

Transitioning to Driverless Cars

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I have little doubt that driverless cars will eventually become the dominant transportation technology in our cities. They will save us time—a lot of it. Residents of American cities spend, on average, nearly 90 minutes traveling daily. Most of that time is spent driving a car or a small truck. The single largest cost of traveling for most of us is the time we waste behind the wheel. Research typically evaluates that cost at one-half an individual's wage, or more in heavy traffic. Driverless cars will reduce traveling costs by enabling us to work, play, or just enjoy the scenery, as our cars will drive themselves. The young, physically or mentally impaired, and elderly people who cannot drive a car will gain a lot more freedom. Some errands will just run themselves with no one inside the car. Most importantly, about 30,000 Americans die on the road every year. Driverless cars will dramatically reduce that number of casualties. They will also create a number of further savings. Most of us currently own cars that sit idle most of the day. Many of us will stop owning a car and instead subscribe to a car-on-demand service. That will make our use of cars much more efficient. We will no longer need an expensive system of traffic lights and signals, as we currently do. We may even be able to reduce the large proportion of prime urban real estate that we devote to the roadway and parking. Yes, we will lose the occasional fun of driving, but that seems a small price to pay given the benefits of driverless cars.

As the cost of traveling falls dramatically with the onset of driverless cars, we will travel more—perhaps a lot more. That will sound scary to some: more pollution, more congestion, and more urban sprawl. Two of those fears are overblown. The current environmental impact of electric cars is disputed, but we are at the beginning of an energy revolution. The days of the old combustion engine are numbered. Whatever the technology that ends up dominating, electric cars or fuel cells, we will stop burning fossil fuels when we travel. More importantly—because their costs are more immediate—the small particulates in the air that cause so many premature deaths will disappear. Our cities have become incredibly cleaner over the past 50 years. That trend will continue even if we significantly increase our traveling.

Turning to congestion, fears of future cities choking because of complete gridlock also are arguably exaggerated. On our main arteries, we typically maintain a time distance of about 1.5 seconds from the vehicle in front of us. Driverless cars will be able to reduce that time distance by a factor of four or more because a computer is able to react immediately, unlike a human driver. This factor implies a very large increase in the capacity of our roads. Even if this capacity increase were not enough, the technology associated with the smooth running of self-driving cars will make it possible for cities to charge travelers more at peak traffic hours and keep the flow going.

More urban sprawl is a real possibility. Commuting to work will become much cheaper because, in many cases, the workday will start as soon as we start our morning journey to work, not when we end it. Historically, cheaper and better urban transportation has been strongly associated with the physical expansion of cities. Although the demand for urban living has arguably risen in the past couple of decades, it is hard to imagine that no one will want to take advantage of easier and more convenient commutes to live in a greener setting.

Whereas it is probably safe to bet that cities will expand, it is hard to know by how much. How many people will be tempted by remote exurbia? To what extent will jobs, retailers, and personal service providers follow them there? Quantitative predictions are all the more difficult, as other changes may occur within cities. Greater freedom from the location of our workplaces may induce residents to sort by preferences in different parts of town even more than they do today. The demand for the nicest parts of our cities will arguably rise even further. On the other hand, if enough residents relocate to remote exurbia, some less desirable neighborhoods may just hollow out. Will American cities suffer from a suburban problem in 2040 just like they suffered from an urban problem in the 1960s and 1970s?

I have no doubt that some places will try to regulate away some of these changes in urban development. Ideally, regulations should curb the negative side effects of new developments. With safer and cleaner cars on hopefully less congested roads, antisprawl policies will lose some—but not all—of their justification. Uncoordinated development remains an issue when developers do not pay the full costs of the infrastructure and public goods associated with new development or when they race for isolation and virgin territories. Regulation will also become more difficult. Some of the old recipes against sprawl will become even less operative than they are now. Greenbelts are already being leapfrogged. Just imagine what may happen when it becomes even easier to do.

Despite some nuances, the future looks mostly bright. The questions are how to get there, and what the transition to a full system of driverless cars will look like. A lot of the discussion so far has focused on insurance and ethical issues. Who is responsible in case of accidents? If the computer has to choose a victim in a collision, who will it be, its own passenger or a passenger in another car? These questions are interesting, but it is hard to imagine they will be major stumbling blocks. New technologies have brought new risks for many years, and ways have been found to spread those risks and define new forms of protection and liability. The ethical question probably makes for interesting debates in an introduction to ethics class at a university, but it is unlikely to have much practical relevance. Driverless cars will be much safer than cars are now, and most of the accidents that can be predicted by the software will be avoided. We may be arguing about a tiny number of casualties; remember that about 30,000 people die on American roads every year.

A good case can be made that the key transitional problems will be instead about the political economy of the regulation of driverless cars and the cohabitation between driverless cars and cars driven by human beings. How those issues get resolved may have major implications.

Driverless cars would have difficulty functioning in existing cities. Cars with drivers are immensely more difficult to predict than are cars without drivers, especially if the latter can communicate with each other. Existing cities are full of quirks and irregularities that make them very hard to map and thus to navigate for a robot. Many of the benefits of driverless cars in terms of smoother rides and

greater capacity at intersections will be realized only when all cars are driverless. We may have cars driven by humans roaming the streets for 20 years or more after the first fully driverless cars have appeared.

For car producers or would-be car producers, two strategies are possible. The first is incremental and consists of making cars gradually less reliant on drivers. That has been the strategy of most incumbent car producers. Some high-end cars already park themselves. Autopilot and emergency braking functions are already installed on the most advanced cars. Arguably, more driverless features will come. The incremental strategy presents one major problem, however. Partially driverless cars may be safer, but the true timesaving benefits of driverless cars will occur only when cars become completely driverless. A car that is 90 percent driverless still requires a driver who is paying attention behind a wheel. With this scenario, the transition is likely to be extremely long, and how the last step about getting rid of the wheel will take place is unclear.

The alternative strategy is rupture and the direct development of cars without a steering wheel; that is the Google, Inc. strategy. It is an appealing but difficult proposition on several counts. It will require maximum software sophistication right from the start. If anything, processes will get easier with more driverless cars. Some technical issues seem extremely tricky to resolve. To take only one example, what happens when it snows? Many complications of our complex cities will become much harder to detect. Also, if successful, this strategy may completely disrupt the car industry. Incumbent car manufacturers that are betting on incremental change, not cars without wheels right from the start, will probably do everything they can to prevent fully driverless cars from being able to operate. The recent proposal to strengthen regulation of driverless cars in California is perhaps just one teaser of the regulatory battles to come.

Realizing that its radical innovation will be a hard sell, Google appears to want to make it even more radical. If Google cars cannot operate in existing cities, perhaps new cities need to be created for them. That probably sounds like a mad idea to many, but history teaches us that it may not be as crazy as it sounds. First, America has a long history of private urban development. Irvine, California, and Dearborn, Michigan (near Detroit), are only two examples of cities that were developed by a private corporation. The sole owner of the Irvine Corporation may be the richest developer in America, but his fortune of \$15 billion pales in comparison with the market capitalization of Alphabet-Google, which nears \$500 billion. Second, history also tells us that making money with transportation is hard. Instead, money often is made with the land. What was possibly the first suburb of America, the Main Line of Philadelphia, Pennsylvania, was developed by rail entrepreneurs who realized that developing suburbs was much more profitable than operating railways.

Large-scale new urban development is thus not impossible. The main challenge will be to find large tracts of land where people want to live. That will be hard. Beyond the possibility of revolutionizing personal transportation, these new developments also would be an opportunity to redefine many things about how we operate cities.

We certainly live in interesting times.

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