403	3,246,833	3,272,677	3,308,288	3,343,947	3,386,131	3,433,625	3,490,092	3,547,127	3,603,213	3,661,543	3,720,439	3,779,899
US vehicles	264,410,178	270,400,000	276,100,000	280,694,992	283,356,008	284,899,227	287,281,063	289,653,425	292,284,459	294,909,466	297,527,856	300,139,035	301,866,067	302,965,685	304,038,444	305,084,025
Miles/vehicle	11,707	11,740	11,636	11,487	11,458	11,487	11,516	11,545	11,585	11,643	11,730	11,818	11,936	12,086	12,237	12,390
US & Canada	**3,370,372**	**3,449,407**	**3,487,670**	**3,499,403**	**3,521,833**	**3,547,677**	**3,583,288**	**3,618,947**	**3,661,131**	**3,708,625**	**3,765,092**	**3,822,127**	**3,878,213**	**3,936,543**	**3,995,439**	**4,054,899**
China	**1,733,482**	**1,926,551**	**2,097,904**	**2,236,437**	**2,340,765**	**2,440,421**	**2,528,989**	**2,625,093**	**2,713,132**	**2,807,063**	**2,878,281**	**2,955,336**	**3,030,498**	**3,112,222**	**3,174,958**	**3,244,189**
China vehicles	152,864,133	169,425,332	185,000,000	197,216,270	206,416,270	214,616,270	223,014,470	231,489,230	239,252,837	246,859,660	253,816,223	260,611,193	267,239,229	273,696,003	279,978,141	286,083,156
Miles/vehicle	11,340	11,371	11,340	11,340	11,340	11,371	11,340	11,340	11,340	11,371	11,340	11,340	11,340	11,371	11,340	11,340
India	**210,000**	**235,200**	**268,128**	**284,941**	**324,435**	**360,390**	**371,413**	**393,698**	**413,383**	**429,918**	**447,115**	**460,528**	**474,344**	**483,689**	**493,217**	**503,334**
India vehicles	30,946,000	34,246,000	37,731,000	41,548,000	45,702,800	49,359,024	52,320,565	55,459,799	58,232,789	60,562,101	62,984,585	64,874,122	66,820,346	68,824,957	70,889,705	73,016,396
Miles/vehicle	6,786	6,868	7,106	7,099	7,099	7,099	7,099	7,099	7,099	7,099	7,099	7,099	7,099	7,028	6,958	6,888
Japan	**442,150**	**448,013**	**454,603**	**456,876**	**459,625**	**462,387**	**464,735**	**466,418**	**467,773**	**468,930**	**469,939**	**471,068**	**472,330**	**473,322**	**476,414**	**479,248**
Japan vehicles	77,188,000	77,574,000	77,885,000	78,118,000	78,353,000	78,588,000	78,750,880	78,799,617	78,792,204	78,750,774	78,684,331	78,559,058	78,377,600	78,151,534	77,883,154	77,570,787
Miles/vehicle	5,728	5,775	5,837	5,849	5,866	5,884	5,901	5,919	5,937	5,955	5,972	5,996	6,026	6,056	6,117	6,178
Australia	**115,000**	**117,300**	**119,646**	**122,039**	**121,990**	**121,941**	**121,893**	**121,844**	**121,844**	**121,844**	**121,844**	**121,844**	**121,844**	**121,844**	**121,844**	**121,844**
Australia vehicles	16,280,000	16,603,000	16,890,000	17,172,000	17,515,440	17,865,749	18,223,064	18,587,525	18,587,525	18,587,525	18,587,525	18,587,525	18,587,525	18,587,525	18,587,525	18,587,525
Miles/vehicle	7,064	7,065	7,084	7,107	6,965	6,825	6,689	6,555	6,555	6,555	6,555	6,555	6,555	6,555	6,555	6,555
APAC	**2,500,632**	**2,727,063**	**2,940,281**	**3,110,292**	**3,246,815**	**3,375,138**	**3,487,029**	**3,607,052**	**3,716,132**	**3,827,755**	**3,917,179**	**4,008,776**	**4,099,016**	**4,191,076**	**4,266,433**	**4,348,215**
Europe	**2,450,000**	**2,450,000**	**2,516,920**	**2,538,130**	**2,566,410**	**2,594,690**	**2,622,970**	**2,651,250**	**2,677,763**	**2,712,654**	**2,750,753**	**2,789,396**	**2,828,559**	**2,873,926**	**2,925,786**	**2,978,582**
Europe vehicles	350,000,000	353,000,000	356,000,000	359,000,000	363,000,000	367,000,000	371,000,000	375,000,000	378,750,000	382,537,500	385,980,338	388,296,220	389,849,404	391,018,953	392,192,009	393,368,586
Miles/vehicle	7,000	7,000	7,070	7,070	7,070	7,070	7,070	7,070	7,070	7,091	7,127	7,184	7,256	7,350	7,460	7,572
MEA	**600,000**	**600,000**	**600,000**	**600,000**	**600,000**	**600,000**	**600,000**	**600,000**	**600,000**	**600,000**	**600,000**	**600,000**	**600,000**	**600,000**	**600,000**	**600,000**
MEA vehicles	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000	75,000,000
Miles/vehicle	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000
LatAm	**400,000**	**413,744**	**427,637**	**442,406**	**455,678**	**469,349**	**478,736**	**488,310**	**498,076**	**503,057**	**508,088**	**513,169**	**518,300**	**523,483**	**528,718**	**534,005**
LatAm vehicles	104,221,000	107,802,000	111,422,000	115,270,000	118,728,100	122,289,943	124,735,742	127,230,457	129,775,066	131,072,816	132,383,545	133,707,380	135,044,454	136,394,898	137,758,847	139,136,436
Miles/vehicle	3,838	3,838	3,838	3,838	3,838	3,838	3,838	3,838	3,838	3,838	3,838	3,838	3,838	3,838	3,838	3,838
Public	**5,045,170**	**5,122,000**	**5,200,000**	**5,255,640**	**5,311,875**	**5,368,712**	**5,426,158**	**5,484,218**	**5,542,899**	**5,602,208**	**5,662,151**	**5,722,736**	**5,783,970**	**5,845,858**	**5,908,409**	**5,971,629**
Total	**14,366,174**	**14,762,214**	**15,172,508**	**15,445,871**	**15,702,612**	**15,955,567**	**16,198,181**	**16,449,777**	**16,696,001**	**16,954,298**	**17,203,263**	**17,456,204**	**17,708,058**	**17,970,886**	**18,224,785**	**18,487,329**
y/y growth																
US vehicles		2%	2%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Miles/vehicle		0%	-1%	-1%	-0.25%	0.25%	0.25%	0.25%	0.35%	0.5%	0.75%	0.75%	1.00%	1.25%	1.25%	1.25%
China vehicles		11%	9%	7%	5%	4%	4%	4%	3%	3%	3%	3%	3%	2%	2%	2%
Miles/vehicle		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
India vehicles		11%	10%	10%	10%	8%	6%	6%	5%	4%	4%	3%	3%	3%	3%	3%
Miles/vehicle		1%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-1%	-1%	-1%
Japan vehicles		1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Miles/vehicle		1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%
Australia vehicles		2%	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%	0%	0%
Miles/vehicle		0%	0%	0%	-2%	-2%	-2%	-2%	0%	0%	0%	0%	0%	0%	0%	0%
Europe vehicles		1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	0%	0%	0%	0%
Miles/vehicle		0%	1%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	2%	2%
MEA vehicles		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Miles/vehicle		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
LatAm vehicles		3%	3%	3%	3%	3%	2%	2%	2%	1%	1%	1%	1%	1%	1%	1%
Miles/vehicle		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Miles by mode																
Personal	9,136,887	9,444,865	9,751,371	9,940,190	10,119,941	10,293,335	10,454,387	10,623,019	10,784,197	10,953,240	11,116,318	11,282,032	11,447,108	11,619,346	11,785,877	11,958,067
Public	5,045,170	5,122,000	5,200,000	5,255,640	5,311,875	5,368,712	5,426,158	5,484,218	5,542,899	5,602,208	5,662,151	5,722,736	5,783,970	5,845,858	5,908,409	5,971,629
Rental	170,803	177,015	188,874	204,994	216,682	229,534	242,137	255,238	269,049	279,993	284,104	284,790	285,357	285,999	286,394	286,823
Ride-hailing	13,315	18,335	32,263	45,047	54,114	63,985	75,500	87,302	99,856	118,858	140,689	166,646	191,622	219,684	244,104	270,811
% of miles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Personal	64%	64%	64%	64%	64%	65%	65%	65%	65%	65%	65%	65%	65%	65%	65%	65%
Public	35%	35%	34%	34%	34%	34%	33%	33%	33%	33%	33%	33%	33%	33%	32%	32%
Rental	1.2%	1.2%	1.2%	1.3%	1.4%	1.4%	1.5%	1.6%	1.6%	1.7%	1.7%	1.6%	1.6%	1.6%	1.6%	1.6%
Ride-hailing	0.09%	0.12%	0.21%	0.29%	0.34%	0.40%	0.47%	0.53%	0.60%	0.70%	0.82%	0.95%	1.08%	1.22%	1.34%	1.46%
Cost per mile																
Personal	$0.53	$0.54	$0.55	$0.56	$0.56	$0.56	$0.56	$0.56	$0.56	$0.56	$0.56	$0.56	$0.56	$0.56	$0.56	$0.56
Public	$0.20	$0.20	$0.20	$0.20	$0.20	$0.20	$0.20	$0.20	$0.20	$0.20	$0.20	$0.20	$0.20	$0.20	$0.20	$0.20
Rental	$0.36	$0.36	$0.36	$0.36	$0.36	$0.36	$0.36	$0.36	$0.36	$0.36	$0.36	$0.36	$0.36	$0.36	$0.36	$0.36
Ride-hailing	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00	$1.98	$1.96	$1.91	$1.81	$1.71	$1.61	$1.51
$ per mile	**$0.41**	**$0.42**	**$0.43**	**$0.44**	**$0.44**	**$0.44**	**$0.44**	**$0.44**	**$0.45**	**$0.45**	**$0.45**	**$0.45**	**$0.45**	**$0.45**	**$0.45**	**$0.45**
Personal	$4,842,550	$5,100,227	$5,363,254	$5,566,507	$5,667,167	$5,764,268	$5,854,457	$5,948,891	$6,039,150	$6,133,814	$6,225,138	$6,317,938	$6,410,381	$6,506,834	$6,600,091	$6,696,517
Public	$1,009,034	$1,024,400	$1,040,000	$1,051,128	$1,062,375	$1,073,742	$1,085,232	$1,096,844	$1,108,580	$1,120,442	$1,132,430	$1,144,547	$1,156,794	$1,169,172	$1,181,682	$1,194,326
Rental	$61,489	$63,725	$67,995	$73,798	$78,006	$82,632	$87,169	$91,886	$96,858	$100,797	$102,278	$102,524	$102,729	$102,960	$103,102	$103,256
Ride-hailing	**$26,630**	**$36,669**	**$64,525**	**$90,093**	**$108,227**	**$127,970**	**$150,999**	**$174,604**	**$199,712**	**$235,339**	**$275,750**	**$318,293**	**$346,836**	**$375,659**	**$393,008**	**$408,925**
TAM ($ millions)	$5,939,703	$6,225,021	$6,535,774	$6,781,526	$6,915,775	$7,048,613	$7,177,856	$7,312,223	$7,444,300	$7,590,392	$7,735,596	$7,883,302	$8,016,740	$8,154,624	$8,277,883	$8,403,024

Source: Company data, Goldman Sachs Global Investment Research, AAA, OECD, Euromonitor, FHWA

We expect global ride-hailing miles to expand at a 5-year CAGR of 15% vs. personal vehicles at +2% over the same period. Our primary approach layers expectations for vehicles in use across major geographies with utilization rates (annual

miles per vehicle). Within our build we assume utilization rates of vehicles in operation generally increase beyond 2024 as autonomous technology sees greater traction and personal vehicle ownership growth moderates. The car replacement aspect of this as families with multiple cars choose to own fewer or individuals at the lower end of the mileage curve opt out of car ownership altogether will be a very gradual process given a car's average lifespan. To that end, looking at the US as an example, **we expect vehicles per licensed driver to begin declining in 2028 while we expect licensed drivers to see declines again as early as 2020**. In Japan, a market where services like Uber's have been limited, cars in operation are expected to begin declining as early as 2024 (GSe).

