

A household perspective on the commuting paradox

Longitudinal relationships between commuting time and subjective wellbeing for couples in China

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DOI

[10.1016/j.tra.2023.103640](https://doi.org/10.1016/j.tra.2023.103640)

Publication date

2023

Document Version

Final published version

Published in

Transportation Research Part A: Policy and Practice

Citation (APA)

Tao, Y., van Ham, M., Petrović, A., & Ta, N. (2023). A household perspective on the commuting paradox: Longitudinal relationships between commuting time and subjective wellbeing for couples in China. *Transportation Research Part A: Policy and Practice*, 170, Article 103640. <https://doi.org/10.1016/j.tra.2023.103640>

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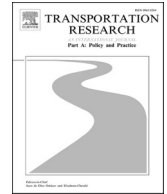
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Transportation Research Part A

journal homepage: www.elsevier.com/locate/tra

A household perspective on the commuting paradox: Longitudinal relationships between commuting time and subjective wellbeing for couples in China

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ARTICLE INFO

Keywords:

Travel behaviour
Well-being
Gender
Family
Causality
Developing countries

ABSTRACT

Research on the experienced utility of commuting time is dominated by an individualistic view of choice concerning the trade-offs between long commutes and job- or housing-related benefits. The widely discussed phenomenon of the commuting paradox shows that individuals systematically report worse subjective wellbeing as commuting time increases over time, indicating the incomplete trade-offs and net disutility for long commutes at the individual level. This paper takes a household perspective and conducts one of the first longitudinal studies on the gendered relationship between commuting time and subjective wellbeing in China. Drawing upon the China Health and Nutrition Survey between 2006 and 2015, we used seemingly unrelated regression models and fixed-effect models not only to compare the within-individual effect but also to investigate the spill-over effect of commuting time on life satisfaction between matched samples of husbands and wives. We additionally examined the role of preschool-aged children and co-residence with their grandparents in the gendered commuting-wellbeing relationship. The results supported the individual-level commuting paradox, considering that both partners had lower levels of life satisfaction with the increase of their own commuting time. Interestingly, husbands' life satisfaction was more negatively affected by wives' commuting time than vice versa, while wives' commuting utility was more related to the great time pressure from childcare and the social support from extended family members. Our research findings have implications for urban planning and governance policies which aim at mitigating job-housing mismatch, delivering accessible childcare services and transforming gendered social norms.

1. Introduction

Long commuting journeys are considered a daily burden for many people and families. According to the commuting monitoring report of 44 cities in China (2022), the average one-way commuting time was up to 36 min, and 24% of the commuters travelled more than 45-minutes between home to job locations. Over the past decade, there has been a growing body of longitudinal evidence concerning the within-individual relationship between the increase of commuting time and the loss in subjective wellbeing (e.g.,

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<https://doi.org/10.1016/j.tra.2023.103640>

Received 20 August 2021; Received in revised form 7 October 2022; Accepted 24 February 2023

Available online 6 March 2023

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Wheatley, 2014; Lorenz, 2018; Ingenfeld et al., 2019; Jacob et al., 2019; Clark et al., 2020). Notably, this body of work dominantly regards individuals as the agent to analyse the commuting-wellbeing relationship, neglecting that individuals' commuting decisions may be reached in a household context with gendered power relations and the negotiation with other family members involved (Coulter et al., 2016; Chiappori and Mazzocco, 2017). Taking into account the linked lives of family members is important in understanding the nuanced relationship between commuting time and subjective wellbeing from the household perspective.

Spatial economists disregard the commuting-related utility cost. They believe that there is always an equilibrium for the decision utility of commuting time (e.g., momentary costs); Otherwise, individuals will adjust job or housing locations to avoid the utility loss from long commutes (Chatterjee et al., 2020). In the classic monocentric urban model where job locations are concentrated in the city centre and workers live in the peripheral areas, workers search for an equilibrium between long commuting journeys and low house prices or a satisfactory living environment away from the city centre (Alonso, 1964; Mills, 1967; Muth, 1969; Ma and Banister, 2006). By contrast, labour economists generally treat housing locations as a given and propose a job search model in which workers are willing to pay high commuting costs to access financially or intrinsically rewarding jobs (Manning, 2003; Roberts et al., 2011; Jacob et al., 2019). In either way of thinking, the disutility from long commutes is fully compensated for by better housing or job conditions, contributing to the equalized decision utility between individuals.

The individual-level utility equilibrium idea may not hold if the focus shifts from the decision utility derived from observed choices to the experienced utility manifested by commuters' subjective wellbeing (SWB; Ettema et al., 2010). Influential research by Stutzer and Frey (2008) shows that longer commuting time is systematically linked to worse SWB outcomes. This finding is summarised as the commuting paradox, that is, individuals' long commuting journeys are not fully justified by the compensation from the housing and job markets, thereby leading to net experienced disutility. However, the phenomenon of the individual commuting paradox has not been supported by some recent longitudinal evidence, which observes negligible effects of within-individual changes in commuting time on corresponding changes in SWB outcomes (e.g., Lorenz, 2018; Morris and Zhou, 2018; Clark et al., 2020). Our study proposes that the commuting paradox can be better understood from the household perspective. According to traditional gender role models, females often take on the role of the primary caregiver and the secondary earner in a household (Bielby and Bielby, 1992; Rapino and Cooke, 2011; Chidambaram and Scheiner, 2020). For this reason, they tend to face higher opportunity costs of commuting time and bear greater psychological burdens from increased commutes than their male partners. Moreover, households are often the unit where commuting decisions are made for multiple family members. This suggests that commuting-SWB relationships may not only depend on the household structure, such as the presence of children, but also manifest themselves as the utility spill-overs between male and female partners. For example, the increase of a female's commuting time may matter not only for the SWB outcome of her own, but also for that of her male partner.

Our study drew from the longitudinal China Health and Nutrition Survey (CHNS) data to analyse whether commuting time is associated with SWB outcomes for couples, and if so, whether and how the presence of children and grandparents influences the gendered commuting-SWB relationship. The answer to these questions will contribute to better understandings of the commuting paradox in three ways. First, we explore the commuting-SWB relationship for matched samples of husbands and wives. Our concerns include not only the difference in the within-individual effect of commuting time but also the spill-overs of commuting utility between husbands and wives. Second, we go beyond the individual-level analysis to study the role of other family members in the gendered commuting-SWB relationship from the household perspective. Third, we enlarge the geographical scope of the international literature by providing one of the first longitudinal studies from China, where socialist market-oriented reforms have greatly reshaped household gender-role divisions over the past few decades (Jarvis et al., 2009; Sun et al., 2019). The contextual specificity of Chinese societies, i. e., intergenerational co-residence, is taken into account given that co-residence with the elder generation is a traditional form of living, as well as a realistic strategy for young couples to reduce housing costs, share childcare responsibility, and thus relieve work-commuting-family conflicts in China (Ta et al., 2019).

