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Long Commuting Time and the Benefits of Telecommuting

MORIKAWA Masayuki
RIETI



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MORIKAWA Masayuki (RIETI)

Abstract

This study, using original survey data, presents empirical evidence on the relationship between commuting time and telecommuting on the one hand, and wages and subjective well-being on the other hand in Japan, where long commuting time is prevalent. According to the analysis, first, individuals, particularly female and non-standard employees, have a strong preference for avoiding long commuting hours compared to long working hours. Second, there is a wage premium for long commuters, and this is greater for female employees. Third, although the number of telecommuters is currently very small, they enjoy wage premiums and higher job satisfaction. These findings suggest that diffusion of telecommuting and satellite offices may contribute to increasing the labor market participation of female and elderly people in metropolitan areas.

Keywords: Commuting time, Telecommuting, Working hours, Wage premium, Job satisfaction

JEL Classification: J22, J28, J31, R41

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Long Commuting Time and the Benefits of Telecommuting

1. Introduction

Commuting time from home to the workplace has been increasing in advanced countries (e.g., Goerke and Lorenz, 2017; Roberts and Taylor, 2017). Japan is not an exception: according to the Survey on Time Use and Leisure Activities (Ministry of Internal Affairs and Communications), in contrast to decreasing working hours, commuting time has shown an increasing trend.¹

Not only working hours, but also commuting hours substantially affect the welfare of individuals. For example, past studies indicate that long commuting induces mental stress and is detrimental to workers' health (e.g., Gottholmseder *et al.*, 2009; Roberts *et al.*, 2011; Künn-Nelen, 2016). Some other studies find evidence that commuting is negatively associated with subjective well-being (e.g., Stutzer and Frey, 2008; Bryson and MacKerron, 2017).²

Another negative aspect of commuting time is its effect on the labor supply of females. Several studies have indicated that long commuting negatively affects labor participation, particularly the full-time employment probability, of married women who bear a larger burden of household responsibilities (e.g., Abe, 2011; Black *et al.*, 2014; Gimenez-Nadal and Molina, 2016; Kawabata and Abe, 2018). A recent study indicates that husbands' commuting time negatively affects wives' employment (Carta and De Philippis, 2018). On the other hand, past studies have found evidence of compensating wages being provided for long commuting hours (e.g., Van den Berg and Gorter, 1997; Van Ommeren *et al.*, 2000; Mulalic *et al.*, 2014; Sakai and Miyazato, 2014). If this is the case, long commuting is accompanied by pecuniary benefits at least to some extent.

For the purpose of reducing commuting time in urban areas and achieving both a better work-life balance and a higher productivity of workers, telecommuting attracts the attention of policy makers. Recent studies have found evidence of higher levels of happiness among telecommuters (Gimenez-Nadal *et al.*, 2018) and higher levels of satisfaction among spouses whose partners work from home (Dockery and Bawa, 2018). These studies suggest a potential of telecommuting to better work-life balance. On the other hand, the impact of telecommuting on productivity of workers has been inconclusive. Bloom *et al.* (2015), based on a field experiment, present evidence that working from home improves the productivity performance of call center employees. In contrast, Battiston *et al.* (2017), using a natural experiment in an organization where workers are required to have complex communications with their colleagues, find that physical proximity of

¹ The average commuting time (daily roundtrip) for those engaged in market work increased from 73 minutes in 2001 to 82 minutes in 2016.

² Bryson and MacKerron (2017) indicate that happiness level is low while commuting, although that it is much lower while working.

workers in the same office improves productivity through better face-to-face communications. Dutcher (2012), based on a laboratory experiment, indicates that a telecommuting environment may have positive effects on productivity for creative tasks but negative effects on productivity for dull tasks.

Overall, although there have been a large number of studies on the effects of commuting time in the field of labor economics and urban economics, studies on telecommuting are still insufficient for drawing policy implications. In this respect, this study intends to contribute to the literature by presenting evidence from originally designed survey data on about ten thousand individuals in Japan, where the commuting time is longer than in the other advanced countries. Specifically, this study documents the relationships between commuting time and worker characteristics, workers' distaste for long commuting hours compared to long working hours, and the relationships between commuting time and telecommuting on the one hand, and wages and subjective well-being on the other hand.

To preview the main findings of this study, first, workers, particularly among females and non-standard employees such as part-time workers, show a strong preference for avoiding long commuting hours compared to long working hours. Second, there is a wage premium for long commuters, which is greater for female employees. Third, although the number of telecommuters is currently very small, they enjoy both higher wages and job satisfaction.

The rest of this paper is organized as follows: Section 2 explains the survey data used in this study and the method of analysis. Section 3 presents the results on commuting hours and telecommuting in Japan. Section 4 concludes the paper with policy implications.