US Vehicle Trends: Potential for a changing complexion as ride-hailing costs decline, utilization improves, and VMTs accelerate above GDP trend

Insights from David Tamberrino, US Autos analyst

Since the dawn of ride-hailing, investors have generally questioned the potential impacts to the auto cycle, sales levels, and fleet size –with some predicting dire consequences for auto manufacturers. So far, vehicles in operation (VIO) have grown faster than US population growth as the post-recession recovery in US SAAR has been coupled with vehicle scrappage rates that have decreased below the long-term average into the low-4% range. And even with some rise in licensed drivers, the amount of vehicles per licensed driver has been increasing (Exhibit 3). Meanwhile, vehicle miles traveled (VMTs) have continued to grow at a historical average rate of approx. half the rate of US GDP growth; as a result, miles traveled per vehicle has been under pressure.

Exhibit 3: Mobility and impacts to US VIO/SAAR levels
Units in mn

	2018	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E
US population	328.0	330.3	332.6	334.8	337.1	339.3	341.5	343.7	345.9	348.0	350.1	352.2	354.3
yoy % growth	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.6%	0.6%	0.6%	0.6%	0.6%
Licensed drivers	225.6	227.5	228.8	230.0	231.2	233.1	234.9	236.8	238.6	239.8	240.9	242.0	243.0
Licensed drivers % of population	68.8%	68.9%	68.8%	68.7%	68.6%	68.7%	68.8%	68.9%	69.0%	68.9%	68.8%	68.7%	68.6%
Vehicles / licensed driver	1.244	1.245	1.245	1.249	1.253	1.254	1.255	1.257	1.258	1.259	1.258	1.257	1.255
yoy % growth	0.8%	0.1%	0.0%	0.3%	0.3%	0.1%	0.1%	0.1%	0.1%	0.1%	-0.1%	-0.1%	-0.1%
US light vehicles in operation	280.7	283.4	284.9	287.3	289.7	292.3	294.9	297.5	300.1	301.9	303.0	304.0	305.1
yoy % growth	*1.7%*	*0.9%*	*0.5%*	*0.8%*	*0.8%*	*0.9%*	*0.9%*	*0.9%*	*0.9%*	*0.6%*	*0.4%*	*0.4%*	*0.3%*
Vehicle miles traveled	3,224,403	3,246,833	3,272,677	3,308,288	3,343,947	3,386,131	3,433,625	3,490,092	3,547,127	3,603,213	3,661,543	3,720,439	3,779,899
yoy % growth	0.4%	0.7%	0.8%	1.1%	1.1%	1.3%	1.4%	1.6%	1.6%	1.6%	1.6%	1.6%	1.6%
US GDP	18,566.4	19,049.2	19,468.3	19,857.6	20,195.2	20,589.6	20,991.7	21,401.6	21,819.6	22,245.7	22,680.1	23,123.0	23,574.6
yoy % growth	*2.9%*	*2.6%*	*2.2%*	*2.0%*	*1.7%*	*2.0%*	*2.0%*	*2.0%*	*2.0%*	*2.0%*	*2.0%*	*2.0%*	*2.0%*
VMT growth vs. GDP growth	0.1x	0.3x	0.4x	0.5x	0.6x	0.6x	0.7x	0.8x	0.8x	0.8x	0.8x	0.8x	0.8x
VMT / vehicle	11,487	11,458	11,487	11,516	11,545	11,585	11,643	11,730	11,818	11,936	12,086	12,237	12,390
yoy % growth	-1.3%	-0.2%	0.2%	0.2%	0.2%	0.4%	0.5%	0.8%	0.8%	1.0%	1.3%	1.3%	1.3%

Source: Census Bureau, NHTSA, IHS, DOT, Goldman Sachs Global Investment Research

With growth in ride-hailing, and the potential to lower costs per mile over time – and thus per mile rate charged to the customer – we see potential for VMT growth to accelerate as the tails of mobility increase (young and older riders able to participate), but for the vehicle fleet to see slowing growth as utilization improves. Essentially, we believe that increased ride-hailing options will drive licensed drivers to stagnate – then decline slightly over-time; along with this, we expect vehicles per licensed driver to eventually see

pressure as multi-car families downshift their fleet size.

The net of this is the beginning of improved asset efficiency (secularly increasing miles per vehicle in operation), but not the death of the automobile market as we currently know it. Instead, we expect VIO growth to slow and for normalized SAAR to trend higher toward a mid-16mn level, but stagnate from there – at least until cost per mile declines materially from the advent of autonomous vehicles or utilization rates improve faster.

We also believe the TAM represents multiple markets converging. Through a combination of substituting car ownership, bus rides, taxis, rental cars, and the addition of micro-mobility, the end result is a similarly large TAM with significant runway. By summing these categories we also see support for a **TAM of more than $5tn by 2023**.

Exhibit 4: Alternative TAM analysis
$ millions

Global	2017	2018	*2019*	*2020*	*2021*	*2022*	*2023*
Buses and Taxis	$703,193	$729,368	$761,023	$813,864	$867,833	$924,536	$984,247
Rental car	$67,995	$73,798	$78,006	$82,632	$87,169	$91,886	$96,858
Private vehicles	$3,539,748	$3,673,894	$3,740,330	$3,804,417	$3,863,941	$3,926,268	$3,985,839
Micro-mobility			$65,498	$67,463	$69,487	$71,571	$73,718
TAM	**$4,310,935**	**$4,477,060**	**$4,644,857**	**$4,768,376**	**$4,888,430**	**$5,014,261**	**$5,140,662**
y/y growth (%)	*5%*	*4%*	*4%*	*3%*	*3%*	*3%*	*3%*
Ridehailing	**$64,525**	**$90,093**	**$108,227**	**$127,970**	**$150,999**	**$174,604**	**$199,712**
y/y growth (%)	*76%*	*40%*	*20%*	*18%*	*18%*	*16%*	*14%*
Penetration	**1%**	**2%**	**2%**	**3%**	**3%**	**3%**	**4%**

Source: Euromonitor, Goldman Sachs Global Investment Research

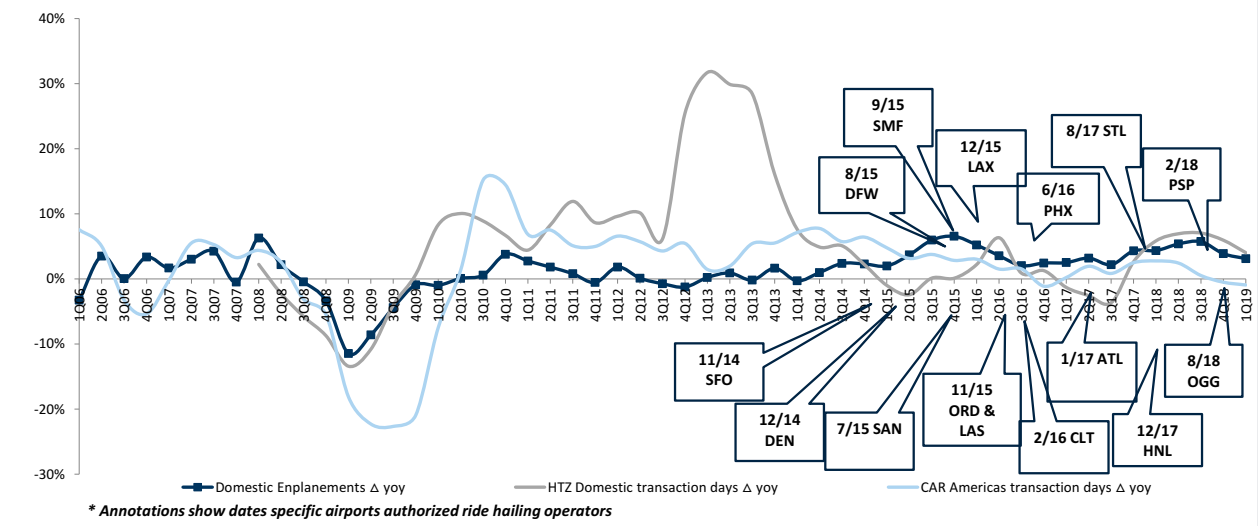
That said, as we've seen with the transition to online from offline in many categories (apparel, grocery, etc.), significant incumbent competitors and the relative convenience of existing solutions can make consumer habits difficult to change. As we have outlined in the past with our analysis of the grocery category , adoptions will often follow an S-curve. As a result, we believe there could be the potential for various **periods of slowing growth ahead of reacceleration** as adoption scales, pricing evolves, and existing solutions/incumbents adapt.

Rental Cars: From on-airport competition, to homeostasis, to potential symbiotic relationships… for now

Insights from David Tamberrino, US Autos analyst

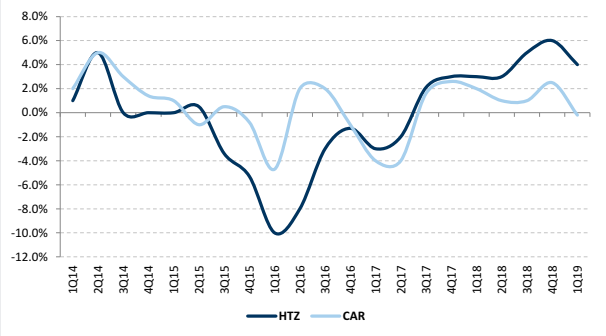
With the growth of ride-hailing – and operations launching at major airports starting in 2014 – we and investors saw Uber/Lyft challenging the rental car agencies for both corporate and leisure travelers. We believe this was borne out in the numbers as well, as transaction day growth saw pressure relative to enplanement growth and public Rental Car operators saw challenging price environments (Exhibits 5-6).

Exhibit 5: Rental Car operators saw slowing growth vs. enplanements as on-airport ride-hail grew
US transaction day growth vs. enplanement growth



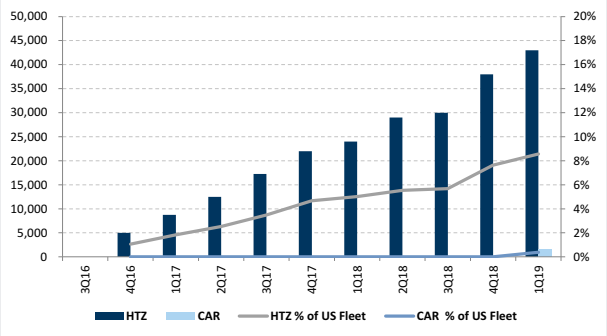
Source: Haver Analytics, Company data

Exhibit 6: Rental Car pricing has been positive over the past seven quarters
yoy growth (%)



Source: Company data

Exhibit 7: HTZ has been growing its ride-hail dedicated fleet for the past two years
Rental Car ride-hail dedicated fleet size by public operator



Source: Company data

However, flash forward to late 2017 and Rental Car pricing turned positive. We believe this came as the overlap between on-airport ride-hail and cannibalization of potential rental car business reached homeostasis, but was also inclusive of a major fleet refresh/re-sizing at HTZ and the deployment of a Demand-Fleet-Pricing model at CAR (which in theory should benefit its competitors as well). At current

ride-hail prices, we believe there is not much incremental share shift to be gained from the Rental Car business (excluding travelers trading convenience/hands-on work ability for price) – as travel of 1-2 days and under 100 miles round-trip have likely already been competed away for the most part.

At present, the two sides have begun to form a symbiotic relationship as ride-hail operators look to drive a higher supply of vehicles on the road – turning to weekly rentals for drivers that may not be able to bring their own asset and as ride-hailers are reluctant to grow an asset-heavy arm – and as Rental Car operators look to bend the depreciation curve by extending the life of their late model assets into lower monthly depreciation periods by cascading down the fleet – similar to how a trucking company would move a Class 8 truck from its first life in over-the-road long-haul trucking (up to 4 years), into a dedicated fleet operation (years 4-7), and then to intermodal drayage (7+ years).

That said, in the future as autonomous technology further develops and is able to be successfully deployed, the competitive backdrop may resume between ride-hail and Rental Car operators – particularly if cost per mile declines. However, with Auto OEMs looking to develop their own AV systems and deploy into their own ride-hailing networks – likely financing the fleet through captive FINCO entities and maintaining vehicles on their own – ride-hail and Rental Car operators could form a deeper strategic relationship between the network operators (i.e., the ride-hail companies) and the asset owners/fleet maintainers (the Rental Car companies).

New addressable markets

Beyond vehicles, we see the opportunity for new transportation modalities to gain traction in the coming years. **Bikes and scooters have been two of the earliest forms of micro-mobility** to find success in more densely populated, pedestrian-friendly environments. Sizing the TAM for micro-mobility is a combination of substituting both walking miles and driving miles for trips less than 3 miles. For the driving miles component we have assumed increasing levels of penetration of miles for trips less than 3 miles, at a rate consistent with the cost per trip of a micro-mobility ride. On the walking miles side, we've taken a weighted average of walking miles globally and assumed a range of mile penetration against an average cost per trip of $1.80. Many micro-mobility rides today charge $1 for unlock with a range of $0.10-$0.25 per minute, and with an average speed of a little less than 15mph, we estimate the average trip length to be ~1.3 miles.

