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Stress that Doesn't Pay: The Commuting Paradox*

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Abstract

People spend a lot of time commuting and often find it a burden. According to standard economics, the burden of commuting is chosen when compensated either on the labor or on the housing market so that individuals' utility is equalized. However, in a direct test of this strong notion of equilibrium with panel data, we find that people with longer commuting time report systematically lower subjective well-being. This result is robust with regard to a number of alternative explanations. We mention several possibilities of an extended model of human behavior able to explain this "commuting paradox".

Keywords: Location theory; commuting; compensating variation; subjective well-being
JEL classification: *D*12; *D*61; *R*41

I. Introduction

Commuting is an important aspect of our lives that demands a lot of our valuable time. There are conflicting ideas on the subject. For most people, commuting is a mental and physical burden, giving cause for various complaints. From an economic perspective, commuting is just one of numerous decisions rational individuals make. If commuting has extra psychological costs, then traveling longer distances to and from work is only chosen if it is either compensated by an intrinsically or financially rewarding job or by additional welfare gained from a pleasant living environment. Accordingly, commuting is determined by an equilibrium state of the housing and labor market, in which individuals' well-being or utility is equalized

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over all actual combinations of alternatives in these two markets. Thus, any disagreement between the two perspectives is due to the strong belief in economics that market forces lead to an equilibrium in which rents are prevented.

The strong notion of equilibrium in urban and regional economic theory, as well as in public economic theory, has only been partially tested so far. Studies have not been carried out as to whether there are systematic rents: rather, derived hypotheses within the equilibrium framework have been analyzed. There is considerable evidence for capitalization of transportation infrastructure in the price of land and for compensating wage differentials due to commuting distance.[1] However, these findings do not require an equilibrium situation, but can also be explained by the law of marginal substitution.

In order to assess the power of the equilibrium framework, a direct test is necessary. Here we analyze data on subjective well-being as proxy measures for people's experienced utility in order to directly test the strong notion of equilibrium in location theory. High quality data are available for Germany, collected by the German Socio-economic Panel. In a data set spanning 19 years, we study whether commuters are indeed compensated for the stress incurred, as suggested in economic models. If this is the case, we should not find any systematic correlation between people's commuting time and their reported satisfaction with life.

Our main result indicates, however, that people with long journeys to and from work are systematically worse off and report significantly lower subjective well-being. For economists, this result on commuting is paradoxical.

The empirical finding is further analyzed in four ways. First, we study the robustness of the empirical finding to different econometric specifications. In particular, a large number of background variables and time-invariant personality traits are taken into account in the estimation approach.

Second, biases in judgment due to the effects of the order in which questions are asked, or differences in salience, might cover up actual compensation in reported life satisfaction. Therefore, domain satisfaction is studied in order to capture possible compensation on the labor and the housing market at a disaggregate level, rather than in an overall measure.

Third, we discuss and empirically analyze two possible explanations within the traditional economic framework that would account for the commuting paradox: (i) While commuting might be a burden for those involved, those people's partners might benefit, so that, overall, the households' well-being is equalized. (ii) Transaction costs prevent people from adjusting to economic shocks and the observed correlation might simply reflect equilibrium in a "real" world with frictions. In fact, the general finding might

[1] See the research cited in Section II below.

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exemplify the importance of moving costs. People are trapped in their commuting situation and experience lower subjective well-being when they had bad luck and ended up with a long commute or did not foresee the costs of commuting. Here, we study people who change either their job or their place of residence, and thus have the possibility of re-optimizing their lives. The question is asked whether they also suffer lower subjective well-being with higher commuting time and we find that they do.

Finally, we suggest several possibilities of an extended model of human behavior that may help us to better understand the "commuting paradox".

The paper proceeds as follows. The costs and benefits of commuting as discussed in economics and psychology are summarized in Section II. The data set is described and the empirical analyses are conducted in Section III. Several explanations of the commuting phenomenon are empirically tested in Section IV. Section V briefly addresses the results in the light of behavioral economics. Concluding remarks are offered in Section VI.

II. The Costs and Benefits of Commuting

The Physical and Mental Burden of Commuting

Commuting involves much more than just covering the distance between home and work. Commuting not only takes time, but also generates out-of-pocket costs, causes stress and intervenes in the relationship between work and family. In fact, it seems that commuting is *the* daily activity that generates the lowest level of positive affect, as well as a relatively high level of negative affect; see Kahneman, Krueger, Schkade, Schwarz and Stone (2004). Moreover, commuting is salient in the everyday routines of many people's lives. Figure 1 gives a brief overview about commuting in European countries and the United States. It clearly shows that commuting is a widespread phenomenon. Workers in these countries commute between 29.2 minutes in Portugal and 51.2 minutes a day in Hungary. The average daily commuting time in the former EU15 is 37.5 minutes. In the United States, traveling to work takes, on average, 48.8 minutes.

Engineers and social scientists have studied a wide range of the private and social costs of commuting; for a review, see Koslowsky, Kluger and Reich (1995). For example, it has been calculated for the United States that a "typical household spends nearly 20 percent of its income on driving costs—more than it spends on food"; see EPA (2001). Besides these private costs for transportation (including commuting), there are the social costs of commuting, due to congestion and pollution of the environment. The calculation of the costs of congestion focuses on the value of time when delays occur whilst traveling. In an extensive survey, Small (1992, p. 44)

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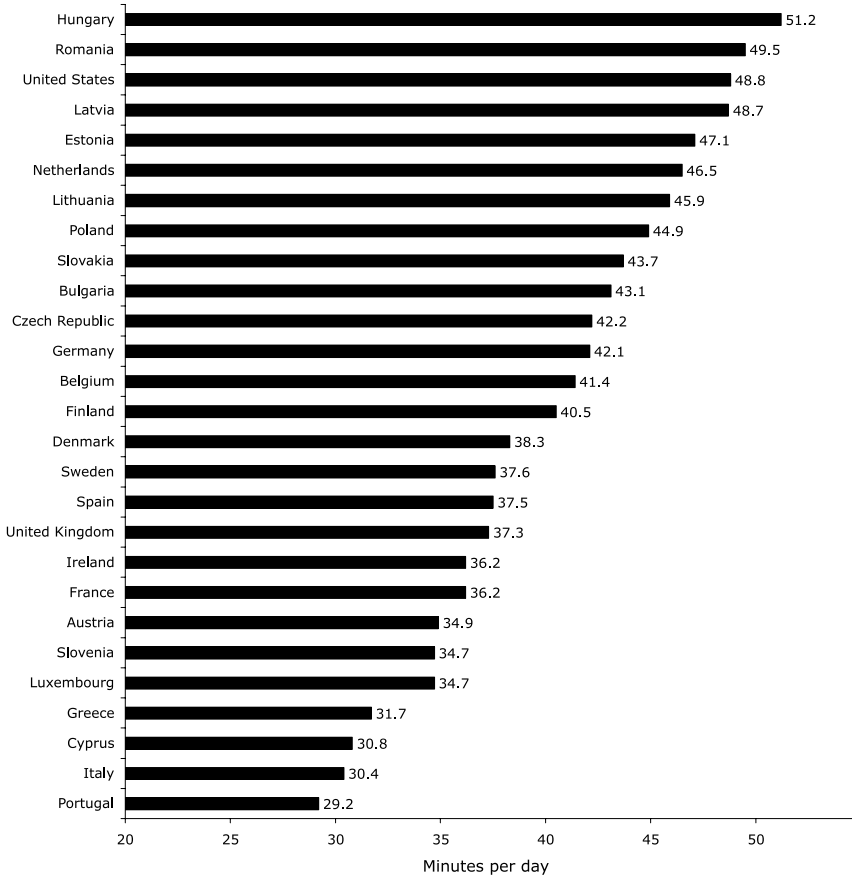

