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**What Have We Learned
from a Recent Survey of Teleworkers?
Evaluating the 2002 SCAG Survey**

Elena Safirova and Margaret Walls

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What Have We Learned from a Recent Survey of Teleworkers? Evaluating the 2002 SCAG Survey

Elena Safirova and Margaret Walls

Abstract

In this paper, we analyze the 2002 Telework Survey conducted by the Southern California Association of Governments (SCAG). Being a relatively recent and large dataset, the survey captures the current state of telecommuting, covering the entire region with a population of 17 million residents, and is not biased by telecommuting policies of particular employees. The survey also distinguishes telecommuters from home-based business owners and therefore provides a more accurate account of the number of telecommuters.

Our analysis focuses on the role of demographic characteristics, such as age, gender, ethnicity, household income, presence of children in the household and household size affect the workers' propensity to telecommute. We also look into the distribution of telecommuters across industries, occupations, and firms of various sizes and observe how professional experience and job tenure impact telecommuting probability. Finally, we analyze telecommuting frequency and how it effects the reduction of vehicle miles traveled (VMT) and gather perceptions of employees who currently don't work at home.

In general, the survey confirms the major factors contributing to telecommuting, such as higher educational level and more professional experience, as well as a longer tenure with the company and one's supervisor. At the same time, the analysis shows that telecommuters are more likely to be male and have smaller households than nontelecommuters. This is surprising given the findings from previous studies. The survey also shows that as many as one-third of telecommuters are working on-site and telecommuting on the same day and therefore eroding VMT reduction from telecommuting. Finally, the data on workers who currently don't telecommute reveal a disconnect between workers desire and ability to telecommute, since less-educated workers are more enthusiastic about working at home than more educated ones while the latter are more likely to be able to telecommute.

This discussion paper is one in a series of four RFF papers on telecommuting published in December 2004. In discussion paper 04-42, Walls and Nelson analyze data from five pilot cities enrolled in the "ecommutate" program. In 04-44, Walls and Safirova review the empirical literature on telecommuting with a focus on trip reduction impacts. Finally, in 04-45, Nelson presents an assessment of institutional and regulatory barriers to using telecommuting in a mobile source emissions trading program. The studies by RFF are part of a larger report on the ecommute program completed by the Global Environment and Technology Foundation (GETF) for the U.S. Environmental Protection Agency. More information about the overall project can be found on the ecommute/GETF website: <http://www.ecommute.net/program/>.

Key Words: telecommuting, SCAG survey

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What Have We Learned from a Recent Survey of Teleworkers? Evaluating the 2002 SCAG Survey

Elena Safirova and Margaret Walls*

I. Introduction

In this paper, we analyze the 2002 Telework Survey conducted by the Southern California Association of Governments (SCAG). The SCAG region has population of 17 million people and encompasses six counties: Los Angeles, Orange, San Bernardino, Riverside, Ventura, and Imperial. The 2002 Telework Survey was carried out as a part of a national demonstration project established to examine the potential for emissions credit trading based on teleworking. The SCAG region is one of five large metropolitan regions in the country participating in this “ecommuter” program, which was created by the National Telecommuting and Air Quality Act passed by Congress in 1999.

The major purpose of the 2002 Telework Survey was to establish a benchmark of the telecommuting population in the region, but the survey can be used for other purposes. In particular, it can provide information about telecommuters’ profiles—their demographic characteristics, the kind of work they do and the industries they work in, their commuting and telecommuting patterns, and more importantly, whether those features are significantly different from those of nontelecommuters. Such information can be valuable to transportation and other agencies that promote telecommuting as a trip reduction strategy to decrease vehicle miles traveled (VMT) and improve air quality in urban areas.

The 2002 survey is of interest for several reasons. First, unlike many smaller datasets, it encompasses the entire L.A. metropolitan region and therefore is not biased by telecommuting policies of particular employers. Second, it is relatively recent and therefore captures the current

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state of telecommuting. Because of rapid developments in the telecommunication technologies, the quantitative data pertaining to telecommuting become obsolete very fast; many 10-year-old studies can no longer be relied upon, since they describe telecommuting before Internet use became widespread. Third, this particular survey made an attempt to distinguish telecommuters and home-based business owners to see how they differ in travel patterns as well as in demographics. If this distinction is not made, responses from self-employed business owners who work at home could lead researchers to erroneous conclusions about the extent of telecommuting.

In this paper, we summarize only a part of the information provided by the survey. In particular, we pay less attention to home-based business owners than we do to telecommuters, we do not describe telecommuting patterns by day of week, and we do not deal with the issues of who provides the equipment that enables telecommuting. What we do look at is how gender, age, presence of children in the household, household income, ethnicity, and household size affect the propensity to telecommute. We also look at the distribution of telecommuters across industries, occupations, and firm size. In addition, we analyze how job tenure and professional experience affect the likelihood of telecommuting. Finally, we assess telecommuting frequency and VMT effects.

II. Survey Methodology

The survey was conducted by a consulting company, NuStats.¹ The data collection has been administered by DataSource, a NuStats affiliate that functions as its data collection arm. The questionnaire was developed by a team consisting of SCAG representatives, NuStats staff, and an experienced telecommuting consultant, Joanne Pratt from Joanne H. Pratt Associates.

