

Choice and Speculation

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Speculation about how driverless vehicle technology will transform cities appears just about everywhere. As a transportation scholar, I often am asked to join in, but I have a problem with doing so. According to most speculation, driverless technologies will “transform” things. Technology is always the actor, like some unalterable force that sets the terms by which cities and human life will unfold. Individuals, governments, and businesses have choices about how they create, sell, and use technology, however, even if that technology promises to be important. We have choices about how we distribute the benefits and burdens wrought by driverless vehicle technology. Those social, economic, and political choices can influence human life in cities just as much as, if not more than, the technology changes, and those choices will shape the technology as much as the technology will inform and influence choice.

My speculations in this article, therefore, highlight the places where I think critical changes and choices are likely to appear. I shall focus my comments on two fundamental changes the technology enables: (1) the labor savings that can result from replacing human with machine labor, and (2) the separation of vehicle from owner/operator made possible by the technology.

Many people who speculate about the labor savings tend to focus on one transport sector at a time, and by far the most attention has been paid to what machine operation can do for individual drivers by giving them back the time they currently spend operating the vehicle. Also important are the aggregate safety benefits expected from computerized operation in both passenger and freight sectors. The World Health Organization estimates that 1.25 million road fatalities occurred globally in 2013.¹ Although it will take some time before the technology becomes global, we should welcome anything that might reduce that horrendous loss of human life.

Some individuals object that they do not trust computers to be safer drivers than humans, but that strikes me as vastly overestimating human competencies. Robotic medical and surgical practices and precision manufacturing suggest that machines can have faster, more accurate reactions than human beings do, even if those machines are not perfect. Computers, even if they might be hacked, do not struggle with distraction, self-interest, or thrill seeking. Sensors do break, but they do not get bored, nor do they get drunk or upset. Sensors do not get distracted by a bee in the car, nor do they text their friends when driving. A driverless vehicle turning left at an intersection does not have to guess whether the oncoming vehicle, also driverless, is going to try to squeak through the yellow

¹ These data were compiled by the author from the World Health Organization's Global Health Observatory database. http://www.who.int/gho/road_safety/mortality/traffic_deaths_number/en/.

light; it will know whether that vehicle will stop or go; standard programming should handle that problem. I dream of a future in which I do not have to pound on anybody's car hood (an unfortunately frequent part of my day-to-day life now) because he or she is pulling forward to make a right-hand turn and not looking right for pedestrians like me. Security and hacking are concerns, as always, but fear of potential, unrealized harms seems to me a poor reason to reject technologies that could reduce the existing, unacceptable road fatality and injury numbers we have now.

Alleviating drivers of the labor required to drive their own cars has many potential consequences, again depending on personal, business, policy, and planning choices. One major question will be how driverless cars become available to people who currently own their own cars. I tend to envision a subscription service that offers different memberships based on usage, by which individuals can schedule themselves to be picked up and dropped off.² Urban residents could opt for a lower subscription rate than would subscribers in suburban areas, much as now the former use taxis for occasional trips and the latter tend to own their own vehicles. An engineer in Helsinki, Finland, has published a study to eliminate privately owned cars in the city by 2025 (Heikkilä, 2014). A new startup affiliated with the Massachusetts Institute of Technology (MIT) promises to automate taxis in Singapore (Matheson, 2016).

Perhaps some families in suburban areas will own their own autonomous vehicles, but owning a car in a metropolitan region with high land prices, however useful the car may be in providing mobility, is expensive even beyond the cost of the vehicle. If you do not *have* to pay to store a vehicle, why would you? Eliminating the need to store cars frees up space on one's property for other activities. For people living in older, inner-ring urban suburbs, the carriage houses currently housing cars could be, in the proper regulatory environment, converted to auxiliary apartments or home offices. Developers could offer more units in a new building rather than providing car storage. We have known for a long time that there are better uses for urban space than storing cars, and driverless technology might enable us to finally act on that knowledge.

Because of the opportunity costs of parking, the subscription business model makes the most sense to me. With that type of model, building parking would be a poor investment if this kind of model were to come about. Big box retailers could replace their parking lots with something useful. Cities would lose auto malls—which, although lucrative for them, are unsightly—as most individuals would not own their own cars, and the retail sector of the market would probably consolidate to niche vendors.

However the vehicles become available to the public, people freed from the task of driving will have more time to do other things, even if they are in a vehicle while they do so. This possibility has been equal parts welcomed and a source of some angst. If driving is no longer a chore, what advantage does public transit have, if any? Overall vehicle miles of travel might increase because travel would become so effortless. Active travel (walking and biking) could decrease, perhaps leading to less exercise and more health problems.

