



THEMATIC INSIGHT

# Future Mobility:

The Road Ahead





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# The long-term **view**

The relevance and impact of the Future Mobility concept for cities, society and hence investors has become evident as transportation has become more electrified and automated, and traditional business models have been disrupted, disintermediated or rebuilt.<sup>1</sup> As we will see, across North America, Europe, and China, 2022 has proven to be a major year of growth, driven by fast-changing consumer and investor attitudes and new public spending.

In September 2022, 532 institutional investors – representing some USD 39 trillion in AuM – collectively urged governments worldwide to act more swiftly to strengthen disclosure, policies and measures, in order to limit global temperature rise to 1.5 degrees C.<sup>2</sup> In 1987, the late Professor Carl Sagan noted the then-projected climate change trajectory would lead to “the conversion

of the Ukraine and the US Midwest into something little different from scrub deserts,” by the middle to late 21st century.<sup>3</sup> 35 years on, the projection remains valid.<sup>4</sup> Sagan opined that the change is happening “at a timescale that nobody worries about, because it’s not our watch, it’s our children and grandchildren”.

However, those voices may be starting to gain traction. In the US, the percentage of adults who believe global warming is happening has risen:<sup>5</sup> 77% now see it as a “crisis” or “serious problem”<sup>6</sup> while almost 93% of European citizens view it as a “serious problem”.<sup>7</sup> IMF research suggested that the Covid-19 pandemic “increased the degree of public worry for climate change, and also increased the willingness to support green recovery policies.”<sup>8</sup> This broader consensus has facilitated the largest investor of them all – public funds – stepping forward.



1 Also see MSCI Thematic Insights, “Future Mobility: Understanding a new transport ecosystem” and “Post-Pandemic Reflections: Future Mobility”  
2 <https://www.unepfi.org/news/industries/investment/500-plus-institutional-investors-urge-governments-to-step-up-climate-ambition/>  
3 <https://www.youtube.com/watch?v=gLOZsTMuurs>  
4 <https://www.bloomberg.com/news/articles/2022-08-15/us-south-midwest-will-reach-temps-of-125-f-by-2050s>  
5 <https://climatecommunication.yale.edu/visualizations-data/ycom-us/>  
6 <https://www.hsph.harvard.edu/news/press-releases/poll-facing-extreme-weather-is-changing-americans-views-about-need-for-climate-change-action/>  
7 [https://ec.europa.eu/clima/citizens/citizen-support-climate-action\\_en](https://ec.europa.eu/clima/citizens/citizen-support-climate-action_en)  
8 IMF, Mohommad, Adil et al, “Impact of Covid-19 on Attitudes to Climate Change and Support for Climate Policies”, February 2021. <https://www.imf.org/-/media/Files/Publications/WP/2022/English/wpiea2022023-print-pdf.ashx>



# Infrastructure + Inflation= Future Mobility?

This gradual consensus-building on the existence and impact of climate change lent the backdrop and helped generate the minimum support required to pass the USD 750 billion “Inflation Reduction Act,” which Forbes magazine dubbed “the most important climate action in US history”.<sup>9</sup> The bill followed the record-breaking, bipartisan USD 1 trillion “Infrastructure Investment and Jobs Act” of 2021.<sup>10</sup>

As all modes of transportation taken together account for 37% of global greenhouse gas emissions, the sector is a key target for emissions-reduction activity (whether driven by regulations or incentives).<sup>11</sup> The 2021 bill provided USD 7.5 billion for electric vehicle charging, and several billion for the electrification of buses, ferries and trains. It established an “Office of Multimodal Freight Infrastructure”<sup>12</sup> and elevated the priority of motor vehicle emissions and safety. The 2022 bill takes these investments much further. Although domestically framed and named to address inflation, the so-called “climate bill by another name”<sup>13</sup> takes clear steps to aid the US meeting Paris Agreement commitments, and provides an impetus for other countries to act on those climate-related issues.<sup>14</sup> Some USD 250 billion is to be made available by the US Department



of Energy to accelerate clean energy programs, including battery and hydrogen storage technologies, which will likely stimulate the entire global industrial sector.<sup>15</sup> Incentives (now up to USD 7,500 in the US) for private consumers who buy electric vehicles are supporting EV market-share growth, along with encouraging production and expansion of production facilities, as well as greater vehicle variety.