2. Literature review

2.1. The relationship between commuting time and SWB

The seminal study by Stutzer and Frey (2008) draws from German Socio-Economic Panel Study (GSOEP, 1985–2003) data to examine the experienced utility of commuting time. They find that individuals systematically report lower levels of life satisfaction as their commuting time increases over time. Given the contradiction with the equilibrium location theory, this finding is termed the commuting paradox, indicating that long commutes do not obtain full compensation from the housing and job markets and thus bring net disutility. To account for the commuting paradox, Stutzer and Frey (2008) propose three possible explanations, including the equilibrium for the dual-earner couples (without differentiating the gender), incomplete trade-offs between dissatisfaction with increased commuting time and better housing or job satisfaction, and the existence of moving costs in the housing and job markets. However, their empirical results fail to validate these explanations. In their follow-up research, Frey and Stutzer (2014) turn to seek explanations from behavioural economics. The main argument involved is that individuals tend to underestimate the future utility of intrinsic attributes (e.g., the opportunity cost of time), but overvalue the extrinsic needs (e.g., well-paid jobs and low housing costs) at the time of making commuting-related decisions. The result is that individuals accept overlong commuting time that contributes to their net experienced disutility.

Stutzer and Frey's works set a benchmark for a great deal of follow-up research that examines commuters' experienced utility by investigating the relationship between commuting time and SWB outcomes. As yet, however, the findings based on different research designs and contexts are rather mixed (See recent reviews by Chatterjee et al., 2020; Tao et al., 2022a). Cross-sectional studies from

Sweden (Friman et al. 2017), Spain (Simón et al., 2020), the United States (Choi et al. 2013), and China (Tao et al., 2022b) consistently find that commuting time is inversely associated with life satisfaction or general psychological wellbeing, suggesting that “stress does not pay” (Stutzer and Frey, 2008). In China, for example, Nie and Sousa-Poza (2018) conduct a cross-sectional mediation analysis showing that longer commuting time is associated with worse happiness and life satisfaction, partly through less time available for sleep. Zhu et al. (2019) pool the samples from China Labour-Force Dynamics Survey (CLDS). The results indicate that people who commute a longer time have higher levels of work stress and lower levels of job and family life satisfaction, which undermines their overall life satisfaction. Particularly, people with obesity problems and living in less urbanised areas are under a greater threat of long commutes (Zhu et al., 2017). Similarly, Sun et al. (2021) draw from the CLDS data to find that the negative association of long commuting time with overall SWB is accounted for by job satisfaction, self-reported health status and social support from neighbours.

However, longitudinal studies, which are mostly conducted in cities of developed countries, fail to validate the commuting paradox. Tao et al. (2022a) have systematically reviewed existing longitudinal evidence on the commuting-SWB relationship. Their results show that even though some of these longitudinal studies come to similar results as the cross-section research (e.g., Stutzer and Frey, 2008; Wheatley, 2014; Milner et al., 2017), there is longitudinal evidence observing a negligible and insignificant impact of commuting time on SWB within the individual. For example, Morris and Zhou (2018) find that longer commuting time results in higher wages and homeownership in the United States, which might justify the weak relationship between commuting time and life satisfaction. Drawing from the same GSOEP data (2007–2013) as Stutzer and Frey (2008), Lorenz (2018)’s fixed-effect modelling analysis suggests that increasingly long commuting journeys are not related to worse life satisfaction for the same individual, even though longer commutes do lead to greater dissatisfaction with life domains (e.g., family life and leisure time). Clark et al., (2020) also use the fixed-effect models and substantiate the insignificant impact of commuting time on general psychological wellbeing and life satisfaction in the United Kingdom. Longitudinal evidence on the negligible commuting-SWB relationship seems to support the utility equilibrium theory, that is, individuals are “successful in balancing the negative aspects of commuting against the wider benefits, e.g. access to employment, earnings and housing” (Clark et al., 2020).

Moreover, it is problematic that the commuting paradox implicitly assumes commuting itself as a source of disutility. In the field of transport geography, several review papers have elaborated that people not only travel to meet instrumental needs (e.g., accessing job locations), but also value travel in its own right (e.g., travel as an enjoyable activity; Ettema et al., 2010; De Vos et al., 2013; Mokhtarian, 2019). One remarkable benefit of commuting is the transition opportunity to get away from the hassles of work affairs and family chores so that commuters can do something pleasant or simply enjoy the time alone (Jain and Lyons, 2008). In addition, the positive utility of commuting time may be related to the travel mode choice. Evidence shows that compared with commuting by car or public transport, active commuting (e.g., walking and cycling to work) for a certain amount of time helps to meet required physical activity levels and improve individual health and SWB (Clark et al., 2020; Jacob et al., 2021; Martin et al., 2014; Tao et al., 2022b).

2.2. Gender differences in the commuting-SWB relationship in the household

An important argument for the individual-level commuting paradox is that someone’s commuting time involves negotiating and balancing with other family members. This means that the utility equilibrium is likely to be reached at the household level. It is economically sound that couples develop a cooperative strategy to maximize their collective utility (Chiappori and Mazzocco, 2017; Hirte and Illmann, 2019). Simply put, someone’s utility losses from long commutes are compensated by the partner’s utility gains, thereby resulting in a roughly zero net utility in the household. In Stutzer and Frey (2008)’s empirical analysis, however, the hypothesis of household-level equilibrium is also rejected. An individual tends to report worse life satisfaction as the partner’s commuting time increases, indicating that long commutes bring negative externalities to other family members.

The household-level commuting paradox can be attributed to the asymmetrical position and bargaining power between male and female partners. Although the past decades have witnessed great advances in women’s economic and social lives (e.g., the normalisation of dual-earner couples and narrowing gender gaps in the commuting distance; Cooke, 2013; Thomas et al., 2017), it is still too early to conclude that “the end of patriarchy was on the immediate horizon” (Perrons, 2003). Even in the dual-earner household, working women are found to face more role conflicts as the primary caregiver and the secondary income earner than working men (Bielby and Bielby, 1992; Chidambaram and Scheiner, 2020). Based on this gendered division of household labour, there is emerging longitudinal evidence showing that compared with men, women performed worse in SWB outcomes with the increase of commuting time or distance (e.g., Roberts et al., 2011; Feng and Boyle, 2014; Wheatley, 2014; Jacob et al., 2019). This disproportionate commuting disutility for women may arise from the domains of job and family lives. In the job domain, married women tend to accept under-qualified and less-rewarding jobs in the local labour market for their male partners’ job careers (Rapino and Cooke, 2011). This limits women’s chances of trading-off longer commutes with better job benefits (e.g., higher wages). In the family domain, women often undertake the main responsibility for domestic tasks, which imposes strict time constraints and increases their psychological sensitivity toward the increase of commuting time (Crane, 2007). As such, striking a balance between household responsibility and professional aspiration may restrict women’s spatial mobility, induce higher opportunity costs of commuting time, and result in greater utility losses from long commutes.