Again, however, I do not see those outcomes as foregone conclusions. As a mobility service, *public* transit might become a thing of the past, but *mass* transit might still retain a cost advantage.

² A more indepth discussion of the options can be found in Levinson and Krizek (2015).

Individual car subscriptions could wind up being very costly, and for densely populated urban areas the benefits of vehicle scale and size do not diminish. Private shuttle buses, such as those that Google, Inc., provides its employees, could easily become automated, and the individuals they currently serve would not necessarily prefer to be in individual pod cars if, as is likely, those cars came with a substantially higher price than a shared vehicle.

The equity concerns of going to a privatized mass transit system are still in play, but they are not insurmountable if mobility service providers were held to similar expectations for lifeline pricing as utility companies are. If the vehicles use clean energies from renewable feedstocks and have zero emissions, then more vehicle miles of travel overall may not become an environmental problem, particularly if the system is much safer than it is now. If people use the vehicles to make extra trips to hiking trails, gyms, paintball battles, and other forms of physical activity, then any decrease in active travel might be offset by more time and opportunities for healthy behaviors. In addition, biking and walking as modes are inherently enjoyable, and they become more so if driverless technologies change vehicles from the menaces they currently are to more predictable, congenial actors in the urban environment.

If people can do other things, such as work or read, while commuting, they might opt for housing even farther away from their jobs than they do now and thus increase sprawl. Of all the worries, this is the one I have heard most often expressed among my urban planning and design students, a group who sees urban form as an important factor in sustainability. Although mobility technologies have indeed changed urban form, urban form has become an object of concern and regulation only recently. Land use controls, growth regulations, environmental regulations, and a market preference for urban—rather than rural or suburban—life might counter sprawl even vis-a-vis mobility technologies, such as driverless cars, that make mobility even easier than it is now. Mobility does not necessarily lower development densities unless development approvals come along with that mobility, just as taxing or otherwise penalizing relatively high levels of vehicle use does not entirely eliminate suburbanization. Whether the ability to travel farther distances translates into broader metropolitan footprints strikes me as something public policy and planning can address, granted sufficient political will.

I also am not convinced that people will necessarily want to spend a lot of time in a vehicle, even if they are not providing the labor to operate it. For instance, flying from my home in Los Angeles to Washington, D.C., takes about 5 hours. I do no driving; I am usually able to fly first class; I do all sorts of productive and fun things to occupy myself during the trip; I am a sedentary person for whom sitting about is unfortunately not a unusual state of affairs; and yet I am ready to claw my way out of that plane by the end of the trip. The prospect of doing anything like that 5-hour plane trip multiple times a week hardly appeals to me. Surely people will want to limit the time they are going to be in containers. What that limit is—when people can occupy themselves and the vehicles are comfortable—is unknown. How much distance travelers might cover during the time they spend in vehicles is also unknown, if vehicle miles of travel go up and increase congestion.

One of the great promises of driverless vehicles is that centralized, real-time route optimization and car sharing would allow for much better use of existing street capacity, so that more travel would be possible with less congestion and far fewer vehicles. A team from MIT estimates that driverless vehicles could serve existing traffic levels with an 80-percent reduction in the number

of cars, simply because most vehicles in an automated fleet would be always in use rather than parked, empty, and idle, as most privately owned vehicles are (Claudel and Ratti, 2015). If such a vision pans out even partially, cities would likely encounter less political pushback when it comes to “road diets” that take away parking and vehicle lanes and use that space for protected bike lanes, extended sidewalks, and more seating and street amenities. Even if it is possible to expand mobility and eke out more capacity from existing infrastructure with route optimization, better vehicle design, and increased car sharing, congestion is still likely at high-demand times and spaces. Developers and business owners will always want to attract more people to their locations if they possibly can. Lakers games are still likely to congest downtown Los Angeles, and Pride parades are going to create some event-related congestion even with automation. If the process works as envisioned, however, congestion would last less time and create less potential for pedestrian-vehicle conflicts. As long as there are cities and desirable things to do in them, we probably are going to have at least some congestion and, as Brian Taylor of the University of California, Los Angeles, pointed out, congestion is not entirely bad from a social perspective (Taylor, 2002).

In speaking to these possibilities and problems, I should be clear: removing the labor required to operate a personal vehicle strikes me as having marvelous potential for enhancing human life—and possibly social inclusion and social justice, if the technology becomes affordable. For example, families in cars would be able to focus on each other while they travel. In my work on family mobility practices, many parents reported that they cherished their time spent driving their children to and from schools and other activities even though they complained about it, because time in the vehicle is time together, even if driving is a chore (Liu, Murray-Tuite, and Schweitzer, 2012). Automating driving so that families can be together in a vehicle—without parents having to choose between safe driving and paying attention to their children—seems to me to be unambiguously positive. Driverless technologies might tempt some parents to simply pack their kids in a vehicle and send them off alone, but I doubt that it would be common.