Finally, US and European governments have been reacting to the ongoing (albeit abating) shortage in automotive–semiconductors by directing investments into “national” semiconductor production. In the US, Biden’s CHIPS and Science Act provided over USD 50 billion to Intel and others for new production, while the EU’s European Chips Act pledged USD 15 billion.<sup>16,17</sup> At the same time, manufacturers have become more creative: the chip shortage is no longer throttling manufacturing as it did in 2021. In Europe, the US and China, total vehicle production numbers are stabilizing (although, notably, the proportion of vehicles with a plug is increasing considerably in all regions).

<sup>9</sup> <https://www.forbes.com/sites/energyinnovation/2022/08/02/the-inflation-reduction-act-is-the-most-important-climate-action-in-us-history/>  
<sup>10</sup> <https://www.forbes.com/sites/energyinnovation/2022/08/02/the-inflation-reduction-act-is-the-most-important-climate-action-in-us-history/>  
<sup>11</sup> <https://www.iea.org/topics/transport>  
<sup>12</sup> <https://www.congress.gov/bill/117th-congress/house-bill/3684%20>  
<sup>13</sup> <https://www.bloomberg.com/news/articles/2022-08-15/us-inflation-reduction-act-is-a-climate-bill-by-another-name>  
<sup>14</sup> <https://www.americanprogress.org/article/how-the-inflation-reduction-act-will-drive-global-climate-action/>  
<sup>15</sup> <https://time.com/6204582/inflation-reduction-act-climate-change/>  
<sup>16</sup> <https://www.cnet.com/tech/computing/global-chip-shortage-gives-us-manufacturing-a-boost/>  
<sup>17</sup> <https://digital-strategy.ec.europa.eu/en/policies/european-chips-act>

# Electric Choice, Electric Charging

Some 100 years ago, the Ford Model T represented close to half of all new vehicle sales in the US – not unlike Tesla’s dominance of the US BEV market today.<sup>18</sup> The dominance of the Model T was short lived, however. Within ten years, hundreds of car brands emerged to expand the market (before consolidation under the “Big Three” in the US by the 1940s). Is history repeating itself?

From 2015 to 2021, the number of different EV models globally available to consumers quintupled.<sup>19</sup> In the US, there were 33 models on offer in Q2 2022 versus 19 the year before.<sup>20</sup> This is consistent with electric vehicles having passed the “Innovator” and “Early Adopter” stages of the Rogers Innovation Adoption curve<sup>21</sup> and moving towards the “mass adoption” phase. With the current rate of acceleration, an agreed-upon ban on the sale of new internal-combustion-engined (ICE) vehicles by 2035 across the EU<sup>22</sup> (as already seen in many countries<sup>23</sup>) will be window-dressing on a shift that was already occurring.

Over 18% of new vehicles sold in Europe in Q2 of 2022 were chargeable (Battery Electric Vehicle - BEV – or Plug-in Hybrid Electric Vehicle - PHEV).<sup>24</sup> Together with Hybrids (HEV), the share was over 40%, outdistancing both petrol and diesel. In the US, electrified vehicle sales rose to 12.6% of new vehicle sales in Q2 of 2022 (from 8.9% in the same period in 2021) with a clear shift toward

BEVs (+66% yoy)<sup>25</sup> and away from Hybrids (-10% yoy). In absolute terms, the beneficiary of that latter trend was Tesla which held a 66% share in US EVs (albeit down 9 percentage points).