The sample design for the survey was based on a list-assisted Random Digit Dialing technology. One eligible adult per household was interviewed based on the “most recent birthday” rule. Of the 30,000 telephone calls made, approximately 5,000 completed interviews with adults in the six-county area were obtained. The survey was conducted during June, July, and August 2002.

¹ The survey description can be found in the final report of the 2002 Telework Study (NuStats 2003).

Among the total surveyed population (5,028 respondents), 55 percent identified themselves as workers. The remaining 45 percent are classified as unemployed or outside the labor force (students, homemakers, retired, etc.) and also include individuals who declined to state their work status. The employed respondents fall in one of three categories:

- teleworkers (employed individuals who work from home some of the time instead of traveling to work²);
- home-based business owners (individuals who operate a home business); or
- employee nonteleworkers (employed individuals who never work from home instead of traveling to work).

Most demographic information was collected from all three groups of employed respondents and therefore can be meaningfully compared.³ Intergroup comparisons beyond basic demographic information—that is, of work-related and commute-related information—are more problematic.

III. Lessons from the Survey Analysis

The questionnaire covered several areas of interest to researchers and practitioners. First, from this survey we can see the differences in demographics between telecommuters and the nontelecommuting population. The survey provides data on age, gender, ethnicity, and educational levels of both telecommuters and traditional commuters, as well as their household income and household structure. Such data are of universal interest for researchers, practitioners, and policymakers as a general indicator of the telecommuting potential of various demographic strata.

The second important set of questions concerns what makes a job suitable or unsuitable for telecommuting. In the early stages of telecommuting research, it was optimistically assumed that any information work was potential telework. Based on such assumptions, the number of telecommuters was projected to exceed 50% by the year 2000.⁴ The SCAG data indicate,

² In this survey, individuals were counted as teleworkers if they had telecommuted at least once in the past two months.

³ We base our analysis on unweighted data from the survey.

⁴ See Nilles et al. (1976).

however, that telecommuting is still very far from a 50% level. From surveys like this we have a chance to learn what aspects of employment limit telecommuting. Although this survey looks at telecommuting only through the eyes of employees, not their managers and employers, its perspective is important, since in most cases the ultimate decision to telecommute rests with the employees and is based on their perceptions.

Third, the survey provides information on telecommuting frequency and commuting patterns of teleworkers. The importance of these data lies in the ability to assess the effective difference between telecommuting “penetration” and telecommuting occasions. The telecommuting penetration rate is the percentage of workers who occasionally telecommute, but only *actual* telecommuting occasions can lead to the transportation- and emissions-related benefits of telecommuting. The survey also contains questions related to modal choice of telecommuters, length of their commute, and the choice of particular telecommuting patterns. Unfortunately, the survey format does not include any questions on nonwork travel behavior of teleworkers compared with either their own travel patterns prior to start of telework or other traditional office workers, and thus we cannot assess whether their noncommuting travel behavior is affected by telework. Obtaining an accurate answer to this question is important for evaluating the transportation-related benefits of telework. Yet very little research exists on the subject.

Last but not least, the survey results offer information on nontelecommuting employees’ attitudes toward telework and their perception of its potential benefits. Unfortunately, the survey did not solicit a similar account of telecommuting benefits by current telecommuters, and therefore no meaningful comparison of perceptions of the two groups can be made.

In addition to analyzing qualitative and quantitative results of the survey, we will point out the features of the survey that prevent us from obtaining conclusive results or lead to potential ambiguities. Those comments both temper the lessons from this survey and provide guidance on future survey improvements.

IV. Demographic Profiles of Telecommuters, Home Business Owners, and Regular Employees

In this section we want to look at basic demographic characteristics of telecommuters, home business owners, and regular office workers. First, we will present the demographic characteristics in the aggregate, and then we will see whether data disaggregation can provide additional insights about demographic characteristics of the three population groups.

In the aggregate, a typical telecommuter appears to be an older male, white, more educated, with high household income and small household size. This picture comes as a striking contrast to many lifestyle-oriented advantages of telecommuting. Proponents of telecommuting often argue that one of its most important advantages is a reduction of stress related to juggling work and family obligations. Based on this assumption, one would expect to find a telecommuting population dominated by mothers with young children—people who should find the flexibility of work at home attractive. Yet the data show that the majority of telecommuters are men. From Table 1, one can see that compared with the other two groups, teleworkers have the highest percentage of males, and a higher percentage of home-based business owners tend to be females. Among those who do not telework, the gender split among employees is most even.

**Table 1. Gender by Teleworking Status:
Percentage of Workers in Each Category⁵**

<i>Gender</i>	<i>Teleworking status</i>			<i>Total</i>
	<i>Teleworker</i>	<i>Home-based</i>	<i>Nonteleworker</i>	
Male	56.87	45.64	48.58	49.31
Female	43.13	54.36	51.42	50.69
Total	100.00	100.00	100.00	100.00

Table 2 shows that nonteleworkers are the youngest of the three categories of workers: nearly 52% of nonteleworkers are under 40, compared with 40% of teleworkers and 30% of home-based workers. Nearly 23% of telecommuters are in their 50s, compared with only 16.7% overall and less than 16% of nonteleworkers.

⁵ Note: Some tables do not total 100 because of rounding.