Apart from not differentiating the gender role, previous literature is limited in examining the spill-over effects of someone’s commuting time on the partner’s SWB outcomes. This issue cannot be overlooked because family members’ lives are linked and interdependent (Coulter et al., 2016; Thomas et al., 2017). Recent research in China has identified a collaborative decision-making for the allocation of job-housing distances between working couples after their residential relocation (Yao and Wang, 2021). Furthermore, changes in the built environment pre-post residential relocation show opposite effects on mode-specific travel time between male and female partners. These environmental changes also indirectly influence one’s daily travels through the partner’s travel mode attitude

and choices, ultimately shaping both partners' SWB outcomes in an interactive way (Guan and Wang, 2019; Mao and Wang, 2020; Wang et al., 2020). Following this way of thinking, we assume that if long commutes impose stress or time burdens on someone, his or her partner could either enjoy the positive utility from this person's job benefits that compensate for long commuting time, or bear the utility loss of less support for family chores. This situation is more complex if gender differences are considered. There is, even if little, evidence stating that males' satisfaction with family life is more influenced by female partners' commuting journeys than vice versa, because in this case, males are less likely to count on their partners to perform household tasks (Brömmelhaus et al., 2020).

Moreover, gendered commuting-SWB relationships may vary according to the household structure, especially the presence of children and their grandparents in the household. Childcare, on the one hand, may impose different impacts on fathers' and mothers' commuting utility. For instance, Rapino and Cooke (2011) find that having children significantly decreases mothers' – but not fathers' – commuting time. Carta and De Philippis (2018) provide an explanation that market services are not a perfect substitute for childcare. As a result, mothers are more likely to reduce commuting and working hours, or even quit the labour market, in exchange for childcare time when fathers' commuting time increases. Feng and Boyle (2014), Wheatley (2014), and Jacob et al. (2019) further extend the discussion to the experienced utility of mothers' commuting time. Their consistent findings are that because of the competing time use for childcare, mothers report worse SWB outcomes as their commuting journeys prolong in distance or time.

Assistance from the elder generation (i.e., children's grandparents), on the other hand, may play a positive role in changing gendered commuting patterns and utilities by shifting the division of labour within the household. Especially in a nation putting much weight on the patriarchal and collective culture of the family, such as China, intergenerational co-residence is a tradition and also becoming a common household strategy for young parents to cope with high housing prices and seek social support for childcare (Wang and Qin, 2017; Ta et al., 2019). Meanwhile, the burgeoning market economy in China is still incapable of providing adequate and affordable pre-school facilities, so the childcare provided by grandparents may contribute to relieving work-life conflicts for young parents, especially for mothers (Sun et al., 2019). Taken together, there is a need to pay due attention to the gender issue and household perspective when examining the experienced utility of commuting time, and especially, the longitudinal evidence of this kind is limited from the developing world such as China.

3. Data and methods

3.1. Data

Our study used data from the China Health and Nutrition Survey (CHNS). CHNS is a household-level longitudinal survey conducted every 2–5 years from 1989 to 2015 in 15 provinces and municipal cities of China. In each of the provinces and municipal cities, a multistage and random cluster process was followed to recruit a sample of around 30,000 individuals from 7,200 households. Within the household, every family member aged 6 and above was invited to fill in a questionnaire including information on demographics, daily activity and travel behaviours, health and SWB. Ethical approval for the survey was acquired from the Internal Review Board of the University of North Carolina at Chapel Hill and the Chinese Centre for Disease Control.

We chose the longitudinal couple samples from the survey waves of 2006, 2009, 2011 and 2015 for study because only the latest four waves contain the SWB information (i.e., a one-item measure of overall life satisfaction). Within the studied ten years, cities in China have experienced rapid urban population and land expansions, along with increasing job-housing mismatch and associated public health and wellbeing issues. The specific criteria for selecting eligible couple samples include that: (1) Husbands and wives aged 20–65 years old were followed 2 or more continuous waves; (2) They stay married and at least one of the partners commuted to work; and (3) They had no missing information on the variables of interest. This selection procedure resulted in 2,435 couple samples (i.e., 4,870 individual samples) with 13,484 person-year observations analysed in our study. Table S1 presents the baseline socioeconomic characteristics of the studied samples, which are similar to those of initially recruited samples and thus representative of the general population with a range of socio-economics in China.

3.2. Variables

The outcome variable is life satisfaction, representing the cognitive aspect of SWB. This global measure of life circumstances derives from reflective reasoning and is regarded as a satisfactory approximation of experienced utility by economists and transport geographers (e.g., Stutzer and Frey, 2008; De Vos et al., 2013; Morris and Zhou, 2018). In our study, life satisfaction was investigated at each wave of the survey by asking husbands and wives the question: "How satisfied are you with your life as a whole?". Their answers ranged from 1 (very unsatisfied) to 5 (very satisfied). Given the small number of answers on being very unsatisfied and being unsatisfied (i.e., levels 1 and 2, collectively accounting for 4.9% of all person-year observations), we combined these two answers to obtain a four-level life satisfaction scale.

The key explanatory variable is commuting time. The reason for choosing commuting time to predict experienced utility is its greater relevance to the opportunity cost of commuting (e.g., time available for other life domains) compared with commuting distance (Roberts et al., 2011; Gutiérrez-i-Puigarnau and Van Ommeren, 2015). Specifically, husbands and wives who were employed at each wave of the survey were required to record their two-way commuting time on a regular working day. Besides, they also reported the travel modes that were used for commuting and the duration that they commuted by each travel mode. The travel mode was coded as active mode (walk or bicycle), public transport (bus or subway), and car.

According to prior literature (e.g., Roberts et al., 2011; Feng and Boyle, 2014; Wheatley, 2014; Jacob et al., 2019; Mao and Wang, 2020), five subsets of covariates that might confound the gendered commuting-SWB relationship were taken into account. They are

demographic characteristics, housing and employment conditions, health status, household structure, and the place of residence, among which household structure is the concern to examine the commuting-SWB relationship for couples at different family life stages. Specifically, the household structure was measured by whether couples lived together with preschool-aged children (<6 years old) and their grandparents. The detailed settings for variables of interest could be found in [Table S2](#).

3.3. Methods

The modelling analysis was performed in three stages. In the first stage, we developed a panel version of seemingly unrelated regression (SUR) models to investigate the effect of commuting time on life satisfaction for matched husbands and wives. In travel behaviour and wellbeing studies, SUR models have been applied to regress the interrelated dependent variables, such as individual travel mode share ([Cao et al., 2009](#)), gendered commuting behaviours ([Kwon and Akar, 2021](#)), and couples' SWB outcomes ([Mao and Wang, 2020](#)). In our study, we estimated husbands' and wives' life satisfaction simultaneously by allowing for their error terms to be correlated. Following [Bjørn \(2004\)](#) and [Nguyen and Nguyen \(2010\)](#), a one-way random effect estimation was employed, given the panel nature of our data. The SUR models are denoted in Formula (1), where the Generalised Least Squares (GLS) are the estimators that we used for estimating the life satisfaction outcome:

$$\begin{pmatrix} y_{1,t} \\ y_{2,t} \end{pmatrix} = \begin{pmatrix} x_{1,t} & 0 \\ 0 & x_{2,t} \end{pmatrix} \begin{pmatrix} \beta_1 \\ \beta_2 \end{pmatrix} + \begin{pmatrix} \delta_{1,t} \\ \delta_{2,t} \end{pmatrix} + \begin{pmatrix} \omega_1 \\ \omega_2 \end{pmatrix} + \begin{pmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \end{pmatrix}$$

or $y_{it} = x_{it}\beta + \delta_{it} + \omega_i + \varepsilon_{it}(1)$

where the life satisfaction outcome, y_{it} , of the matched husband and wife i at the survey wave t is a function of time-varying and time-invariant explanatory variables x_{it} , within-individual residual effects δ_{it} , between-individual random effects ω_i , and a correlated error term between husbands and wives ε_{it} .