Fig. 1. Average daily commuting time in Europe and the US
Data sources: Data for European countries are from the *European Survey on Working Conditions*, conducted by the European Foundation for the Improvement of Living and Working Conditions in 2000 for member countries and in 2001/02 for acceding and candidate countries. Data for the US are from US Census Bureau, *2002 American Community Survey*.

concludes that "a reasonable average value of time for the journey to work is 50 percent of the gross wage rate, while recognizing that it varies among different industrialized cities from perhaps 20 to 100 percent of the gross wage rate, and among population subgroups by even more".

Psychologists have focused on the non-pecuniary costs of commuting and emphasize that it is an unpleasant experience that often has delayed effects on health and family life; for surveys, see e.g. Novaco, Stokols and Milanesi (1990) and Koslowsky *et al.* (1995). Commuting is associated with many environmental stressors like noise, crowds, pollution and thermal conditions

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that cause negative emotional and physical reactions. Reactions depend, of course, not only on the time and distance involved in commuting, but also on other factors that interact with the stressors mentioned above. Commuting is more stressful when people are not in control of certain factors that can crop up during the drive to work, e.g. due to traffic congestion or when they are under considerable time pressure. The strain of commuting is associated with raised blood pressure, musculoskeletal disorders, lowered frustration tolerance and increased anxiety and hostility, being in a bad mood when arriving at work in the morning and coming home in the evening, increased lateness, absenteeism and turnover at work, as well as adverse effects on cognitive performance; see Koslowsky *et al.* (1995).

The Benefits Associated with Commuting

People benefit from commuting when it allows them to get to an office or a factory in order to supply their work, or when they can find either superior or cheaper housing, albeit at a greater distance from work. Individuals take these benefits, as well as the pecuniary and non-pecuniary commuting costs mentioned above, into consideration when they make decisions on where to live, where to work and how to commute. Accordingly, houses that are further away from the location of work opportunities are less attractive to people, and thus have a lower market value, *ceteris paribus*. Jobs that involve a longer commute have to pay employees more in order to attract them and keep them. If all the participants in a perfect housing and labor market optimize, all the commuters are fully compensated for their traveling costs from home to work, either by higher salaries or by lower rents. Individuals' utility is then equalized over all possible locations within space.[2] These insights have been established in classical urban location theory, as in e.g. Alonso (1964), Muth (1969) and Huriot and Thisse (2000), and public economics theory based on Tiebout's (1956) model of fiscal competition between jurisdictions; see e.g. Conley and Konishi (2002).[3] They reflect the strong belief in economics that market forces lead to an equilibrium in which rents and discrimination are prevented.

[2] This prediction is expected to hold in equilibrium. In the short run, people may not have found their optimal portfolio. There are individuals who gain rents from commuting, while others suffer from costs related to commuting that are not compensated. On average, however, it is expected that people be compensated for costs incurred from commuting. It is thus predicted that there is no systematic relationship between commuting time and people's utility level.

[3] The efficient allocation of resources has been studied, based on the conviction set forth by Wildasin (1987, pp. 1136ff.) that "migratory flows will arbitrage away any utility differentials among jurisdictions. Therefore, it is appropriate to impose equal utilities as a constraint at the outset, and to ask what allocation of resources will maximize the common level of utility for all households".

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The strong notion of equilibrium in location theory has only been partially tested so far. It has not been studied whether there are systematic rents: rather, derived hypotheses within the equilibrium framework have been analyzed. There is considerable evidence for capitalization of transportation infrastructure in the price of land, and distance from job locations and other amenities in housing prices, as in e.g. McMillen and Singell (1992) and So, Orazem and Otto (2001), as well as for compensating wage differentials due to commuting distance, as in e.g. van Ommeren, van den Berg and Gorter (2000) and Timothy and Wheaton (2001).

However, these approaches do not allow us to assess whether the compensation of commuters is complete and, if it is not, to calculate the amount that would be needed. The extent of compensation would provide evidence to judge the relevance of conclusions that are based on equilibrium theories. In the next section, we propose a new approach of directly measuring the degree to which commuters are compensated for the burden of commuting.

III. Empirical Analysis of the Effects of Commuting on Subjective Well-being

Data and Descriptive Statistics

Individuals' compensation for commuting has so far been studied in terms of higher earnings and lower rents for housing. Here we apply a novel approach and directly analyze commuters' level of experienced utility. Thereby, reported subjective well-being is used as a proxy measure for utility.[4] Although this is not (yet) standard practice in economics, indicators of happiness or subjective well-being have increasingly been studied and successfully applied; for surveys see e.g. Frey and Stutzer (2002a,b), Layard (2005) and Di Tella and MacCulloch (2006).

Measures of reported subjective well-being passed a series of validation tests, revealing that people who report high subjective well-being smile more often during social interactions and are less likely to commit suicide. Changes in brain activity and heart rate account for substantial variance in reported negative affects. Reliability studies found that reported subjective well-being is fairly stable and sensitive to changing life circumstances; see Frey and Stutzer (2002b) for references. However, in order to conduct welfare comparisons on the basis of reported subjective well-being, a further

[4] Subjective well-being is the scientific term in psychology for an individual's evaluation of his or her experienced positive and negative affect, happiness or satisfaction with life. With the help of a single question or several questions on global self-reports, it is possible to get indications of individuals' evaluation of their life satisfaction or happiness; see Diener, Suh, Lucas and Smith (1999).

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condition has to be met. Well-being must be interpersonally comparable. Economists are likely to be skeptical about this claim. However, evidence has been gathered that it may be less of a problem on a practical level than on a theoretical level. Happy people, for example, are rated as happy by friends and family members, as reported by e.g. Lepper (1998), as well as by spouses. Furthermore, ordinal and cardinal treatments of satisfaction scores generate quantitatively very similar results in microeconometric happiness functions; see e.g. Frey and Stutzer (2000) and Ferrer-i-Carbonell and Frijters (2004). Therefore, throughout the paper, results from least-squares estimations are reported. The existing state of research suggests that, for many purposes, happiness or reported subjective well-being is a satisfactory empirical approximation to experienced utility.