2. Data and Method of Analysis

We designed and implemented an original survey for Japanese individuals: the "Survey of Life and Consumption under the Changing Economic Structure" in 2017. The survey was conducted by Rakuten Research, Inc., which was contracted out by the Research Institute of Economy, Trade and Industry (RIETI). The sample individuals were randomly chosen from the 2.3 million registered monitors at Rakuten Research, Inc. and stratified by gender, age, and region (prefecture) in accordance with the Population Census in 2015 (Statistics Bureau, Ministry of Internal Affairs and Communications).³ The number of respondents were 10,041, but in this

³ To be more specific, using software developed by the Rakuten Research, Inc., the target number of responses was set at the cell (gender*age class*prefecture) level proportional to the Population Census. Then, an invitation e-mail was sent randomly by taking into account the predicted response rate. When the number of responses fell short of the target at the cell level, additional invitation e-mails were sent until the target number was reached.

study we excluded individuals who were not engaged in market work. As a result, the number of observations used in this study is 6,856.

The survey items included daily round-trip commuting hours, frequency of telecommuting per week, and various individual characteristics such as gender, age, educational qualifications, type of employment, tenure, annual earnings, and weekly working hours.

The question on commuting time was worded as “How long is your daily round-trip commute?” The choices were grouped by 30-minute intervals: (1) zero (work at home), (2) less than 30 minutes, (3) 30 minutes-1 hour, (4) 1 hour-1.5 hours, (5) 1.5-2 hours, (6) 2-2.5 hours, (7) 2.5-3 hours, (8) 3-3.5 hours, (9) 3.5-4 hours, and (10) 4 hours or more. In the regression analysis, in order to ensure comparability with weekly working hours, the median values of these groups were converted into weekly hours by multiplying by the number of workdays in a week. Then a logarithmic transformation was applied to construct the commuting hours variable. In this calculation, “less than 30 minutes” and “4 hours or more” were treated as 15 minutes and 4 hours and 15 minutes, respectively. In order to enable logarithmic conversion, one minute was assigned to the “zero” response.

The question on the relative distaste for commuting hours and working hours was worded as follows: “What is your opinion regarding a hypothetical situation in which your daily round-trip commute increases by an hour and another situation in which your work hours increase by an hour?” and the three choices were (1) “I wouldn’t like an increase in my commuting hours,” (2) “I wouldn’t like an increase in my work hours,” and (3) “There wouldn’t be any difference.”

Regarding telecommuting, the survey asked “Do you telecommute? Please choose among the following.” The choices are (1) no, (2) yes (one day a week or less), (3) yes (about two days a week), (4) yes (three or four days a week), and (5) yes (five days a week or more). The survey questionnaire noted that “Telecommuting refers to work performed at home or a satellite office close to home.” However, since the percentage of telecommuters (those who choose from (2) to (5)) was only about 5% as indicated later, we summarized this information into a binary variable of whether the respondents are telecommuters in the subsequent analysis.

In addition to simple tabulations of the survey responses, we conducted (1) OLS estimations to explain commuting hours by individual characteristics, (2) ordered-probit estimations to explain preference over commuting and working hours, (3) OLS estimations of a standard wage function augmented with commuting hours and telecommuting, and (4) ordered-probit estimations to explain subjective job/life satisfaction. The specific variables used in the analysis are explained with the estimation results in the next section.

The numbers and percentages of observations used in this study are reported in **Appendix Table A1** by individual characteristics. The summary statistics of weekly commuting hours, weekly working hours, annual earnings, and annual household income are presented in **Appendix**

Table A2.

3. Results

3.1. Commuting Time and Telecommuting in Japan

The distribution of commuting hours (round-trip) is summarized in **Table 1**. The percentages of commuters who spend more than two hours a day commuting are 10.4% of all workers, 13.3% males, and 6.3% females (panel A). The mean figures for male and female workers by using the median values of each category are 59.7 and 44.4 minutes, respectively. Panel B indicates the figures obtained after excluding company executives, the self-employed, and family workers from the sample. In this sample of salaried employees, the mean figures are higher and the gender gap is larger. When the sample is further restricted to standard full-time employees (panel C), the gender gap is reduced, but the commuting time of males is still longer than that of females. The relatively long commuting time of male workers is similar to those in other countries (e.g., Black *et al.*, 2014; Giménez-Nadal and Molina, 2016).

Since the survey collected information about the region (prefecture) of the residence and the workplace, we could calculate the number of individuals whose commute crosses the border of prefectures (**Table 2**). In the Tokyo metropolitan area, the number of commuters from the other prefectures to Tokyo is about ten times more than that of commuters in the opposite direction (panel A). In the entire sample, a large majority of workers commute within the boundary of a prefecture, but when the sample is limited to those whose commute crosses the border, the number of the “reverse commuters” is small (panel B). Even if the commuting time is the same, when commuting between a residence in denser areas and a workplace located in less dense areas (reverse commuting), traffic congestion can be avoided. However, in reality, those who enjoy such comfortable commuting form the minority.

