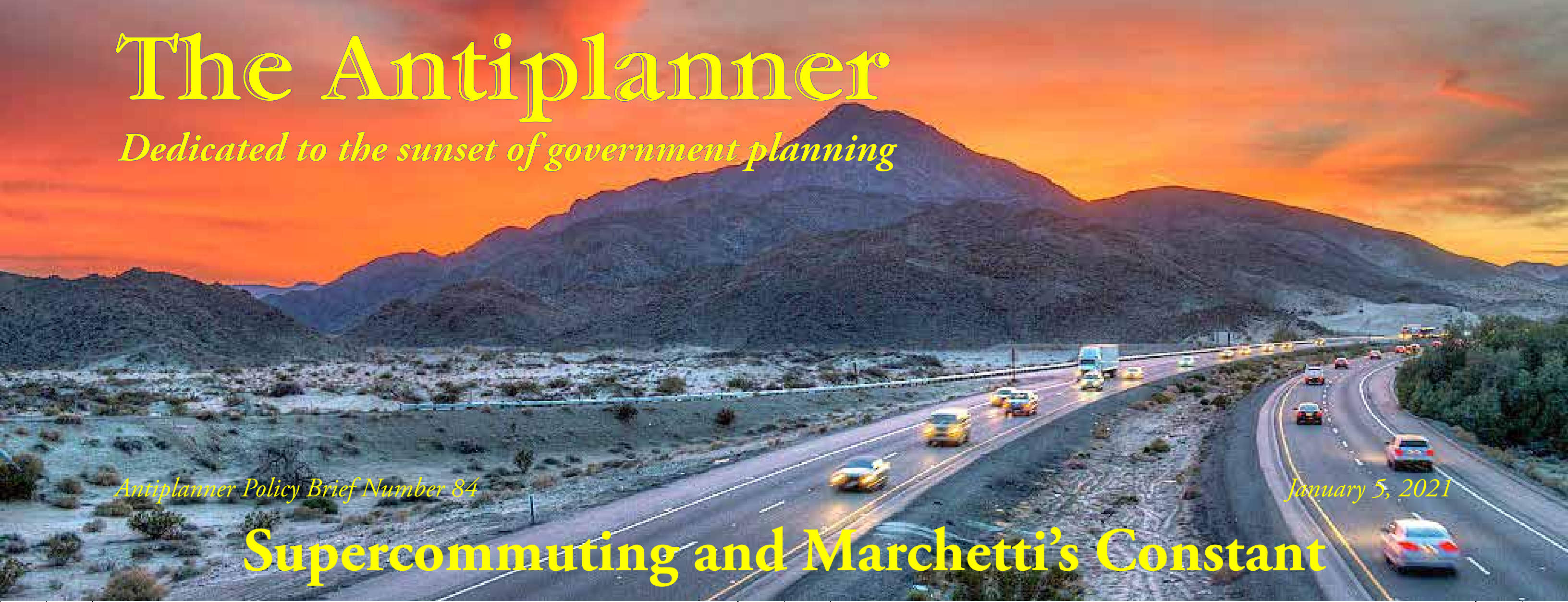

The Antiplanner

Dedicated to the sunset of government planning

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Supercommuting and Marchetti's Constant

The number of supercommuters—people who commute more than 90 minutes each way to and from work—has grown much faster than the total number of workers in the United States. In 2010, 2.4 percent of commuters spent more than 90 minutes *en route*; by 2019, it was 3.1 percent.

These supercommuters are not evenly distributed across the country. Instead, both the number and the rapid growth of supercommuters are concentrated in a few states, mainly California, Hawaii, Massachusetts, New York, and Washington. In particular, the Boston, New York, San Francisco, San Jose, Seattle, and Washington metropolitan areas all have large numbers and higher than average growth of supercommuters. These states and urban areas are all known for using some form of growth management to minimize sprawl.

Increased traffic congestion may be partly responsible for the growth of supercommuting. As a 2019 article in the San Jose *Mercury-News* pointed out, Alameda and Contra Costa counties saw the fastest growth in supercommuters in the San Francisco Bay Area. These are core counties, right across the Bay Bridge from San Francisco, so if more of their residents are spending more time commuting, it could be because traffic has slowed down for everyone.

Most supercommuters, however, live outside of a metropolitan area and commute to jobs in that area. In fact, according to Wikipedia, that's the definition of *super commuter*; the 90-minute threshold is merely a way of estimating the number of supercommuters using readily available census data.

There are several reasons why people might live outside of a metropolitan area and commute a long distance to a job in that area. Perhaps other family members have jobs closer to their home. Perhaps they want to stay in their home for sentimental or aesthetic reasons.