The end result is a micro-mobility TAM with a wide range (Exhibit 8). Assuming the midpoint of 1%-5% penetration of miles across the two sub-components results in a nearly **$200Bn total addressable opportunity globally**. Given the relatively early stage of the category, we would expect it to be several years before these modalities reach scale, though regulations and popularity of these services could accelerate that.

Exhibit 8: Micro-mobility TAM analysis
$ millions

Micro-mobility					
World popluation (mn)	7,500				
% age 15-64	64%				
Urban	55%				
Extreme poverty	10%				
Addressable population (mn)	2,376				
Steps/day	**9,510**				
US	5,900				
Global	9,700				
Steps/mile	**2,000**				
Miles walked per day	4.8				
Total miles walked per day (mn)	**11,298**				
Annual	**4,123,726**				
Scooter/bike addressable	1%	2%	3%	4%	5%
Addressable miles (mn)	**41,237**	**82,475**	**123,712**	**164,949**	**206,186**
Miles per trip	1.3	1.3	1.3	1.3	1.3
Addressable trips (mn)	**31,721**	**63,442**	**95,163**	**126,884**	**158,605**
Cost per trip	$1.80	$1.80	$1.80	$1.80	$1.80
$ Walking TAM (mn)	**$57,098**	**$114,195**	**$171,293**	**$228,391**	**$285,489**
Vehicle TAM <3 miles	600,000	600,000	600,000	600,000	600,000
Scooter/Bikes addressable	1%	2%	3%	4%	5%
Cost per mile	$1.40	$1.40	$1.40	$1.40	$1.40
$ Driving TAM (mn)	**$8,400**	**$16,800**	**$25,200**	**$33,600**	**$42,000**
Driving + Walking TAM ($mn)	**$65,498**	**$130,995**	**$196,493**	**$261,991**	**$327,489**

Source: Company data, Goldman Sachs Global Investment Research, Medicine & Science in Sports & Exercise, Pennington Biomedical Research Center

Ride-hailing as a utility vs. luxury good

When Uber initially launched in the US in 2010 it was a taxi competitor and in its early days Uber's differentiation centered around its cost and convenience relative to calling for a cab. Today, **prices are on the rise, and we believe this has been a primary factor in the company's slowing Rides growth**, in addition to FX, competition, and seasonality.

To ultimately revolutionize the way consumers move from point A to point B, we believe ride-hailing companies will need to transform their core product in to a utility from a luxury good. With real price sensitivity in the category, we believe reflected in the slower Rides growth for Uber versus rising prices, lowering the price point for its core product (not simply cheaper modalities like micro-mobility and Pool) will be paramount for driving increased adoption. Said differently, the rapid adoption we've seen in the category to date and subsequent deceleration, in our view, reflects **an industry coming off a "sugar rush" of cheap rides and driver subsidies fueled by venture capital**. As a result, we see several trends running at odds in the space. With a lack of profitability but also a need to lower prices to drive adoption, we expect growth to moderate as losses continue, but shrink, for several years.

Exhibit 9: Uber - Cost per mile analysis across top 20 metro areas

UberX pricing per Uber's fare estimator website and app

Uber	Cost	Distance (mi.)	Cost/mi	Start	Dest.
NYC	$37.10	4.7	$7.89	World Trade Center	Rockefeller Center
San Francisco	$20.54	6.0	$3.42	Uber HQ	Lands End Lookout
Washington	$17.87	5.5	$3.25	National Cathedral School	Library of Congress
San Jose	$17.90	6.0	$2.98	Solar4America Ice	3190 Stevens Creek Blvd
Dallas	$8.06	2.8	$2.88	Deep Ellum Brewing Co.	American Airlines Center
Chicago	$15.67	6.0	$2.61	601 N Wells St	Wrigley Field
Philadelphia	$14.63	6.0	$2.44	Wells Fargo Center	507 North Front St
Denver	$13.13	5.5	$2.39	Mile High Stadium	5910 W Mississippi Ave, 80226
San Diego	$13.90	6.0	$2.32	Hotel del Coronado	1900 Park Blvd
Fort Worth	$11.49	5.0	$2.30	Joe T. Garcia's	Fort Worth Zoo
Seattle	$13.22	6.0	$2.20	The Walrus and the Carpenter	CenturyLink Field
Houston	$13.21	6.0	$2.20	2701 Yale St	Minute Maid Park
Columbus	$12.84	6.0	$2.14	Ohio Stadium	100 E Main St, 43215
Austin	$12.26	6.0	$2.04	LBJ Presidential Library	7952 Anderson Square, 78757
El Paso	$12.21	6.5	$1.88	Butterfield Trail Golf Club	El Paso International Airport
Charlotte	$12.92	7.0	$1.85	Bank of America Stadium	Charlotte Douglas Int'l
Los Angeles	$10.91	6.0	$1.82	519 Santa Monica Blvd	3762 Overland Ave
Phoenix	$10.73	6.0	$1.79	Guedo's Taco Shop	1250 South Los Altos Dr
Indianapolis	$10.48	6.0	$1.75	Indianapolis Motor Speedway	36 East Washington St, 46204
Jacksonville	$10.29	6.0	$1.72	Jacksonville Zoo and Gardens	2113 James Hall Dr., 32209
San Antonio	$10.06	6.0	$1.68	San Antonio Zoo	1345 Paso Hondo
		Average	**$2.55**		
		ex-NYC	*$2.28*		
		Median	**$2.20**		

These exhibits represent our individual checks at various points in time and which creates the potential to skew the comparison. Ultimately we think all of the the data is worth including given the varying use cases and considerations for consumers in real time.

Source: Company data

Exhibit 10: Lyft - Cost per mile analysis across top 20 metro areas

Lyft pricing per Lyft's fare estimator website

Lyft	Cost	Distance (mi.)	Cost/mi	Start	Dest.
NYC	$30.00	4.7	$6.38	World Trade Center	Rockefeller Center
San Francisco	$26.00	8.5	$3.06	Lyft HQ	Lands End Lookout
Washington	$13.50	5.5	$2.45	National Cathedral School	Library of Congress
San Jose	$16.50	6.0	$2.75	Solar4America Ice	3190 Stevens Creek Blvd
Dallas	$9.00	2.8	$3.21	Deep Ellum Brewing Co.	American Airlines Center
Chicago	$13.50	6.0	$2.25	601 N Wells St	Wrigley Field
Philadelphia	$13.50	6.0	$2.25	Wells Fargo Center	507 North Front St
Denver	$13.50	5.5	$2.45	Mile High Stadium	5910 W Mississippi Ave, 80226
San Diego	$13.50	6.0	$2.25	Hotel del Coronado	1900 Park Blvd
Fort Worth	$10.50	5.0	$2.10	Joe T. Garcia's	Fort Worth Zoo
Seattle	$22.50	6.0	$3.75	The Walrus and the Carpenter	CenturyLink Field
Houston	$13.50	6.0	$2.25	2701 Yale St	Minute Maid Park
Columbus	$11.00	6.0	$1.83	Ohio Stadium	100 E Main St, 43215
Austin	$13.50	6.0	$2.25	LBJ Presidential Library	7952 Anderson Square, 78757
El Paso	$11.00	6.5	$1.69	Butterfield Trail Golf Club	El Paso International Airport
Charlotte	$13.50	7.0	$1.93	Bank of America Stadium	Charlotte Douglas Int'l
Los Angeles	$11.00	6.0	$1.83	519 Santa Monica Blvd	3762 Overland Ave
Phoenix	$11.00	6.0	$1.83	Guedo's Taco Shop	1250 South Los Altos Dr
Indianapolis	$10.50	6.0	$1.75	Indianapolis Motor Speedway	36 East Washington St, 46204
Jacksonville	$10.50	6.0	$1.75	Jacksonville Zoo and Gardens	2113 James Hall Dr., 32209
San Antonio	$11.00	6.0	$1.83	San Antonio Zoo	1345 Paso Hondo
		Average	**$2.47**		
		ex-NYC	*$2.27*		
		Median	**$2.25**		

These exhibits represent our individual checks at various points in time and which creates the potential to skew the comparison. Ultimately we think all of the the data is worth including given the varying use cases and considerations for consumers in real time.

Source: Company data

Drive vs. Ride: Comparing the costs of car replacement

In the US there are currently a little more than 1.2 cars per licensed driver. We expect that number to continue climbing modestly as vehicle sales outpaces the rate of driver's license issuances. We believe this trend partly represents the re-urbanization of many regions on top of the proliferation in ride-hailing within these more densely populated areas. However, consumers are very cost conscious and the internet has introduced significant transparency around vehicle costs, maintenance, and insurance. Below we outline the **per mile cost comparison between owning/leasing a car versus ride-hailing** with Uber/Lyft.

Drive vs. Ride calculator

Drive vs. Ride calculator	
Drive	
How many miles do you drive per week?	259
How much are you paying for gas (per gallon)?	$2.86
What's your gas mileage?	25
If you pay for parking, how much per month?	$0
What is your monthly car payment?	$456
	Monthly
Car payment	$456
Registration, taxes	$62
Insurance	$99
Gas	$127
Maintenance	$93
Additional costs (e.g., parking)	$0
Total monthly cost	**$836**
Monthly miles	1,129
Cost per mile	**$0.74**
Ride(hailing)	
Cost per mile	**$2.00**

This tool is intended for illustrative purposes only and should not be relied upon for any other use.

Source: AAA, EPA, Experian, FHWA.

In general we have leveraged data from AAA, the EPA, and the FHWA to examine average costs for different components of the total cost of ownership. We recognize there are many variables to consider here, but to make for a more consistent comparison we have used national averages in most cases. We've made many of the assumptions flexible so that inputs can be updated, but ultimately **owning/leasing a car is still significantly cheaper on a cost per mile basis than ride-hailing for the average driver**. For consumers with below average miles driven, ride-hailing becomes cost-competitive, based on national averages and assuming no parking fees, **around 80 miles per week**. We believe this is one of the reasons why Uber is so much more expensive in places like New York City where total cost of ownership is higher (parking, tolls, maintenance, insurance) versus Phoenix, for example, where many of the cost components would be cheaper or non-existent.

How does this all get fixed?

Rationalization of competition and technology advancements will be key for the sustainability of ride-hailing companies long-term. More rational competition, particularly on the driver side of the market, could carry **significant benefits for take rate and margins**. Over the long-term, we believe improvements in take rate represent the most meaningful single source of leverage in the operating models of ride-hailing

companies. While decreasing the magnitude and frequency of driver incentives will mathematically improve take rates over time, **autonomous technology advancements**, even on a very limited scale, present significant opportunity for improved unit economics.

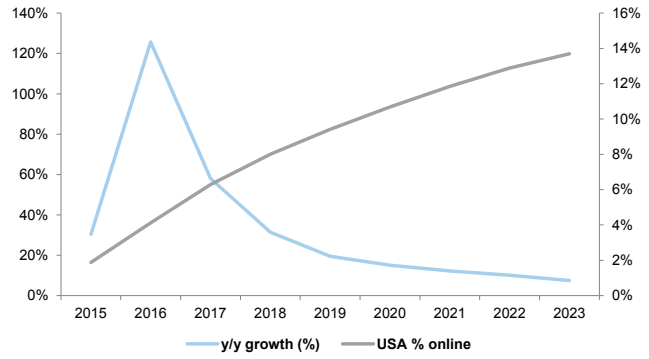
We also see **network efficiency**, driven primarily by **density of driver supply** and **rider frequency**, as a primary driver of long-term sustainability for these models. Reducing rider wait times should carry positive implications for frequency, which we believe companies can also facilitate through loyalty programs and scale more broadly.

Eats

Food delivery, as attractive as the secular growth drivers appear, is a challenging business on a standalone basis. While the AOV is ~2x an in-store ticket, according to a number of fast casual restaurants and publicly reporting online food ordering/delivery businesses, the added cost of the delivery driver (in-house or outsourced) on top of already thin restaurant margins makes for challenging unit economics unless the majority of orders are incremental. In addition, the rapid growth within the category (US online food ordering 67% CAGR 2015-'18, +29% globally) has made for a hyper-competitive environment with steep discounts for first-time customers and significant incentives to drivers to provide enough coverage to meet demand.