In the context of an EV transition, it’s notable that prices of new vehicles have risen sharply, with the Average Transaction Value (ATV) in the US setting a new record over USD 48,000 in July 2022, an 11.9% increase year-on-year.<sup>26</sup> Meanwhile, although BEVs remain higher-priced than their ICE stablemates, average hybrid and alternate fuel vehicles (including BEV) prices were now lower in the US, at \$39,000 (despite Tesla’s ATV increasing by over 11%).<sup>27</sup>

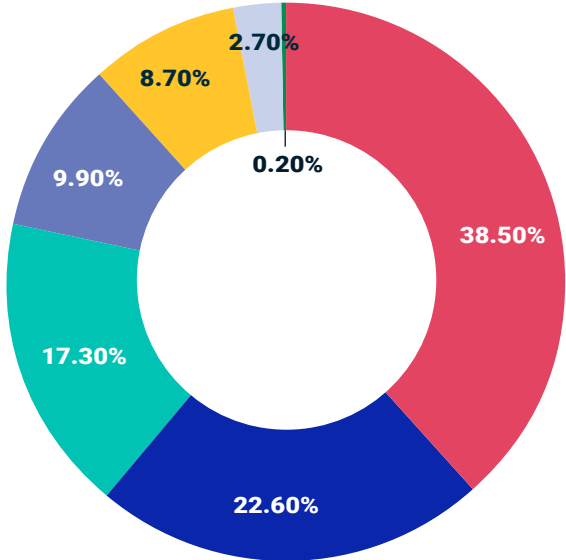
Some 16 million BEV or PHEV cars were on the world’s roads in 2021 – a tripling in just three years.<sup>28</sup> Roughly half of these were in China. The impact from the over 300 available EV models by manufacturers (many Chinese) is now credibly on the horizon. In Europe, the established electric vehicle brands MG (SAIC) and Polestar (Geely via Volvo) will soon be joined – especially in fleets – by NIO, Maxis, Aiways, BYD and others. In the US, where “range anxiety”<sup>29</sup> and pickup trucks still prevail, Rivian sales will be closely watched, especially as Ford has a backlog of nearly three years on its electric F-150 Lightning trucks, with over 200,000 reservations having been placed, according to the company.

Exhibit 1:  
New car fuel types, Europe Q2 2022:  
Aggregate EV sales exceed Petrol Vehicles

Source: European Automobile  
Manufacturers’ Association (ACEA)



This sales growth is leading to investment and acquisition activity in the charging infrastructure space. While business models on how to “sell” electricity for EVs vary widely, as do prices per kWh, the International Energy Agency (IEA) has projected the EV electricity market will grow by at least 20-fold to USD 190 billion by 2030.<sup>30</sup> Hence the transmission of energy into the vehicles – via public and private charging stations – is increasingly garnering investor attention. Bloomberg New Energy



Finance has forecast investments in charging infrastructure to exceed USD 360 billion by 2030.<sup>31</sup> Key listed actors in this space would include Blink Charging, ChargePoint, EVgo, Volta among the pure plays. Among the energy majors, BP has acquired Chargemaster and Amply Power, and entered into partnerships with Volkswagen in Europe and Hertz in the US, and Shell has acquired Cable Energía, Ubitricity, and has partnered with ABB.<sup>32</sup>

18 <https://www.autonews.com/article/20000828/ANA/8280853/1920s>

19 International Energy Agency, Global EV Outlook 2022. Available: <https://iea.blob.core.windows.net/assets/ad8fb04c-4f75-42fc-973a-6e54c8a4449a/GlobalElectricVehicleOutlook2022.pdf>

20 <https://www.coxautoinc.com/market-insights/ev-sales-hit-new-record-in-q2-2022/>

21 [https://en.wikipedia.org/wiki/Diffusion\\_of\\_innovations](https://en.wikipedia.org/wiki/Diffusion_of_innovations)

22 <https://www.consilium.europa.eu/en/press/press-releases/2022/06/29/fit-for-55-council-reaches-general-approaches-relating-to-emissions-reductions-and-removals-and-their-social-impacts/>

23 Governments in parts of Belgium, Italy, and Norway had previously enacted plans to ban the sale of internal-combustion engine vehicles, even prior to the European Commission’s agreement.