Regarding the inclusion of explanatory variables, SUR models followed a step-by-step approach to examine the commuting paradox at the household level. Model 1 included the commuting time of one's own to estimate the variances in life satisfaction with the change of commuting time (e.g., associations of husbands' commuting time with husbands' life satisfaction), after adjusting for the covariates excluding housing- and employment-related variables. Following [Clark et al. \(2020\)](#), we also introduced the within-individual averaged commuting time across survey waves to remove its cross-sectional variations, but the results showed little difference in the effect of commuting time on life satisfaction for both partners. Model 2 took into account possible compensating factors from housing and job markets to control for the market imperfection and to assess the net utility of commuting time. Partner's commuting time was further added in model 3 to study whether someone's life satisfaction was influenced by the partner's commuting journeys (e.g., associations of husbands' commuting time with wives' life satisfaction). To analyse the role of household structure on the gendered commuting-SWB relationship, model 4 included the interaction terms between (partner's) commuting time and the presence of preschool-aged children in the household, and model 5 further added the interaction terms with co-residence with grandparents. Given the GLS estimators used, all explanatory variables had gone through the multi-collinearity test before fitting the SUR models. The variance inflation factor (VIF) values between them were all below 4.0, indicating no serious multi-collinearity problems.

In the second stage, fixed-effect (FE) ordered logit models were employed to analyse the within-individual variances of life satisfaction between survey waves for husbands and wives, respectively (models 6 and 7). According to [Stutzer and Frey \(2008\)](#), the FE model contributes to better understandings of the commuting-SWB causality because it removes any endogeneity derived from time-invariant idiosyncratic characteristics. For example, personality traits may predispose the way that individuals choose job-housing relationships and psychologically react to changes in commuting time, suggesting a spurious commuting-SWB relationship if those unobserved time-invariant variables are left uncontrolled. In addition, compared with the SUR models using the GLS estimators, the FE ordered logit models using the Blow-up and Cluster (BUC) estimators are more suitable to predict the life satisfaction outcome that was measured by an ordinal scale ([Dickerson et al., 2014](#); [Clark et al., 2020](#)). The FE models are demoted in Formula (2), with the same explanatory variables as the fully-adjusted SUR models (i.e., model 5) included:

$$y_{i,t} = \beta_1 x_{it} + \delta_{it} + \varepsilon_i(2)$$

where the life satisfaction outcome, y_{it} , of the husband or wife i at the survey wave t is a function of time-varying explanatory variables x_{it} , a within-individual time-varying error term δ_{it} and a person-specific error term ε_i .

Another important challenge in identifying the commuting-SWB causality is the sample selection bias. This selection bias comes from the fact that commuting time can only be observed for people who were employed at the time of the survey. Excluding those person-year observations that reported unemployed or arbitrarily setting their commuting time to zero may misestimate the commuting disutility. This is particularly the case for wives because they have a higher likelihood of leaving the labour market as commuting time increases ([Roberts et al., 2011](#); [Carta and De Philipppis, 2018](#)). Therefore, we used the Heckman approach to correct for the bias of selecting into the labour market before fitting the SUR and FE models. Specifically, we estimated a random effect probit model on whether or not the participant was in employment for each wave of the survey. Following [Rapino and Cooke \(2011\)](#) and [Roberts et al. \(2011\)](#), the explanatory variables of employment status included the aforementioned covariates, plus the partner's working hours and monthly wages acting as over-identifying instruments. Finally, the inverse Mills ratio (i.e., the Mills term) generated from the probit model was additionally included in the models for predicting couples' life satisfaction.

In the third stage, several sensitivity analyses based on the SUR models were performed to test for the robustness of gendered

commuting-SWB relationships. First, we examined the mode-specific effect of commuting time on life satisfaction because the commuting utility could depend on the travel mode used (Martin et al., 2014; Clark et al., 2020; Jacob et al., 2021). Second, we grouped the two-way commuting time into 5 categories (<30, 30–60, 60–90, 90–120 and greater than 120 min) because the negative wellbeing effect of commuting time might be negligible, or even reversed, below certain time thresholds, indicating a non-linear relationship (Dickerson et al., 2014; Ingenfeld et al., 2019). Third, we investigated geographical variations in the gendered commuting-SWB relationship by including the interaction terms between commuting time and the type of geographic area for the place of residence. This is of our interest because, in urbanising China, commuting time has increased more rapidly in large cities than in small cities, towns and rural areas (Zhu et al., 2017). However, it is not clear to what extent the effect of commuting time on SWB outcomes varies over space. Fourth, we restricted couple samples to those who did not change commuting modes, job and housing locations between survey waves. As such, any variances in commuting time were induced by exogenous shocks (e.g., changes in traffic infrastructure or congestion), rather than the reverse causality from low levels of life satisfaction to proactively adjusting commuting time (e.g., by relocation or changing travel modes; Gutiérrez-i-Puigarnau and van Ommeren, 2015; Jacob et al., 2019). Fifth, we focused on the subgroup of dual-earner couples that both partners were employed along the survey waves. The reason is that more intra-couple negotiations on job-housing relationships might be required to relieve the work-family conflicts in these households (Chidambaram and Scheiner, 2020; Yao and Wang, 2021).

4. Results

4.1. Descriptive results

Table 1 shows the distribution of life satisfaction, commuting time and employment status for husbands and wives, respectively. Even though husbands and wives presented little difference in life satisfaction, their working and commuting situations varied from each other. Specifically, around 40 percent of person-year observations (43.0% for husbands and 44.1% for wives) rated their overall life satisfaction as moderate or bad. Although both partners experienced an increase of commuting time, the gender gap in commuting time became increasingly large along the survey waves. From 2006 to 2015, the daily average commuting time for husbands went up from 33.9 to 47.0 min, while that for wives increased from 32.2 to 41.2 min. Notably, household structure matters for the gendered commuting behaviours. Average two-way commuting time showed a significant difference between fathers and mothers, but the significance disappeared when parents lived together with their children's grandparents. In addition, compared with wives, husbands were more likely to commute by car (34.4% versus 14.8%) but less likely to walk or cycle to work (62.8% versus 79.2%). Regarding

Table 1
Life satisfaction, commuting and employment information for husbands and wives^a.