**Table 2. Age by Teleworking Status:
Percentage of Workers in Each Category**

<i>Age</i>	<i>Teleworking status</i>			<i>Total</i>
	<i>Teleworker</i>	<i>Home-based</i>	<i>Nonteleworker</i>	
18–19	0.96	2.05	2.44	2.24
20s	10.22	9.23	21.26	19.16
30s	29.07	18.97	28.21	27.66
40s	30.35	42.05	27.68	28.99
50s	22.68	19.49	15.68	16.74
>60	6.39	7.18	3.94	4.45
Declined	0.32	1.03	0.80	0.76
Total	100.00	100.00	100.00	100.00

Among the three groups, telecommuters have the highest level of education. Compared with survey respondents overall, the category includes a smaller percentage of persons with educational attainment below the four-year college level and a higher share of the people who have four or more years of higher education. The nonteleworkers category, in turn, has a higher percentage of persons with relatively low educational attainment (community college or less) and a lower percentage of persons with at least a college degree than the survey respondents overall. Home-based business owners, on the other hand, have more education than regular employees but less than telecommuters. Also, perhaps because such enterprises are highly differentiated, home-business owners include a small segment of persons who did not finish high school.

**Table 3. Education by Teleworking Status:
Percentage of Workers in Each Category**

<i>Educational level</i>	<i>Teleworking status</i>			<i>Total</i>
	<i>Teleworker</i>	<i>Home-based</i>	<i>Nonteleworker</i>	
11th grade or less	0.64	3.08	2.83	2.60
High school	7.35	10.77	21.17	18.87
Community college	23.64	35.90	34.37	33.26
4-year college	36.74	27.69	26.75	27.95
Some graduate school	7.35	4.10	3.37	3.87
Graduate degree	22.36	16.41	10.58	12.33
Declined	1.92	2.05	0.93	1.12
Total	100.00	100.00	100.00	100.00

Teleworkers have the highest household incomes among the three groups. As Table 4 shows, for all household income brackets under \$65,000, telecommuters are less well represented than either of the other two groups, but they have higher percentages for all the brackets above \$65,000. And vice versa: nonteleworking employees have higher percentages than the entire surveyed population for all income brackets under \$80,000 and lower percentages for incomes above that level. Finally, home-based business owners seem to occupy two enclaves of the household income distribution—the low middle and the very top. This is related to the heterogeneity of this group, which includes people with widely varying skill levels.

**Table 4. Income by Teleworking Status:
Percentage of Workers in Each Category**

<i>Combined annual 2001 household income</i>	<i>Teleworking status</i>			<i>Total</i>
	<i>Teleworker</i>	<i>Home-based</i>	<i>Nonteleworker</i>	
Less than \$20,000	2.88	4.62	9.43	8.35
\$20,000–\$34,999	5.43	16.92	16.83	15.55
\$35,000–\$49,999	10.54	18.46	18.78	17.82
\$50,000–\$64,999	9.58	13.33	12.93	12.58
\$65,000–\$79,999	11.82	7.69	10.50	10.45
\$80,000–\$99,999	14.70	7.18	7.66	8.42
\$100,000 or more	31.31	21.54	11.78	14.68
Declined	13.74	10.26	12.09	12.15
Total	100.00	100.00	100.00	100.00

Table 5 presents results by ethnicity. Teleworkers and home-based business owners have very similar profiles, with about 70% in both groups being white (non-Hispanic). Although telecommuting is slightly more popular among African Americans, and there are somewhat more Asian Americans running home-based businesses, overall ethnic profiles of telecommuters and home-based business owners are very similar. At the same time, minority groups have a higher representation among nonteleworking employees.

**Table 5. Ethnicity by Teleworking Status:
Percentage of Workers in Each Category**

<i>Ethnic group</i>	<i>Teleworking status</i>			<i>Total</i>
	<i>Teleworker</i>	<i>Home-based</i>	<i>Nonteleworker</i>	
White, not Hispanic	69.97	71.28	50.80	54.41
African American	6.07	5.64	8.81	8.28
Hispanic	11.18	11.28	25.69	23.03
Asian	4.47	6.67	7.35	6.98
American Indian	0.64	0.00	0.75	0.69
Other	3.83	3.59	3.76	3.76
Declined	3.83	1.54	2.83	2.86
Total	100.00	100.00	100.00	100.00

The survey asked about the presence of children under 6 years old in the household. Table 6 shows that nearly 77% of teleworkers (versus 73% of nonteleworkers) have no children under 6. However, respondents with one child under 6 years old make up nearly 17% of all

nonteleworkers and only 13% of teleworkers. For two or more children under 6, the percentages are closer but still higher for nonteleworkers than for teleworkers.

Table 6. Household Presence of Children under 6 by Teleworking Status: Percentage of Workers in Each Category

<i>Children under 6</i>	<i>Teleworking status</i>			<i>Total</i>
	<i>Teleworker</i>	<i>Home-based</i>	<i>Nonteleworker</i>	
None	76.68	74.36	73.21	73.68
One	13.10	15.38	16.65	16.16
Two or more	8.30	9.75	9.08	9.05
Declined	1.92	0.51	1.06	1.12
Total	100.00	100.00	100.00	100.00

Table 7 indicates that teleworkers are associated with a smaller household size than both the general population and the other two groups of workers. The percentage of teleworkers with no other adults in the household is almost 4 percentage points higher than in the surveyed population overall. For the households with one other adult, the teleworkers still surpass all other groups, although to a lesser extent. Conversely, teleworkers account for a smaller share of households with more than two other adults than any other group. On-site employees are at the other end of the spectrum: nonteleworkers are the smallest percentage of households with no more than one other adult, and the largest percentage with two or more.

