

NOW THAT TRAVEL CAN BE VIRTUAL, WILL CONGESTION VIRTUALLY DISAPPEAR?

by

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The ability of telecommunications to substitute for travel occurred to people almost as soon as the invention of the telephone. Letters and articles appearing in the *London Spectator* and *The Times* in 1879 speculated on the potential of the telephone to replace face-to-face meetings. The science fiction of H. G. Wells ("When the Sleeper Wakes", 1899) and E. M. Forster ("The Machine Stops", 1909) imagined videoconferencing (or the "kineto-tele-photograph", as Wells put it) accomplishing the same purpose. An article in the January 17, 1914 *Scientific American* supplement foresaw telecommunications leading to a reduction in transit congestion.

A new round of speculation was launched in the 1960s and 70s, as computing technology began to permeate society, and was given added salience by the energy crises of that period. Today, fax machines and personal computers are ubiquitous, videoconferencing is commonplace (in some organizations) -- and congestion is worse than ever (by some measures). What's going on? Are we still at the beginning of that ultimately massive wave of travel substitution, or are we expecting something which is not likely to happen? My own beliefs, based on 15 years of research starting from a much more optimistic position, now incline toward the latter view. I'll explain why.

Most recent empirical research in this area has focused on the potential of telecommuting to reduce travel. Telecommuting can be defined as the use of telecommunications to reduce, shift, or eliminate the commute to a conventional workplace. It is of primary interest because commuting is the biggest single trip purpose, and hence the commute trip makes the largest contribution to congestion. Further, it is likely that a higher proportion of commute trips would be substitutable than would be the case for other trip purposes such as shopping or education. Thus, telecommuting is perhaps our best hope for mitigating congestion by replacing trips with telecommunications. Conversely, if it appears that telecommuting won't do much good, then it's unlikely that the collective reductions (if any) due to teleshopping, teleconferencing, distance learning, telemedicine, telebanking, and other "tele-stuff" will amount to much either.

The impact of telecommuting on travel has two components: the level of adoption of telecommuting, and the travel impacts of a given level of telecommuting. Let's consider each in turn.

The Adoption of Telecommuting

From the perspective of transportation impacts, what counts is not how many people say they're (sometimes) telecommuting, but how many are actually doing so on any given day. That number is quite literally the product of several factors: how many *can* do it? Of those, how many *want* to? Of those, how many *do*, and of those, *how often* and *for how long* do they do it?

A variety of constraints prevent people from telecommuting: lack of awareness, job unsuitability, technology unavailability or cost, management unwillingness. While all of these constraints will be mitigated over time, the question is how fast and how far. Further, not everyone who can telecommute wants to, and not everyone who says they want to actually does. Constraints of a psycho-social nature include a desire for the professional and/or social interaction of the regular office, concern about career advancement, lack of self-discipline, concerns about domestic tensions or distractions, and viewing the commute trip as a desired buffer between home and work realms. Even the absence of any constraints is not a sufficient condition for telecommuting to occur: there must also be some kind of positive motivation to do so. Potential motivations may be work-related, family-related, or personal, as well as travel-related.

Finally, while full-time telecommuting suits some, most people prefer doing it part-time, one or two days a week on average. This means that the transportation impacts on any given day will be based on a number of telecommuters falling somewhere between 20% and 40% of the total. Furthermore, several studies have noted that people tend not to telecommute forever: one half are likely to drop out within a year or so of starting. This means that even as new telecommuters are being added, they are partially just compensating for dropouts, with the result that the total number of telecommuters is not growing as fast as its proponents expected.

How do all these factors multiply out? The best available data suggest that no more than 2% of the workforce is telecommuting on any given day -- and that's in a state like California, in which a number of conditions (traffic problems, technology use, history of involvement) are more favorable to telecommuting than elsewhere. I also believe that the *net* growth rate is relatively slow.

The Travel Impacts of Telecommuting

Empirical studies conducted in the Netherlands, Australia, and the United States are unanimous in finding a net reduction in vehicle distances traveled by telecommuters. This may seem like an obvious result until you realize that there are several ways in which telecommuting might actually *increase* vehicle travel: by stimulating new trips due to "cabin fever" from working at home all day, or by shifting telecommuters from ridesharing and transit to driving alone on the days that they do commute.

The challenge arises in trying to understand what these short-term, small-scale results mean at a systemwide level, especially in the future. Several observations can be made. First, the reported reductions in travel only apply to telecommuters, on days that they telecommute, for as long as they telecommute. I estimate that today, telecommuting by 2% of the workforce or less translates to a reduction of 1-2% in total personal vehicle travel -- an amount swamped out by background growth in overall distance traveled.

Second, the per-occasion reductions in travel are likely to decline over time. This is because the early adopters of telecommuting studied so far tend to live twice as far from work as the average. As (or if) telecommuting moves into the mainstream, the commute distances saved on each occasion will fall closer to the average. The generation of new trips is also likely to increase: the early adopters of telecommuting may not have been motivated to make new trips because they were already traveling so far on the days they still had to commute.

Finally, the long-term impacts of telecommuting, especially on residential location, are not well understood. If the ability to telecommute motivates some people to move even farther from work than they live now, the average commute distance for telecommuters may not decrease as much as suggested above, but the outcome could hardly be considered a travel savings, either! Another phenomenon which is well-recognized but not well-understood is that of "latent demand". If telecommuting ever *did* reduce congestion to a noticeable extent, the argument goes, the excess capacity on the highways would quickly be filled by new travel and shifts in existing travel (e.g. from transit to driving alone).

Historically, transportation and communications have appeared to be complements -- increasing together -- rather than substitutes. There is no reason to expect that relationship to change. When appropriately applied, telecommuting offers substantial benefits to employers, employees, and society at large. Sizable reductions in travel will not be among those benefits, but telecommuting is still worth promoting for other reasons.

FURTHER READING

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BIOGRAPHICAL INFORMATION

Patricia L. Mokhtarian joined UC Davis in 1990, after nine years in regional planning and consulting in Southern California. She has been studying the impacts of telecommunications technology on travel behavior, land use, and the environment since 1982, and has written or co-authored more than

40 journal articles and reports in that area. Recent studies focus on modeling the individual decision to telecommute, implementing and evaluating the institutional viability and transportation effectiveness of telecommuting centers, modeling the air quality impacts of telecommuting, and analyzing the travel and communications impacts of advanced telecommunications capabilities to residences and small businesses. Other research interests include travel behavior and travel demand forecasting in general, and transportation / land use interactions. She obtained her Ph.D. in Operations Research from Northwestern University in 1981.

Prof. Mokhtarian is the founding chair of both the national Telecommuting Advisory Council and the Committee on Telecommunications and Travel Behavior of the Transportation Research Board. She recently served on the National Academy of Sciences Committee to Study Technology and Telecommuting, and advised the Congressional Office of Technology Assessment regarding the impact of wireless communications on mobility. She has given numerous presentations on telecommuting and telecommunications planning in classroom and professional society meeting settings throughout the United States and abroad. She has presented or prepared testimony on telecommunications planning issues to the State Legislatures of California and Washington; to the California Energy Commission; and to the Los Angeles City Council. She has been interviewed on telecommuting by a variety of broadcast and print media, and has served as a consultant to several public- and private-sector clients.