

Automotive & Assembly Practice

# Where does shared autonomous mobility go next?

Shared autonomous mobility is at a critical point, and five factors may determine how the market evolves and which companies succeed.

*This article is a collaborative effort by Kersten Heineke, Ani Kelkar, Martin Kellner, Andreas Mertens-von Rüden, and Dmitry Tolstinev, representing views from McKinsey's Automotive and Assembly Practice.*



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**Panacea or pipe dream?** Discussions about the viability of shared autonomous mobility can veer in either direction, with some envisioning strong market growth while others see insurmountable obstacles. These discussions have become more intense in 2022, as the autonomous-vehicle (AV) industry attempts to move from testing and validating the technology to launching and commercializing it. Some challenges have arisen, as demonstrated by drops in valuations for pure-play AV players and slowing investments into the space.

The industry also saw some consolidations this year, such as the merger of Velodyne with Ouster, as well as the exits of some notable contenders. That said, commercial successes of key players in China and the United States suggest that the promise of shared autonomous mobility, including robo-taxis and robo-shuttles, could soon be realized for the on-road, inner-city transportation of people.

Five key factors may influence the future market and the success of the companies that operate in it:

- **Tightening capital availability.** With a changing global economic landscape, geopolitical uncertainty, the war in Ukraine, rampant inflation, and severe energy woes in Europe and elsewhere, less funding is available, particularly for disruptive technologies. That places enormous pressure on stakeholders in the shared AV segment to advance their technology and stake a differentiated claim in key mobility markets/cities.
- **Speed of deployment.** There are now only a handful of at-scale commercial services and pilots for shared AV mobility, but we believe companies must act quickly to gain a foothold and achieve commercial scale in key markets based on their operational-design domain capabilities.
- **Strong unit economics.** Successful shared AV players must compete with existing mobility modes on price and rapidly seek

favorable unit economics through operational excellence and innovative technology to gain a competitive edge.

- **Regulatory support.** Stakeholders may benefit from securing collaborative partnerships with regulators and local transit authorities as they seek to fit into existing mobility ecosystems.
- **Strong partnerships.** Companies can help ensure a stable supply base by forming collaborative partnerships. These arrangements are particularly vital today, given the often-strained links of most industry value chains.

## Capital is becoming more selective

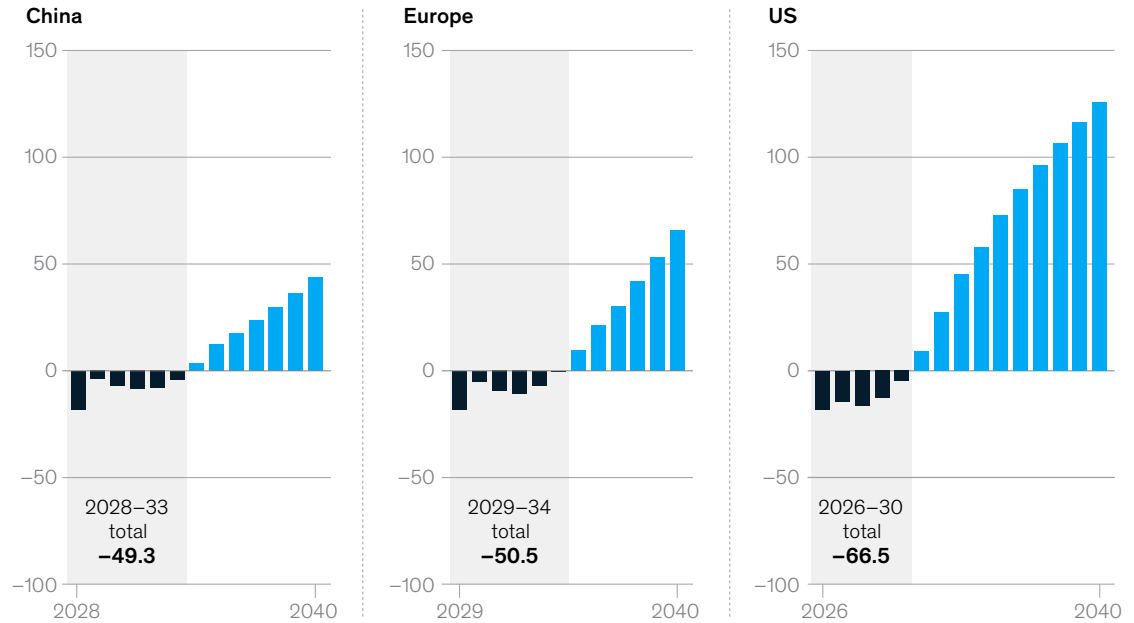
Today's increasingly uncertain economic and political environment has created headwinds for R&D and venture capital investments. As investors have become more cautious, capital has become more selective. Autonomous shared mobility investments in the United States fell from a peak of \$25 billion in prepandemic 2019 to an estimated \$3 billion in 2022. China also saw capital appetite dry up from \$10 billion in 2017 to an estimated \$2 billion in 2022. The continued cooling of investment sentiment in 2022, combined with growing uncertainty about commercialization timelines, will likely make it more difficult for the AV players to raise additional capital. Capital access has not halted, however, as evidenced by select funding rounds of more than \$200 million completed by players, including Wayve, earlier this year.