24 BEV = Battery Electric Vehicle, PHEV = Plug-in Hybrid Electric Vehicle. Source: ACEA. <https://www.acea.auto/figure/fuel-types-of-new-passenger-cars-in-eu/>

25 <https://www.coxautoinc.com/market-insights/ev-sales-hit-new-record-in-q2-2022/>

26 <https://b2b.kbb.com/news/view/new-vehicle-prices-set-record-in-july-2022/>

27 <https://www.motorbiscuit.com/electric-vehicle-average-transaction-price-hits-66997-up-13-over-2021/>

28 International Energy Agency, Global EV Outlook 2022. Available: <https://iea.blob.core.windows.net/assets/ad8fb04c-4f75-42fc-973a-6e54c8a4449a/GlobalElectricVehicleOutlook2022.pdf>

29 Range anxiety = the perception that an EV may have insufficient charge to complete a journey, or before reaching another charge point

30 <https://www.iea.org/reports/global-ev-outlook-2022/trends-in-charging-infrastructure>

31 <https://www.bloomberg.com/news/articles/2022-08-16/car-charging-investment-soars-driven-by-ev-growth-and-government-funds#xj4y7vzkg>

32 BP Partnership with Hertz in the US: <https://www.reuters.com/business/autos-transportation/hertz-ties-up-with-bp-ev-charger-installations-north-america-2022-09-27/>, BP partnership with Volkswagen in Europe: <https://www.volkswagen-newsroom.com/en/press-releases/volkswagen-group-and-bp-launch-strategic-partnership-to-rapidly-rollout-ev-fast-charging-in-europe-7906>, Shell acquisition in Iberia: <https://www.petrolplaza.com/news/30370>, Shell acquisition of Ubitricity: <https://www.bloomberg.com/news/articles/2021-01-25/shell-buicks-up-ev-charging-network-with-ubitricity-acquisition>, Shell partnership with ABB: <https://electrek.co/2022/04/28/abb-signs-global-agreement-to-provide-its-full-portfolio-of-ev-charging-technology-to-shell/>



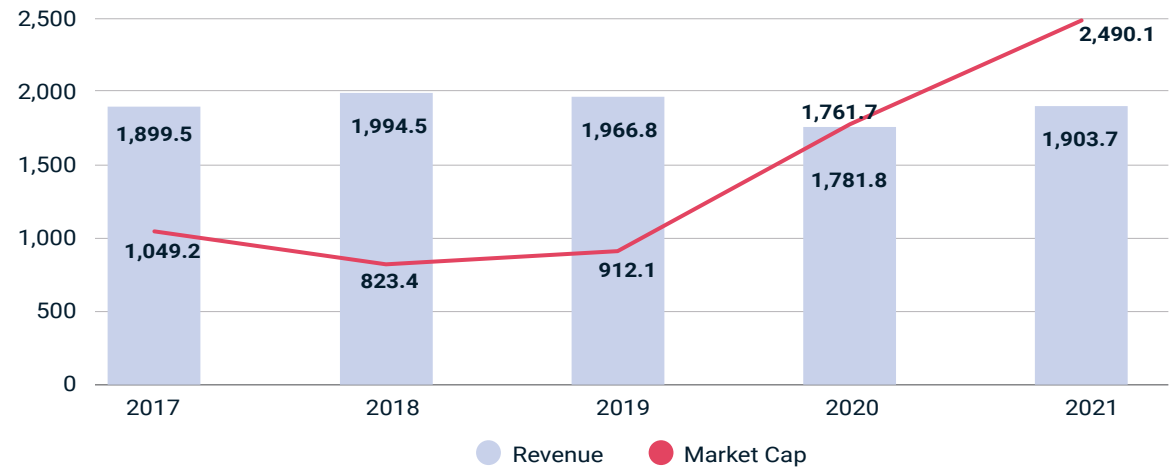
# Sector valuation changes and a new value-chain