In the US, online food ordering data from Euromonitor shows $47bn in spend in 2018 going to more than $56bn in 2019 (+20% y/y vs. +31% in 2018). From a Global perspective, online food ordering reached $176bn in 2018 and is expected to top $203bn in 2019 (+16% y/y vs. 25% in 2018). By 2023, online food ordering is expected to reach nearly $298bn, with $86bn coming from the US alone, but only reaching 10% and 14% of total spend, respectively (Exhibits 11, 12).

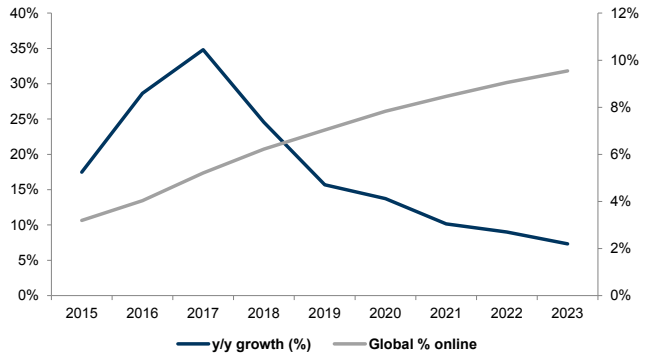
Exhibit 11: USA online food ordering penetration, growth
y/y growth (%) LHS; USA % online RHS



2019-2023 figures are Euromonitor estimates

Source: Euromonitor

Exhibit 12: Global online food ordering penetration, growth
y/y growth (%) LHS; Global % online RHS



2019-2023 figures are Euromonitor estimates

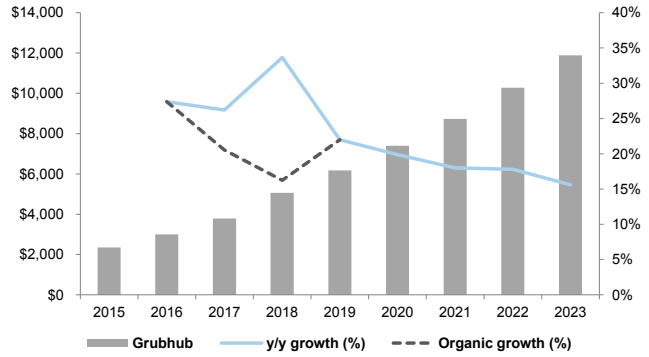
Source: Euromonitor

For companies that primarily provide logistics, running these three-sided marketplaces means having to split the economics on a relatively low ticket item an additional time. While charging delivery fees can offset some incremental driver costs, it is very apparent to consumers placing a delivery order via an app that the total cost of the basket is higher than its in-store equivalent with all the additional fees included. Said differently, many investors remain cautious on the sustainability of a logistics model in the food category given the need for higher fees against a relatively small basket size in a highly competitive category. While we believe this is a value-added service that consumers will pay for, the industry will have to raise prices, negatively impacting growth, in order to become more sustainable, in our view.

From a competitive perspective, peers continue to invest for growth. Recently Grubhub launched 100+ delivery markets in 4Q18 and DoorDash has raised $1.3bn in venture

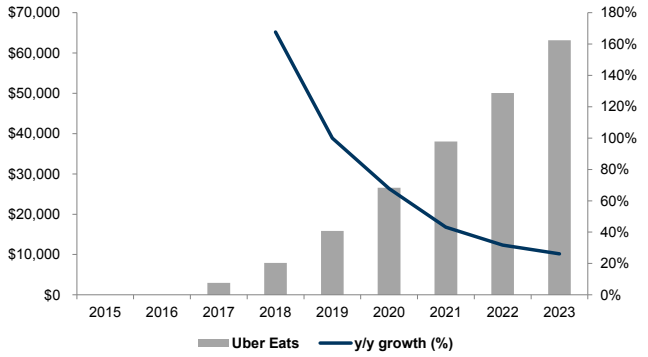
capital since Aug-2018. While data points for private company DoorDash are limited, Grubhub (US) and Uber Eats (Global) continue to show healthy growth. While incremental delivery market launches are expected to drive accelerating gross food sales growth for Grubhub (Exhibit 13), Uber Eats is expected to maintain its 100%+ growth rate globally.

Exhibit 13: Grubhub gross sales growth accelerating on delivery market launches
$ millions



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 14: Uber Eats growth expected to remain elevated
$ millions



Source: Company data, Goldman Sachs Global Investment Research

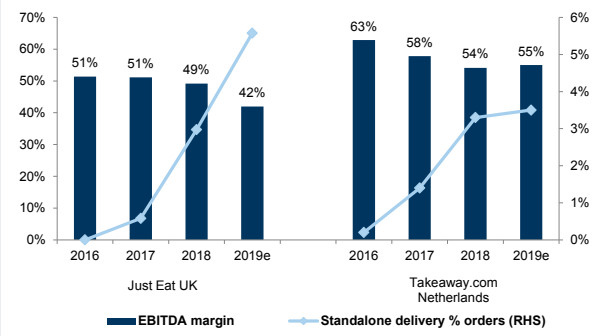
What's happening in Europe?

Insights from Rob Joyce, Pan-European Retail analyst

In Europe the online food delivery market is led by 3 listed players: **Just Eat** (see below for European countries they operate in), **Takeaway.com** and **Delivery Hero**. These businesses all started as marketplace models and have evolved, to varying degrees, to the hybrid model favoured by Grubhub.

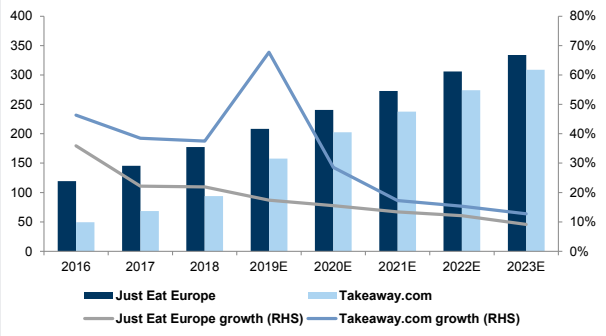
Uber Eats (core market UK), **Deliveroo** (core market UK) and **Glovo** (core market Spain) are the largest amongst the players who started as standalone food delivery businesses (though mirroring the listed players, we have recently seen a trend towards introducing some pure marketplace restaurants to these platforms).

Exhibit 15: Both Just Eat and Takeaway.com are investing marketplace profits to drive standalone delivery



Source: Company data, Goldman Sachs Global Investment Research

Exhibit 16: Consolidation driving order growth acceleration at Takeaway.com



Source: Company data, Goldman Sachs Global Investment Research

While the European marketplace operators have been slower to integrate standalone delivery models than Grubhub in the US, they are **all now committed to developing the hybrid model**, funding this using their highly profitable revenue streams (Exhibit 15). Order growth for Uber Eats' main European listed competitors remains double digit (note Takeaway.com acquired **Delivery Hero's operations in Germany**, driving the growth spike), though likely below that of the (smaller) standalone delivery operators.

In addition to well funded market place led competitors, **Deliveroo has also just completed its series G** funding round, taking its total funding to date to €1.53bn. Potentially of more interest is that Amazon, who had not previously invested in the company, led this $575mn round. While data points are limited for privately owned Deliveroo, its latest accounts (2017) show annual revenue growth of 116% to £277mn, with EBITDA losses of £161mn.

Just Eat European markets (c.80% of 2018 Group orders): UK, Ireland, France, Spain, Italy, Denmark, Norway, Switzerland.

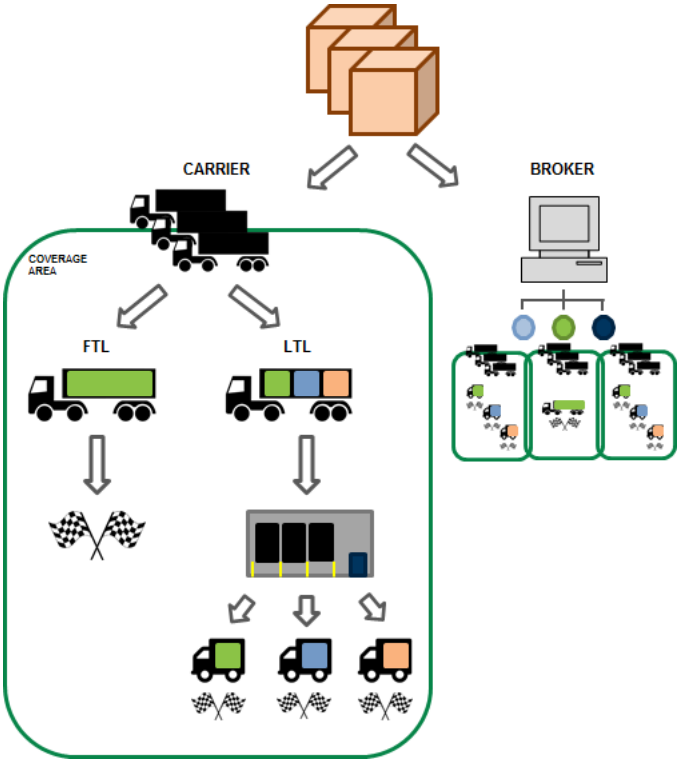
Takeaway.com European markets (c.95% of 2018 Group orders):: Netherlands, Germany, Poland, Austria, Belgium, Bulgaria, Romania, Switzerland, Portugal, Luxembourg.

Delivery Hero European markets (c.15% of 2018 Group ex Germany orders): Austria, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Republic, Finland, Greece, Hungary, Norway, Romania, Serbia, Sweden.

Freight

The benefits of ride-hailing have also been able to translate from B/C2C to B2B in the freight category. **Globally the freight industry represents a $3.8tn market, with $700bn in the US alone**, comprised of carriers and brokers coordinating shipments. Of the ride-hailing companies globally Uber is the primary example to date of a company that has leveraged its existing platform to facilitate freight movements (outside of ride-hailing see Amazon). Uber's positioning in the market is effectively that of a highly reliant broker, given its technology platform and app-based user experience. While many brokers and third-party logistics providers have invested to increase app functionality and technology utilization (see XPO Logistics, Coyote Logistics (UPS), TQL, JB Hunt, CH Robinson, etc.), Uber has aggressively positioned itself as the technology-enabled disruptor, according to our diligence conversations with freight customers. To date, Uber has seen more than half a million downloads of its Freight app in the US.

Exhibit 17: Freight market illustration



Source: Goldman Sachs Global Investment Research

Carriers vs. brokers. The two primary ways for moving freight are via carriers and brokers. Brokers do not own the trucking assets and work as the intermediary between shippers and carriers, facilitating the movement of the freight, negotiating pricing, and coordinating various other components of the transaction. Carriers own their assets and will generally run freight directly from pick-up to drop-off, offering a more consistent experience as a result, in many cases. Carriers tend to have defined coverage areas while brokers can coordinate across coverage areas to move freight. **Today roughly ~1/3 of the market runs through a broker relationship, while 2/3 is the direct shipper-carrier model**.

During our diligence conversations, customers discussed the logistics of working with carriers and brokers, highlighting that carriers often provide more reliable service given their ownership of the trucking assets, while brokers tended to be more competitive on price but somewhat less consistent.

Because of Uber's technology-driven, app-based approach to freight, many customers viewed the service as a unique hybrid between a carrier and broker. With the original launch in April 2017 in Texas now having expanded to all freight corridors in the US, Uber is now the largest virtual fleet in the country. Uber has recently launched its Freight product in Europe, a ~$500bn market. From its early tests in the US, Uber Freight has seen its network deliver incremental efficiency for truckers and fleets by **reducing cost of ownership by 15%**. We expect this level of efficiency, both from an operational and administrative perspective, to continue building momentum behind freight in the mobility category.

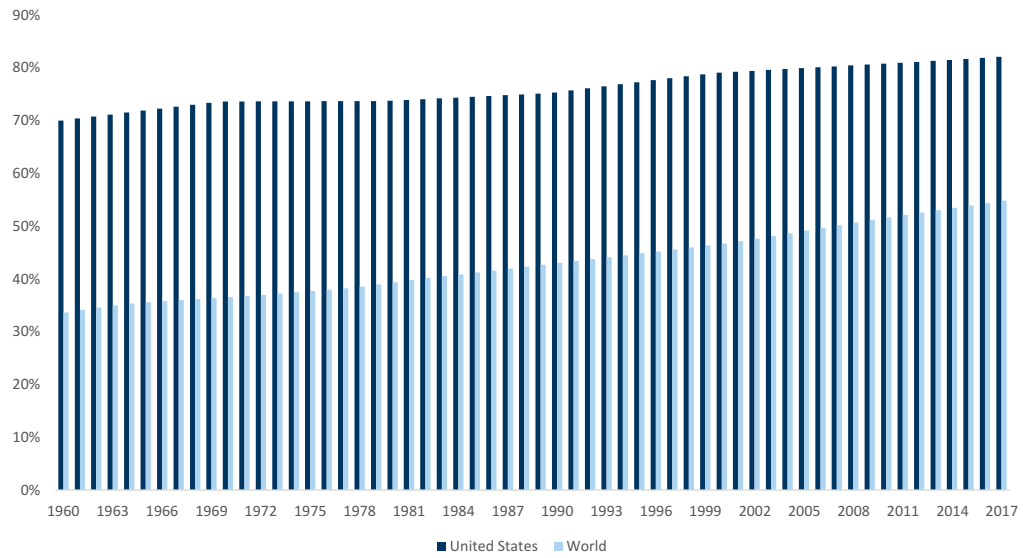
The Bigger Picture: Laying out communal impacts

Beyond its function as a utility for consumers, we believe that the evolution of mobility driven by companies like Uber, Lyft, and others has the potential to change the way cities are built, the labor markets in which these services exist, and the safety and behaviors of people in the communities these services operate in.