The more selective capital environment is particularly pertinent for AV players gearing up for commercialization because they must prepare for significant outlays required before the business turns profitable (Exhibit 1). The analysis suggests cumulative burn rates of about \$50 billion to \$67 billion through 2030, with results varying by region. In a capital-constrained environment, commercialization might occur more slowly because only a limited group of profitable markets will emerge.

Exhibit 1

## Significant capital outlays will be necessary before autonomous-vehicle businesses are profitable.

Net cash, projected, \$ billion



Note: The first year for each country reflects the cumulative prelaunch investment.  
Source: McKinsey Center for Future Mobility

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### Quickly capturing new markets is vital

Autonomous shared mobility players that can deploy rapidly in specific cities could gain an advantage that allows them to build competitive “moats.” The competition will likely be most intense in major urban areas, given their critical mass of demand, population density, and access to infrastructure. Top markets worldwide will likely include Beijing, London, New York City, Paris, and Shanghai, based on an analysis of the size of the total AV markets in China, Europe, and the United States in 2035 (Exhibit 2). Underscoring the importance of major urban areas to autonomous mobility, the analysis also shows that the top five

markets in select regions/countries will account for an outsize share of the total shared AV market—about 50 percent in China and the United States and 60 percent in Europe.

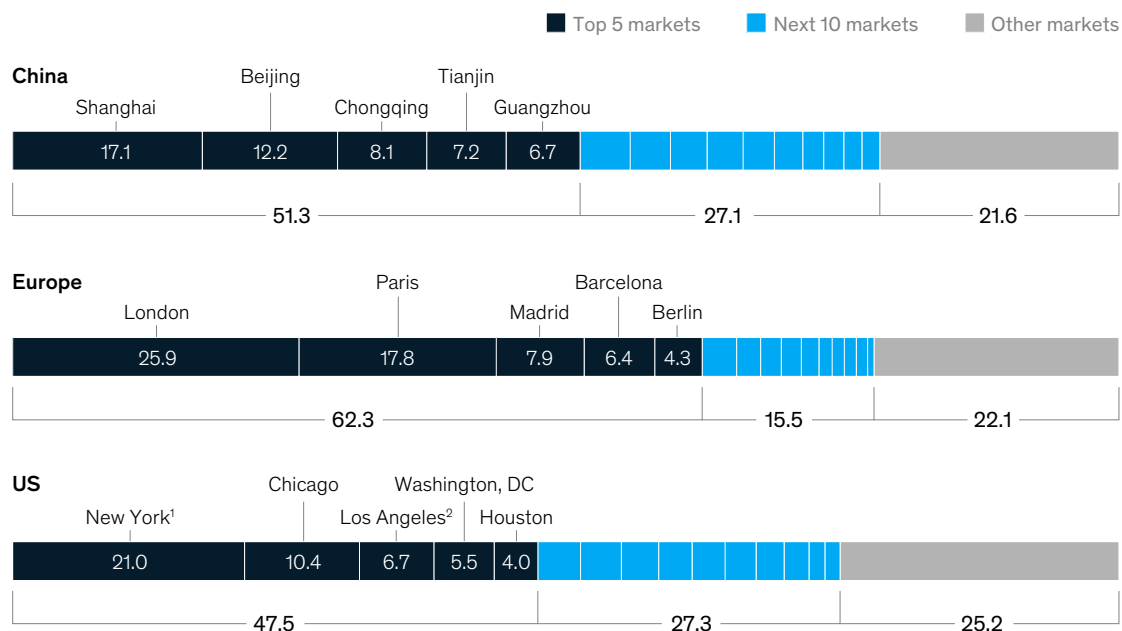
### Strong unit economics provide a competitive buffer

First movers may have an advantage in customer acquisition. As competitive intensity increases, those with more favorable unit economics will be able to offer lower prices, driving consumer adoption. At scale, it is expected that the per-mile cost of autonomous shared mobility will be highly competitive with private vehicles and more cost-

## Exhibit 2

### The top five markets in a region may account for an outside share of the total shared autonomous mobility market.

Portion of total shared autonomous mobility market by region, 2035 projection, %



Note: Figures may not sum to 100%, because of rounding.