Next, we ran OLS regressions to explain commuting hours based on individual characteristics. We focused on salaried employees by excluding company executives, the self-employed, and family workers from the sample. The explanatory variables were gender, age categories in ten-year intervals, employment type⁴, marital status, living with children, living with a family member needing long-term care, home ownership, and (logarithm of) population density of the workplace prefecture. The reference categories were male, age 40-49, standard full-time employee,

⁴ Employment type is grouped into nine categories: (1) company executive, (2) self-employed, (3) family worker, (4) standard full-time employee, (5) part-time worker, (6) hourly-paid worker, (7) dispatched employee (temporary agency worker), (8) contract employee, and (9) fixed-term employee (*shokutaku*).

unmarried, not living with children,⁵ not living with a family member needing long-term care, and renter.

According to the estimation results, commuting time is significantly shorter for each of the following categories: females, age 20-29, age 60 or older, and non-standard employees (column (1) of **Table 3**).⁶ The determinants of commuting hours differ greatly by gender. Among females, the commuting time of married, non-standard employees, and those who have children of schooling age tends to be shorter (column (3)).⁷ The coefficient of having preschool children is statistically insignificant, but the result may reflect the fact that females with preschool children tend to opt-out from the labor market. For males, the coefficients for married and living with children with junior high school or younger are insignificant, but those who have senior high school or older children and own their residence tend to commute for longer hours (column (2)). As expected, the coefficient for the population density of workplace is positive and highly significant irrespective of gender, meaning that those who work in metropolitan areas incur a long commuting time.⁸

The result of a shorter commuting time for female non-standard employees is consistent with past studies that long commuting negatively affects labor participation, particularly the full-time employment probability, of married females (e.g., Abe, 2011; Black *et al.*, 2014; Kawabata and Abe, 2018; Carta and De Philippis, 2018). The longer commuting of males who own their residence can be interpreted as reflecting a joint maximization of household utility under the trade-off between better amenity of residence and longer commuting time.

Table 4 presents the percentages of telecommuters and the frequency of telecommuting. Panel A indicates the figures for salaried employees by dropping company executives, self-employed, and family workers from the sample. The percentage of telecommuters is 5.2% and the gender differences are small. Even when limiting the sample to standard full-time employees (panel B), the patterns are essentially the same.⁹

⁵ In the survey, children were classified into three categories depending on their age: preschool children, junior high school or elementary school children, and high school students or older.

⁶ Non-standard employee includes part-time worker, hourly-paid worker, dispatched employee (temporary agency worker), contract employee, and fixed-term employee (*shokutaku*).

⁷ Even if we limit the sample to standard employees, the result is essentially unaltered.

⁸ There is a weakly positive correlation between commuting time and weekly working hours (correlation coefficient of 0.226). This is consistent with past studies on the positive effect of commuting time on working hours (e.g., Gutierrez-i-Puigarnau and van Ommeren, 2010; Giménez-Nadal and Molina, 2014).

⁹ According to a simple probit model on the determinants of telecommuting, the explanatory power of observable individual characteristics such as gender, age, and family composition is very limited. If anything, married females with elementary or junior high school children, and males with a family member needing long-term care show a somewhat higher probability to telecommute.

3.2. Preferences for Commuting and Working Hours

Table 5 shows the responses to a hypothetical question “What is your opinion regarding a hypothetical situation in which your daily round-trip commute increases by an hour and another situation in which your work hours increase by an hour?” The percentage of respondents choosing “I wouldn’t like an increase in my commuting hours” is 55.3%, which is far larger than the percentage of choosing “I wouldn’t like an increase in my work hours” (25.1%). The remainder (19.6%) responded “there wouldn’t be any difference.” This result suggests that a large number of individuals are unable to maximize their welfare by determining optimal (shorter) commuting time.

The result presented above is different from past studies outside Japan that suggest that disutility when working is larger than when of commuting (e.g., van Ommeren *et al.*, 2000; Bryson and MacKerron, 2017). van Ommeren *et al.* (2000) report an estimation result that willingness to pay for a reduction of one hour commuting is equivalent to wages of 0.5 hours. Bryson and MacKerron (2017) indicate that the happiness level while working is lower than while commuting. The stronger dislike for commuting time in Japan may be caused by the longer commuting time relative to that in other advanced countries. When splitting the sample by gender, although both male and female employees exhibit a stronger dislike for commuting, the percentage of female workers wanting to avoid lengthening commuting hours is larger than male workers by more than 10 percentage points (panel A of **Table 5**).