The Impact on Urbanization: from NYC to rural America and everywhere in between

Over the last 100 years, the US urban population has increased more than five-fold to over 250mn people, and continues to increase as a % of the total population today (Exhibit 18). As more mature cities evolve and newer cities are created in response to a growing population, we believe the growing availability of new mobility options has the potential to change the way cities think about city planning and expenditure priorities; including parking structures, construction priorities, and public transportation.

Exhibit 18: Urban population as a % of total
US vs. Global



Source: United Nations Population Division, World Bank

As perhaps the most pertinent example of a mature city with established public transportation, ride-hailing, car-sharing, and micro-mobility options, New York City is much more limited in its parking coverage and land use. The city has only 0.6 parking spaces per household, valued at $20.6bn or $6,570 per household according to a 2018 Mortgage Bankers Association study. Despite the city's unique characteristics, it represents the significantly lower relative per capita cost associated with parking real estate (even before construction considerations) vs. a number of other cities and rural municipalities. As an example, the study also concluded that Seattle has 5.2 parking spaces per household, valued at $35.8bn or roughly $118K per household (nearly 18x higher than New York). Jackson, Wyoming, a much smaller urban center, was determined to have a significantly higher 27.1 parking spaces per household, valued at

just $711mn on lower land prices and population, but still $192K per household (nearly 30x higher than New York).

With the statistics of these smaller cities in mind, we believe that the shift towards newer mobility options has the potential to dramatically alter land use and costs for growing urban centers over time. Particularly in a city like Seattle, where low housing supply and a significant ramp in home prices has created a difficult homebuying environment, latent parking space could serve as a prime source for real estate and provide city planners optionality in mitigating these issues. Summit, New Jersey was the first town in the state to begin subsidizing Uber rides for overcrowded commuter parking lots, a program that according to a city official (per press reports) would only cost the city $167,000 per year vs. the roughly $10mn it would cost to build a new parking lot. We expect over time as the ride-hailing industry continues to penetrate regions outside of core megacities in the US, we're likely to see more explicit impacts to public parking projects and expenditures, particularly given the outsized parking spaces and costs per household in smaller, growing urban centers.

The impact on traffic congestion

In the U.S., data and analytics company INRIX noted earlier this year that traffic congestion costs Americans more than 4 days or 97 hours annually, equating to $1,348 per driver. These costs are particularly higher in areas with slower 'last mile' average travel speeds, which unsurprisingly include larger major cities like New York, Boston, Chicago, and Los Angeles. Micro-mobility initiatives (Uber's JUMP, Lime, Bird, Meituan's Mobike, Alibaba-backed Hellobike), which across these players have reached a significant number of cities on all major continents, have the potential to reduce congestion in areas where it takes on average 5-7 minutes+ in traffic to complete the last mile of a trip.

Internationally too, mobility companies have an outsized ability to improve growing congestion problems in urban areas (nine out of the top ten most congested cities in the world are outside the US, according to INRIX) and provide alternative forms of transport, including broader micro-mobility offerings. In Cairo, where a 2014 World Bank Study noted the equivalent of $2.8bn in losses driven by the city's traffic congestion issues, UberBus aims to provide cost-effective transportation options where public transport and other urban planning initiatives are inadequate. At 5E£ per ride and under 0.5E£ per mile, the service is a fraction of the cost of individual taxi services (which in the area range from 5-6E£ per mile) and an alternative to crowded public transport systems. Uber's cheaper ride-share options and Scooter availability also provide middle-ground pricing options for those not wanting to use public transport but are unable to afford a taxi cab regularly. As Uber and competitors continue to penetrate international markets, we expect there will be more opportunities to leverage data and best practices to improve urban congestion issues.

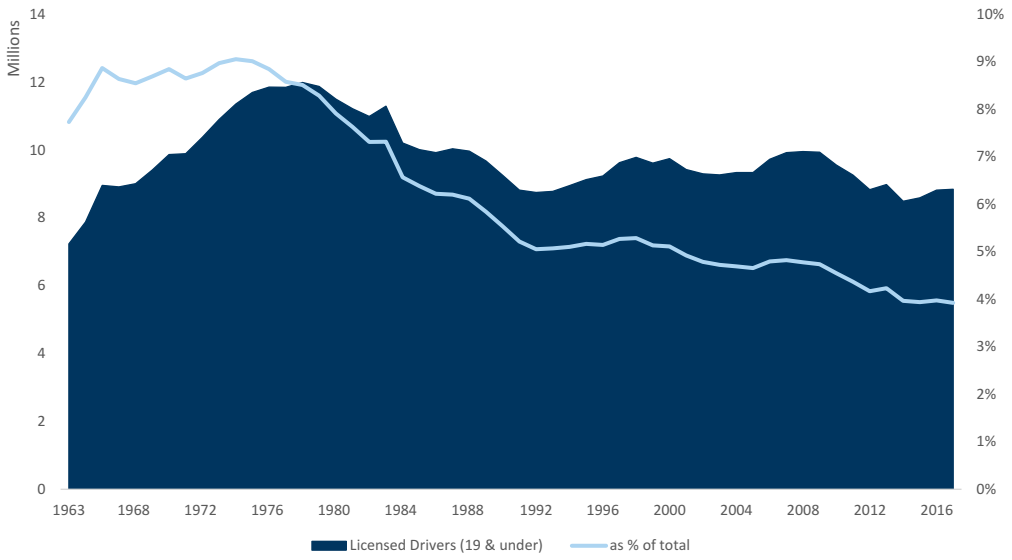
The impact on safety and behavior

While still early in ride-hailing's impact across geographies, we believe there is the potential for profound impacts on driver safety and behavior over time. For example, car

safety and other factors have driven alcohol-related motor vehicle fatalities down significantly over the last thirty years, and since 2009 there has been further, consistent decline in the proportion of motor-vehicle related fatalities that were alcohol-involved, to 39% in 2017 from 42% in 2009, the lowest recorded figure since the US DoT and NHTSA began tracking these statistics.

We've also continued to see younger drivers in the US increasingly opt out of obtaining a drivers license relative to the prior three decades, with the 19 years old & under category falling below 9 million licensed drivers in 2012-2017 for the first time since 1994, and despite significant growth in the broader population since that time (US DOT's Federal Highway Administration). While the 20-34 age category has seen licensed drivers remain stable and even increase modestly in some cases, to the extent the 19 & under population is a leading indicator for broader behavioral changes, particularly in light of growing popularity of alternative transportation, we could see these trends continue in the coming years.

Exhibit 19: Younger Licensed Drivers have declined over time
US, data below references drivers 19 & under



Source: US Department of Transportation, Federal Highway Administration

Venture Capital Horizons

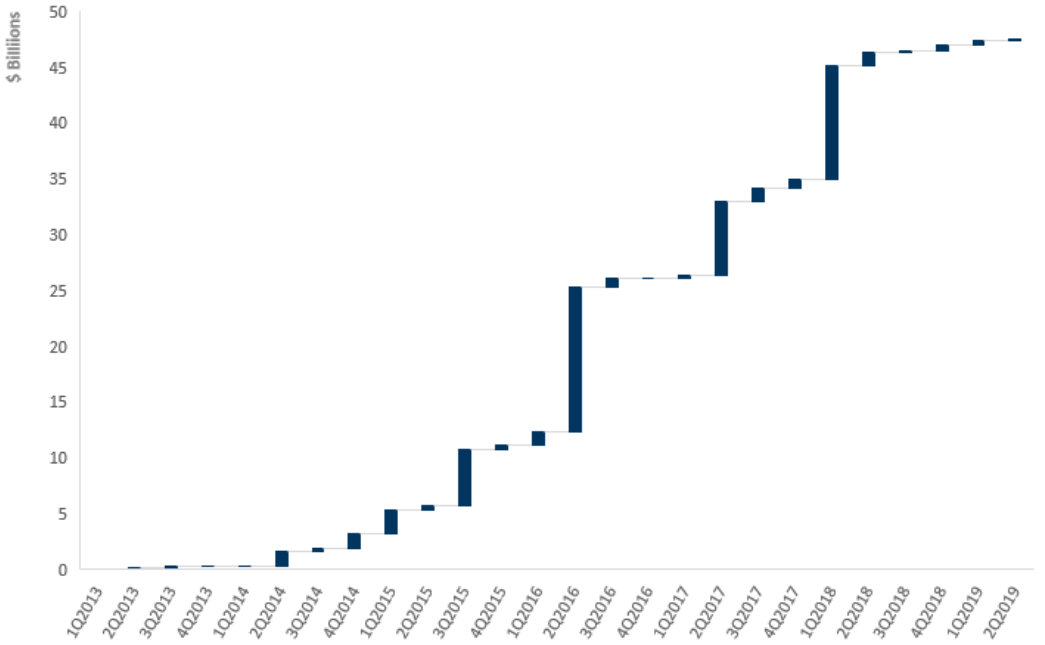
Companies in Uber's addressable categories have raised more than $120bn in global funding cumulatively since 1995, with >$100bn of this funding coming over the last four years (Exhibits 23, 24). Funding growth has largely been driven by ride-hailing, Food Delivery and Electric Vehicle categories, though there are also a number of emerging verticals like Micro-Mobility (e.g. bikes, scooters), car-sharing, and Aerial vehicles that have taken share in recent quarters. Of the cumulative funding, 45% has occurred in China and 32% in the US, with much smaller contributions from India (5%), Singapore (3%), the UK (2%), Germany (2%), Indonesia (2%), Colombia (1%) and Brazil (1%).

In 2014, when competitive funding started to ramp significantly on the back of multiple $1bn+ rounds at Uber and $100mn+ rounds at Gett, Delivery Hero, Ola, Grab, and Lyft, the ride-hailing and food delivery categories, primarily in the US and China, drove the first notable increase in funding. In the two years following, $1bn+ rounds at DiDi, Meituan, and Lyft and a number of other financings in the category drove annualized funding to $30bn from just $1bn in early 2014. Despite the 30x increase in venture investment dollars, deal count only increased by roughly 2x, highlighting the substantial concentration of dollars amongst a small number of companies. This trend continued through 2018, when funding reached nearly $40bn on a TTM basis for four straight quarters as Food Delivery, Electric Vehicles, and Micro-mobility funding reached their peak, with relatively stable funding in ride-hailing. Following 18 straight quarters of 100+ deals closing in these categories, deal count dropped to 94 in 1Q19 and 74 in 2Q19 (pro-rated for full quarter), and the ride-hailing category has remained below $1bn for four straight quarters, the first such stretch since early 2014.

Capturing ride-hailing's private market rationalization. Since the end of 2018, both deal count and private funding have declined substantially, in what we believe is the beginning of a rationalization of dollars going to fund losses driven by subsidies for drivers, riders, and consumers in these categories.

Historically, the world's largest ride-hailing companies have made their most significant raises every 3-4 quarters and often very close to competitors from a timing perspective (Exhibit 20), starting in 2Q14 and most notably in 3Q15, 2Q16, 2Q17 and 1Q18. Uber and Lyft's IPOs in 1H19 mark the end of private capital raises for a number of these companies, and we've seen funding fall significantly as a result.