In the popular press, Tesla’s market capitalization is often remarked upon: after all, it exceeded the next 10 automakers combined (including VW, Toyota, Daimler, BYD and Ford) as of 21 October 2022. However, since 2021 legacy OEMs have grown EV sales at twice the rate of Tesla and have some advantages with respect to production capacity and experience.<sup>33</sup> Those top ten automakers by revenue also easily top Tesla’s sales (albeit not its 2020-2021 year-on-year sales growth of 87%).<sup>34</sup>

One key question facing investors currently is whether the near-tripling of the total market cap of the automobile industry (the top 20 OEMs and suppliers) since 2017 is sustainable. Total revenues for the group have slightly decreased since 2017 but the total market capitalization of the same companies has increased by over 2.5-fold. The collective market cap now exceeds revenues of the same companies by over USD 0.5 trillion.

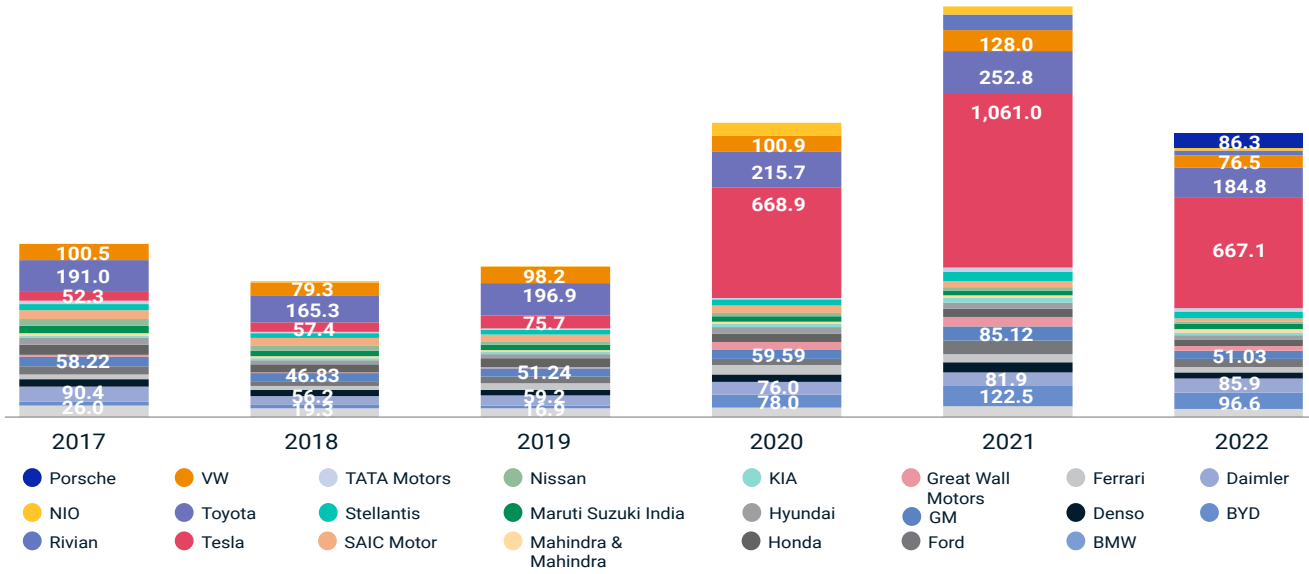
**Exhibit 2:**  
**Aggregated Revenue vs. Aggregated Market Capitalization of Significant Automotive OEMs and Suppliers (in \$ billions)**

Source: Neckermann Strategic Advisors, October 2022



**Exhibit 3:**  
**Automotive Industry Top 20, Market Cap Breakdown 2017 to 2022 (USD billions)**

Source: Neckermann Strategic Advisors, all data at end of year, except for 2022 (21 October 2022)