Panel B of the table indicates the preference for commuting and working by the direction of commuting: commuters within the same prefecture, commuters between a lower density prefecture of residence and a higher density prefecture of workplace, and reverse-commuters. According to this categorization, dislike for commuting time is relatively weak in reverse-commuters, suggesting that the degree of traffic congestion affects the disutility of commuting time.

Next, we ran ordered-probit estimations to explain the preference for commuting/working hours by various individual characteristics. In this estimation, the ordinal dependent variable was defined as “I wouldn’t like an increase in my commuting hours”=1, “there wouldn’t be any difference”=2, and “I wouldn’t like an increase in my work hours”=3. Therefore, the negative coefficients imply a stronger dislike for lengthening commuting hours. The explanatory variables were gender, age class, employment type, working hours (logarithm)¹⁰, commuting hours

¹⁰ In the survey, weekly working hours (inclusive of overtime, are classified into 12 categories: (1) 15 hours or less, (2) 15-19 hours, (3) 20-21 hours, (4) 22-29 hours, (5) 30-45 hours, (6) 35-42 hours, (7) 43-45 hours, (8) 46-48 hours, (9) 49-59 hours, (10) 60-64 hours, (11) 65-74 hours, and (12) 75 hours or more. A logarithmic transformation is applied to the median values of these categories to construct the working hours variable. In this calculation, “15 hours or less” and “75 hours or more” are treated

(logarithm), annual earnings (logarithm)¹¹, marital status, dummy variables for living with children, a dummy variable for living with a family member needing long-term care, and one for telecommuters. Since this estimation was done for all workers, dummy variables for employment type included company executives, self-employed, and family workers.

The estimation results are presented in **Table 6**. The coefficient of female is a large negative value and statistically significant at the 1% level (column (1)). Female workers have a strong dislike for long commuting hours, after accounting for other individual characteristics. For both male and female workers, the coefficients of older age classes tend to be negative, but the statistical significance levels are weak (columns (2) and (3)).

By employment type, the coefficients for part-time, hourly-paid, and temporary agency workers have large negative values and are highly significant for females. This result is consistent with the regression result on the determinants of commuting hours (**Table 3**), reinforcing the interpretation that commuting time strongly affects females' choice of employment type. In other words, females, to avoid a long commute, tend to self-select non-standard employment opportunities available near their residence.

Coefficients of marital status and children are insignificant both for the male and female subsamples, possibly because the impact of the same hours of working and commuting on family life does not differ. Commuting and working hours are also unrelated to the preference of a longer commuting or longer working hours. Interestingly, the coefficient for telecommuter is negative and significant for male workers, suggesting that males with a strong dislike for long commuting make use of telecommuting opportunities.

However, as evidenced in the low pseudo R-squared, the explanatory power of the observable individual characteristics is limited. Preference for a shorter commute is heterogeneous among the seemingly same type of individuals. We would like to stress that the Japanese have a strong dislike for long commuting time, irrespective of their individual characteristics.

3.3. Commuting Time, Telecommuting, and Wages

as 13 hours and 79.5 hours, respectively.

¹¹ In the survey, annual earnings (tax inclusive, expressed in yen) are classified into 18 categories: (1) less than 500 thousand, (2) 500 to 999 thousand, (3) 1 to 1.49 million, (4) 1.5 to 1.99 million, (5) 2 to 2.49 million, (6) 2.5 to 2.99 million, (7) 3 to 3.99 million, (8) 4 to 4.99 million, (9) 5 to 5.99 million, (10) 6 to 6.99 million, (11) 7 to 7.99 million, (12) 8 to 8.99 million, (13) 9 to 9.99 million, (14) 10 to 12.49 million, (15) 12.5 to 14.99 million, (16) 15 to 17.49 million, (17) 17.5 to 19.99 million, and (18) 20 million or more. A logarithmic transformation is applied to the median values of these income classes to construct the earnings variable. In this calculation, "less than 500 thousand yen" and "20 million yen or more" are treated as 250 thousand yen and 21.25 million yen, respectively.

In this subsection, we present the results of estimating wage functions separately for male and female workers to see the relationship between long commuting time and wages. The dependent variable was log annual earnings and log working hours was included as the explanatory variables. The main explanatory variables of interest were log commuting hours and a dummy for telecommuter. Other explanatory variables included age (in ten-year intervals), tenure, education, occupation, employment type, one-digit industry, and log of population density of the prefecture where workplace is located.¹²

The estimation results are presented in **Table 7**. The coefficients of the variables representing human capital such as education and tenure are omitted in the table. The coefficients for population density are positive and highly significant, reflecting economies of density. The size of the coefficients means doubling population density increases wages by 2-3%. After controlling for these factors, the coefficients for commuting time are positive and significant at the 1% level both for the male and female subsamples: the longer the commuting hours, the higher the wages. Although this cross-sectional relationship cannot be interpreted as an indication of causality, the positive association is consistent with the mechanisms of a compensating wage differential as well as the better matching of employers and employees in a large labor market.