The current study is based on data on subjective well-being from the German Socio-economic Panel Study (GSOEP). The GSOEP is one of the most valuable data sets for studying individual well-being over time. It was started in 1984 as a longitudinal survey of private households and persons in the Federal Republic of Germany, and was extended to include residents in the former German Democratic Republic in 1990. From this survey, we primarily used the eight waves between 1985 and 2003 that contain information about individual commuting time. Additional waves were taken into account when studying commuting distance and when imputing information on commuting time. All of our estimations are based on unbalanced panels. People in the survey were asked a wide range of questions with regard to their socio-economic status and their demographic characteristics. Moreover, they reported their actual commuting time and their subjective well-being. Commuting time is captured by the question, "How long does it normally take you to go all the way from your home to your place of work using the most direct route (one way only)?" Reported subjective well-being is based on the question, "How satisfied are you with your life, all things considered?" Responses range on a scale from 0 "completely dissatisfied" to 10 "completely satisfied". In order to study the effect of commuting on individual well-being, we restricted the sample to those who either commute on a regular basis to the same place or work at home and who report being either employed or self-employed. Descriptive statistics for the dependent variable life satisfaction, as well as all the covariates used in the empirical analysis, are provided in Table A1 in the Appendix.

Figure 2 presents the distribution of reported commuting time in Germany between 1985 and 2003. On average, people in the sample commute 22 minutes one way (a total of 44 minutes a day) with a standard deviation of 18 minutes. Median commuting time is 15 minutes. Commuters, who report traveling to work taking an hour or more, comprise 6.8 percent of the sample.

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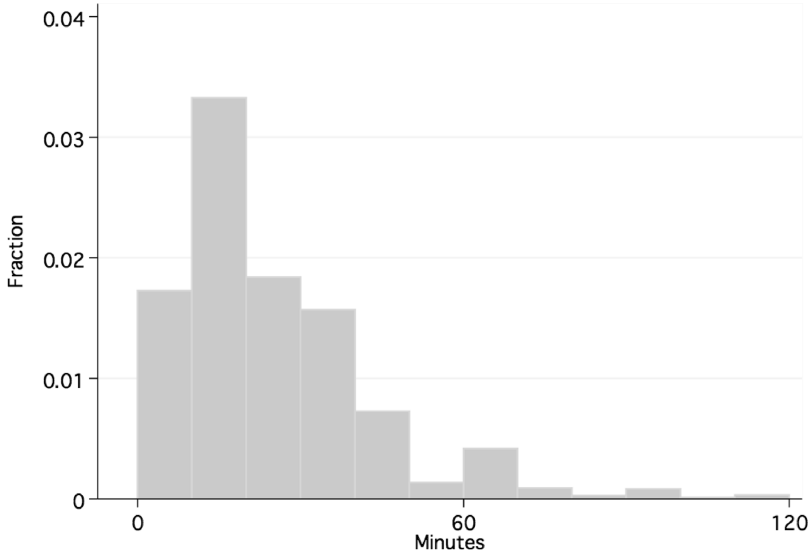

Fig. 2. Distribution of average daily commuting time (one way)
Data source: GSOEP.

Commuting and Reported Satisfaction with Life

Testing Strategy. The concept of equilibrium in economics predicts that pecuniary, as well as mental, costs of commuting are compensated for on the labor and housing market. Thus, individuals' utility level is equalized over all actual combinations of alternatives in these two markets. This, of course, only holds for homogeneous people. We start with this assumption to introduce our empirical testing strategy. However, we also extend our argument to include people with heterogeneous preferences. Empirical estimations refer only to the latter case. In the underlying model, commuters' utility is increasing in consumption c of goods, services and housing, and decreasing in the disamenity D for commuting time, $U = u(c, D)$.

Utility U is equal to $\bar{U}$ for realized combinations of income y_i, time spent commuting D_i and rent r_i across individuals indexed by i:

$$U_i = u(y_i, D_i, r_i) = \bar{U} \quad \text{for all } i. \tag{1}$$

Totally differentiating this equilibrium condition, we get

$$dU = \frac{\partial u}{\partial y} dy + \frac{\partial u}{\partial D} dD + \frac{\partial u}{\partial r} dr = 0. \tag{2}$$

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For variation in commuting time D, this implies that

$$\frac{dU}{dD} = \frac{\partial u}{\partial y}\frac{dy}{dD} + \frac{\partial u}{\partial D} + \frac{\partial u}{\partial r}\frac{dr}{dD} = 0. \tag{3}$$

The LHS of equation (3) states that the overall change in utility due to a change in the disamenity commuting time is zero. A decomposition of the total change is provided on the RHS of equation (3). There are three effects of an increase in commuting time. There is a marginal gain in utility due to a higher level of consumption that is reached because jobs that require longer commutes offer a higher income. Moreover, longer commuting time reduces rents for housing and thus leaves additional money for consumption. Besides these two positive effects, there is a marginal decrease in utility due to the burden of spending more time commuting. Given that incomes and rents for housing exclusively reflect compensation for commuting conditions, the three effects add up to zero.

The prediction in equation (3) can be tested directly. We take commuters' reported satisfaction with life as a proxy measure for individual utility. The idea for the empirical test is captured in the following regression equation:

$$u_i = \alpha + \beta D_i + \varepsilon_i. \tag{4}$$

The coefficient β measures the total change in utility due to a change in commuting time. Under the null hypothesis $\beta = 0$, commuting time is entirely compensated by either higher salaries or lower rents for housing. The alternative hypothesis $\beta < 0$ states that commuting time is not fully compensated on the labor and housing market.

Cross-section Evidence. Figure 3 provides a first visual test to see whether there are indications of any kind of a correlation between commuting time and people's life satisfaction. Average life satisfaction is reported for the four quartiles of commuting time. Contrary to the prediction of $\beta = 0$ in equilibrium, results indicate that there is a sizable negative correlation between commuting time and individuals' well-being. For each subsequent quartile of longer commuting time, we find, on average, a lower reported satisfaction with life. While life satisfaction is 7.23 points, on average, for people who commute 10 minutes or less (first quartile), average satisfaction scores for the top fourth quartile (commuting time more than 30 minutes) is 6.99 points, i.e., 0.24 points lower.

The raw correlation between commuting time and life satisfaction does not take into consideration that we compare people with heterogeneous preferences facing different restrictions. In other words, the optimal commuting time is probably systematically different for different groups of people. Thus the observed lower subjective well-being of people who spend more time traveling from home to work might just reflect that these are people with

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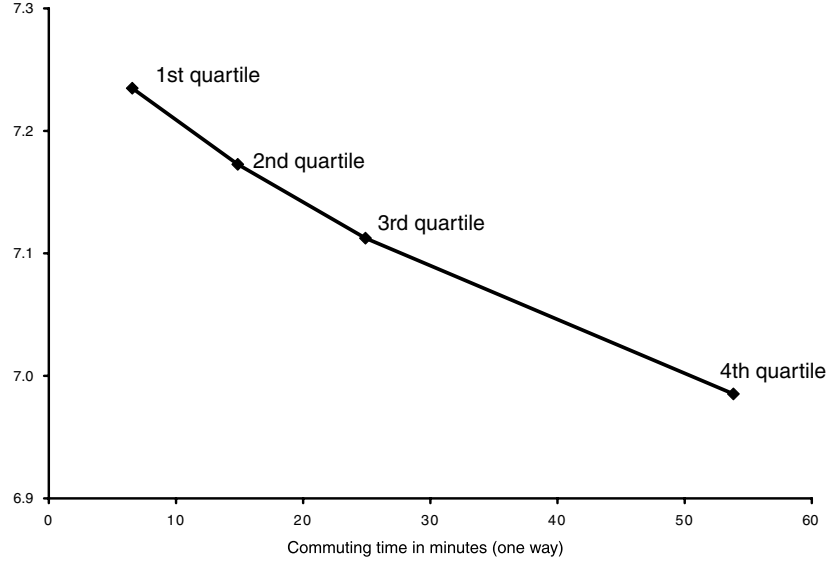

Fig. 3. Commuting time and average reported satisfaction with life, Germany, 1985–2003
Data source: GSOEP.

different socio-demographic and socio-economic characteristics. In order to apply the test for compensation, groups of people who are very similar have to be empirically constructed. Technically, a multiple regression approach is applied to control for individual characteristics.