		Husbands ^{b,c}	Wives ^{b,c}	Difference ^d
Life satisfaction				
Very bad or bad		4.8	5.0	
Moderate		38.2	39.1	
Good		39.4	39.0	
Very good		17.6	16.9	
Commuting time		39.7 (46.2)	38.2 (45.2)	
2006		33.9 (35.1)	32.2 (34.3)	
2009		35.2 (39.3)	34.3 (38.2)	
2011		39.1 (42.7)	35.2 (39.3)	*
2015		47.0 (46.4)	41.2 (44.6)	*
Couples living with children (<6 years old)		42.4 (50.5)	39.5 (45.8)	*
Couples living with children and grandparents		44.0 (51.0)	42.5 (50.0)	
Commuting mode				
Car	Percentage	33.4	14.8	**
	Time	39.3 (48.9)	35.4 (39.7)	*
Public transport	Percentage	9.0	10.3	*
	Time	59.9 (54.1)	53.6 (47.0)	*
Active mode	Percentage	62.8	79.2	**
	Time	34.5 (40.9)	34.1 (42.8)	
Employment information				
Employment status				**
Being employed		92.3	75.2	
Being unemployed		7.7	24.8	
Primary wage earner		74.9	25.1	**
Monthly wages ^c		2326.3 (3157.2)	1757.8 (2400.6)	**
Weekly working hours		43.6 (17.3)	40.8 (17.9)	**

a. N = 4,870 individual samples and 13,484 person-year observations.

b. Results are show in % or means (standard deviations).

c. Differences in mean values and proportions were examined by t-tests and chi-squared tests, respectively. Results are shown as * p < 0.05 and ** p < 0.01.

d. Monthly wages were uniformly inflated to the 2006 level, and RMB (renminbi) is the official currency of People's Republic of China.

employment status, husbands worked longer hours, earned more wages, and had a higher proportion of being in employment (92.3% versus 75.2%) than wives.

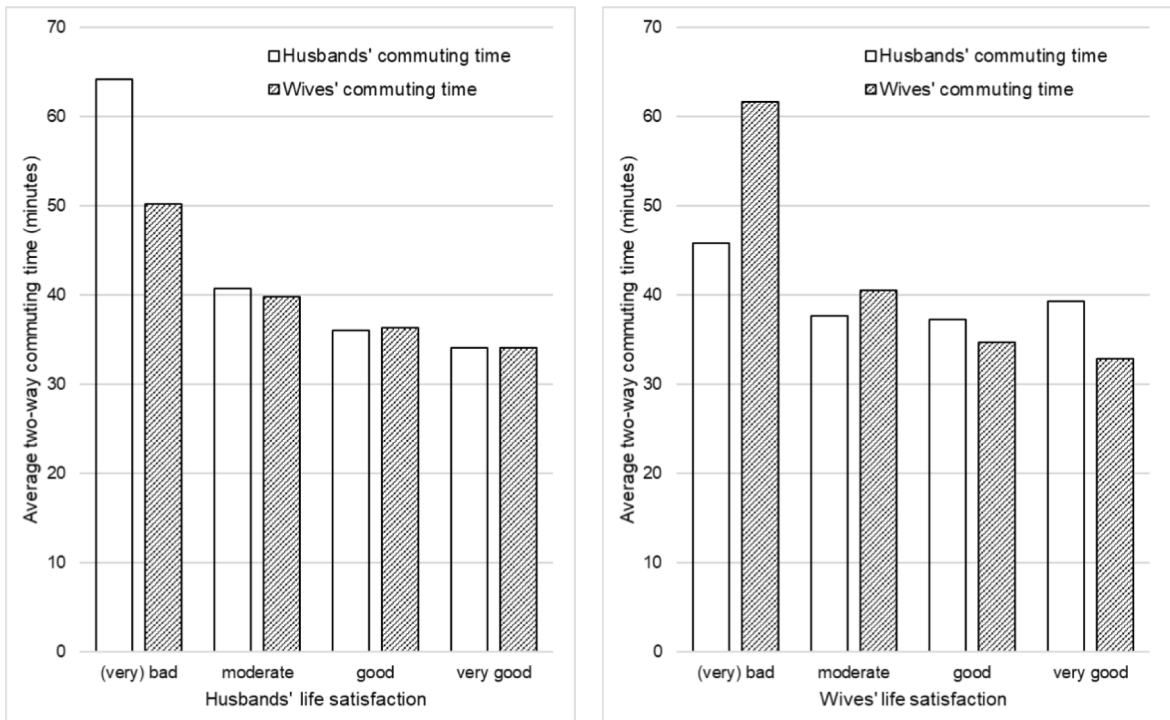
Fig. 1 shows the two-way relationship between commuting time and life satisfaction for matched husbands and wives. Interestingly, a husband's life satisfaction was patterned by not only his own but also his wife's commuting time (Fig. 1a). Specifically, husbands reported lower levels of life satisfaction when both partners spent a longer time on daily commuting journeys. By contrast, a wife's life satisfaction was only negatively associated with the commuting time of her own (Fig. 1b). There was no clear pattern between husbands' commuting time and wives' life satisfaction. Although providing an initial insight into the relationship between commuting time and life satisfaction, Fig. 1 represents the results for pooled couples across survey waves. Also, the results were not adjusted for other time-varying characteristics, especially possible job- and housing-related compensation for longer commutes. For these considerations, we carried out the following modelling analysis to further identify the within-individual variances of life satisfaction over time with the increase of both partners' commuting time.

4.2. Modelling results

The SUR and FE model results for matched husbands' and wives' life satisfaction are presented in Table 2. Specifically, Models 1–5 show the results of SUR models, and models 6–7 show the results of FE models.

Model 1 substantiated the independent effect of someone's commuting time on his or her own life satisfaction after controlling for the covariates and the correlated life satisfaction outcomes for couples. When commuting time increased, husbands and wives decreased their life satisfaction levels by a similar magnitude. After considering the possible job and housing compensation in model 2, the effect size of commuting time on life satisfaction increased for both partners but still stay relatively small. Besides, gaining home ownership and having a larger living space were significantly associated with higher levels of life satisfaction, indicating partial compensation for greater commuting costs from the housing market. However, neither longer working hours nor higher wages (including absolute wages and wage differences between partners) significantly predicted life satisfaction outcomes for husbands and wives.

In model 3, we included the partner's commuting time and it is interesting to find that husbands' life satisfaction was more negatively influenced by wives' commuting time than vice versa. Specifically, when a wife increased the commuting time, her husband's life satisfaction significantly decreased. By contrast, increases in a husband's commuting time mildly improved his wife's life satisfaction, but this effect is only significant at $p < 0.10$. After taking the husband's commuting time into account, the negative influence of a wife's commuting time on her own life satisfaction became stronger in magnitude, suggesting a greater commuting



(a) Husbands' life satisfaction

(b) Wives' life satisfaction

Fig. 1. The two-way relationship between commuting time and life satisfaction for matched husbands and wives.

Table 2
Seemingly unrelated regression and fixed-effect model results of the relationship between commuting time and life satisfaction for husbands and wives.