Interestingly, the size of the coefficient of commuting hours is larger for female than for male workers. Quantitatively, doubling commuting hours increases wages of male and female workers by 4.0% and 6.9%, respectively. As reported previously, females have a stronger dislike for a long commute and tend to self-select employment opportunities at a short distance from residence. As a reflection of this preference, the compensating wage differential for long commuting is relatively large.

The coefficients of telecommuting are positive and highly significant both for males and females: expressed in percentage terms, the wage premium is 10.1% for males and 11.1% for females. Since telecommuting is beneficial for individual workers, this result is counterintuitive. We cannot detect the reason behind the wage premium from the data used in this study, but one possible interpretation is that higher productivity of telecommuters outweighs the negative compensating wage differential.¹³ Of course, the higher productivity is not necessarily an

¹² Mean and standard deviation of tenure are 12.02 years and 11.09 years, respectively. Educational attainment is classified into seven categories: (1) elementary school or junior high school, (2) senior high school, (3) vocational school, (4) junior (2-year) college, (5) 4-year college or university, (6) graduate school (master's degree), and (7) graduate school (doctoral degree). Occupation is grouped into 13 categories: (1) administrative and managerial, (2) professional and engineering, (3) clerical, (4) sales, (5) trade, (6) services, (7) security, (8) agriculture/forestry/fishery, (9) manufacturing process, (10) transport and machine operation, (11) construction and mining, (12) carrying, cleaning, and packaging, and (13) other occupations. Industry is classified into 14 categories in accordance with the Japan Standard Industry Classification.

¹³ Gariety and Shaffer (2007) analyze wage differentials associated with working at home in the U.S. and find that working at home is associated with positive wage differentials overall, but with negative

indication of causality between telecommuting and productivity, but highly productive workers might have an option to telecommute.

3.4. Commuting Time, Telecommuting, and Subjective Well-being

We used an ordered-probit model to analyze the relationship between commuting time and subjective well-being, the results of which we present in this sub-section. Explanatory variables were gender, age, type of employment, log of working hours, log of commuting hours, log of annual earnings, and a dummy variable for telecommuter. In the survey, the specific wording of the question on job satisfaction was “Overall, how satisfied are you with your current work?” The choices are (1) satisfied, (2) somewhat satisfied, (3) difficult to say, (4) somewhat dissatisfied, and (5) dissatisfied. The question on life satisfaction was “Overall, how satisfied are you with your life?” and the five choices are the same as in the job satisfaction question. In the estimations, we assigned the values from 5 to 1 to the categories from “satisfied” to “dissatisfied,” respectively and used this as the ordinal dependent variable. Therefore, positive coefficients mean a higher job/life satisfaction.

Table 8 presents the ordered-probit estimation results. The coefficients of commuting hours, one of our main interests, are negative but statistically insignificant for both genders in the estimations of job satisfaction (columns (1) and (2)). At first glance, the insignificance is inconsistent with the strong dislike for long commuting hours reported before, but we interpret this to mean that respondents do not think about the disutility of commuting as part of “job” satisfaction. On the other hand, the estimated coefficient of telecommuter is positive and highly significant both for the male and female subsamples. Those who actually use a telecommuting opportunity enjoy high subjective well-being. By gender, interestingly, the coefficient is larger for males than females.

Columns (3) and (4) of the table are the estimation results for life satisfaction. In these estimations, the log of household income instead of earnings and a dummy variable for owning a residence are used as explanatory variables. The coefficient of commuting hours is insignificant for males, but it is negative and marginally significant (at the 10% level) for females. The coefficients of telecommuter are positive, but statistically significant only for male workers.

To summarize, according to the observations from the survey data used in this study, telecommuting is associated with both high wages and subjective well-being, indicating that it is

ones in some industries. They suggest that the positive effect on wages may stem from either the selective granting of working at home to more productive employees or from a productivity-enhancing factor.

a desirable working style at least from the standpoint of workers. In this sense, expanding the availability of telecommuting is one of the good labor management practices for improving workers' welfare.

4. Conclusion

This study, using original survey data on Japanese individuals, documents the differences in commuting time by individual characteristics, the workers' preference between commuting and working hours, and the relationship between commuting time and telecommuting on the one hand, and wages and subjective well-being on the other hand. The study was based on the consideration that not only working hours, but also commuting hours must impact the welfare of individuals, particularly in a country characterized by the prevalence of long commutes.