Obviously, Tesla contributes to this, but Rivian, BYD and Great Wall also play their part in this shift in sector Price/Sales ratio. Has the “automotive” industry been redefined? Tesla and peers are not merely “car” companies. Tesla has its supercharger network, software business, energy division and promises of a robotaxi fleet operation. BYD is similarly diversified: ~10% of revenues from battery production, 27% from mobile handsets and its semi business was only spun-off in early 2022.<sup>35, 36</sup>

A mixture of a desire for national champions and fear of a repeat of 2020/21 supply chain disruption seems to be driving significant upstream investments into battery cells, and even raw materials mining. Benchmark Mineral Intelligence (BMI) has suggested automakers “will need to become miners” in order to secure

the necessary capacity for their transformation to EV.<sup>37</sup> Volkswagen, Daimler, Ford and other OEMs have made major gigafactory investments but China’s clear dominance in battery cell and battery pack development and production is unlikely to be eroded quickly. Europe’s market share is projected by BMI to grow from 6.8% in 2021 to 16.2% in 2031 while North America would more than double from 5.5% to 11.4%. China would then still have over 70% share of cell capacity of what would be a vastly larger pie: from around 1 TWh in 2021 to nearly 8 TWh in 2021.

<sup>33</sup> <https://electrek.co/2022/08/03/morgan-stanley-bev-market-share-tesla/>  
<sup>34</sup> Tesla sold 499,535 vehicles in 2020, sold 935,950 vehicles in 2021.  
<sup>35</sup> Investor Relations, [https://www.bydglobal.com/cn/en/BYD\\_ENInvestor/InvestorAnnals\\_mob.html](https://www.bydglobal.com/cn/en/BYD_ENInvestor/InvestorAnnals_mob.html)  
<sup>36</sup> <https://www.investorinsights.asia/post/introducing-byd-part-2>  
<sup>37</sup> <https://www.benchmarkminerals.com/membership/auto-oems-will-need-to-become-miners-gigafactories-europe-berlin-event-benchmark-launches-giga-usa/>

# Software and the new automotive entrants

Besides the battery value chain, software is also absorbing a much greater share of revenues within the automotive and mobility in the last three years. Volkswagen expects software-enabled industry revenues to approach EV or ICE revenue streams by 2030<sup>38</sup>, and has committed to quadruple its own software R&D from 2022 to 2026. Similarly, Stellantis expects EUR 20 billion in incremental revenues from software by 2030.<sup>39</sup> It has also added greater focus towards carsharing and on-demand mobility with an aim for a 70-fold increase in revenues of its Free2Move mobility unit by 2030.<sup>40</sup> Data-driven strategies have also created the business opportunities targeted by specialist start-up companies like Wejo and Otonomo, although for investors, their SPAC-driven IPOs have fared less well.

Nevertheless, the potential of a USD 3 trillion automotive and mobility industry is too large to be ignored by the world's largest technology companies. Alphabet has been prominently involved in the autonomous driving development race, but Apple's significance as a key actor within the automotive ecosystem today is already unquestionable: no fewer than 98% of new cars

in the US have Apple's CarPlay installed, and over two-thirds of consumers consider this when buying a new car.<sup>41</sup> The brand strength loyalty to the company is such that purchase consideration for an Apple car – which has not even been announced – is strong. In a study of 200,000 new vehicle buyers in the US in August 2022, Apple was in the top 3 just behind Toyota and Honda and beating out Ford and Tesla.<sup>42</sup> In China, Baidu (often known as "China's Google") already builds a car: the RT6.<sup>43</sup> The vehicle isn't meant for end-consumers and doesn't even require a steering wheel. Instead, from next year, it will be used in the company's robotaxi operations, Apollo, which are operating in 10 cities already.<sup>44</sup>