Life satisfaction ^a	Model 1: SUR		Model 2: SUR		Model 3: SUR		Model 4: SUR		Model 5: SUR		Model 6: FE	Model 7: FE
	Husbands	Wives	Husbands	Wives	Husbands	Wives	Husbands	Wives	Husbands	Wives	Husbands	Wives
Age	0.11** (0.00)	0.11** (0.00)	0.10** (0.00)	0.10** (0.00)	0.10** (0.00)	0.10** (0.00)	0.10** (0.00)	0.10** (0.00)	0.10** (0.00)	0.10** (0.00)	— ^f	—
Age square	−0.00** (0.00)	−0.00** (0.00)	−0.00** (0.00)	−0.00** (0.00)	−0.00** (0.00)	−0.00** (0.00)	−0.00** (0.00)	−0.00** (0.00)	−0.00** (0.00)	−0.00** (0.00)	—	—
Education: Middle school or below	Reference		Reference		Reference		Reference		Reference		—	—
High school or college	0.01 (0.02)	0.08* (0.03)	0.01 (0.02)	0.08** (0.02)	0.01 (0.02)	0.08** (0.02)	0.01 (0.02)	0.08** (0.02)	0.01 (0.02)	0.07** (0.02)	—	—
University or above	0.14** (0.04)	0.19** (0.05)	0.13** (0.04)	0.19** (0.05)	0.13** (0.04)	0.19** (0.05)	0.13** (0.04)	0.19** (0.05)	0.13** (0.04)	0.19** (0.05)	—	—
<i>Hukou</i> ^b : rural-to-urban migrants or rural residents	Reference		Reference		Reference		Reference		Reference		Reference	
Urban residents	0.01 (0.02)	0.01 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.19 (0.23)	0.09 (0.20)
Presence of children	0.05* (0.02)	0.10** (0.02)	0.04* (0.02)	0.08** (0.02)	0.03 (0.02)	0.08** (0.02)	0.01 (0.04)	0.00 (0.04)	0.01 (0.04)	0.01 (0.04)	0.15* (0.07)	0.19 (0.12)
Presence of grandparents	0.12** (0.03)	0.12** (0.03)	0.11** (0.03)	0.10** (0.03)	0.11** (0.03)	0.10** (0.03)	0.11** (0.03)	0.10** (0.03)	0.06* (0.03)	0.01 (0.03)	0.20* (0.11)	0.09 (0.05)
Chronic diseases	−0.14** (0.02)	−0.09** (0.03)	−0.14** (0.02)	−0.09** (0.03)	−0.14** (0.02)	−0.09** (0.03)	−0.14** (0.02)	−0.09** (0.03)	−0.14** (0.02)	−0.09** (0.03)	−0.27* (0.11)	−0.13 (0.10)
Place of residence: town or rural areas	Reference		Reference		Reference		Reference		Reference		—	—
Megacities	0.14** (0.04)	0.19** (0.06)	0.15** (0.04)	0.20** (0.07)	0.16* (0.04)	0.21** (0.07)	0.16** (0.04)	0.21** (0.07)	0.16** (0.05)	0.21** (0.07)	—	—
Other cities	−0.06 (0.05)	−0.04 (0.03)	−0.05 (0.03)	−0.03 (0.03)	−0.04 (0.03)	−0.03 (0.03)	−0.04 (0.03)	−0.03 (0.03)	−0.04 (0.03)	−0.03 (0.03)	—	—
The Mills term ^c	−0.09** (0.01)	−0.06** (0.01)	−0.09** (0.02)	−0.04** (0.01)	−0.09** (0.02)	−0.04** (0.01)	−0.09** (0.02)	−0.04** (0.01)	−0.09** (0.02)	−0.04** (0.01)	−0.26** (0.07)	−0.26** (0.08)
Commuting time ^d	−0.09** (0.01)	−0.10** (0.01)	−0.11** (0.01)	−0.13** (0.01)	−0.08** (0.01)	−0.13** (0.02)	−0.08** (0.02)	−0.11** (0.02)	−0.09** (0.02)	−0.11** (0.02)	−0.31** (0.06)	−0.32** (0.07)
Primary wage earner			0.03 (0.02)	−0.02 (0.03)	0.02 (0.02)	−0.01 (0.03)	0.02 (0.02)	−0.01 (0.03)	0.02 (0.02)	−0.00 (0.03)	−0.04 (0.10)	−0.09 (0.12)
Monthly wages ^e			0.01 (0.01)	0.01 (0.01)	0.01 (0.00)	0.01 (0.01)	0.01 (0.00)	0.01 (0.01)	0.01 (0.00)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Working hours			−0.00 (0.00)	0.00 (0.00)	−0.00 (0.00)	0.00 (0.00)	−0.00 (0.00)	0.00 (0.00)	−0.00 (0.00)	0.00 (0.00)	−0.00 (0.00)	0.00 (0.00)
Housing tenure			0.24** (0.05)	0.22** (0.05)	0.25** (0.05)	0.22** (0.05)	0.25** (0.05)	0.22** (0.05)	0.24** (0.05)	0.21** (0.05)	0.45** (0.18)	0.43** (0.18)
Housing area			0.01** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)	0.01** (0.00)
Partner's commuting time ^c					−0.04** (0.01)	0.02 (0.01)	−0.03 (0.02)	0.01 (0.02)	−0.03 (0.02)	0.01 (0.02)	−0.15* (0.07)	−0.00 (0.05)

(continued on next page)

Table 2 (continued)

Life satisfaction ^a	Model 1: SUR		Model 2: SUR		Model 3: SUR		Model 4: SUR		Model 5: SUR		Model 6: FE	Model 7: FE
	Husbands	Wives	Husbands	Wives	Husbands	Wives	Husbands	Wives	Husbands	Wives	Husbands	Wives
Commuting time × Children							0.02 (0.01)	−0.04** (0.01)	0.01 (0.01)	−0.05 (0.04)	−0.03 (0.05)	−0.08* (0.05)
Partner's Commuting time × Children							−0.03* (0.01)	0.04* (0.02)	−0.05 (0.04)	0.02 (0.01)	0.01 (0.12)	−0.05 (0.05)
Commuting time × Children × Grandparents									0.03* (0.01)	0.04* (0.02)	0.08 (0.08)	0.07* (0.03)
Partner's commuting time × Children × Grandparents									0.04 (0.05)	0.06** (0.02)	0.16 (0.14)	0.21** (0.08)
(Pseudo) R ²	0.04	0.03	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05
Correlation residuals	0.58		0.57		0.57		0.57		0.57		—	

a. Results are shown as unstandardised coefficients with significance (robust standard errors). Significance: * $p < 0.05$, ** $p < 0.01$.

b. *Hukou* specifies the dual household registration system in China, which divides residents into urban residents and rural residents or rural-to-urban migrants.

c. The Mills term represents the inverse Mills ratio generated from the probit model on the probability of being in employment.

d. Commuting time was transformed to the unit of hours for easy interpretation.

e. Monthly wages were uniformly inflated to the 2006 level and transformed to the unit of a thousand RMB (*renminbi*, the official currency of People's Republic of China).

f. — represents not applicable.

disutility for working wives than for working husbands in the household.

In models 4 and 5, we further took into account the presence of preschool-aged children and their grandparents, respectively. Generally, the commuting utility for mothers was more related to the household structure than that for fathers. Model 4 shows that mothers marginally lowered life satisfaction levels with the increase of their own commuting time, but this effect was not significant for fathers. In addition, fathers' life satisfaction became worse as mothers' commuting time increased, while mothers' life satisfaction surprisingly became better with the increase of fathers' commuting time. Model 5 finds that co-residence with grandparents significantly alleviated parents' commuting and childcare burdens. When grandparents were available at home, not only were both parents psychologically relieved from longer commuting time by rating marginally higher levels of life satisfaction, but also mothers' life satisfaction turned much better resulting from fathers' longer commuting time.