Exhibit 20: Ride-hailing VC Investment waterfall
Cumulative funding since 1Q13 in $bn



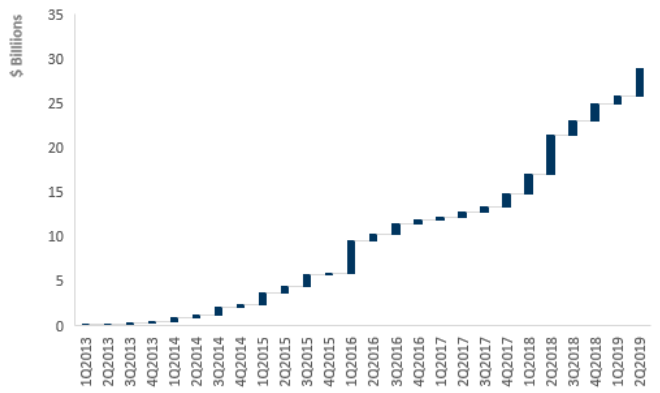
Source: Pitchbook, Goldman Sachs Global Investment Research

Food Delivery still garnering dollars, but is a ride-hailing-like slowdown in DMs ahead? As an earlier stage category than ride-hailing, food delivery companies and companies with food delivery components generated their most significant investment dollars in 1H18, and since then much higher investment dollars than ride-hailing ($800mn+ in each quarter since 3Q18, ex-IPOs), with $1.3bn for DoorDash and $400mn at Postmates in the US, and a number of other players globally (e.g. Swiggy in India, Rappi in South America). We believe that going forward, particularly with the public debuts of Uber and Lyft and significant regional traction from non pure-play food delivery providers (e.g. Didi's 99 in Brazil), there will be a significant slowdown in private funding to fund subsidies for drivers and consumers, and that the industry will see similar trends to the ride-hailing category. However, recent raises from food delivery companies suggest this may be further off than we expect (Exhibit 21).

The dawn of micro-mobility, autonomous, car-sharing, and aerial ambitions. While ride-hailing and food delivery are the largest private investment categories, the world of mobility also includes a number of categories that create more efficient avenues of travel; including bikes and scooters (micro-mobility), the development of autonomous vehicles, vehicle sharing, and aerial vehicles. These categories in aggregate generated nearly $20bn in funding over the last 5 years after <$500mn in total prior to 2013, and substantially half of that funding coming since the beginning of last year. The rise in micro-mobility has been driven by significant funding at upstarts Hellobike, Lime, Ofo, Bird, and Mobike, as well as a number of acquisitions/investments from larger players Meituan, Uber and Lyft. With Fair and Turo being the best examples of competitors in the vehicle-sharing category, funding here is much smaller and earlier stage than even other emerging categories. In autonomous vehicles, recent large dollar investments in Nuro and Aurora, in addition to Zoox and Nio, have driven the category to its largest

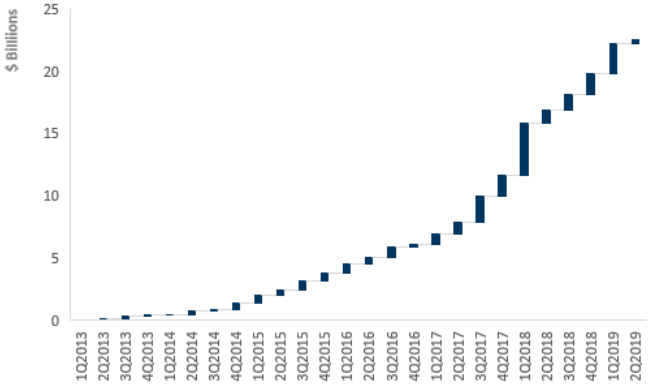
annualized funding in 1H19, though the category is significantly smaller than we've seen ride-hailing, food delivery, and even electric vehicles more broadly reach to date.

Exhibit 21: Food Delivery VC Investment waterfall
Cumulative funding since 1Q13 in $bn



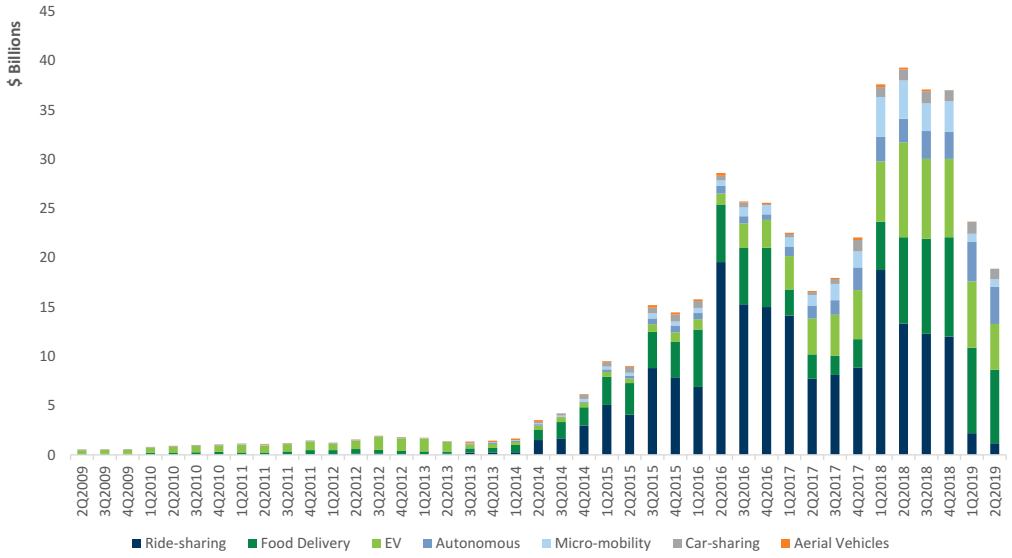
Source: Pitchbook, Goldman Sachs Global Investment Research

Exhibit 22: Micro-mobility, autonomous, car-sharing, aerial vehicle aggregate VC Investment waterfall
Cumulative funding since 1Q13 in $bn



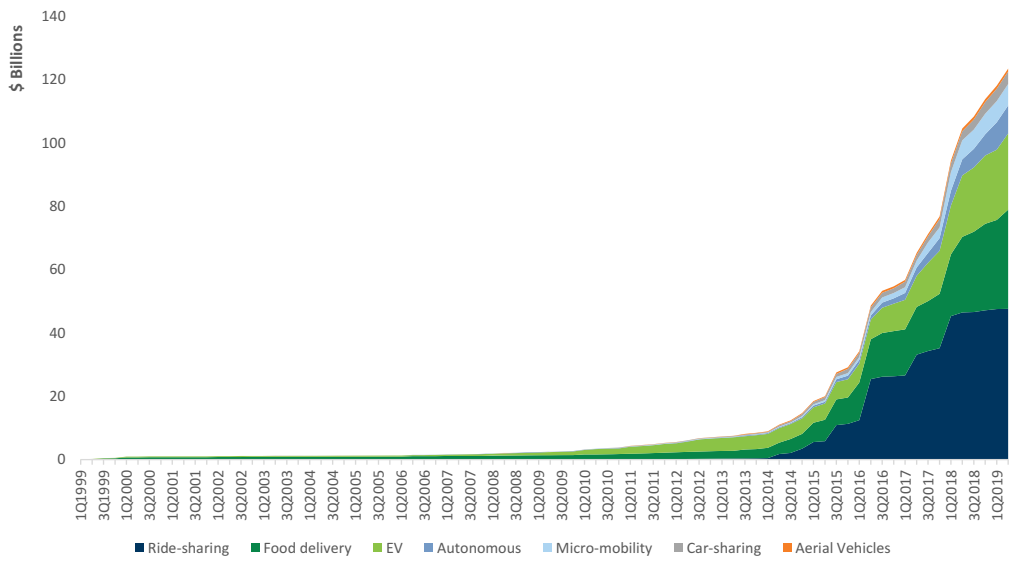
Source: Pitchbook, Goldman Sachs Global Investment Research

Exhibit 23: TTM Venture Capital investment, by vertical
$mn; 2Q19 pro-rated



Source: Pitchbook, Goldman Sachs Global Investment Research

Exhibit 24: Cumulative Venture Capital investment, by vertical
$mn, 2Q19 pro-rated



Source: Pitchbook, Goldman Sachs Global Investment Research

Methodology: For methodology, we use Pitchbook vertical categorizations and company descriptions to classify companies within the ride-sharing, Food Delivery, EV, Autonomous, Micro-mobility, Car-sharing, and aerial vehicle categories. To the extent company overlaps in its classifications, we equal-weight funding attribution to applicable categories in the particular investment period. For Uber, we split funding attribution by expected revenue generation splits. Note also we only include completed deals and do not include deals which Pitchbook has designated 'announced/in progress.' Grab's reported $4.5bn capital raise in 1Q was one of the deals not included in the above analysis, as it was not designated as completed.

Exhibit 25: Select ride-sharing companies, by capital raised
$mn, pre-M&A/IPO if applicable, ex-debt financing

	Capital Raised	HQ Location	Company Description
Didi Chuxing	$22,740	Beijing, China	Mobile ride-hailing application in China; local vehicles & taxis for hire
Uber	$13,690	San Francisco, CA	Technology provider matching consumers with drivers and restaurants and shippers with carriers
Lyft	$4,910	San Francisco, CA	Second largest ride-sharing service provider in the U.S.
Grab	$3,940	Midview City, Singapore	On-demand ride-hailing platform for taxis, private cars, and motorbikes in SE Asia
Ola	$3,110	Bengaluru, India	Online ride-hailing platform designed to connect drivers and passengers in India
GO-JEK	$3,150	Jakarta, Indonesia	Ride-hailing and delivery platform in Indonesia
UCAR Technology	$1,370	Tianjin, China	Providing an in-house fleet and local licensed drivers where customers request car service
Careem	$774	Dubai, UAE	Provider of a car booking platform designed to connect passengers with local drivers.
Gett	$573	Tel Aviv, Israel	Operator of an online on-demand car booking platform designed to offer ride-sharing services.

Source: Pitchbook, Data compiled by Goldman Sachs Global Investment Research

Exhibit 26: Select food delivery companies, by capital raised
$mn, pre-M&A/IPO if applicable, ex-debt financing

	Capital Raised	HQ Location	Company Description
Meituan-Dianping	$7,300	Beijing, China	Offers diversified daily services including food delivery, in-store dining, hotel, and travel booking and other services.
Ele.me	$2,090	Shanghai, China	Meal ordering platform in China
DoorDash	$1,970	San Francisco, CA	Developer of a food delivery application intended to provide on-demand food-ordering and delivery services.
Delivery Hero	$1,760	Berlin, Germany	Provider of online food delivery services from restaurants and cafes, also operating as its own delivery service
Deliveroo	$1,520	London, United Kingdom	Developer of an online food delivery platform intended to help users order restaurant meals in the UK
Rappi	$1,460	BogotÆ, Colombia	Helps consumers order groceries, food and drugstore medications
Miss Fresh	$1,360	Beijing, China	Developer of an application platform designed to offer fresh food to customers across China.
Swiggy	$1,270	Bengaluru, India	Developer of an on-demand food delivery platform in India
BigBasket	$694	Bengaluru, India	Operator of a food delivery platform designed to offer food and grocery products
Postmates	$681	San Francisco, CA	On-demand delivery platform in the US
FreshDirect	$517	Bronx, NY	Online retail platform to sell food and grocery products

Source: Pitchbook, Data compiled by Goldman Sachs Global Investment Research

Exhibit 27: Select micro-mobility companies, by capital raised
$mn, pre-M&A/IPO if applicable, ex-debt financing

	Capital Raised	HQ Location	Company Description
Hellobike	$1,640	Shanghai, China	Operator of a bike sharing platform designed to create an intelligent urban traffic system.
Ofo	$1,620	Beijing, China	Developer of a bike-sharing platform designed to offer an efficient ride in the fast-paced city
Mobike	$832	Beijing, China	Provider of a bike sharing platform in China designed to allow users to locate nearby bikes.
Lime	$777	San Mateo, CA	Developer of a bike sharing platform designed to change the way people travel within blocks.
Gogoro	$480	Guishan, Taiwan	Developer of an electric scooter that utilizes rechargeable smart batteries
Bird	$268	Santa Monica, CA	Provides citizens with access to shared personal electric vehicles that can be picked up and dropped off anywhere

Source: Pitchbook, Data compiled by Goldman Sachs Global Investment Research

Exhibit 28: Select autonomous vehicle companies, by capital raised
$mn, pre-M&A/IPO if applicable, ex-debt financing

	Capital Raised	HQ Location	Company Description
Nio	$2,100	Shanghai, China	Sells smart and connected premium electric vehicles, driving innovation in AI and autonomous vehicles
Xpeng	$1,360	Guangzhou, China	Developer of Internet cars and electric vehicles designed to offer autonomous driving technologies
Nuro	$1,030	Mountain View, CA	Developer of a vehicle that is a fully autonomous, on-road vehicle
Zoox	$790	Foster City, CA	Developer of an autonomous mobility ecosystem that includes self-driving vehicles, control systems, AI and a ride-sharing service
Aurora	$626	Palo Alto, CA	Developer of an autonomous car technology designed to create self driving cars
Tianji Enovate	$374	Shanghai, China	Manufacturer of electric cars
Quanergy	$325	Sunnyvale, CA	Developer of solid state sensors designed to offer smart sensing services for self-driving cars
Faraday Future	$300	Los Angeles, CA	Designer and manufacturer of intelligent electric vehicles created to provide sustainable transportation

Source: Pitchbook, Data compiled by Goldman Sachs Global Investment Research

Disclosure Appendix

Reg AC

We, Heath P. Terry, CFA, Daniel Powell, Piyush Mubayi, Franklin Jarman, David Tamberrino, CFA, Bruno Amorim, CFA and Rob Joyce, hereby certify that all of the views expressed in this report accurately reflect our personal views about the subject company or companies and its or their securities. We also certify that no part of our compensation was, is or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

Unless otherwise stated, the individuals listed on the cover page of this report are analysts in Goldman Sachs' Global Investment Research division.