The main findings of this study can be summarized as follows: First, individuals—particularly females and non-standard employees—have a strong preference for avoiding long commuting hours compared to long working hours. Second, wage premiums are offered to long commuters, which is greater for female employees. Third, although the number of workers who telecommute is small, they enjoy both a wage premium and higher job satisfaction.

These findings suggest that shortening commuting time plays an important role in improving the work-life balance and well-being of workers in general, and that policies to diffuse telecommuting and satellite offices may contribute to enhancing labor participation of female and elderly workers in metropolitan areas. However, it should be noted that, even with the progress of information and communications technologies, diffusion of telecommuting has an inherent limitation. There are a number of jobs that require physical proximity of workers with customers or daily face-to-face communication among workers in a common workplace.

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Table 1. Distribution of Round-Trip Commuting Hours

		0 hours	less than 0.5 hours	0.5 to 1 hour	1 to 1.5 hours	1.5 to 2 hours	2 to 2.5 hours	2.5 to 3 hours	3 to 3.5 hours	3.5 to 4 hours	4 hours or more	Simple average (minutes)
A. All working individuals	Male	7.9%	26.8%	27.2%	15.1%	9.6%	6.3%	3.6%	1.8%	0.7%	1.0%	59.7
	Female	8.8%	38.2%	28.8%	12.0%	6.0%	3.2%	1.3%	0.8%	0.4%	0.7%	44.4
	All	8.3%	31.6%	27.9%	13.8%	8.1%	5.0%	2.6%	1.3%	0.6%	0.8%	53.3
B. Employees	Male	1.0%	26.4%	30.0%	16.9%	10.7%	7.1%	4.1%	2.1%	0.8%	1.0%	66.1
	Female	3.1%	40.4%	30.8%	12.7%	6.4%	3.5%	1.4%	0.8%	0.4%	0.6%	47.0
	All	1.9%	32.5%	30.4%	15.0%	8.8%	5.5%	2.9%	1.5%	0.6%	0.8%	57.8
C. Standard employees	Male	0.6%	25.3%	30.6%	17.4%	11.7%	7.2%	4.0%	1.8%	0.6%	0.8%	66.3
	Female	1.6%	31.3%	31.9%	17.2%	8.9%	4.9%	1.7%	1.2%	0.3%	0.8%	56.1
	All	0.9%	27.0%	31.0%	17.3%	10.9%	6.6%	3.3%	1.6%	0.5%	0.8%	63.4

Notes: Simple average (minutes) is calculated by taking the median values of each category. Figures in Panel B do not include company executives, self-employed, and family workers.

Table 2. Reverse Commuting

A. Tokyo Metropolitan Area

Prefecture of residence	Prefecture of workplace	Observations
Tokyo	Tokyo	770
Other prefectures	Tokyo	433
Tokyo	Other prefectures	43

B. All Prefectures

Prefecture of residence	Prefecture of workplace	Observations
Within a prefecture		6,074
Lower density	Higher density	634
Higher density	Lower density	184

Notes: Lower and higher densities mean the relative population density of the prefecture of the residence and that of the workplace.

Table 3. Individual Characteristics and Commuting Hours

	(1) All	(2) Male	(3) Female
Female	-0.2184 *** (0.0243)		
Age 20-29	-0.1058 *** (0.0360)	-0.1435 *** (0.0484)	-0.0486 (0.0534)
30-39	-0.0354 (0.0320)	-0.0584 (0.0417)	0.0161 (0.0496)
50-59	0.0478 (0.0329)	0.0674 (0.0426)	-0.0056 (0.0497)
60-69	-0.0500 (0.0372)	-0.1212 ** (0.0551)	-0.0908 * (0.0514)
70-	-0.4165 *** (0.1112)	-0.6143 *** (0.1428)	-0.3180 * (0.1691)
Part-time worker	-0.5188 *** (0.0324)	-0.3746 *** (0.0725)	-0.4758 *** (0.0383)
Hourly paid worker	-0.4363 *** (0.0476)	-0.3085 *** (0.0678)	-0.5058 *** (0.0671)
Dispatched employee	0.0262 (0.0603)	0.0820 (0.1102)	-0.0023 (0.0717)
Contract employee	-0.0141 (0.0457)	0.1068 (0.0658)	-0.1276 ** (0.0639)
Fixed-term employee	-0.1478 * (0.0810)	-0.0095 (0.0937)	-0.2752 * (0.1412)
Married	-0.0451 * (0.0268)	0.0517 (0.0397)	-0.1647 *** (0.0370)
Preschool children	0.0595 (0.0366)	0.0558 (0.0472)	0.0369 (0.0584)
Children, primary or junior high school	0.0090 (0.0333)	0.0682 (0.0432)	-0.1437 *** (0.0512)
Children, senior high school or older	0.0245 (0.0296)	0.1183 *** (0.0401)	-0.1137 *** (0.0425)
Family members needing care	0.0548 (0.0513)	0.0408 (0.0705)	0.1048 (0.0755)
Residence ownership	0.0989 *** (0.0234)	0.1429 *** (0.0313)	0.0361 (0.0346)
Ln population density (workplace)	0.1705 *** (0.0071)	0.1991 *** (0.0093)	0.1230 *** (0.0109)
Observations	5,451	3,091	2,360
Adj. R ²	0.2080	0.1833	0.1828