Many, however, especially in areas with strict growth-management policies, become supercommuters in order to find housing that they can afford. People who work in San Francisco or high-tech Bay Area suburbs such as Palo Alto and Sunnyvale, are almost three times more likely to be supercommuters than the national average. As housing becomes less affordable, more people become supercommuters.

According to the 2019 American Community Survey, 4.0 percent or more commuters take more than 90 minutes to get to work in 110 out of the 634 cities for which travel times to work were calculated. Of these 110, 95 are in states or regions that have strong growth-management laws: California, Connecticut, the DC area (including Maryland and northern Virginia), Florida, Hawaii, Massachusetts, New Jersey, New York, and Washington. In these cities, many if not most of the supercommuters are probably seeking affordable housing.

There are a few exceptions to this. Atlanta and some of its suburbs, including Alpharetta and Sandy Springs, have high percentages of supercommuters, as do Midland and Odessa, Texas. Neither Georgia nor Texas have strong growth-management laws and housing is affordable in all of these cities. Chicago also has a high percentage of supercommuters even though housing is fairly affordable. These exceptions show that housing is not the only reason for supercommuters, but the fact that they are exceptions shows that it is an important one.

The American Community Survey has tables that break down commute times by mode, but the longest time identified is 60 or more minutes. Fortunately, there is an almost perfect correlation between people taking 60 or more minutes and people taking 90 or more minutes.

Because transit is slower than driving, transit commuters are about four times more likely to take 60 or more minutes than auto users. However, because transit is such a small share of total commuting, three-and-one-half times as many drivers and carpoolers take 60 or more minutes as transit riders. Transit riders taking 60 or more minutes outnumber auto users who take this amount of time in a few cities, including Baltimore, Boston, New York, Portland, San Francisco, Seattle, and Washington, but not in any metropolitan areas. In short, in most cities and every metropolitan area, the great majority of supercommuters are auto users, not transit riders.

Marchetti's Constant

Marchetti's constant refers to the hypothesis that people tend to devote an average of a little more than an hour a day to travel. It is named after physicist Cesare Marchetti, who described it in a 1994 paper. However, it really should be called Zahavi's constant, because (as Marchetti admitted) the concept of a travel-time budget was first described in detail in 1974 by an Israeli planner named Yacov Zahavi.

Nor was Zahavi the first to think of it. In a 1934 book, Lewis Mumford wrote,

> *Mr. Bertrand Russell has noted that each improvement in locomotion has increased the area over which people are compelled to move: so that a person who would have had to spend half an hour to walk to work a century ago must still spend half an hour to reach his destination, because the contrivance that would have enabled him to save time had he remained in his original situation now—by driving him to a more distant residential area—effectually cancels out the gain.*

Mumford, who loved cities and hated suburbs, clearly viewed this as a negative, indicating that faster locomotion was "compelling" people to travel further, thus "cancelling the gains" from that improvement. It never occurred to him that most people who walked to work at that time were forced to live in crowded tenements while the automobile gave them access to better housing in cleaner, more attractive neighborhoods.

Zahavi went much further than Russell or Mumford, documenting the universality across both nations and time of what is now known as Marchetti's constant. In 1979, the U.S. Department of Transportation released Zahavi's detailed transportation model based on this concept that could be applied to any urban area. He named the model the "Unified Mechanism of Travel" or UMOT, and it was simple enough to run on an Apple II computer.

Zahavi's research and his model were often misunderstood by planners who were happy to dismiss them because they challenged what was then (and remains today) conventional wisdom within the planning profession. For example, some planners assumed that the concept required that everyone in a city or urban area spend exactly one hour a day in travel. In fact, what both Zahavi and Marchetti said was that the average amount of time over the course of a year that people would spend in travel would be about the same for any urban area.

Since Marchetti's paper was published, numerous researchers have tried to prove or disprove whether Zahavi's travel-time budget is correct, and many have concluded that it is. One study, for example, compared data from places as different as Boston and the Ivory Coast. It concluded that "despite substantial spatial and infrastructural differences, the commute time distributions and average values are indeed largely independent of commute distance or country."

Born in 1926 in what is now Israel, Yacov Zahavi started his career working for the Tel Aviv Department of Transportation, then became a consultant working for, among others, the U.S. Department of Transportation, the World Bank, and the Federal Republic of Germany. Sadly, he died of a heart attack at the age of 56 while attending a transportation conference in 1983.

Planners resisted Zahavi's ideas because they directly contradicted what they wanted to believe about the benefits of density, mass transit, and other urban planning ideas. Publication of the 1973 book, *Compact City*, persuaded many urban planners that making urban areas denser and more compact would save energy, reduce congestion, and clean the air. Zahavi's work showed that these plans would fail.