Young drivers are, generally speaking, the most inexperienced and demonstrably poor at judging risks (Kahan et al. 2007). Recent years have seen an increase in the number of families delaying the age at which their children obtain their driver’s licenses several years beyond the minimum age (Brown and Handy, 2015). Teenagers in places served by public transit get the chance to explore their cities much more readily than do those who are beholden to parents or friends who can drive. Driverless vehicles would be a way to provide that mobility and enable discovery to occur much more safely for teenagers—and for the rest of us.

The ability to operate a motor vehicle does not depend solely on age. Many people who have visual impairment or other barriers to driving can face social isolation in places not well served by public transit. Some barriers to driving also make using public transit impossible. Paratransit services for people with disabilities are very expensive to provide; however, they are vital to maintaining quality of life and social inclusion for those who depend on them. Being able to patronize the same driverless vehicle services that everybody else does strikes me as both practically and symbolically significant for people who otherwise would be unwilling or unable to drive. Some patrons of paratransit require physical assistance to access the vehicle even if it is automated, so paratransit will not go away entirely, but it would become much less costly to provide over the long term if many current paratransit patrons can move to general mobility services.

A driverless vehicle will not refuse to pick up passengers because of the color of their skin.

Thus, I do see some important possibilities for driverless vehicle technologies to do good for social inclusion and safety. The land use effects of expanded mobility can go any number of ways. One example concerns seniors. Urbanists have spent years conjecturing that the graying of America's population will result in older Americans' abandoning their suburban homes for high-density, mixed-use environments, where they can walk and take transit rather than drive (Nelson, 2013). It is an appealing idea, but it also assumes quite a bit about people's willingness to move and downsize. Past generations of seniors generally have aged in place, for many sensible reasons (Painter and Lee, 2009). By retirement, people may have their homes finished as they like, and leaving a house is difficult once it is finally done the way you like. Even if children have flown the nest, sometimes they fly back, as in the case of millennials coming back to live with parents because young workers face expensive urban housing markets, long job searches, and wage stagnation. Grandparents' homes may be empty much of the year, but the extra bedrooms are handy when holidays roll around. And not all of us, as we age, want to be around busy urban areas.

Driverless vehicle technologies, just like new real estate developments that serve the growing market of seniors, could change the options available to older people weighing the decision whether to leave their single-family neighborhoods. Plenty of us, as we age, feel like our vision and reactions are not what they should be and give up driving. In an automobile-dependent context, that decision to give up the car can change an individual's life considerably. Giving up driving can mean losing independence and a subsequent increase in social isolation, which can prove very damaging to health and quality of life (Cornwell and Waite, 2009). Without a car, a senior trying to stay in a suburban family home can find it harder to get to the doctor, go shopping, and access other activities to stay engaged. Driverless vehicle technologies can offer seniors the ability to stay in their longtime homes much longer if that is what they prefer, although it is not what urban density reform advocates hope they will do for the sake of better urban form.

Too much deterministic thinking about what driverless technologies will do runs into trouble because of those myriad possibilities. Just because past generations of seniors have mostly aged in place does not mean this generation will. American baby boomers, as one group, have been more numerous, affluent, and residentially mobile than were their parents and grandparents, and companies tend to flock to supply the consumer demands of this large demographic group. Many individuals in this generation may desire the urban amenities that new lifestyle developments offer them more than they want to stay in their single-family homes, even with driverless technologies to help them get around, particularly if real estate developers put together innovative developments that cater to many tastes. Driverless vehicles will expand the choices available.

The labor savings from automated driving, however, is not universally good news. For transit agencies, labor represents a major component of the cost of getting a bus or a train out to serve passengers. Transit companies in cities around the world face different cost and revenue structures but, in the United States, few public transit agencies come close to covering their operating costs with fare collections. The cost recovery ratio, which is the ratio of the revenues from fares relative to the total operating costs, provides an indication of how well fare revenues cover expenses. For some U.S. rail operators, cost recovery runs about 66 percent; for other companies that have both

rail and bus, the recovery ratio can get below 30 percent (Schweitzer, forthcoming). Eliminating drivers will be a major operating cost savings. Machines will not demand overtime, and they do not object to split or weekend shifts. Transit patrons may benefit, on the whole; lowering operating costs might be the key that unlocks greater frequencies, and service frequencies are a key component of service quality and, thus, ridership.