GS Factor Profile

The Goldman Sachs Factor Profile provides investment context for a stock by comparing key attributes to the market (i.e. our coverage universe) and its sector peers. The four key attributes depicted are: Growth, Financial Returns, Multiple (e.g. valuation) and Integrated (a composite of Growth, Financial Returns and Multiple). Growth, Financial Returns and Multiple are calculated by using normalized ranks for specific metrics for each stock. The normalized ranks for the metrics are then averaged and converted into percentiles for the relevant attribute. The precise calculation of each metric may vary depending on the fiscal year, industry and region, but the standard approach is as follows:

Growth is based on a stock's forward-looking sales growth, EBITDA growth and EPS growth (for financial stocks, only EPS and sales growth), with a higher percentile indicating a higher growth company. **Financial Returns** is based on a stock's forward-looking ROE, ROCE and CROCI (for financial stocks, only ROE), with a higher percentile indicating a company with higher financial returns. **Multiple** is based on a stock's forward-looking P/E, P/B, price/dividend (P/D), EV/EBITDA, EV/FCF and EV/Debt Adjusted Cash Flow (DACF) (for financial stocks, only P/E, P/B and P/D), with a higher percentile indicating a stock trading at a higher multiple. The **Integrated** percentile is calculated as the average of the Growth percentile, Financial Returns percentile and (100% - Multiple percentile).

Financial Returns and Multiple use the Goldman Sachs analyst forecasts at the fiscal year-end at least three quarters in the future. Growth uses inputs for the fiscal year at least seven quarters in the future compared with the year at least three quarters in the future (on a per-share basis for all metrics).

For a more detailed description of how we calculate the GS Factor Profile, please contact your GS representative.

M&A Rank

Across our global coverage, we examine stocks using an M&A framework, considering both qualitative factors and quantitative factors (which may vary across sectors and regions) to incorporate the potential that certain companies could be acquired. We then assign a M&A rank as a means of scoring companies under our rated coverage from 1 to 3, with 1 representing high (30%-50%) probability of the company becoming an acquisition target, 2 representing medium (15%-30%) probability and 3 representing low (0%-15%) probability. For companies ranked 1 or 2, in line with our standard departmental guidelines we incorporate an M&A component into our target price. M&A rank of 3 is considered immaterial and therefore does not factor into our price target, and may or may not be discussed in research.

Quantum

Quantum is Goldman Sachs' proprietary database providing access to detailed financial statement histories, forecasts and ratios. It can be used for in-depth analysis of a single company, or to make comparisons between companies in different sectors and markets.

GS SUSTAIN

GS SUSTAIN is a global investment strategy focused on the generation of long-term alpha through identifying high quality industry leaders. The GS SUSTAIN 50 list includes leaders we believe to be well positioned to deliver long-term outperformance through superior returns on capital, sustainable competitive advantage and effective management of ESG risks vs. global industry peers. Candidates are selected largely on a combination of quantifiable analysis of these three aspects of corporate performance.

Disclosures

Coverage group(s) of stocks by primary analyst(s)

Heath P. Terry, CFA: America-Internet. Daniel Powell: America-Internet. Piyush Mubayi: Asia Internet. David Tamberrino, CFA: America-Autos & Auto Parts, America-Autos Dealers, America-Rental Car. Bruno Amorim, CFA: Latin America-Airlines, Latin America-Construction, Latin America-Diversified Industrials, Latin America-Infrastructure. Kota Yuzawa: Japan-Automobiles. Fei Fang: A-Share Autos, China Autos. Rob Joyce: Europe-Food Retail.

A-Share Autos: Contemporary Amperex Technology.

America-Autos & Auto Parts: Adient Plc, Aptiv Plc, BorgWarner Inc., BRP Inc., BRP Inc., Cooper-Standard Holdings, Delphi Technologies Plc, Ford Motor Co., General Motors Co., Goodyear Tire & Rubber Co., Harley-Davidson Inc., Lear Corp., Magna International Inc., Magna International Inc., Polaris Industries Inc., Tenneco Inc., Tesla Inc., Visteon Corp..

America-Autos Dealers: AutoNation Inc., Camping World Holdings, Group 1 Automotive Inc..

America-Internet: Amazon.com Inc., Blue Apron Holdings, Booking Holdings Inc., CarGurus Inc., Cars.com Inc., Criteo SA, eBay Inc., Etsy Inc., Eventbrite Inc., Expedia Group, GrubHub Inc., LendingClub Corp., Lyft Inc., Netflix Inc., PayPal Holdings, Pinterest Inc., Redfin Corp., Snap Inc., Spotify Technology S.A., Stitch Fix Inc., TripAdvisor Inc., Trivago N.V., TrueCar, Twitter Inc., Uber Technologies Inc., Zillow Group.

America-Rental Car: Avis Budget Group, Hertz Global Holdings.

Asia Internet: 58.com Inc., Alibaba Group, Aurora Mobile Ltd., Baidu.com Inc., Ctrip.com International, Gridsum, Huya Inc., iQIYI Inc., JD.com Inc., Jianpu Technology Inc., Meituan Dianping, MOMO.COM Inc., NetEase Inc., PChome Online Inc., Pinduoduo Inc., Qeeka Home (Cayman) Inc., Sea Ltd., SINA Corp., Singapore Post, Sogou Inc., Tencent Holdings, Tencent Music Entertainment Group, Uxin Ltd., Vipshop Holdings, Weibo Corp., Xiaomi Corp., YY Inc..

China Autos: BAIC Motor Co, Brilliance China Automotive, BYD Co. (A), BYD Co. (H), China Grand Auto, China Harmony New Energy Auto, Chongqing Changan Auto (A), Dongfeng Motor, Geely Automobile Holdings, Grand Baoxin Auto Group, Great Wall Motor Co. (H), Great Wall Motor Co.(A), Guangzhou Automobile Group (A), Guangzhou Automobile Group (H), NIO Inc., SAIC Motor, Yongda Auto, Zhengtong Auto Services Holdings, Zhongsheng Group.

Europe-Food Retail: Ahold Delhaize NV, Carrefour, Casino, Colruyt, Delivery Hero, J Sainsbury, Jeronimo Martins, JUST EAT, Morrison (Wm), Ocado Group, Takeaway.com, Tesco.

Japan-Automobiles: Aisin Seiki, Bridgestone, Denso, Hino Motors, Honda Motor, Isuzu Motors, JSP Corp., Mazda Motor, Mitsubishi Motors, Mitsui High-tec Inc., Nifco Inc., Nissan Motor, NOK Corp., Subaru Corp., Sumitomo Rubber Industries, Suzuki Motor, Toyota Boshoku, Toyota Motor, Unipres Corp., Yamaha Motor.

Latin America-Airlines: Azul SA, Azul SA, Copa Holdings, GOL Linhas Aereas Inteligentes SA, GOL Linhas Aereas Inteligentes SA, LATAM Airlines Group, LATAM Airlines Group, Volaris, Volaris.

Latin America-Construction: Cemex, Cemex SAB.

Latin America-Diversified Industrials: Localiza Rent a Car SA, Weg SA.

Latin America-Infrastructure: Corporacion America Airports S.A., Grupo Aeroportuario del Centro Norte, Grupo Aeroportuario del Centro Norte, Grupo Aeroportuario del Pacifico, Grupo Aeroportuario del Pacifico, Grupo Aeroportuario del Sureste, Grupo Aeroportuario del Sureste, Grupo CCR, Grupo Ecorodovias, Pinfra, Rumo SA.

Company-specific regulatory disclosures

Compendium report: please see disclosures at https://www.gs.com/research/hedge.html. Disclosures applicable to the companies included in this compendium can be found in the latest relevant published research

Distribution of ratings/investment banking relationships

Goldman Sachs Investment Research global Equity coverage universe

	Rating Distribution			Investment Banking Relationships		
	Buy	Hold	Sell	Buy	Hold	Sell
Global	35%	53%	12%	66%	58%	52%

As of April 1, 2019, Goldman Sachs Global Investment Research had investment ratings on 2,840 equity securities. Goldman Sachs assigns stocks as Buys and Sells on various regional Investment Lists; stocks not so assigned are deemed Neutral. Such assignments equate to Buy, Hold and Sell for the purposes of the above disclosure required by the FINRA Rules. See 'Ratings, Coverage groups and related definitions' below. The Investment Banking Relationships chart reflects the percentage of subject companies within each rating category for whom Goldman Sachs has provided investment banking services within the previous twelve months.

Price target and rating history chart(s)

Compendium report: please see disclosures at https://www.gs.com/research/hedge.html. Disclosures applicable to the companies included in this compendium can be found in the latest relevant published research

Rating and pricing information

Lyft Inc. ($57.62), Uber Technologies Inc. ($40.41), Netflix Inc. ($336.63), PayPal Holdings ($105.52), Alphabet Inc. ($1,038.74), Spotify Technology S.A. ($122.81), Twitter Inc. ($34.43), Expedia Group ($116.17), CarGurus Inc. ($33.53), ANGI Homeservices Inc. ($14.07), Etsy Inc. ($61.07), GrubHub Inc. ($62.94), Yelp Inc. ($30.36), Facebook Inc. ($164.15), Frontdoor Inc. ($39.02), Uber Technologies Inc. ($41.25) and Amazon.com Inc. ($1,692.69).

Regulatory disclosures

Disclosures required by United States laws and regulations

See company-specific regulatory disclosures above for any of the following disclosures required as to companies referred to in this report: manager or co-manager in a pending transaction; 1% or other ownership; compensation for certain services; types of client relationships; managed/co-managed public offerings in prior periods; directorships; for equity securities, market making and/or specialist role. Goldman Sachs trades or may trade as a principal in debt securities (or in related derivatives) of issuers discussed in this report.

The following are additional required disclosures: **Ownership and material conflicts of interest:** Goldman Sachs policy prohibits its analysts, professionals reporting to analysts and members of their households from owning securities of any company in the analyst's area of coverage. **Analyst compensation:** Analysts are paid in part based on the profitability of Goldman Sachs, which includes investment banking revenues. **Analyst as officer or director:** Goldman Sachs policy generally prohibits its analysts, persons reporting to analysts or members of their households from serving as an officer, director or advisor of any company in the analyst's area of coverage. **Non-U.S. Analysts:** Non-U.S. analysts may not be associated persons of Goldman Sachs & Co. LLC and therefore may not be subject to FINRA Rule 2241 or FINRA Rule 2242 restrictions on communications with subject company, public appearances and trading securities held by the analysts.

Distribution of ratings: See the distribution of ratings disclosure above. **Price chart:** See the price chart, with changes of ratings and price targets in prior periods, above, or, if electronic format or if with respect to multiple companies which are the subject of this report, on the Goldman Sachs website at https://www.gs.com/research/hedge.html.