In a 1978 paper, Zahavi specifically questioned two of the cherished beliefs of the densifiers. "The first," he noted, "is the belief that people in compact cities need less motorized travel than in dispersed cities because more destinations are within walking distance." Instead, he showed "that the daily travel distance per car is remarkably similar in all cities, whether small or large, compact or dispersed." This erased many of the supposed benefits of growth management.

"The second example," Zahavi went on to say, "refers to the belief that, by increasing the cost of travel, in money and/or time terms, dispersed cities may be encouraged to coalesce back into compact ones. However, all available observations suggest that instead of residences gravitating back towards the jobs at city center, the opposite process occurs under increased travel costs, namely that jobs disperse outwards, towards the residences." This overturned the supposed benefits of focusing on transit rather than roads for transportation.

These were not messages that planners wanted to hear in 1978, any more than they want to hear them today. As British transportation planner David Metz noted in his 2008 book, *The Limits to Travel*, Zahavi's ideas "didn't fit the prevailing paradigm of transport economists and analysts." Although Metz devoted much of his book to Zahavi's concepts, he himself doesn't seem to have learned Zahavi's lessons as his later books contained the same wishful thinking that spawned *Compact City*. *Travel Fast or Smart?* argued for transportation policies that put accessibility (meaning density) above mobility. *Peak Car* argues that car use is declining (when in fact it is still growing throughout the world) so cities need to invest more in public transit.

Planning Flaws

Even Marchetti, I would argue, didn't understand the full implications of Zahavi's constant. His paper on the subject was full of highly questionable planning assumptions. For example, in 1920 a linguist named George Zipf observed that there was a straight-line relationship (measured on a log-log scale) between the size of cities and their rank order. But Marchetti noted that, by 1990, that relationship no longer applied. Instead of concluding that there was something wrong with Zipf's law, he concluded that the world was "in some way . . . not at equilibrium" and needed some planners to make it conform with Zipf's rather arbitrary rarios.

Marchetti also naively believed that there were transportation revolutions "every Kondratiev cycle," meaning about every 40 to 60 years. Many people today believe that Kontratiev's view of the world (as Wikipedia says) "involves recognizing patterns that may not exist." In this case, it certainly doesn't explain why there were essentially no transportation revolutions over the 1,000 or more years between the invention of the stirrup and the invention of the steam locomotive, or why the automobile and airplane revolutions happened at about the same time and not 40 to 60 years apart.

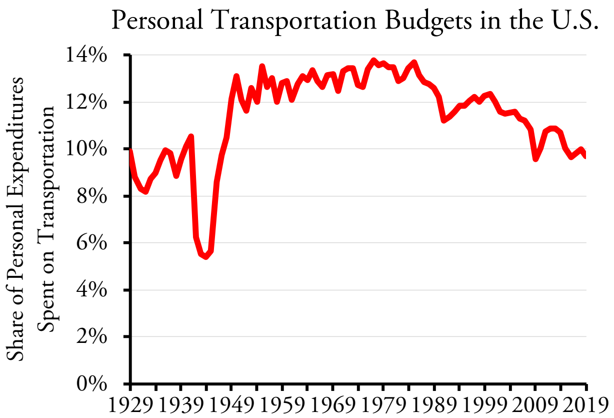
Based on Marchetti's faith that the next revolution was due, he predicted that it would be magnetically levitated trains operating in a partial vacuum in a pipe—in other words, a hyperloop. He thought this would be far less expensive than "the extraordinary cost of air travel." While some today might say he was prescient, he failed to foresee the extraordinary decline in the cost of air travel or the extraordinarily high cost of infrastructure required for his maglev trains in a vacuum tube.

Zipf's law, Kondratiev cycles, and other oversimplifications of reality do not stand up to scrutiny and should not be used as a guide for planning cities. Even Zahavi's constant is not a hard-and-fast rule. As one biography notes, Zahavi understood that it could "change over time, vary from one place to another, and needs to be established by measurement before being used."

Yet there are only 24 hours in a day, and if we spend roughly a third sleeping and a third working that only leaves eight hours for travel, eating, recreation, socializing, and other activities. Unless we can combine together two or more of these activities (such as travel and socializing), the average person simply isn't going to be able to spend much more than an hour a day on travel.

In the same way, Zahavi also found that, from 1950 to 1980, people consistently spent about one-eighth of their total personal expenditures on travel. Table 2.5.5 of the Bureau of Economic Analysis' National Income and Product Accounts shows that this has declined since then to about 10 percent, probably because, for most Americans, time is a greater constraint on travel than money.