Notes: OLS estimation results with robust standard errors in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The reference categories are age 40-49 and standard employee.

Table 4. Percentages of Telecommuters

		No	1 day a week or less	About 2 days a week	3 or 4 days a week	5 days a week or more
A. Employees	Male	94.5%	3.4%	1.1%	0.5%	0.5%
	Female	95.2%	1.8%	1.1%	0.8%	1.1%
	All	94.8%	2.7%	1.1%	0.6%	0.8%
B. Standard employees	Male	94.5%	3.5%	1.1%	0.3%	0.5%
	Female	95.9%	2.2%	0.7%	0.2%	1.0%
	All	94.9%	3.1%	1.0%	0.3%	0.7%

Note: Employees (Panel A) do not include company executives, self-employed, and family workers.

Table 5. Distaste for Lengthening Commuting and Working Hours

		(1) Dislike an increase in commuting hours	(2) Indifferent	(3) Dislike an increase in work hours
A. By gender	Male	50.0%	22.2%	27.7%
	Female	62.7%	15.9%	21.5%
	All	55.3%	19.6%	25.1%
B. By commuting direction	Within a prefecture	55.6%	19.5%	24.9%
	Low to high density	54.9%	18.6%	26.5%
	High to low density	47.3%	24.3%	28.4%

Note: The specific question is “what is your opinion regarding a hypothetical situation in which your daily round-trip commute increases by an hour and another situation in which your work hours increase by an hour?”

Table 6. Preference for longer Commuting Hours compared to longer Working Hours

	(1) All	(2) Male	(3) Female
Female	-0.2153 *** (0.0356)		
Age 20-29	0.1819 *** (0.0536)	0.0773 (0.0703)	0.3023 *** (0.0827)
30-39	0.0779 (0.0489)	0.0794 (0.0629)	0.0813 (0.0791)
50-59	0.0271 (0.0475)	0.0708 (0.0617)	-0.0381 (0.0756)
60-69	0.0067 (0.0506)	-0.0035 (0.0692)	-0.0342 (0.0779)
70-	-0.1501 (0.1076)	-0.2306 * (0.1344)	-0.1224 (0.1869)
Company executives	-0.0050 (0.0691)	-0.0455 (0.0802)	0.1263 (0.1415)
Self-employed	-0.0351 (0.0557)	0.0070 (0.0665)	-0.1548 (0.1089)
Family workers	0.3345 *** (0.1058)	0.3938 ** (0.1779)	0.2902 ** (0.1333)
Part-time worker	-0.2880 *** (0.0575)	-0.1019 (0.1062)	-0.3356 *** (0.0751)
Hourly paid worker	-0.2726 *** (0.0748)	-0.1415 (0.0955)	-0.4595 *** (0.1222)
Dispatched employee	-0.5426 *** (0.1010)	-0.6203 *** (0.1599)	-0.5351 *** (0.1297)
Contract employee	-0.1027 (0.0689)	-0.0591 (0.0901)	-0.1679 (0.1092)
Fixed-term employee	0.0452 (0.1114)	0.0805 (0.1443)	-0.0388 (0.1814)
Telecommuter	-0.1051 * (0.0603)	-0.1594 ** (0.0756)	0.0134 (0.1003)
Ln working hours	-0.0515 (0.0362)	-0.0551 (0.0454)	-0.0561 (0.0615)
Ln commuting hours	0.0116 (0.0185)	0.0089 (0.0233)	-0.0042 (0.0315)
Ln earnings	-0.0082 (0.0225)	-0.0164 (0.0289)	-0.0197 (0.0371)
Married	-0.0225 (0.0375)	0.0229 (0.0537)	-0.0781 (0.0550)
Preschool children	-0.0724 (0.0562)	-0.0820 (0.0727)	-0.0760 (0.0914)
Children, primary or junior high school	-0.0277 (0.0491)	-0.0027 (0.0631)	-0.0839 (0.0812)
Children, senior high school or older	-0.0073 (0.0408)	-0.0185 (0.0535)	-0.0040 (0.0654)
Family members needing care	0.0156 (0.0744)	-0.0473 (0.0997)	0.1036 (0.1111)
Observations	6,435	3,765	2,670
Pseudo R ²	0.0154	0.0047	0.0210

Notes: Ordered-probit estimation results with robust standard errors in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. The reference categories are age 40-49 and standard employee.