Driving a bus or a train, however, currently is a well-paying, often unionized, job that a person with moderate training can do. Driverless technologies promise to be what business school writers have dubbed *disruptive* technology, a term that strikes me as a euphemism. Disruption suggests that a shock occurs, people recover, and then things roll on. That may be true for some people fortunate enough to have relative security in contemporary global job markets. It might also be true in places committed to helping those who are out of work. For others, however, in places where social welfare and insurance programs have been cut, job loss can be both devastating and long term. Students from an economic or business background often tell me that displaced workers “will learn new skills, retool, and all the new economic growth will provide other opportunities.” That thinking makes sense encapsulated within the clean bubble of microeconomic theory, but it does little to help 45-year-olds with two children who have few other skills when they get a pink slip.

Bus and rail drivers also are the human face of transit companies, and the same is true for taxicab drivers. Over my nearly 20 years of riding transit in major metropolitan areas, I have a whole portfolio of stories about how drivers make a difference. Some have been grumps, but most others have been great. More times than I can count, bus drivers have thwarted harassers who wanted to follow women and LGBTQIA patrons, helped a parent with a newborn collapse a recalcitrant stroller, and provided sensible traveler information to tourists and newcomers befuddled by changeable message signs tailored to locals. If I live to see it, I shall miss leaving the airport and chatting with a cabbie, sometimes a longtime native with tips on the most wonderful things, and other times a recent arrival from another interesting part of the world.

Transit and taxi drivers are only one group facing hard times. The news is not much better for drivers in freight shipping, in which businesses tend to run on a low margin, and the labor cost savings provide an incentive to pursue new capital investments in driverless fleets. Long-haul truckers may be particularly vulnerable, as machines do not need to rest and would be exempt from hours-of-service regulations. Many long-haul over-the-road (OTR) truckers hail from rural regions, so job losses in this sector may dry up yet another steady income source for rural residents.

This problem is one area in which conventional microeconomic assumptions about *labor* as an abstract concept differ from what is likely to occur in specific places to specific people. OTR trucking is very hard work that keeps truckers away from their homes, sometimes for weeks at a time. These workers may find new work elsewhere, perhaps in warehousing, as cost savings allow for more production. The warehousing example, however, typifies the potential spatial reorganization of labor that can carry steep personal costs and that too often falls under the radar of neoclassical economics. Currently, OTR truckers can choose where they live. By contrast, warehousing and manufacturing jobs, which also are highly automated, tie workers to a specific location, often on the fringe of a major metropolitan area. A shift in occupation from OTR trucking to other types of manufacturing or distribution employment could be another push to migrate from rural areas

to cities. As somebody who migrated from a rural area to cities for economic reasons, I can attest that such migration involves many more personal and family sacrifices than people who are never subjected to “structural adjustments in the labor force” can truly understand.

About 350,000 owner operators (truck drivers who own their own rigs) currently are registered. Adding up all the workers who identify as “driver” across all professions in the United States alone accounts for 2.8 million people, however, and about two-thirds of them are male.³ As of this writing, an estimated 7.1 million people in the United States are unemployed, so the long-term shakeout could be an increase in unemployment of about 30 percent.⁴ Fleets will not change overnight, certainly, but when those jobs begin to disappear, the consequences loom large for those who have few other skills with which to obtain work. Many will join the ranks of the unemployed, even if new jobs open up in warehousing or in other segments of the manufacturing sector. The belief that new manufacturing or other segments of the freight sector will necessarily absorb unemployed workers might be wishful thinking.

Like all the other changes I have discussed, what happens with job displacement will hinge on the public policy and planning choices made, along with private-sector implementation and individual choices. The labor market effects of driverless vehicles may be far reaching, but they do not have to be devastating to individuals and places if new education, training, and income opportunities can ease the transition.

Choices abound, and although driverless vehicles are not going to be here overnight, planning and public policy should begin to prepare for the changes sooner rather than later. Nearly effortless mobility might indeed prompt people to seek housing farther away from their jobs and thus increase sprawl, but not if municipalities stick with urban growth boundaries and infill plans. If, however, local residents succeed in opposing any and all new development, including new dropoff locations and road diets, driverless vehicles will not do much to help shrink streets, either. Depending on how well transit companies manage the transition, transit service might improve so much that low-wage workers priced out of proximity to job centers could have much better access to jobs. The technology could really help people who cannot drive for various reasons enjoy much more mobility than they had before, but only if they can afford the mobility services offered. Perhaps all of us—pedestrians, cyclists, passengers, and fellow travelers—could be made far safer; it is an outcome well worth investing in. The choices are ours to make.

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³ Compiled by the author from data available as of June 27, 2016, from the U.S. Bureau of Labor Statistics occupation data. <http://www.bls.gov/bls/occupation.htm>.

⁴ Compiled by the author from data available as of June 27, 2016, from the U.S. Bureau of Labor Statistics employment data. <http://www.bls.gov/news.release/empsit.nr0.htm>.

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