The effect of covariates on life satisfaction showed little difference between husbands and wives. Results from age and age square exhibited a non-linear change in life satisfaction: With increases in age, both partners were firstly more satisfied with overall life before their life satisfaction worsened at an elder age. Besides, better-educated people, people who lived together with children and grandparents, and people who resided in the megacity rated higher levels of life satisfaction, while chronic physical diseases constituted a significant threat to overall life satisfaction, for husbands and wives alike. Regarding the results of correlated error terms, the residual correlation in life satisfaction was moderate-to-high between matched husbands and wives, indicating the existence of other factors commonly influencing couples' SWB outcomes and the validity of using SUR models in our study.

To better understand the commuting-SWB causality, we further employed the FE ordered logit models to focus solely on the within-individual variances of life satisfaction for husbands and wives, respectively (models 6 and 7). Note that some demographic variables and the variable of the place of residence were automatically excluded from the FE models, because they were largely time invariant (e.g., educational attainment and the city size) or varying to the same degree (e.g., age) for the same individual between survey waves. The results from FE models to a great extent corroborated those from SUR models: Both partners uniformly reported worse satisfaction with the increase of their own commuting time; Husbands' life satisfaction was negatively impacted by wives' commuting time; Mothers were more dissatisfied with life as the commuting time of their own increased, while co-residing with grandparents reduced this commuting disutility for mothers.

A final note of the modelling analysis is that the results of the inverse Mills ratio identified the selection bias from excluding the unemployed observations or simply regarding their commuting time as zero. In all models, the Mills term was predictive of worse life satisfaction, suggesting that neglecting selective employment would overestimate the effect of commuting time on life satisfaction. Even so, it should be kept in mind that the R^2 of all models were low, which is consistent with some longitudinal studies on commuting-SWB relationships (Roberts et al., 2011; Lorenz, 2018; Morris and Zhou, 2018). The low R^2 suggests that life satisfaction is a broad measure involving people's subjective assessment on various aspects of life and long commuting time does act as one of the daily hassles.

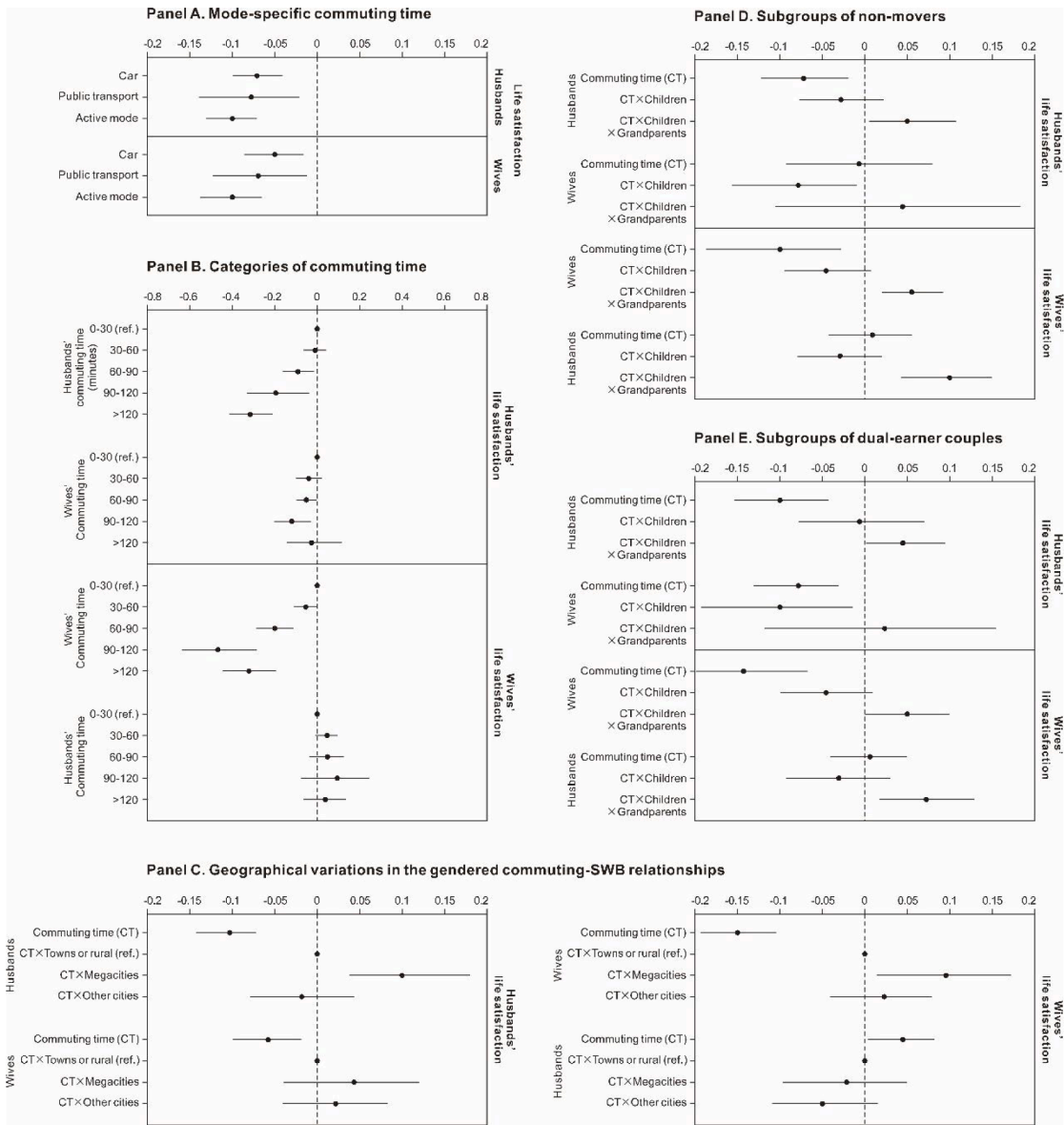
4.3. Sensitivity analysis results

In the sensitivity analysis based on the SUR models, the commuting-SWB relationship for husbands and wives was examined by classifying commuting time and focusing on certain subgroups of interest (Fig. 2). After differentiating the mode-specific commuting time, panel A finds that longer commuting time was predictive of worse life satisfaction regardless of the travel modes that commuters used. Results from panel B identified a non-linear commuting-SWB association, considering that the negative effect of commuting time on both partners' life satisfaction was only significant for daily commuting journeys lasting more than 60 min. Especially for wives, commuting over 60 min a day worsened their life satisfaction in a much larger magnitude than for husbands. In panel C, commuting-SWB relationships showed geographic variations based on the population size of the city where couples resided. Compared with couples from town or rural areas, those residing in the megacity decreased much less in levels of life satisfaction as their commuting time increased, possibly due to greater job and housing opportunities in a larger search area in the megacity. After excluding couple samples who moved houses, changed jobs or changed commuting modes in panel D, we obtained similar results as in the SUR and FE models, i.e., the commuting disutility for both partners, the spill-overs from mothers' longer commuting time to fathers' worse life satisfaction and from fathers' longer commuting time to mothers' better life satisfaction, as well as the role of grandparents in alleviating mothers' commuting disutility. In panel E, we selected two-worker households and refitted the SUR models after excluding the Mills term. The results show that the work-life conflicts and related commuting disutility were more prominent for dual-earner couples. Compared with the results for all couples, working couples' life satisfaction was more influenced by their own commuting time given the larger effect size. Besides, working husbands or fathers reported much worse life satisfaction when their partners increased the commuting time.