Equation (4) is extended in order to include a set of individual covariates X_i:

$$u_i = \alpha + \beta D_i + \gamma X_i + \varepsilon_i . \tag{5}$$

It is important to note that X_i does not include respondents' labor income, their household income or working hours. This is crucial, because income (and to some extent also working hours) is one of the variables through which people are compensated for the distance they cover to and from work. Equation (5) only makes a sharp prediction of $\beta = 0$ if all channels for compensation remain uncontrolled. If income is controlled, people who spend more time commuting are, of course, worse off, *ceteris paribus*.

Heterogeneous preferences for commuting also imply sorting. It is the quintessence of spatial economics that people reside where their preferences are best met. It is this process of sorting and arbitrage that leads to the prediction on compensation. How do heterogeneous tastes for commuting and sorting affect any observed partial correlation between commuting time and life satisfaction in a cross-section estimation?

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Imagine that people have homogeneous tastes in all respects but commuting. There are some people who strongly dislike commuting. Given their possibilities on the labor market, they are worse off than people who do not mind commuting. What commuting time do these people optimally choose? They have a high willingness to pay for a short commute. Other things equal, they thus live closer to where they work and are willing to pay more for housing. From the two arguments, the following picture emerges: people who dislike commuting have a disadvantage in our spatial economy. While they choose a combination of job and housing that involves relatively short commuting, they experience lower utility than people whose disutility from commuting is small. Accordingly, all else equal, a *positive* correlation between commuting time and a proxy measure for utility is expected. This prediction runs counter to the correlation observed in our sample. With regard to the specific sorting argument, we estimate a lower bound in the following cross-section equation.[5]

In Table 1, equation (5) for the effect of commuting time on life satisfaction was first estimated in a pooled least-squares regression, taking a large number of individual characteristics into account, as well as year dummies.[6] The results in Table 1 show that people who spend more time commuting report lower satisfaction with life, *ceteris paribus*. Based on an F-test, the proposition that the two commuting variables together are not correlated with reported life satisfaction is rejected on the 99 percent level. An increase of an individual's commuting time by one hour and an initial commuting time of 0 refers, on average, to a 0.28 point ($t = -9.20$) lower subjective well-being. For one standard deviation (i.e., 18 minutes) the effect amounts to -0.09 ($t = -5.92$).

Evidence from Estimations with Individual-specific Fixed Effects. The pooled estimation in Table 1 identifies the effect of commuting on reported well-being, based on the variation in these two variables between people and for each individual over time. It is assumed that any measurement errors, as well as unobserved characteristics, are captured in the error term of the estimation. Indeed, many mistakes in people's answers are random

[5] A similar argument holds for people with preferences for environmental qualities that are positively correlated with commuting like gardens in residential areas. These people require less compensation and are relatively better off. However, the observed correlations in a pooled cross-section estimation overestimate the losses incurred (or they are in fact spurious) if people have preferences for spatial characteristics that are positively correlated with commuting but negatively with person-specific reporting behavior.

[6] A discussion of the results for the socio-demographic and socio-economic factors in Germany can be found in Stutzer and Frey (2004). Note that self-employment is taken as a control variable even though some people may choose to be self-employed in order to avoid the daily stress of commuting.

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Table 1. *Commuting and satisfaction with life, Germany 1985–2003 (dependent variable: satisfaction with life)*

	(1)		(2)	
	Coefficient	*t*-Value	Coefficient	*t*-Value
Commuting time (in minutes)	−0.0054	−5.04	−0.0054	−3.30
Commuting time squared	0.012*e* − 3	0.96	0.035*e* − 3	1.97
Individual characteristics[a]	Yes		Yes	
Individual fixed effects	No		Yes	
Year fixed effects	Yes		Yes	
F-test (Prob. > *F*) Commuting time = 0 and commuting time squared = 0	0.000		0.000	
Effect of one hour of commuting	−0.284	−9.20	−0.200	−3.99
No. of observations	39,141		39,141	
No. of individuals	19,088		19,088	
	(3)		(4)	
Commuting time	−0.0045	−9.88	−0.0025	−3.47
Individual characteristics[a]	Yes		Yes	
Individual fixed effects	No		Yes	
Year fixed effects	Yes		Yes	
Effect of one hour of commuting	−0.270	−9.88	−0.151	−3.47
No. of observations	39,141		39,141	
No. of individuals	19,088		19,088	

Data source: GSOEP.

Notes: Partial correlations are from least-squares estimations.

[a] Individual control variables in specification (1) include age, age squared, sex, six categories for years of education, two variables for the relationship to the head of household, nine variables for marital status, three variables for the number of children in the household, the square root of the number of household members and indicators for self-employment, residence in the New German *Laender*, foreigners with EU nationality, other foreigners and first interview.

and thus do not bias the estimation results. This holds true, for example, for the order of questions, the wording of questions, actual mood, etc. However, non-sampling errors are not always uncorrelated with the variables of interest. A measurement error perspective suggests that the inferences can be clouded by unobserved personality traits that, in our case, influence individuals' commuting behavior, as well as how they respond to subjective well-being questions. For instance, restless people who have difficulty settling down may, on average, choose longer commutes and may also report lower satisfaction with life. As a result, the observed correlation is biased.

A related concern involves heterogeneity in people's income (generating potential). If housing options close to workplaces are not feasible for some people due to income constraints, they might be more likely to live in suburbs and spend more time commuting. Long commuting time might

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thus reflect low household income and the correlation in the cross-section might be spurious.[7] However, idiosyncratic effects that are time invariant can be controlled for if the same individuals are re-surveyed over time. This is the case for our longitudinal data set, in which it is possible to consider a specific baseline well-being for each individual. The statistical relationship between commuting and reported subjective well-being is then identified by the variation in commuting time within observations for the same person. In our sample, the mean standard deviation of individual commuting experiences is 8.7 minutes.