Table 7. Number of Other Adults in the Household by Teleworking Status: Percentage of Workers in Each Category

<i>Other adults in the household</i>	<i>Teleworking status</i>			<i>Total</i>
	<i>Teleworker</i>	<i>Home-based</i>	<i>Nonteleworker</i>	
None	25.24	23.59	20.64	21.37
One	53.04	52.31	51.82	51.99
Two	13.42	15.38	17.89	17.21
Three or more	7.03	7.18	8.59	8.31
Declined	1.28	1.54	1.06	1.12
Total	100.00	100.00	100.00	100.00

The data in the survey also lead to several more observations. First, even in this relatively small sample, one can find a stratification of telecommuters. For example, as we stated above, males constitute the majority (approximately 56%) of telecommuters. But if we look at the

segment with educational attainment below a four-year college degree, about 55.5% of telecommuters are female. In fact, the gap between females and males in this low-education segment is more pronounced for telecommuters than it is for on-site workers (51.5%). Interestingly, this trend is sharply reversed for the workers with four-year college degrees. Among telecommuters, about 58% of such workers are males, while in the population of on-site workers, only 48.3% are males. Finally, for workers with graduate degrees, males constitute 71.4% of telecommuters but only slightly more than half (51.5%) of nonteleworkers. In other words, among telecommuters, the education-related gender gap is more pronounced than among regular on-site workers. The higher the educational attainment of a female worker, the less likely she is to telecommute compared with her male counterparts with comparable education.

From this particular survey we cannot determine what factors have contributed to that educational gender gap among telecommuters. However, this is an interesting observation that should be noticed by researchers and practitioners. It is likely, for example, that if telecommuting is less popular among women with advanced degrees, efforts to encourage them to telecommute will not be productive.

Interestingly enough, home-based business owners don't show a similar trend. Although women form a majority (54%) of this group overall, after we control for educational attainment, gender shares do not fluctuate as drastically. Among home-business owners without college degrees, a higher percentage is female—almost 61%—and the majority of home-business owners who have college degrees (53%) are male. However, among home-business owners with graduate degrees, the majority (53%) are again women. Therefore, among home-business owners the educational gender gap appears to be less evident than among regular office workers. This leads us to speculate that perhaps the telecommuting gender gap might be related to different gender perceptions about traditional workplace, career advancement, workplace visibility, and corporate culture among men and women, since those factors would not affect home-based business owners. Alternatively, this gap could be related to differences in men's and women's occupations or particular job responsibilities that we did not control for here. A more careful analysis is needed to investigate this question further.

Another way to look at this question is to see whether we can find a similar trend by analyzing the distribution of household incomes instead of education. Although household income is usually correlated with the individual's educational attainment, it can also include the income of a spouse or other member of the household as well as income not related to wage earnings. Therefore, one would expect that the gender gap described above would be less correlated to income than to education and perhaps not even noticeable at all.

However, a comparison of household incomes of female and male telecommuters with those of office workers shows that the gap exists here as well. For example, 61.5% of telecommuters with household incomes above \$65,000 are males, while among office workers with household incomes in the same range, males make up about 57%. For the lower levels of household income, the picture is more complicated, with no evident gender gap for telecommuters, but for on-site workers the gender gap is present and visible for the entire income spectrum.

Another interesting question is whether the family structure of employees who end up telecommuting is correlated with other demographic characteristic of workers. Is the supposition that mothers of young children have a strong propensity to telecommute supported by the data? As it turns out, there are practically no gender differences among telecommuters with respect to the presence of children under six in the household. For both men and women, about 77% of telecommuters have no small children, and about 20% have one or two small children. The same is true for nontelecommuters, with the only difference being that among this group, the number of employees with no small children is three percentage points lower, at 74%, and the number of workers with one or two children correspondingly increases to about 23%.

The presence of small children in the households of telecommuters varies more by income level than by gender. For example, among teleworkers with household incomes under \$35,000, 8% have one child under six, and 11.5% have two. Among teleworkers with incomes between \$35,000 and \$65,000, the percentages are 12% and 7.5%. Finally, among telecommuters with household incomes in the \$65,000–\$80,000 range, shares of workers with one and two young children are 15% and 6.5%, respectively. Since some of this could be explained by correlation between age and income, more rigorous analysis is needed to determine whether age variation accounts for the difference. However, it should be noted that for on-site employees alone, the effect of household income on the number of small children in the household is much less prominent than for telecommuters, with variation within one percentage point. Alternatively, it could be related to particular work duties of telecommuters.

One should note that for a given income bracket, gender differences may become more prominent. For example, among male telecommuters with household incomes between \$65,000 and \$80,000, almost 86% have no small children, approximately 11% have one child under six, and only 3.5% have two small children. For female telecommuters in the same income range, only 67% have no small children, with 22% and 11% having one and two small children, respectively.

