

8. Implications for Autonomous Vehicles

After years of development and testing, several companies are operating truly autonomous vehicles in passenger service – vehicles without a “safety manager” who can intervene in case something goes wrong. Many of the early implementations involve shuttles that run short distances on fixed routes that can be mapped in detail, providing an opportunity for real-world testing and for the general public to experience autonomous technology.³³

Beyond shuttles, Waymo is transporting passengers in the Phoenix area in fully autonomous vehicles that pick-up passengers who request a trip using a smartphone app. General Motors has indicated it plans a similar roll-out in one or more major cities, likely including San Francisco in 2019. Other companies are also likely to enter the mix such as Daimler/Mercedes Benz, Aptiv and others.³⁴

Whether working with Uber or Lyft or setting up their own shared ride services, these companies are expected to use a TNC service model. They are also expected to deploy the service in dense urban centers where constant use will spread the cost of AV technology across many trips.³⁵

A critical and much-discussed issue is whether this path leads to a “heaven” or “hell” outcome, to use the dichotomy coined by Robin Chase. In the “heaven” scenario, people rely on shared autonomous vehicles and expanded public transit; electric vehicles replace gasoline power thus reducing greenhouse gas emissions; and acres of surface parking are replaced with parks, affordable housing and other active land uses. In the “hell” scenario, autonomous vehicles induce sprawl as people are less concerned about long commutes; miles driven and traffic congestion increase in both cities and suburbs; empty cars cruise city streets instead of paying for parking; and public support for bus and rail service erodes, leaving lower-income people stranded.

Whether self-driving vehicles lead to heaven or hell depends in large part on whether people want to use shared autonomous services. A widely-cited travel model for Lisbon, Portugal, for example, found that traffic could increase by approximately 50 percent if travelers favored autonomous “regular taxis” that are not shared. On the other hand, the model showed a 37 percent decline in vehicle-kilometers, and total elimination of congestion, under a shared-taxi scenario. The latter, more heavenly, scenario

envisioned six-seat vehicles providing on-demand, door-to-door shared rides; eight-person and 16-person mini-buses that serve pop-up stops on demand and provide transfer-free rides; and rail and subway services continuing to operate as currently.³⁶

Other travel models have found either large increases in vehicle mileage or large reductions, depending on assumptions about which types of services – shared or private – prove most popular.³⁷

Based on today’s TNC experience, the service model of six-seat, on-demand, door-to-door shared rides does not appear viable. Even in the nation’s densest urban areas, the large majority of Uber and Lyft rides are private rides – one traveling party per trip. Few door-to-door shared rides involve more than two traveling parties. Moreover, many customers who select the shared option are not matched to anyone else; they thus have the benefit of both the lower shared-ride fare and direct door-to-door service.

To try to put more passengers into their vehicles, Uber and Lyft are expending substantial resources promoting walk-to-the-stop services like Uber Express POOL and Lyft Shared Rides. They hope that straightening out the route will attract more passengers, even with walking to a pick-up location. (See discussion in box on page 26.) Whether this will substantially increase average vehicle occupancy remains to be seen. Already using relatively straight-line routing, Via (using mostly minivans) is averaging less than two-person occupancy in both Manhattan’s high-density environment and in its Arlington, Texas pilot.

On the other hand, TNC experience has proven the appeal of private ride TNC service, e.g., the “regular taxis” in the Lisbon model that lead to large increases in traffic congestion. If autonomous technology reduces costs and lowers fares, growth of private ride (autonomous) TNCs would certainly accelerate. The result would be further increases in driving, whether patrons were converting from their own car or from public transit, walking, biking or not making the trip.

In sum, given current TNC experience, it is unlikely that shared, door-to-door services will become a major component of urban transportation systems in the autonomous future.

What seems far more likely is the continued centrality of two time-honored modes: door-to-door private ride taxis, and fixed-route transit. Both modes can be enhanced by technologies now in use by TNCs and microtransit to provide greater transparency and manage operations in real-time, and by autonomous technologies that promise to dramatically improve safety and reduce costs. But these two service models seem likely to be the mainstays of the autonomous future.

There are many benefits to public transit in this scenario. By eliminating labor costs, autonomous fixed-route transit can likely be operated at much higher frequencies and thus with smaller vehicles that make fewer pick-ups and drop-offs, further speeding service. They might be programmed like modern elevators, where customers indicate where they want to go and a smartphone app tells them which vehicle to take (not necessarily the next one) to further optimize efficiency. It may also become far easier to transfer between buses (or minibuses) since the main impediment to transferring is long and uncertain wait times for the next bus. Easier transfers mean that far more origin and destination trip pairs can be accessed readily, further strengthening transit offerings.

Without public policy intervention, however, the first steps into an autonomous future are almost certain to greatly exacerbate big-city traffic congestion. Cheaper, better taxi service may draw patrons from both personal auto and transit, but in either case will add mileage to city streets. Straight-line shared minivans, vans and minibuses will also add to vehicle mileage as people move to these services from high-capacity buses and trains. Add in induced trips and the effects of additional density from less need for parking, and the demand on urban streets intensifies further.

There are many issues beyond the scope of this report involved with planning for the self-driving future. But the issue of traffic, by itself, clearly highlights the central role that public policy must play in planning and implementation of self-driving services.

As with today's mix of personal autos, TNCs, taxis, commercial vehicles and buses, the central goal should be to reduce traffic and emissions and improve safety while ensuring quick and reliable mobility to the entire population. As is the case today, this will mean aligning individual incentives with societal goals to make high-efficiency modes the preferred means of transportation, particularly in dense urban centers. Buses and trains need to be the fastest, most convenient and reliable and most comfortable way to get around town.

The labor savings from AVs can be quite helpful in realizing this future, both in improving safety and increasing frequency and reliability. But unless there are public policy interventions (see discussion on pages 28-31), the likelihood is that the future mirrors today's reality: more automobility, more traffic, less transit, and less equity and environmental sustainability.

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The challenge for policy makers is to steer development of AV services away from this future. The good news is that policy makers need not wait until AVs arrive. Officials can start today with TNCs and personally driven autos. And in fact, it is critical that they do so. Officials must set public policy on the right path to reach goals of mobility, safety, equity and sustainability today, before auto makers, tech companies and TNCs – all of whom will have invested billions of dollars in autonomous technologies and will be competing fiercely for market share – arrive at their doorstep pressing AVs onto city streets.