Additional disclosures required under the laws and regulations of jurisdictions other than the United States

The following disclosures are those required by the jurisdiction indicated, except to the extent already made above pursuant to United States laws and regulations. **Australia:** Goldman Sachs Australia Pty Ltd and its affiliates are not authorised deposit-taking institutions (as that term is defined in the Banking Act 1959 (Cth)) in Australia and do not provide banking services, nor carry on a banking business, in Australia. This research, and any access to it, is intended only for "wholesale clients" within the meaning of the Australian Corporations Act, unless otherwise agreed by Goldman Sachs. In producing research reports, members of the Global Investment Research Division of Goldman Sachs Australia may attend site visits and other meetings hosted by the companies and other entities which are the subject of its research reports. In some instances the costs of such site visits or meetings may be met in part or in whole by the issuers concerned if Goldman Sachs Australia considers it is appropriate and reasonable in the specific circumstances relating to the site visit or meeting. To the extent that the contents of this document contains any financial product advice, it is general advice only and has been prepared by Goldman Sachs without taking into account a client's objectives, financial situation or needs. A client should, before acting on any such advice, consider the appropriateness of the advice having regard to the client's own objectives, financial situation and needs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests and a copy of Goldman Sachs' Australian Sell-Side Research Independence Policy Statement are available at: https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html. **Brazil:** Disclosure information in relation to CVM Instruction 598 is available at https://www.gs.com/worldwide/brazil/area/gir/index.html. Where applicable, the

Brazil-registered analyst primarily responsible for the content of this research report, as defined in Article 20 of CVM Instruction 598, is the first author named at the beginning of this report, unless indicated otherwise at the end of the text. **Canada:** Goldman Sachs Canada Inc. is an affiliate of The Goldman Sachs Group Inc. and therefore is included in the company specific disclosures relating to Goldman Sachs (as defined above). Goldman Sachs Canada Inc. has approved of, and agreed to take responsibility for, this research report in Canada if and to the extent that Goldman Sachs Canada Inc. disseminates this research report to its clients. **Hong Kong:** Further information on the securities of covered companies referred to in this research may be obtained on request from Goldman Sachs (Asia) L.L.C. **India:** Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (India) Securities Private Limited, Research Analyst - SEBI Registration Number INH000001493, 951-A, Rational House, Appasaheb Marathe Marg, Prabhadevi, Mumbai 400 025, India, Corporate Identity Number U74140MH2006FTC160634, Phone +91 22 6616 9000, Fax +91 22 6616 9001. Goldman Sachs may beneficially own 1% or more of the securities (as such term is defined in clause 2 (h) the Indian Securities Contracts (Regulation) Act, 1956) of the subject company or companies referred to in this research report. **Japan:** See below. **Korea:** This research, and any access to it, is intended only for "professional investors" within the meaning of the Financial Services and Capital Markets Act, unless otherwise agreed by Goldman Sachs. Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (Asia) L.L.C., Seoul Branch. **New Zealand:** Goldman Sachs New Zealand Limited and its affiliates are neither "registered banks" nor "deposit takers" (as defined in the Reserve Bank of New Zealand Act 1989) in New Zealand. This research, and any access to it, is intended for "wholesale clients" (as defined in the Financial Advisers Act 2008) unless otherwise agreed by Goldman Sachs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests is available at: https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html. **Russia:** Research reports distributed in the Russian Federation are not advertising as defined in the Russian legislation, but are information and analysis not having product promotion as their main purpose and do not provide appraisal within the meaning of the Russian legislation on appraisal activity. Research reports do not constitute a personalized investment recommendation as defined in Russian laws and regulations, are not addressed to a specific client, and are prepared without analyzing the financial circumstances, investment profiles or risk profiles of clients. Goldman Sachs assumes no responsibility for any investment decisions that may be taken by a client or any other person based on this research report. **Singapore:** Further information on the covered companies referred to in this research may be obtained from Goldman Sachs (Singapore) Pte. (Company Number: 198602165W). **Taiwan:** This material is for reference only and must not be reprinted without permission. Investors should carefully consider their own investment risk. Investment results are the responsibility of the individual investor. **United Kingdom:** Persons who would be categorized as retail clients in the United Kingdom, as such term is defined in the rules of the Financial Conduct Authority, should read this research in conjunction with prior Goldman Sachs research on the covered companies referred to herein and should refer to the risk warnings that have been sent to them by Goldman Sachs International. A copy of these risks warnings, and a glossary of certain financial terms used in this report, are available from Goldman Sachs International on request.

European Union: Disclosure information in relation to Article 6 (2) of the European Commission Delegated Regulation (EU) (2016/958) supplementing Regulation (EU) No 596/2014 of the European Parliament and of the Council with regard to regulatory technical standards for the technical arrangements for objective presentation of investment recommendations or other information recommending or suggesting an investment strategy and for disclosure of particular interests or indications of conflicts of interest is available at https://www.gs.com/disclosures/europeanpolicy.html which states the European Policy for Managing Conflicts of Interest in Connection with Investment Research.

Japan: Goldman Sachs Japan Co., Ltd. is a Financial Instrument Dealer registered with the Kanto Financial Bureau under registration number Kinsho 69, and a member of Japan Securities Dealers Association, Financial Futures Association of Japan and Type II Financial Instruments Firms Association. Sales and purchase of equities are subject to commission pre-determined with clients plus consumption tax. See company-specific disclosures as to any applicable disclosures required by Japanese stock exchanges, the Japanese Securities Dealers Association or the Japanese Securities Finance Company.

Ratings, coverage groups and related definitions

Buy (B), Neutral (N), Sell (S) -Analysts recommend stocks as Buys or Sells for inclusion on various regional Investment Lists. Being assigned a Buy or Sell on an Investment List is determined by a stock's total return potential relative to its coverage. Any stock not assigned as a Buy or a Sell on an Investment List with an active rating (i.e., a stock that is not Rating Suspended, Not Rated, Coverage Suspended or Not Covered), is deemed Neutral. Each region's Investment Review Committee manages Regional Conviction lists, which represent investment recommendations focused on the size of the total return potential and/or the likelihood of the realization of the return across their respective areas of coverage. The addition or removal of stocks from such Conviction lists do not represent a change in the analysts' investment rating for such stocks.

Total return potential represents the upside or downside differential between the current share price and the price target, including all paid or anticipated dividends, expected during the time horizon associated with the price target. Price targets are required for all covered stocks. The total return potential, price target and associated time horizon are stated in each report adding or reiterating an Investment List membership.

Coverage groups: A list of all stocks in each coverage group is available by primary analyst, stock and coverage group at https://www.gs.com/research/hedge.html.

Not Rated (NR). The investment rating and target price have been removed pursuant to Goldman Sachs policy when Goldman Sachs is acting in an advisory capacity in a merger or strategic transaction involving this company and in certain other circumstances. **Rating Suspended (RS).** Goldman Sachs Research has suspended the investment rating and price target for this stock, because there is not a sufficient fundamental basis for determining, or there are legal, regulatory or policy constraints around publishing, an investment rating or target. The previous investment rating and price target, if any, are no longer in effect for this stock and should not be relied upon. **Coverage Suspended (CS).** Goldman Sachs has suspended coverage of this company. **Not Covered (NC).** Goldman Sachs does not cover this company. **Not Available or Not Applicable (NA).** The information is not available for display or is not applicable. **Not Meaningful (NM).** The information is not meaningful and is therefore excluded.

Global product; distributing entities

The Global Investment Research Division of Goldman Sachs produces and distributes research products for clients of Goldman Sachs on a global basis. Analysts based in Goldman Sachs offices around the world produce research on industries and companies, and research on macroeconomics, currencies, commodities and portfolio strategy. This research is disseminated in Australia by Goldman Sachs Australia Pty Ltd (ABN 21 006 797 897); in Brazil by Goldman Sachs do Brasil Corretora de Títulos e Valores Mobiliários S.A.; Ombudsman Goldman Sachs Brazil: 0800 727 5764 and / or ouvidoriagoldmansachs@gs.com. Available Weekdays (except holidays), from 9am to 6pm. Ouvidoria Goldman Sachs Brasil: 0800 727 5764 e/ou ouvidoriagoldmansachs@gs.com. Horário de funcionamento: segunda-feira à sexta-feira (exceto feriados), das 9h às 18h; in Canada by either Goldman Sachs Canada Inc. or Goldman Sachs & Co. LLC; in Hong Kong by Goldman Sachs (Asia) L.L.C.; in India by Goldman Sachs (India) Securities Private Ltd.; in Japan by Goldman Sachs Japan Co., Ltd.; in the Republic of Korea by Goldman Sachs (Asia) L.L.C., Seoul Branch; in New Zealand by Goldman Sachs New Zealand Limited; in Russia by OOO Goldman Sachs; in Singapore by Goldman Sachs (Singapore) Pte. (Company Number: 198602165W); and in the United States of America by Goldman Sachs & Co. LLC. Goldman Sachs International has approved this research in connection with its distribution in the United Kingdom and European Union.

European Union: Goldman Sachs International authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority, has approved this research in connection with its distribution in the European Union and United Kingdom; Goldman Sachs AG and Goldman Sachs International Zweigniederlassung Frankfurt, regulated by the Bundesanstalt für Finanzdienstleistungsaufsicht, may also distribute research in Germany.

General disclosures

This research is for our clients only. Other than disclosures relating to Goldman Sachs, this research is based on current public information that we consider reliable, but we do not represent it is accurate or complete, and it should not be relied on as such. The information, opinions, estimates and forecasts contained herein are as of the date hereof and are subject to change without prior notification. We seek to update our research as appropriate, but various regulations may prevent us from doing so. Other than certain industry reports published on a periodic basis, the large majority of reports are published at irregular intervals as appropriate in the analyst's judgment.

Goldman Sachs conducts a global full-service, integrated investment banking, investment management, and brokerage business. We have investment banking and other business relationships with a substantial percentage of the companies covered by our Global Investment Research Division. Goldman Sachs & Co. LLC, the United States broker dealer, is a member of SIPC (https://www.sipc.org).

Our salespeople, traders, and other professionals may provide oral or written market commentary or trading strategies to our clients and principal trading desks that reflect opinions that are contrary to the opinions expressed in this research. Our asset management area, principal trading desks and investing businesses may make investment decisions that are inconsistent with the recommendations or views expressed in this research.

The analysts named in this report may have from time to time discussed with our clients, including Goldman Sachs salespersons and traders, or may discuss in this report, trading strategies that reference catalysts or events that may have a near-term impact on the market price of the equity securities discussed in this report, which impact may be directionally counter to the analyst's published price target expectations for such stocks. Any such trading strategies are distinct from and do not affect the analyst's fundamental equity rating for such stocks, which rating reflects a stock's return potential relative to its coverage group as described herein.

We and our affiliates, officers, directors, and employees, excluding equity and credit analysts, will from time to time have long or short positions in, act as principal in, and buy or sell, the securities or derivatives, if any, referred to in this research.

The views attributed to third party presenters at Goldman Sachs arranged conferences, including individuals from other parts of Goldman Sachs, do not necessarily reflect those of Global Investment Research and are not an official view of Goldman Sachs.

Any third party referenced herein, including any salespeople, traders and other professionals or members of their household, may have positions in the products mentioned that are inconsistent with the views expressed by analysts named in this report.

This research is not an offer to sell or the solicitation of an offer to buy any security in any jurisdiction where such an offer or solicitation would be illegal. It does not constitute a personal recommendation or take into account the particular investment objectives, financial situations, or needs of individual clients. Clients should consider whether any advice or recommendation in this research is suitable for their particular circumstances and, if appropriate, seek professional advice, including tax advice. The price and value of investments referred to in this research and the income from them may fluctuate. Past performance is not a guide to future performance, future returns are not guaranteed, and a loss of original capital may occur. Fluctuations in exchange rates could have adverse effects on the value or price of, or income derived from, certain investments.

Certain transactions, including those involving futures, options, and other derivatives, give rise to substantial risk and are not suitable for all investors. Investors should review current options and futures disclosure documents which are available from Goldman Sachs sales representatives or at https://www.theocc.com/about/publications/character-risks.jsp and https://www.fiadocumentation.org/fia/regulatory-disclosures_1/fia-uniform-futures-and-options-on-futures-risk-disclosures-booklet-pdf-version-2018. Transaction costs may be significant in option strategies calling for multiple purchase and sales of options such as spreads. Supporting documentation will be supplied upon request.

Differing Levels of Service provided by Global Investment Research: The level and types of services provided to you by the Global Investment Research division of GS may vary as compared to that provided to internal and other external clients of GS, depending on various factors including your individual preferences as to the frequency and manner of receiving communication, your risk profile and investment focus and perspective (e.g., marketwide, sector specific, long term, short term), the size and scope of your overall client relationship with GS, and legal and regulatory constraints. As an example, certain clients may request to receive notifications when research on specific securities is published, and certain clients may request that specific data underlying analysts' fundamental analysis available on our internal client websites be delivered to them electronically through data feeds or otherwise. No change to an analyst's fundamental research views (e.g., ratings, price targets, or material changes to earnings estimates for equity securities), will be communicated to any client prior to inclusion of such information in a research report broadly disseminated through electronic publication to our internal client websites or through other means, as necessary, to all clients who are entitled to receive such reports.

All research reports are disseminated and available to all clients simultaneously through electronic publication to our internal client websites. Not all research content is redistributed to our clients or available to third-party aggregators, nor is Goldman Sachs responsible for the redistribution of our research by third party aggregators. For research, models or other data related to one or more securities, markets or asset classes (including related services) that may be available to you, please contact your GS representative or go to https://research.gs.com.

Disclosure information is also available at https://www.gs.com/research/hedge.html or from Research Compliance, 200 West Street, New York, NY 10282.