Overall, a cursory look at the demographic data provided here suggests that on aggregate, telecommuters are likely to be older and have fewer children than regular office workers. Although telecommuters are more likely to be men, gender and education level differently affect the propensity to telecommute on the part of different segments of workers.

We will observe more closely how telecommuting is related to workplace characteristics in the next section.

V. Telecommuters' Workplaces: Employees' Outlook

In this section we look briefly at what types of employers are more likely to allow their workers to telecommute and what workplace- and occupation-related factors can encourage more teleworking. An important caveat is that in this survey, the descriptions of work and workplaces are presented from the viewpoint of employees, and therefore the picture may be incomplete or one-sided.

From Table 8, one can see which industries have the highest percentage of telecommuters. The industries where the percentage of teleworkers is higher than in the general surveyed population include finance, insurance, and real estate (FIRE), consulting, and aerospace. A somewhat disturbing fact that undermines the value of this information is that as many as 28% of teleworkers, and 25% of all workers, were unable to associate their employers with one of the industries on the list and declared that they work for "Other" industry. These large percentages may compromise the conclusions from this table, and future teleworking surveys should adopt a more traditional industry classification, such as the one used in the U.S. Census Bureau's decennial census.

Since telecommuting is apparently more closely related to a worker's occupation than to the industry in which he works, not much can be learned from comparisons of demographic structure of telecommuters here. In most cases, telecommuters follow the same trends that exist for all workers. For example, construction is a traditionally male industry (employing 9% of males in the surveyed population versus only 1% of females), and the same is true for telecommuters in this field (5% male versus 1.5% female). Similarly, health care work has traditionally employed many women (17.5% of females in the surveyed population versus 5% of males), and the same is true for telecommuting health care workers (16% female versus 3% male).

**Table 8. Distribution of Telecommuters by Industry:
Percentage of Workers in Each Category**

<i>Industry</i>	<i>Teleworking status</i>			<i>Total</i>
	<i>Teleworker</i>	<i>Home-based</i>	<i>Nonteleworker</i>	
Construction	3.51	6.15	5.05	4.95
Manufacturing	6.39	2.56	8.72	8.03
Transportation	2.88	3.08	5.05	4.66
Wholesale trade	2.24	2.05	1.99	2.02
Retail trade	4.15	7.69	7.93	7.48
FIRE	12.46	6.15	7.13	7.66
Arts and entertainment	6.71	6.67	3.32	3.94
Health care	8.95	6.15	12.27	11.46
Educational services	7.67	2.56	13.42	12.00
Consulting	9.58	13.33	3.59	4.95
Government	4.15	3.08	5.40	5.10
Aerospace	2.56	0.00	1.64	1.63
Military	0.00	0.51	0.80	0.69
Other	28.12	39.49	23.12	24.84
Declined	0.64	0.51	0.58	0.58
Total	100.00	100.00	100.00	100.00

Table 9 lays out the distribution of the three groups of workers by occupation. Workers in sales are much more likely than the surveyed population in general to telecommute. Other occupations favorable for telecommuting include consulting, other professional services, and to a lesser extent, senior management. Occupations in which the percentage of the total sample surveyed is approximately equal to the percentage of the sample of teleworkers surveyed include finance and accounting, architecture and engineering, public relations, and education.

It should be noted that the survey did not do a good job of identifying occupation: 19.8% of telecommuters and about the same percentage of workers overall were not able to associate themselves with an occupation on the list. Nevertheless, even these imperfect data provide more detail on how the population of telecommuters can be broken out by demographic and occupational lines. For example, among workers without college degrees, an occupation in sales seems to be more popular than in the surveyed population, with 22% of telecommuters working in sales, compared with 11% of the overall surveyed population. For sales employees with college degrees, the numbers are similar to those for the entire surveyed population, without stratification by level of education, with 21% of telecommuters working in sales and only 9.5% of all workers employed in sales. The percentage of employees who have graduate degrees and

work in sales drops drastically: approximately 4% of these telecommuters work in sales, compared with 2% of all workers with graduate degrees.

**Table 9. Distribution of Telecommuters by Occupation:
Percentage of Workers in Each Category**

<i>Occupation</i>	<i>Teleworking status</i>			<i>Total</i>
	<i>Teleworker</i>	<i>Home-based</i>	<i>Nonteleworker</i>	
Construction	2.24	4.62	4.34	4.12
Maintenance and repair	1.28	2.56	3.81	3.43
Production and crafts	1.60	3.08	3.72	3.43
Secretarial and administrative support	4.15	4.62	9.21	8.32
Finance and accounting	6.07	6.15	5.58	5.68
Architecture and engineering	2.88	1.03	2.08	2.10
Information services	0.64	1.54	1.28	1.23
Public relations	1.92	2.05	1.68	1.74
Education and training	8.63	2.56	10.72	9.91
Health services	5.75	4.10	9.03	8.32
Social services	1.28	0.51	1.73	1.59
Consulting	6.71	7.18	1.28	2.31
Other professional	7.03	6.67	3.50	4.12
Sales	17.25	11.79	8.06	9.36
Customer services	2.24	2.56	4.52	4.12
Public safety	1.28	1.03	1.59	1.52
Military	0.00	0.00	0.80	0.65
Senior management	4.79	3.59	2.83	3.11
Middle management	3.19	1.54	4.16	3.87
Other	19.81	32.31	18.38	19.52
Declined	1.28	.51	1.68	1.55
Total	100.00	100.00	100.00	100.00

As we learned in the preceding section, telecommuting is more widespread among workers with higher levels of education. Therefore, it is interesting to see how the occupational profile changes with educational level. If telecommuters with graduate degrees tend not to work in sales, which occupations do they have? The two major telecommuting occupations for holders of graduate degrees are consulting and “other professional,” which account for 14% and 10% of telecommuters, respectively, compared with 6% and 6.5% for the entire population, respectively. Interestingly enough, among telecommuters with graduate degrees, 20% are educators, which makes education the most popular occupation for telecommuters with graduate degrees. However, among the entire population of graduate degree holders, the share of educators is even higher (24%).