The second estimation in Table 1 reports the result for an estimation with individual fixed effects that excludes spurious correlation due to time-invariant unobserved characteristics of people. Partial correlations again show a negative effect of commuting time on life satisfaction. The two variables for commuting time are jointly statistically significantly different from zero.[8] People who spend one hour rather than 0 minutes commuting (one way) report, on average, a -0.20 points ($t = -3.99$) lower level of subjective well-being. For one standard deviation (i.e., 18 minutes), the effect is -0.086 ($t = -3.52$). The size of the commuting effect for one standard deviation is half the effect of finding or losing a partner for those who are single (fixed-effects estimation). Compared to the effect of becoming unemployed ($= -0.671$), as reported in Stutzer and Frey (2004, Table 4), an increase in commuting time by one standard deviation (one hour) is about one-eighth (one-fourth) as bad for life satisfaction.

Thus, the results of the raw correlation and the pooled estimation are confirmed. All of them are at odds with the prediction of standard location theory and the implicit assumption in many economics models that, on average, people are compensated for commuting.

The two estimation approaches in Table 1 lead to somewhat different results for the effect of commuting on subjective well-being. The partial correlation is larger in the pooled regression, which also includes information on variation between people. Potentially, this allows us to estimate the correlation between commuting time and subjective well-being more efficiently. In order to test whether the individual fixed effects are correlated with the explanatory variables, a Hausman test was performed.

[7] Contrary to the mentioned presumption, in an estimation of the covariates of commuting time in Germany (not shown), household income is statistically significantly positively correlated with commuting time. A doubling of household income is related to a slightly higher commuting time of 0.63 minutes.

[8] A quadratic specification of the effect of commuting time on life satisfaction is chosen because we hypothesize that the marginal burden of commuting is falling. This is based on the idea that monetary commuting costs increase in a less than proportional way to increases in commuting time. In the fixed-effects estimation, this hypothesis is not rejected. However, we also report results for linear specifications in the bottom half of Table 1.

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The hypothesis that there are no systematic differences in the coefficients between the fully efficient model in the first two columns and the less efficient fixed-effects estimate in Table 1, however, is clearly rejected. The negative effect of commuting in the fixed-effects model thus more accurately measures the incompleteness in compensation.

The Role of Commuting Distance and the Mode of Transportation. In order to broaden the view on the phenomenon, Table 2 takes commuting distance and the mode of transportation into account.[9] Commuting distance is an alternative proxy for the burden of commuting. However, we judge it as less accurate because distance as such is less closely related to the opportunity cost of commuting than commuting time. We still find a statistically significant small negative effect of commuting distance on reported life satisfaction. The effect of a change in commuting time (e.g. an increase due to worse congestion or a decrease due to a new road), when commuting distance is kept constant, is estimated in specification (2). Not surprisingly, a larger negative effect is estimated than in Table 1 as the variation in unexpected changes in commuting time becomes more important in the estimation. In contrast, Section IV below reports estimations for people who either change their job and/or their residence. These estimations exploit variation in commuting time which people are supposed to have known about when they changed their job and/or residence.

The pleasures and pains of commuting depend on the mode of transportation. We test whether there are also systematic differences in the negative partial correlation between commuting time and subjective well-being for people who commute either by car, by public transport or by some other means. According to our interpretation, the question is whether there are differences in the degree of incomplete compensation between users of private and public transportation. In our sample, 63 percent of respondents mainly commute by car, 14 percent mainly use public transport, and 24 percent use either other transportation modes (motorcycle, bike, on foot) or a combination of different modes.

In order to test for systematic differences in the partial correlations, interaction terms between commuting time and the mode of transportation are included. Specification (3) restricts differences to slopes (i.e., there are no transportation mode-specific intercepts). Specification (4) allows

[9] Information about commuting distance is available for the following years: 1985, 1990 West Germany, 1991 East Germany, 1992, 1993, 1995 and 1997–2005. As commuting distance was included in the survey more frequently than commuting time, estimation (1) in Table 2 is based on 103,270 observations from 25,171 individuals.

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Table 2. *Commuting distance, transportation mode and satisfaction with life (dependent variable: satisfaction with life)*

	(1)		(2)	
	Coefficient	*t*-Value	Coefficient	*t*-Value
Commuting time			−0.0114	−7.70
Commuting time squared			0.048*e* − 3	3.13
Commuting distance (in km)	−2.013*e* − 3	−2.25	9.308*e* − 3	5.66
Commuting distance squared	0.012*e* − 3	1.18	−0.065*e* − 3	−3.72
Individual characteristics[a]	Yes		Yes	
Individual fixed effects	Yes		Yes	
Year fixed effects	Yes		Yes	
No. of observations	103,270		38,818	
No. of individuals	25,171		18,966	
	(3)		(4)	
Commuting time (CT) (car)	−0.0111	−2.91	−0.0127	−2.88
Commuting time squared (car)	0.134*e* − 3	2.66	0.149*e* − 3	2.72
CT × public transport	5.948*e* − 3	1.28	2.368*e* − 3	0.23
CT2 × public transport	−0.129*e* − 3	−1.82	−0.102*e* − 3	−0.96
CT × other transportation mode	5.311*e* − 3	1.11	0.0107	1.42
CT2 × other transportation mode	−0.138*e* − 3	−1.85	−0.190*e* − 3	−2.04
Public transport			0.1014	0.44
Other transportation mode			−0.0894	−0.91
Individual characteristics[a]	Yes		Yes	
Individual fixed effects	Yes		Yes	
Year fixed effects	Yes		Yes	
F-test (Prob. > *F*) Commuting time = 0 and commuting time squared = 0	0.014		0.015	
F-test (Prob. > *F*) CT × public transport = 0 and CT2 × public transport = 0 (and public transport = 0)	0.140		0.215	
Effect of one hour of commuting by car	−0.185	−1.71	−0.222	−1.84
Effect of one hour of commuting by public transport	−0.291	−2.31	−0.344	−2.56
No. of observations	21,353		21,353	
No. of individuals	16,288		16,288	

Data source: GSOEP.

Notes: Partial correlations are from least-squares estimations.

[a] The same control variables for individual characteristics as in Table 1 are included.

for transportation mode-specific intercepts. Both estimations offer similar results. While the estimated negative effect of one hour of commuting is larger for users of public transport than users of cars, the difference is imprecisely measured and not statistically significantly different from

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zero. For both equations, it is not rejected that the interaction terms for commuting time and public transport (and a specific intercept for public transport in equation (4)) are jointly equal to zero.

To our knowledge, the empirical analyses in Table 1 and specifications (3) and (4) in Table 2 directly test, for the first time, the strong notion of equilibrium in location theory. This is made possible by applying individual reported subjective well-being as a proxy measure for utility. Contrary to the common understanding in economics, there seems to be a systematically incomplete compensation of people who spend more time commuting between home and work.

Calculation of the Missing Compensation in Monetary Terms. How much additional income would a commuter have to earn in order to be as well-off as someone who does not commute? This calculation has to be taken with a grain of salt as there are many unresolved issues in the assessment of the marginal utility of income from data on subjective well-being; see the discussion in Clark, Frijters and Shields (2008). We calculated the compensation in three steps (exemplary for the mean commuting time of 22 minutes).