<sup>1</sup>New York and Newark, NJ.

<sup>2</sup>Long Beach, Los Angeles, and Santa Ana.

Source: McKinsey Center for Future Mobility

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effective than car-sharing services, car rentals, ride-hailing, or solo taxis (Exhibit 3).

### Support of the regulators will be imperative

In a recent McKinsey survey of AV industry leaders, 60 percent of respondents believed that regulation will be the largest bottleneck to the growth of a thriving market. They were less concerned with demand issues. European experts are most skeptical of regulatory support, compared with their Chinese and US peers. There are some hopeful signs, however, since cities are increasingly disincentivizing use of private

vehicles. AV service providers could partner with cities to ensure sustainable, affordable, and more accessible alternatives.

### Strong partnerships can ensure supply chain stability

Key autonomous-driving technologies are still relatively new, and the industry will continue to change as it moves forward. Based on our survey, three-quarters of industry leaders believe partnerships will be key to success. Integrated development efforts, involving an ecosystem of suppliers and autonomous-driving stack developers, would assist with the development



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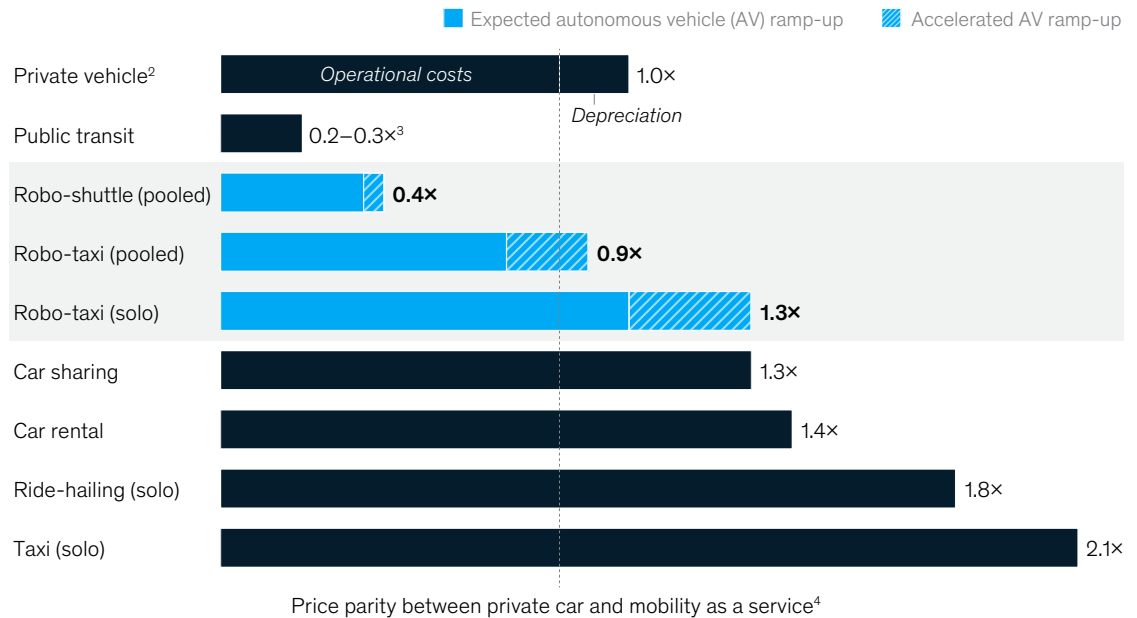
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Exhibit 3

## When shared autonomous mobility achieves scale, it could have better unit economics than private vehicles and other forms of transportation.

Costs per passenger mile traveled (PMT),<sup>1</sup> 2035 projection, indexed



<sup>1</sup>For shared modes, end-customer price per PMT; for private vehicle, manufacturer suggested retail price (MSRP) share per year and operational costs (eg, maintenance, insurance, charging, cleaning, parking, tolling, financing, etc).

<sup>2</sup>Assumed MSRP of \$34,360 and PMT of 197,106 miles.

<sup>3</sup>Varies by trip length.

<sup>4</sup>Depending on city-specific pricing and trip length.

Source: McKinsey Center for Future Mobility

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of several critical technologies and allow them to be produced at scale for widespread deployment. As an example, prediction and decision-making software capabilities, which almost 70 percent

of survey respondents viewed as important to autonomous operations, remain in the initial stages of development.

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