Table 10 presents the survey data on the distribution of on-site workers and telecommuters by employer size. As is evident from the table, telecommuters are more likely to work either for very small employers (with fewer than 25 workers) or for very large companies (with more than 500 employees).

Interestingly, this polarization in the size of telecommuters' workplaces is more pronounced for women than for men. In the surveyed population, men are more likely than women to work for small employers: only 11.2% of men versus 12.1% of women work for very large companies, but men and women work for very small employers in nearly equal proportions, 34.8% to 33%. For telecommuters, on the other hand, 46.77% of women versus 42.7% of men work for employers with fewer than 25 workers, and 18.5% of women versus 10.1% of men are employed by companies with more than 500 employees.

**Table 10. Distribution of Employees by Employer Size:
Percentage of Workers in Each Category**

<i>Firm size (employees)</i>	<i>Teleworker</i>	<i>Nonteleworker</i>	<i>Total</i>
Fewer than 25	44.41	32.37	33.84
25–99	21.41	28.74	27.85
100–249	10.54	15.99	15.32
250–499	5.11	7.17	6.92
500 or more	13.74	11.38	11.67
Declined	4.79	4.34	4.40
Total	100.00	100.00	100.00

Below we briefly describe our findings on how a worker's experience in her occupation, length of tenure with her employer, and duration of work under the same supervisor affect telecommuting.

We have already observed that telecommuters are on average older than on-site workers (although they are younger than home-based workers). Therefore, it comes as no surprise that teleworkers have more experience in their present occupation, as shown in Table 11. Telecommuters have an average of 9.48 years of experience in their present occupation, compared with 8.60 years for the entire surveyed population. At the same time, home-based business owners as a group are least experienced in their field, with 6.88 years of experience.

**Table 11. Role of Professional Experience in Telecommuting:
Percentage of Workers in Each Category**

<i>Years of experience</i>	<i>Teleworking status</i>			<i>Total</i>
	<i>Teleworker</i>	<i>Home-based</i>	<i>Nonteleworker</i>	
2 or fewer	19.81	27.69	24.27	24.20
3–5	17.57	25.64	20.87	20.93
6–10	21.72	20.61	19.75	20.02
11–15	12.47	11.79	12.18	12.09
16–20	27.80	11.28	21.30	21.33
Declined	0.64	3.08	8.57	1.63
Total	100.00	100.00	100.00	100.00

Telecommuters are also more likely to have a longer tenure with a particular employer. On average, teleworkers have been with their present employer for 6.88 years (compared with 6.59 years for all surveyed employees and 6.54 years for on-site employees). However, this difference between telecommuters and other employees seems to be less significant than years of experience in the profession in general.

**Table 12. Role of Job Tenure in Telecommuting:
Percentage of Workers in Each Category**

<i>Years of work for the same employer</i>	<i>Teleworker</i>	<i>Nonteleworker</i>	<i>Total</i>
2 or fewer	33.55	34.85	34.70
3–5	23.00	22.98	22.99
6–10	18.53	17.36	17.50
11–15	7.04	10.08	9.45
16–20	17.26	13.37	13.85
Declined	0.64	1.64	1.52
Total	100.00	100.00	100.00

Finally, from Table 13, one can observe how telecommuters and nontelecommuters compare in the number of years working for the same supervisor. Telecommuters, on average, have worked 4.74 years under the same supervisor, compared with only 3.55 years for on-site workers and 3.69 years for survey respondents overall.

**Table 13. Role of Management Stability in Telecommuting:
Percentage of Workers in Each Category**

<i>Years of work for the same supervisor</i>	<i>Teleworker</i>	<i>Nonteleworker</i>	<i>Total</i>
2 or fewer	46.32	53.50	52.63
3–5	19.16	22.98	22.52
6–10	15.02	11.87	12.25
11–15	3.84	3.85	3.85
16–20	7.79	3.37	3.92
Declined	7.67	4.43	4.82
Total	100.00	100.00	100.00

VI. Telecommuting Frequency and Commute Distance

The potential of telecommuting for reducing vehicle miles traveled and emissions depends on the telecommuting penetration rate—that is, the percentage of workers who at least sometimes work at home instead of traveling to the office—and on the average commute distance. However, the product of the number of telecommuters and miles to work gives us only an upper bound on the VMT that can be eliminated through telecommuting. Several factors can reduce the actual decrease in VMT and emissions to a fraction of this upper estimate.