First, the life satisfaction differential was calculated that we attribute to incomplete compensation. This calculation is based on the specification and estimated coefficients in Table 1 (second estimation including fixed effects):

$$\begin{aligned}\Delta U &= u(D=22) - u(D=0)\\ &= -5.425e-3*22+0.035e-3*22^2-0\\ &= -0.1025. \end{aligned} \tag{6}$$

Second, the marginal utility of additional income was estimated based on an extended microeconometric happiness function. In order to estimate a coefficient for the gross marginal effect of additional income, a full specification is necessary that keeps important determinants of income constant. Here, commuting time and working hours are controlled for, in addition to the covariates mentioned in Table 1. Income is measured in terms of the real monthly net labor income (w) and the real monthly household income (y) (consisting of the respondent's labor income w as well as other household members' income v).[10]

$$U=\alpha+\beta_1 D+\beta_2 D^2+\gamma X+\delta_1 w+\delta_2 w^2+\delta_3 y+\delta_4 y^2 \quad \text{and} \quad y=w+v. \tag{7}$$

[10] The results for this estimation can be obtained from the authors on request.

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The marginal utility of additional labor income at the sample mean ($\bar{w} = 1{,}326$ euros, $\bar{y} = 2{,}800$ euros) is

$$\begin{aligned}\frac{\partial u}{\partial w} &= \delta_1 + 2*\delta_2*w + \delta_3 + 2*\delta_4*y \\ &= 0.157e-3 + 2* -7.80e-09*1{,}326 + 0.100e-3 \\ &\quad + 2* -3.24e-09*2{,}800 \\ &= 0.218e-3. \end{aligned} \tag{8}$$

Third, the ratio between the loss in utility due to commuting and the marginal utility of income was built to calculate the missing compensation in monetary terms:

$$\frac{\Delta U}{\partial u/\partial w} = \frac{-0.1025}{0.218e-3} = -469.19. \tag{9}$$

Full compensation for commuting 22 minutes (one way) compared with no commuting at all, is estimated to require an additional monthly income of approximately 470 euros or 35.4 percent of the average monthly labor income. We do not want to insist on the specific number, but would like to emphasize that the loss in well-being due to a suboptimal commuting situation seems sizable whether put in perspective relative to other determinants of subjective well-being or translated into monetary terms.

IV. Is There a Simple Explanation for the Commuting Phenomenon?

The finding that people who spend more time commuting are systematically worse off stands in sharp contrast to the equilibrium view in economics. There are two completely different ways of reacting to this challenge: First, the empirical finding may be misleading. In fact, equilibrium is maintained when households are considered as units that are compensated, or when utility from jobs and housing is studied directly. Second, equilibrium may not be attained because of frictions. Transaction costs restrict residential and job mobility and prevent commuters from being fully compensated.

Is Full Compensation Attained at the Household Level?

While commuting might be a burden for those involved, the members of their family might benefit so that, overall, the households' well-being is equalized. The empirical finding can thus be explained by a too limited selection of the decision-making unit. At a household level, the equilibrium may still be attained.

This possible explanation of the commuting paradox is studied empirically in Table 3. We analyze whether an individual's subjective well-being

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Table 3. *Satisfaction with life and partners' commuting time (dependent variable: satisfaction with life)*

	(1)		(2)	
	Coefficient	*t*-Value	Coefficient	*t*-Value
Partner's commuting time (in minutes)	−0.0018	−0.71	−0.0012	−0.48
Partner's commuting time squared	0.021*e* − 3	0.76	0.018*e* − 3	0.62
Commuting time			−0.0063	−2.51
Commuting time squared			0.055*e* − 3	2.04
Irregular commuting			−0.3573	−2.02
Commuting to different places			−0.0237	−0.19
Not commuting			−0.1759	−1.05
Individual characteristics[a]	Yes		Yes	
Individual fixed effects	Yes		Yes	
Year fixed effects	Yes		Yes	
No. of observations	19,054		19,054	
No. of individuals	10,556		10,556	

Data source: GSOEP.

Notes: Partial correlations are from least-squares estimations.

[a] Individual control variables are the same as in Table 1. In addition, two control variables for work status (unemployment and no paid work or other status) are included.

is increasing in relation to his or her partner's commuting time. A positive partial correlation could balance out the compensation that is missing for those who actually commute. However, our results do not support this alternative explanation. In a pooled least-squares estimation (not shown), we find that the more time respondents' partners spend commuting, the less satisfied the respondents are. The negative effect is roughly a third of the size of the effect that is measured for people's own commuting (first estimation in Table 1). This result indicates that commuting might even result in negative externalities for other family members (consistent with previous research on commuting and family tensions mentioned in Section II). However, in the fixed-effects estimations shown in Table 3, the negative effect of a partner's commuting time is close to zero. In sum, there is no evidence that people systematically benefit from the commuting of other household members.

The issue of intra-household bargaining can be excluded if only single-person households are studied. However, the sample is then reduced substantially to 3,622 observations and individuals are observed, on average, only 1.5 times. In a fixed-effects estimation, we find a large negative effect of commuting time on life satisfaction. The partial correlation for the linear term is -0.0197 ($t = -2.62$) and the square term is $0.17e-3$ ($t = 1.95$). This amounts to a negative effect of a one-hour commute of -0.578 ($t = -2.68$). However, the standard error of this estimation is

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large and the 95 percent confidence interval includes the negative effect estimated for the fixed-effects specification shown in Table 1. Still, the finding strengthens the paradoxical finding from the previous section, rather than any alternative explanation based on intra-household altruism or bargaining.

Are There Indications for Compensation in Satisfaction with Particular Life Domains?

There is a second reason why equilibrium could actually be attained, though not be reflected accordingly in reported subjective well-being. When people make a judgment about their well-being, particular life domains and experiences might be more salient than others; see Schwarz and Strack (1999). In our case, commuting might be over-represented in people's evaluation calculus at the time of the interview.

In order to detect possible compensation on the labor and the housing market that might not be accurately measured in overall life satisfaction, we additionally study domain satisfaction. The results are shown in Table 4.

Table 4. *Commuting and domain satisfaction*

	Satisfaction with ...				
	Health	Job	Dwelling	Spare time	Environment
Mean satisfaction	7.072	7.147	7.426	6.506	6.143
[std. dev.]	[2.05]	[2.02]	[2.15]	[2.29]	[2.03]
Estimation coefficients					
Commuting time	$-7.00e-3$	$-8.69e-3$	$-0.57e-3$	-0.014	$-1.85e-3$
	(-3.55)	(-4.03)	(-0.25)	(-4.45)	(-0.76)
Commuting time squared	$0.05e-3$	$0.07e-3$	$0.00e-3$	$0.05e-3$	$0.00e-3$
	(2.58)	(3.35)	(0.00)	(1.42)	(0.39)
Individual characteristics[a]	Yes	Yes	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
F-test (Prob. $> F$) Commuting time $= 0$ and commuting time squared $= 0$	0.001	0.000	0.855	0.000	0.598
Effect of one hour of commuting	-0.223	-0.243	-0.034	-0.658	-0.075
	(-3.70)	(-3.67)	(-0.49)	(-6.98)	(-1.00)
No. of observations	39,069	38,356	38,938	28,018	29,430
No. of individuals	19,063	18,756	19,014	17,901	16,068

Source: GSOEP.