38 [https://www.volkswagenag.com/presence/investorrelation/publications/presentations/2022/06/2022.06.22-23\\_UniCredit%20Automotive%20Credit\\_VW\\_AG\\_VWFS.pdf](https://www.volkswagenag.com/presence/investorrelation/publications/presentations/2022/06/2022.06.22-23_UniCredit%20Automotive%20Credit_VW_AG_VWFS.pdf)

39 <https://www.stellantis.com/en/news/press-releases/2021/december/stellantis-targets-20-billion-in-incremental-annual-revenues-by-2030-driven-by-software-enabled-vehicles>

40 <https://www.stellantis.com/en/news/press-releases/2022/july/free2move-becomes-a-world-leader-in-mobility-with-acquisition-of-share-now>

41 <https://www.theverge.com/2022/6/6/23156741/ios-16-carplay-apple-wwdc-hvac-deeper-integration>

42 <https://www.businesswire.com/news/home/20220831005309/en/Apple-Already-Has-Greatest-Future-Vehicle-Consideration-Among-Automakers-Reports-Strategic-Vision>

43 <https://carnewschina.com/2022/09/02/baidu-rt6/>

44 Baidu Press Release, via <https://www.prnewswire.com/news-releases/baidu-unveils-next-gen-autonomous-vehicle-ready-to-provide-driverless-robotaxi-half-of-taxi-fares-301590644.html>

# Replacing the human driver

Baidu first launched its robotaxi fleet in 2021 and received its license to operate fully driverless fleets in August 2022, winning the first milestone in its race against rivals like Pony.ai, WeRide and AutoX.<sup>45</sup> The company is in a global race with its US rival, Alphabet, whose Waymo division has been operating a pilot program of driverless robotaxis in California since 2018 and in Phoenix, Arizona since August 2022.<sup>46</sup>

Beyond passenger transportation, autonomous freight and logistics operations are forecast to follow robotaxi deployment. Given still cautious rollout of passenger services, autonomous logistics and deliveries may represent a more immediate profitable business opportunity. While not essential

for operational launch, infrastructure investments may also follow: a 430 kilometer-long road for autonomous freight logistics in China will be completed by 2025.<sup>47</sup> On the so-called "last-mile", millions of packages have already been delivered by autonomous pods and robots in cities across the world while Uber has announced a partnership with Nuro to start autonomous food delivery in two cities (Houston and Mountain View).<sup>48</sup>

45 <https://www.ft.com/content/22583bbe-29c2-4348-aac9-29f5d7c75bea>

46 <https://techcrunch.com/2022/08/29/waymo-opens-up-driverless-robotaxi-service-in-downtown-phoenix-to-vetted-passengers/>

47 <http://www.ecns.cn/cns-wire/2022-09-02/detail-ihccsiks1358511.shtml>

48 <https://techcrunch-com.cdn.ampproject.org/c/s/techcrunch.com/2022/09/08/uber-turns-to-autonomous-vehicle-startup-nuro-for-eats-deliveries/amp/>





# Disintermediation in the **Automotive Industry**

The automotive supply chain (and value chain) may be expanding upstream to incorporate batteries, software and energy components, but the downstream is being disintermediated. The relationship between an end-customer, be it a mobility-user, fleet buyer or logistics company, and a mobility supplier no longer requires a dealership or leasing company. Whether it's a car, car-as-a-service, or carless mobility-as-a-service, individual users have been turning to apps while fleet buyers have been going to source. Mercedes-Benz and Rivian partnering to build electric vans in Europe is just one example of this trend.<sup>49</sup> Rivian's key investor, and by far its largest customer, is Amazon, again buying direct from the maker. Similarly, DHL has placed orders for self-driving trucks directly from TuSimple and Navistar.<sup>50</sup>

While BMW, Daimler, and Stellantis have accelerated their shift toward the so-called "agency model" with company-owned dealerships, former dealerships have been left to look quickly for new business models. Even some disruptor dealerships are struggling: Cazoo recently abandoned its vehicle sales model outside the UK.<sup>51, 52</sup> Ultimately, however, the greatest source of disintermediation may not be eliminating elements – such as dealerships – from the downstream automotive value chain, or even the removal of drivers, but the removal of cars from cities.