First, many telecommuters work at home only once a month or even less, and when VMT is multiplied by telecommuting frequency, the actual reduction is low. Second, when telecommuters travel to work, they may use public transportation instead of personal vehicles. Therefore, when they telecommute, they eliminate a trip but do not reduce VMT or emissions. This effect is not very large but still needs to be taken into account. Third, some telecommuters report that sometimes they work at home a part of the day and in the office the rest of the day. Although this counts as telecommuting, it has no effect on VMT or emissions.⁶

Finally, there are more subtle effects that are impossible to analyze with the SCAG data but can nevertheless be significant and should not be disregarded. One is the effect of

⁶ They may reduce roadway congestion, however, if they do not travel during peak periods.

telecommuting on nonwork trips. In the literature,⁷ there have been estimates of this effect for both home-based and telecenter-based telecommuters; some of the evidence suggests that telecommuters may make more nonwork trips and thus partly offset any VMT reduction. Since this survey does not include a detailed trip diary of telecommuters, we cannot address this issue in detail. A second question is whether telecommuters as a group have longer commute distances than other workers. This is relevant for estimating VMT reduction from full-time telecommuters who never travel to work: their commute distances are unknown and are approximated based on commute distances of other workers. Moreover, is it appropriate to use commute distances of current telecommuters to evaluate the potential VMT savings from telecommuting growth?

Unfortunately, in this survey only telecommuters and home-based business owners were asked about their commute distances and other aspects of commuting behavior, and therefore we cannot compare the commuting behavior of commuters and telecommuters.

From Table 14, found on the next page, we can compute the average commute distance of teleworkers: 21.9 miles each way. The distances exhibit some variation by demographic factors, however. For example, commuting distances of women are shorter (only 18.21 miles each way, versus 24.6 miles for men). Persons with higher levels of education commute longer distances to their jobs than people with less education: telecommuters without college degrees commute an average of 19.85 miles, and telecommuters with graduate degrees commute an average of 24.02 miles.

The difference probably arises because better-educated workers have more specialized skills that are harder to match with a given employer's needs. We expect the same general tendencies to exist among on-site office workers. Moreover, given that telecommuters are generally more educated than on-site office workers, it is likely that teleworkers as a group have longer commute distances than other employees, but we cannot verify this or compare minor variations because information on commute patterns of full-time on-site workers is not available.

⁷ See Henderson et al. (1996).

Table 14. Distribution of Telecommuters by Commute Distance

<i>Commute distance, one way (miles)</i>	<i>Teleworkers (percentage)</i>
Work at home full-time	8.63
1–5	16.28
6–10	12.15
11–15	16.02
16–20	7.03
21–30	16.55
31–40	6.40
41–50	6.72
51–75	3.20
76–100	1.28
More than 100	3.51
Declined	8.31
Total	100.00

Table 15 summarizes the answers to the question, “Where did you work each day last week, even if your behavior was different from usual?” Home, telework center, and employer’s satellite center were included as possible telework locations. The results show that the frequency of teleworking for the people who consider themselves telecommuters is just under 49.23%. That means that the average teleworker works at home or in a center almost 2.5 days a week.

Table 15. Distribution of Telecommuters by Telecommuting Frequency

<i>Frequency of working at different locations last week</i>	<i>Teleworkers (percentage)</i>
Home	48.78
Employer’s site	36.72
Telework center	0.13
Satellite center	0.32
Client site	5.24
Out of town	2.50
Didn’t work	5.56
In a car, bus, or train	0.13
Other	0.82
Total	100.00

The statistics in Table 16 help clarify the reason for that seemingly high telecommuting frequency. As many as 27.8% of teleworkers report that they both telecommute and go to their regular worksite on the same day. Such behavior significantly reduces VMT savings arising from telecommuting. Moreover, the information presented in Table 16 raises the question of what extent are survey respondents adhering to the standard definition of telecommuting as “work at home or in a satellite office instead of commuting to regular workplace”? Some of the off-site work may actually represent “catch-up” work that should not be included in telecommuting.

**Table 16. Distribution of Telecommuters
by Work in the Office and at Home on the Same Day**

<i>Frequency of working at home and in the office on the same day</i>	<i>Teleworkers (percentage)</i>
Almost every day	27.80
Once a week or more	35.78
Once a month or more	18.53
A few times a year	5.43
Once a year	4.79
Declined	7.67
Total	100.00

From the figures in the previous two tables, we conclude that to obtain an estimate of VMT reduction, we should use information on commute mode instead of reported telecommuting frequency. Table 17 summarizes telecommuters’ answers to the question, “How did you get to work each day last week?” Only 25.62% of telecommuters, on an average workday, did not use any mode and therefore either telecommuted or did not work. Thus, according to information from respondents on their mode choice, telecommuting frequency is only about 26%—that is, on any given workday, the percentage of teleworkers who are actually working at home is approximately 26%. This is a much lower percentage than was shown in Table 15, where almost half of telecommuters reported that they worked at home.⁸

⁸ A slight discrepancy will result from incorrect treatment of satellite and telecenter workers, but we disregard this effect.