Notes: Partial correlation coefficients are from least-squares estimations. t-Values are in parentheses.

[a] The same control variables for individual characteristics as in Table 1 are included.

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According to the initial notion of equilibrium, it is hypothesized that people who spend more time commuting are compensated by a more attractive job or home and, accordingly, report higher satisfaction with these two aspects. However, results for domain satisfaction contradict these predictions. People with a lengthy distance to and from work do not report increased satisfaction with their dwelling and report even lower satisfaction with their job. Employed and self-employed people who spend an hour commuting (one way) report, on average, a 0.24 points ($t = -3.67$) lower satisfaction with their job. Both findings are inconsistent with the idea of compensation in location theory and sustain the commuting paradox. Results in Table 4 further indicate that commuting time is significantly negatively correlated with health satisfaction and it has a large negative effect on people's satisfaction with their spare time.[11] We thus find a negative partial correlation for commuting time in one specific domain of satisfaction where we would expect so (i.e., spare time) and a negative or no correlation for three domains in which we would expect a positive one (i.e., job, dwelling and environment).

Is Equilibrium Not Attained as a Result of Frictions?

The reasoning so far might be countered by arguing that there are disequilibrium models (or search models) in urban and regional economics that complement Alonso–Muth-type residential location models; for surveys see e.g. Clark and van Lierop (1986) and Crampton (1999). These models take transaction costs explicitly into account, as in e.g. Weinberg, Friedman and Mayo (1981) and van Ommeren, Rietveld and Nijkamp (1997). While they generate similar predictions for individual behavior on the urban labor and housing market to the former ones, they predict lower utility for those in a disadvantaged situation with long commuting times; see e.g. van Ommeren (2000). Transaction costs prevent people from adjusting to economic shocks. In particular, transaction costs might hinder people from experiencing a longer or more disturbing commuting time *ex post* than expected *ex ante* from re-optimizing. Therefore, people might be locked into a disadvantaged commuting situation. It is very difficult to reject an explanation based on transaction costs (in particular as transaction costs might also be systematically involved in behavioral explanations).

A related reasoning links the opportunities for optimization to economic status. It might be hypothesized that poor people have less chance of

[11] The finding that there are significant differences in the negative effect of commuting on domain satisfaction indicates that the results cannot simply be interpreted as response biases, whereby less happy people paint an overall gloomier picture in every dimension, i.e., they overstate commuting time, report lower domain satisfaction and so on.

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optimizing, due to powerful agents on the housing and labor markets, so that they end up spending more time commuting that is not compensated. Contrary to this presumption, in our sample, people from low-income households do not commute more on average (see footnote 7). However, they seem to experience reduced compensation of the burden of commuting compared to people from high-income households. In the subsample of people with a low household income (below median), a fixed-effects estimation specified as in Table 1, panel (2) shows an effect of one hour of commuting on life satisfaction of -0.251 ($t = -3.27$), while the effect is -0.134 ($t = -1.94$) for people from high-income households (median or above). However, it cannot be rejected that the coefficients for commuting time and commuting time squared are the same in the two subsamples (Prob. $> F = 0.203$). Due to the limited longitudinal variation, statistically significant differences in commuting effects between subsamples are difficult to establish.

In the remainder of this subsection, we focus on persons who changed their job or their place of residence between those survey waves for which we have information on commuting time. These people have the possibility of re-optimizing. Thus, it is not expected that any changes in commuting time will be systematically linked to reported life satisfaction. In contrast, if individuals for some reason accept commuting, despite not being compensated (the paradoxical case), a negative effect of increased commuting time on utility would again be observed.

If uncompensated commuting is a reflection of the cost of re-optimizing, individuals who change either their residence or their job might overcome the inferior situation and choose optimal commuting time. Of course, it might still be that movers who increase their commuting time do so because of bad luck and have no better alternative (e.g. because they were fired). The degree of compensation associated with moving was tested based on observations for which consecutive information on commuting time is available, i.e., for the years 1985/90, 1990/93 for the Old German *Laender*; 1992/93 for the New German *Laender*; and 1993/95, 1995/98 and 1998/2003 for both. A new panel was generated, restricted to people who either changed their job and/or their place of residence anytime between the respective years. Missing information for the commuting time between years is imputed following a simple rule. As long as respondents stay in their job and in their residence, commuting time is carried forward to the following year with missing information. Accordingly, for years in the past when respondents stayed in the same job and residence, commuting time is imputed backwards. If someone only moves once between years with reported information on commuting time, commuting time can be imputed throughout. The new panel thus restricts the variation in commuting time to changes due to moving. It consists of episodes between two (old German

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Laender 1992/93) and six (1985/90 and 1998/2003) annual observations. Reports of life satisfaction right before and after somebody moves can be taken into account and a temporary effect of having a new job or residence can be captured empirically. The same specifications as in Table 1 were estimated. Results are shown in Table 5.

Table 5. *Compensation of people who relocate or change jobs (dependent variable: satisfaction with life)*

	All movers (1)	All movers (2)	Change of residence (3)	Change of job (4)
Commuting time	−0.0041	−0.0019	−0.0047	−0.0027
	(−3.10)	(−1.08)	(−1.39)	(−1.00)
Commuting time squared	4.70*e*−6	−0.852*e*−6	0.026*e*−3	0.011*e*−3
	(0.31)	(−0.05)	(0.67)	(0.39)
Change of residence	0.1661	0.1379	0.1104	0.3158
	(5.65)	(5.61)	(3.73)	(2.38)
Change of job	−0.1057	0.0179	0.1096	0.0457
	(−4.11)	(0.80)	(0.96)	(1.60)
Individual characteristics[a]	Yes	Yes	Yes	Yes
Individual fixed effects	No	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
F-test (Prob. > *F*) Commuting time = 0 and commuting time squared = 0	0.000	0.035	0.169	0.306
Effect of one hour of commuting	−0.230	−0.115	−0.192	−0.122
	(−6.09)	(−2.20)	(−1.88)	(−1.45)
No. of observations	25,712	25,712	9,818	11,052
No. of individuals	5,560	5,560	2,316	3,031
	(5)	(6)	(7)	(8)
Commuting time	−0.0037	−0.0019	−0.0027	−0.0017
	(−6.79)	(−2.59)	(−1.76)	(−1.49)
Change of residence	0.1660	0.1379	0.1100	0.3157
	(5.65)	(−5.61)	(3.72)	(2.38)
Change of job	−0.1057	0.0179	0.1085	0.0454
	(−4.11)	(0.80)	(0.95)	(1.59)
Individual characteristics[a]	Yes	Yes	Yes	Yes
Individual fixed effects	No	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Effect of one hour of commuting	−0.224	−0.116	−0.163	−0.103
	(−6.79)	(−2.59)	(−1.76)	(−1.49)
No. of observations	25,712	25,712	9,818	11,052
No. of individuals	5,560	5,560	2,316	3,031

Data source: GSOEP.

Notes: Partial correlation coefficients are from least-squares estimations. *t*-Values are in parentheses.