Table 7. Commuting Hours, Telecommuting, and Wages

	(1) Male	(2) Female
Ln working hours	0.2645 *** (0.0288)	0.5175 *** (0.0356)
Ln commuting hours	0.0564 *** (0.0128)	0.0956 *** (0.0166)
Telecommuter	0.0967 ** (0.0437)	0.1055 * (0.0618)
Ln population density (workplace)	0.0396 *** (0.0072)	0.0334 *** (0.0089)
Age	yes	yes
Tenure	yes	yes
Education	yes	yes
Occupation	yes	yes
Employment type	yes	yes
Industry	yes	yes
Observations	3,765	2,670
Adj. R ²	0.5028	0.5378

Notes: OLS estimation results with robust standard errors in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 8. Commuting Hours, Telecommuting, and Subjective Well-being

	(1)	(2)	(3)	(4)
	Job satisfaction		Life satisfaction	
	Male	Female	Male	Female
Ln working hours	-0.2048 *** (0.0458)	-0.2961 *** (0.0573)	-0.1855 *** (0.0464)	-0.2470 *** (0.0525)
Ln commuting hours	-0.0290 (0.0214)	-0.0384 (0.0275)	0.0162 (0.0215)	-0.0489 * (0.0268)
Ln earnings	0.2225 *** (0.0315)	0.1718 *** (0.0347)		
Ln household income			0.2446 *** (0.0327)	0.3266 *** (0.0321)
Residence ownership			0.0852 ** (0.0420)	0.0414 (0.0479)
Telecommuter	0.2322 *** (0.0656)	0.1912 ** (0.0859)	0.2164 *** (0.0685)	0.0727 (0.0878)
Age	yes	yes	yes	yes
Employment type	yes	yes	yes	yes
Observations	3,765	2,670	3,765	2,670
Pseudo R ²	0.0272	0.0184	0.0249	0.0297

Notes: Ordered-probit estimation results with robust standard errors in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Appendix Table A1. Composition of the Survey Respondents

		Nobs.	(%)
All working individuals		6,856	100.0%
Gender	Male	3,975	58.0%
	Female	2,881	42.0%
Age	20-29	1,020	14.9%
	30-39	1,272	18.6%
	40-49	1,647	24.0%
	50-59	1,308	19.1%
	60-69	1,450	21.1%
	70-	159	2.3%
Education	Primary school or junior high school	113	1.6%
	Senior high school	1,751	25.5%
	Vocational school	790	11.5%
	Junior (2-year) college	773	11.3%
	4-year college or university	2,984	43.5%
	Graduate school (master's degree)	355	5.2%
	Graduate school (doctoral degree)	90	1.3%
Family	Not married	2,668	38.9%
	Married	4,188	61.1%
	Preschool children	771	11.2%
	Children, primary or junior high school	868	12.7%
	Children, senior high school or older	1,404	20.5%
	Family members needing care	310	4.5%
Residence	Owned residence	4,661	68.0%
Employment type	Company executive	352	5.1%
	Self-employed	673	9.8%
	Family worker	126	1.8%
	Standard full-time employee	3,464	50.5%
	Part-time worker	1,128	16.5%
	Hourly paid worker	408	6.0%
	Dispatched employee	199	2.9%
	Contract employee	378	5.5%
	Fixed-term employee (<i>shokutaku</i>)	128	1.9%
Occupation	Administrative & managerial	747	10.9%
	Professional & engineering	1,650	24.1%
	Clerical	1,514	22.1%
	Sales	374	5.5%
	Trade	447	6.5%
	Service	1,033	15.1%
	Security	83	1.2%
	Agriculture/forestry/fishery	54	0.8%
	Manufacturing process	286	4.2%
	Transport & machine operation	82	1.2%
	Construction & mining	73	1.1%
	Carrying/cleaning/packaging	156	2.3%
	Other occupations	357	5.2%
	Union membership	1,517	22.1%

Appendix Table A2. Summary Statistics

	(1) All		(2) Male		(3) Female	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Ln working hours	3.513	0.502	3.640	0.467	3.337	0.497
Ln commuting hours	1.133	0.874	1.278	0.871	0.928	0.836
Ln earnings	5.604	0.971	5.951	0.861	5.124	0.909
Ln household income	6.157	0.786	6.225	0.780	6.091	0.786

Notes: Working and commuting hours are weekly hours. Earnings and household income are annual figures.