The limited number of hours in a day places an upper bound on the amount of time people spent traveling. Zahavi realized that there is also a lower bound on the time spent traveling. Too many planners, including Mumford and Metz, assume that travel is simply a cost with no benefits. Yet University of California, Davis, civil engineer Patricia Mohktarian (now at Georgia Tech), pointed out that people often travel for the fun of it and and don't just see travel as a means to an end. As far as commuting goes, her surveys found, most people want to keep some distance between their homes and their work.



When Zahavi was writing, Americans spent about an eighth of their budgets on travel. It has since declined to about a tenth, probably because time is a greater constraint than money for most Americans. If time becomes less of a constraint, then people will be willing to spend a little more money on travel. Source: Bureau of Economic Analysis, National Income & Product Accounts, table 2.5.5.

Since people were willing to budget about 10 percent of their dollars to travel, Zahavi realized that, if travel got less expensive, they wouldn't spend less money; they would travel more. Similarly, since people were willing to spend about 5 percent of their time on travel, if travel got faster, they wouldn't spend less time; they would travel more miles. "Auto drivers appear to trade travel time savings for more trips," he concluded.

These insights meant that many urban plans were doomed to failure. When government tries to make travel less necessary through compact development, people find other reasons to travel. When government tries to make travel more expensive by increasing congestion, people find ways to evade that expense.

The growth in the number of supercommuters in the San Francisco Bay Area and other growth-managed regions doesn't necessarily contradict this. Commuting is only one reason for travel, and supercommuters may compensate by spending less time on other travel goals.

Implications

People are going to travel, on average, an hour or so per person per day. In the United States, more than 80 percent of that travel, and well over 90 percent of urban travel, will be by automobile. Density, mixed-use developments, and similar schemes are not going to reduce that travel, which means they are not going to save energy, reduce greenhouse gas emissions, or meet other goals. Attempts to quash driving may even make it harder to achieve those goals as automobiles use more energy and emit more pollution in congested traffic.

It appears likely that the pandemic will permanently increase the amount of telecommuting. Zahavi's data suggests that telecommuters won't spend less time traveling; they will just travel for other reasons. People who start working at home full-time will travel more than they previously did for social, recreational, and other purposes. One of the drawbacks of working at home is that you begin to feel more like you are living at work, and travel will become the way of getting away from work.

People who start working at home several days a week will realize they can live further away from their workplaces and spend the same amount of time commuting per week. For example, if someone who previously spent 25 minutes each way getting to and from work five days a week begins commuting to work only one day a week, they can move two hours away from their work and still spend less total time commuting than before. This will increase the demand for single-family homes and reduce the demand for multifamily housing.

One result of the pandemic is that the morning rush hour has disappeared while the afternoon peak period is longer because people are more likely to use that time to drive for non-work travel. This will have implications for future infrastructure needs: total congestion may decline, but growing urban areas will still need to build new roads to meet travel demand.

Driverless cars are likely to break Zahavi's law, leading to an increase in the amount of time people spend traveling to more than an hour a day. Passengers in driverless cars will be able to do anything that they could otherwise do in their own livingrooms: watch television, read a book, socialize, play games, work on their laptops, talk on the phone. Instead of spending an hour a day traveling and several hours in their homes, people will spend more time traveling and less at home. The main limit to travel will be monetary, but since much of the cost of car ownership is fixed, many people could dramatically increase the travel they do without exceeding the 10 to 12 percent limit of their incomes that they are willing to dedicate to travel.

Travel is a part of our lives. Instead of treating it like a cost, we should embrace it, using it to enhance our economic and social well beings. To the extent that government is involved in transportation, instead of trying to limit travel it should do what it can to enable it and to extend the benefits of travel to as many people as possible.

For those who want to analyze commute times, the Antiplanner has posted eight different spreadsheets from the 2010 and 2019 American Community Surveys showing commute times for the nation and by states, counties, cities, and metropolitan areas (2019 data are not yet available for urban areas). Four show the total number of people by travel times to work (with calculations showing the percent who take 60 to 89 minutes and over 90 minutes) and the other four show travel times by mode of travel (with calculations showing the percent who take more than 60 minutes by each mode). Two of each group of four are based on the locations of people's homes and two are based on the locations of workplaces.

Table	Year	Geography	Group	File Size
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B08603	2010	Work	Total	2.4MB
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B08134	2010	Home	by Mode	408KB
B08134	2019	Home	by Mode	429KB
B08534	2010	Work	by Mode	14.3MB
B08534	2019	Work	by Mode	13.2MB

Randal O'Toole, the Antiplanner, is a transportation and land-use policy analyst and author of The Best-Laid Plans: How Government Planning Harms Your Quality of Life, Your Pocketbook, and Your Future. *Masthead photo of supercommuters in the Soda Mountains near Barstow is by Carol M. Highsmith.*