[a] The same control variables for individual characteristics as in Table 1 are included.

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Compared to the results in Table 1, movers report a smaller reduction in life satisfaction when commuting time is increased. The effect for one hour is −0.115 units and thus about half the size of the effect found in the baseline estimation. However, this effect is still substantial and statistically significant. In the fixed-effects estimation for all movers, an F-test rejects that commuting time and commuting time squared are jointly equal to zero. Less can be said about whether there is a systematic difference in the negative effect of commuting for people who only change their residence or only change their job. While the effect seems larger for people who relocate than for people who change their job, the standard errors are too large to draw a statistically valid conclusion. People who change their residence experience, on average, temporarily higher life satisfaction in their new home.[12]

In sum, people who change their job and/or their residence still experience reduced life satisfaction if their new arrangement involves longer commuting. While the smaller effect size hints to some sort of moving costs (that explain part of the overall negative correlation), the phenomenon remains partly unexplained.

V. Towards Behavioral Explanations

There is yet another reaction to the general result of this study. Individuals' decisions concerning commuting cannot be fully understood within the traditional economics framework. It is an issue "[w]here economics stops short" (*Economist*, 1998, special issue on commuting). Inspiration from other social sciences may complement an economic analysis of commuting behavior. Most prominent are insights from psychology that have been successfully integrated into a new cross-disciplinary field of economics and psychology, as in e.g. Rabin (1998), Camerer, Loewenstein and Rabin (2003) and Frey and Stutzer (2007).

There are at least two lines of reasoning that could contribute to a better understanding of people's commuting behavior. First, people might not be capable of correctly assessing the true costs of commuting for their well-being. They might rely on inadequate intuitive theories when they predict how they are affected by commuting. In particular, they may make mistakes when they predict their adaptation to daily commuting stress.[13] It has, for

[12] Specifications (3) and (4) report effects for a change of residence as well as a change of job because some people (who again move later on) have just moved before the initial observation with reported information about commuting time.

[13] Excellent overviews on people's difficulties in predicting future utility, as well as on adaptation, are provided in Frederick and Loewenstein (1999) and Loewenstein and Schkade (1999).

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example, been found that people do not get used to random noise; see Weinstein (1982). In contrast, people adapt to a large extent to higher income; see e.g. Stutzer (2004). In the case of overestimated adaptation, people systematically choose too long commuting times. A similar reasoning is followed in Simonsohn (2006). He argues that commuting behavior can be better understood in a framework of constructed preferences. People come up with some reference level of commuting time or commuting radius that they are only prepared to give up after experiencing negative effects on their well-being. In a challenging study on people who move from one US city to another, Simonsohn finds that people from a city where the average commuting time of the population is high (or low) also choose to commute more (or less) than average at their new place of residence (keeping individuals' own past commuting experience constant). In the latter model, people can thus either commute too much or too little.

Second, people's weak will-power might be another reason why long commutes are not compensated.[14] Those with limited self-control and insufficient energy might be induced to not even try to improve their lot. This view corresponds to what some lay people seem to think. The decision to start searching for a job closer to home or an apartment that reduces commuting time is again and again postponed to the following week. However, this can only be a partial explanation as there are indications of a negative effect of commuting on reported life satisfaction even for those individuals who have either changed their residence and/or their job. Still, some people might not only smoke more and save less than they would actually like, but also commute more than what they consider to be optimal.

VI. Concluding Remarks

Commuting is for many people a time-consuming experience five days a week. The journey from home to work and back is therefore an important aspect of modern life; it affects people's well-being and demands difficult decisions about mobility on the labor and housing market.

Commuting is also interesting for economic research conceptually. The decision to commute is hardly regulated. People are expected to freely optimize. This environment allows for testing basic assumptions of the economic approach, like market equilibrium. Positive and normative theories

[14] The consequences of (economic) agents with self-control problems are discussed in e.g. O'Donoghue and Rabin (1999) and Brocas and Carrillo (2003).

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in urban and regional economics, as well as in public economics, rely on a strong notion of equilibrium. It is assumed that people who can move freely and change jobs arbitrage away any utility differentials between people, whether they are due to residential characteristics or due to covering distance, *ceteris paribus*.

In our test with panel data on subjective well-being for Germany, we find, contrary to the prediction of equilibrium location theory, a large negative effect of commuting time on people's satisfaction with life. People who commute 22 minutes (one way), which is the mean commuting time in Germany, report, on average, a 0.103-point lower satisfaction with life. This phenomenon is robust to a wide range of possible response biases, and it is not explained by compensation at the level of households. If people are aware of the full costs of commuting, the finding shows the importance of moving costs of trapped individuals. However, an albeit small effect also holds for people who either change their job or their place of residence and so have the opportunity of re-optimizing their commuting situation. There might, also for them, well be an explanation in terms of economic costs not yet found and thus not yet incorporated into the analysis. This cost factor would be interesting to know, because it potentially relates to a sizable loss in well-being and should be explicitly modeled in urban and public economics. Until an adequate rational-choice explanation has been provided, we propose the general result to be a "commuting paradox".

Research along the lines studied in the field of economics and psychology may well provide a better understanding of people's decisions about where to live and work and how long the commuting time may be. We favor an explanation based on wrongly predicted adaptation. Decisions about commuting involve a difficult trade-off between socially positively sanctioned income and some loss of spare time that is difficult to assess. Other behavioral anomalies may also play an important role in commuting decisions. Limited will-power and loss aversion, however, may better explain why people remain in an inferior status quo rather than why people who spend more time commuting suffer lower well-being. It will be a major challenge for future research to discriminate between alternative "behavioral" explanations of the phenomenon.

For many people, commuting seems to encompass stress that does not pay off. A better understanding of this phenomenon should provide valuable insights on the institutional and behavioral restrictions to compensation. Moreover, it may help commuters to increase their individual well-being.

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Appendix

Table A1. *Descriptive statistics*

	Mean	Std. dev.		Fraction (%)
Satisfaction with life	7.143	1.67	Male	55.6
Commuting time (in minutes)	22.079	18.35	Female	44.4
			Head of household or spouse	86.1
Commuting distance (in kilometers)	12.698	19.11	Child of head of household	12.8
			Not child of head of household	1.1
Working hours (hours per week)	38.954	11.68	Single, no partner	18.8
			Single, with partner	6.4
Real net labor income per month, 2000 euros	1,326.601	933.06	Married	65.0
			Separated, with partner	0.3
Real net household income per month, 2000 euros	2,799.666	1,639.37	Separated, no partner	1.3
			Divorced, with partner	2.5
			Divorced, no partner	3.9
Age	38.907	11.77	Widowed, with partner	0.3
Years of education	11.505	3.13	Widowed, no partner	1.2
No. of household members	3.117	1.35	Spouse living abroad	0.2
			No children in household	54.1
			1 child in household	23.6
			2 children in household	16.8
			3 or more children in household	5.5
			Employed	83.5
			Self-employed	16.5
			Western Germany	79.8
			Eastern Germany	20.2
			National	83.1
			EU foreigner	6.8
			Other foreigner	10.1
			First interview	4.9

Data source: GSOEP.

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