Table 17. Distribution of Telecommuters by Commute Mode

<i>Frequency of using different commute modes last week</i>	<i>Teleworkers (percentage)</i>
No mode	25.62
Drove alone	66.32
Carpool	2.68
Vanpool	0.38
Airplane	1.30
Bicycle or walking	1.09
Subway, train, or light rail	0.13
Bus	0.83
Other	1.55
Total	100.00

VII. Perceptions of Nontelecommuters

Ideally, a survey of this type would structure the questionnaire to make possible comparisons between present telecommuters and on-site workers; in the SCAG dataset, significant pieces of information are available for one group only. In this section we briefly discuss what can be learned from workers who stated that they currently don't work at home.

First, a little over 20% of the on-site workers (21.5% of women, 19% of men) said that the nature of their jobs would allow them to work from home on an occasional basis. This share of potential telecommuters increases with respondents' educational level and household income. For example, only 13% of workers without high school diplomas answered the question positively, compared with 24% of college graduates and almost 33% of workers with graduate degrees. Only 15.5% of workers with household incomes below \$20,000 believe that they can telecommute, compared with 24% of workers in the \$65,000–\$80,000 income bracket and almost 34% of employees with incomes above \$100,000.

Asked whether they would like to work at least some days at home rather than traveling to their usual workplace, 51.8% of respondents said yes and 48.2% said no. For females, the share of affirmative answers is one percentage point higher and for males it is one percentage point lower than for all on-site workers. Interestingly, the share of affirmative answers declines slightly with both education and income levels. Almost 55% of respondents with household incomes below \$20,000 would like to telecommute, versus only 47.2% of workers with incomes above \$100,000. Only 45% of persons with graduate degrees said that they would like to

telecommute. The share of on-site workers who would like to telecommute occasionally also increases with the number of children younger than six in the household, and among workers with two young children, 61.5% would like to telecommute on an occasional basis.

Asked whether their employers would allow them to telecommute, 18.6% of on-site workers answered yes and 78.5% answered no (2.9% did not know). There is almost no variation by gender, but workers with higher household incomes and higher levels of education were more likely to say yes: 24% of those with incomes above \$100,000 and 25% of those with graduate degrees thought that their employers would allow them to occasionally work at home.

Workers with different educational levels value the advantages of occasional work at home differently. In the overall surveyed population of on-site workers, 39.85% think that the advantage of telecommuting in providing more personal time is very important. However, more than 53% of workers without college degrees consider this advantage very important, versus only 28% of workers with graduate degrees. Similarly, the view that telecommuting would help reduce stress is shared by 35.8% of respondents overall, but by 43% of persons without college degrees and by only 20.5% of those with graduate degrees. Asked about the value of telecommuting in helping the environment and reducing pollution, 43% of workers overall consider it very important, but 51.7% of persons without high school diplomas agree with this assessment, versus only 32.7% of graduate degree holders.

Perhaps the more tepid perceptions of the advantages of telecommuting reflect the skepticism that comes with education. Note that the only advantage of telecommuting that most respondents consider to be very important is the reduction of stress related to commuting. Overall, 51.8% of workers believe that it is very important, and among graduate degree holders, 44.9% of respondents agree.

VIII. Conclusions

In this paper we have provided an overview of the 2002 Telework Survey conducted by the Southern California Association of Governments. The advantages of this survey are that it is relatively recent and covers a large metropolitan area.

The results of the survey generally confirm the list of factors thought to increase the likelihood of telecommuting—for example, having more education and having more professional experience in general, as well as a longer tenure with one's current company and one's current supervisor—increase the probability that a worker telecommutes. The survey has also revealed that telecommuters are more likely to be male and have smaller households than

nontelecommuters—findings that come as a surprise, since other surveys have shown women, and especially women with children, to be likely telecommuters.⁹ In this paper we did not look at the connection between telecommuting frequency and demographic factors. It may be that gender and household size are more relevant to telecommuting frequency than to telecommuting choice per se.

Another interesting finding from this dataset is that a surprisingly high number of workers—27.8% of all telecommuters—report that they go to their regular workplace “almost every day” they telework. If we add to this number the (lower) frequency of work in two places on the same day reported by other workers, we find that one-third of employees are working both on-site and off-site on the same day. This finding leads to a significant discounting of the VMT reduction effect that is usually computed on the assumption that teleworkers are eliminating some commuting trips.

Finally, the data on employees who currently do not telecommute reveal a disconnect between workers’ desire to telecommute and their ability to do so. Workers with relatively lower educational attainment are more enthusiastic about the opportunity to telecommute than better-educated workers, but the latter are more likely to have jobs that make telecommuting possible. Although this disconnect is based only on the stated preferences of people who currently do not telecommute, it may indicate that there are limits to further growth of telecommuting.

⁹ See, e.g., Popuri and Bhat (2003).

References

- Henderson, D.K., B.E. Koenig, and P.L. Mokhtarian. 1996. Using Travel Diary Data to Estimate the Emissions Impacts of Transportation Strategies: The Puget Sound Telecommuting Demonstration Project. *Journal of the Air and Waste Management Association* 46(1): 47–57.
- Nilles, J.M., F.R. Carlson, P. Grey, and G.J. Hanneman. 1976. *The Telecommunications-Transportation Tradeoff*. New York: John Wiley.
- NuStats, Inc. 2003. 2002 Telework Study, draft final report. Austin, TX: NuStats. May 14.
- Popuri, Y., and C.R. Bhat. 2003. On Modeling Choice and Frequency of Home-Based Telecommuting. *Transportation Research Record* 1858: 55–60.