# Modal shift accelerates

To complement the governmental investments in industries linked to the growth of electrification, many countries have introduced measures that build on some of the learnings from the Covid-19 lockdowns with respect to city life and toxic/carbon emissions. Empty cities, and the resultant reduced air pollution, has led cities (in particular, in Europe) to build more pedestrian walkways and bicycle lanes. In Summer 2022, Germany promoted a modest but popular push toward public transportation by subsidizing public transport at the user-level. Over three months, 52 million monthly train tickets were sold at 9 euros. The public transport union calculated a CO2 savings of 1.8 million tonnes - the equivalent of planting some 90 million trees - and total traffic fell by 3%.<sup>53, 54</sup> Luxembourg, Estonia, and over 100 other cities worldwide have made public transport fully free at the point of use, while other countries are exploring highly-subsidised options: all in the interest of reducing emissions and congestion.<sup>55</sup> California is even considering a USD 1,000 incentive for residents to not own a car.<sup>56</sup>

Completing the picture of potential alternatives to car ownership are bike-sharing and scooter-sharing (potentially growing by 10% and 23% p.a.

through 2030, according to Oliver Wyman)<sup>57</sup>, as well as carsharing, ridepooling, and ridehailing. As a caveat, however, support for each segment is often accompanied by lofty user growth targets and conflicting market share projections. Scooter-sharing operators Helbiz and Bird, along with ridepooling conglomerate SWVL Holdings with their SPAC-enabled public listings have become cautionary tales for equity investors seeking exposure to this theme. But while the operators have struggled to reach profitability, some manufacturers have already reached it: Ninebot-Segway, who produces many of the e-scooters used by shared mobility operators, achieved EBIT margins over 5% in 2021.

49 <https://media.mercedes-benz.com/article/677a158b-be7d-4069-9580-402b4a6231c7>

50 <https://www.reuters.com/business/autos-transportation/dhl-orders-100-self-driving-us-trucks-tusimple-navistar-2021-12-16/>

51 <https://europe.autonews.com/automakers/mercedes-bmw-stellantis-favor-agency-sales-model-others-disagree>

52 <https://www.theguardian.com/business/2022/sep/08/cazoo-to-abandon-its-business-operations-in-europe-and-cut-750-jobs>

53 <https://www.euronews.com/travel/2022/08/30/9-rail-pass-this-is-how-much-germanys-cheap-train-tickets-increased-passenger-numbers>

54 <https://www.railtech.com/all/2022/08/09/germanys-9-euro-ticket-did-not-take-enough-cars-off-the-road/>

55 <https://freepublictransport.info/city/>

56 <https://cities-today.com/californians-could-get-1000-credit-for-not-owning-a-car/>

57 <https://www.oliverwymanforum.com/content/dam/oliver-wyman/ow-forum/mobility/2022/Value%20Pool%20Report.pdf>



# Conclusion

While the short-term semiconductor crisis in the automotive and tech industries has begun to abate, the fundamental challenges for the “old” world of automotive remain. The concept and practice of future mobility appears to be now making real impact at the economywide level. An alignment of consumers, investors and governments toward more climate-conscious transportation options seems likely to accelerate the creation of conditions that will support companies in the space well beyond a short-term horizon.

MSCI would like to thank Lukas Neckermann, Managing Director of Neckermann Strategic Advisors, for useful discussions and insightful analysis of this megatrend which have greatly facilitated the preparation of this document.

Lukas Neckermann is the author of three books: “The Mobility Revolution” (2015), “Corporate Mobility Breakthrough 2020” (2017) and “Smart Cities, Smart Mobility: Transforming the Way We Live and Work” (2018).





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