5. Discussion and conclusions

5.1. Discussion of main findings

Research on the experienced utility of commuting time used to assume an individualistic view of choice concerning the trade-offs between long commutes and job- or housing-related benefits. Our study contributes to the international evidence base by longitudinally examining the relationship between commuting time and life satisfaction for matched samples of husbands and wives from the household perspective in China. The main findings are that husbands and wives similarly reported worse life satisfaction as their own commuting time increased over time. Furthermore, husbands' life satisfaction was more negatively influenced by wives' commuting



a. Results are shown as unstandardized coefficients with 95% confidence intervals.
 b. The covariates were controlled for in the SUR models for sensitivity analyses and their results were not shown in the figure.

Fig. 2. Sensitivity analysis results of the relationship between commuting time and life satisfaction for husbands and wives based on the SUR models^{a,b}. a. Results are shown as unstandardized coefficients with 95% confidence intervals. b. The covariates were controlled for in the SUR models for sensitivity analyses and their results were not shown in the figure.

time than vice versa, while the commuting utility for wives was more related to the household structure (i.e., the presence of children and their grandparents in the household) than that for husbands. These findings lend credence to the commuting-SWB causality, because we followed a stringent longitudinal research design and corrected for the biases from reverse causality and selective employment.

Echoing the work by [Stutzer and Frey \(2008\)](#), our study corroborated the commuting paradox at the individual level. To husbands and wives themselves, there were additional costs of long commutes that were not paid off from the housing and job markets, and especially, this experienced disutility was noticeable for the commuting journeys over 60 min a day. By focusing on the within-individual variances of life satisfaction, our fixed-effect analysis contributes to the causal inference, demonstrating that longer commuting time does constitute a reason for worse overall SWB. This causality can hardly be drawn from the aggregated national statistics and cross-sectional research evidence where the coincidence between commuting time/distance and SWB might derive from

the heterogeneous tastes of residential and travel choices for different people (Tao et al., 2022a). A case in point is that high-income people who often reside in suburban large houses tend to drive long to work and show a positive outlook on life, that is, income counteracts the negative effect of commuting journeys on SWB outcomes.

Regarding the gender difference in commuting-SWB relationships, our study finds that husbands and wives similarly showed worse life satisfaction when the commuting time of their own increased. This finding is discordant with some longitudinal studies from developed countries, where women are shown under a greater burden of commuting disutility than men (Roberts et al., 2011; Feng and Boyle, 2014; Brömmelhaus et al., 2020). Their explanation is that as the secondary income earner in the family, women often cannot justify their increasing commuting time by the wage rate offered. In our study, the uniform commuting disutility for both partners might exemplify the moving costs in the housing market given that couples shared the same residential location. The model results also suggest that housing area and tenure, rather than wages and working hours, constituted a part of the compensating factors for longer commutes. In other words, couples were willing to accept longer commuting time to access a bigger house or get home ownership. However, improving the housing condition is not always feasible in Chinese cities as indicated by the increasing housing price and stabilising residential mobility in recent years (Sun et al., 2019; Zhu et al., 2019). Besides, according to behavioural economics, people, in this case, are very likely to overestimate the future utility of housing-related benefits and underestimate the psychological burden imposed by daily commuting journeys (i.e., the inconsistency between decision utility and experienced utility; Frey and Stutzer, 2014). Because of the utility misestimation and restrained housing choices, couples will ultimately be in a disequilibrium state where they have to bear the experienced disutility arising from increasing commuting time.

Moreover, our study observed the intra-couple spill-overs of commuting utility but not in a way that completely supported the household-level utility equilibrium. On the one hand, the increase of a wife's commuting time worsened not only her own but also her husband's life satisfaction. It is possible that wives' longer commutes are not out of choice for better job benefits, so husbands still need to work the same to sustain the family (Jacob et al., 2019). Meanwhile, husbands gain less support for family chores when wives commute for a longer time, resulting in husbands' greater dissatisfaction with life (Brömmelhaus et al., 2020). On the other hand, a wife's life satisfaction surprisingly turned better with the increase of her husband's commuting time, and this is especially the case when they became parents and lived together with their children's grandparents. The reason could lie in that fathers are compensated for the increased commutes with more income. This economic compensation is shared by female partners and is essential to raising a child. Another important mechanism underlying the intra-couple utility spill-overs is the traditional gender role in the historically patriarchal society of China. This prevailing gender belief regards that women should place more on household responsibility than occupational aspiration. It not only legitimates the discomfort that husbands felt from wives' longer commuting time, but also explains why wives were psychologically relieved when husbands commuted a longer time for better job careers.

Regarding the role of household structure, the commuting disutility is closely tied with parental status. Our results show that mothers who had preschool-aged children marginally reported worse life satisfaction with the increase of their commuting time, and this effect on mothers was much greater if both parents were employed. This finding conforms to the hypothesis of "a second shift at home" for females (Hochschild and Machung, 2012). Influenced by the culturally prescribed gender role, working mothers have to combine paid employment with the overwhelming majority of childcare tasks (Feng and Boyle, 2014; Jacob et al., 2019). When everyday work and commuting journeys call for increasing time costs, mothers are more likely to suffer from work-family conflicts and experience disproportionate commuting disutility. The source of this disutility can be great time pressure from taking care of children after commuting home and chauffeuring preschool-aged children to childcare facilities that are often not located on their way to the workplace (Kwan, 1999; Rapino and Cooke, 2011; Chidambaram and Scheiner, 2020).

It is reassuring, however, that co-residence with grandparents to a great extent alleviated mothers' commuting disutility. Unlike the popularity of shrinking family sizes and nuclear family structures in developed countries (Jarvis et al., 2009), intergenerational co-residence is still a common form of living in China. Particularly, co-residence with extended family members is widely recognised as a way for young couples to balance the intra-couple division of household duties (Ta et al., 2019). Our study adds to the evidence that extended household structure matters for mothers' commuting utility. The childcare provided by grandparents not only decreased the utility loss arising from mothers' longer commuting time but also generated utility spill-overs from fathers' longer commuting time to mothers' better life satisfaction. There are two possible reasons to account for this result. First, market services are not a reliable source of childcare in the burgeoning market economy of China because they are not geographically accessible in many areas or economically affordable for many households. Drawing from the same dataset as our study, Sun et al. (2019) find that "more than 60% of the women had never used any kind of childcare service provided by a nonhousehold member". Second, market services are not a perfect substitute for the childcare provided by family members. When young parents commute for a long time, they, especially mothers, would feel at ease if grandparents are available to look after grandchildren because of the kinship ties between them.

5.2. Policy implications

Our research findings provide important policy implications for travel demand management, urban planning and social governance. Considering the commuting disutility for both genders, our study lends support to urban planning initiatives in mitigating local job-housing mismatch, such as decentralising job locations and developing rapid transit links between residential and job (sub)centres (Ma and Banister, 2006; Ibraeva et al., 2020). In the context of urban China, the implementation of affordable housing projects with easy access to residents' workplaces is another important task posed to governments and real estate developers. In addition, flexible workplace arrangements, such as working from home on some days of the week, are also a viable way to alleviate commuting disutility, especially at the time of the post-COVID-19 era when telecommunication technologies and home offices are well set to cope with the tasks of remote work.

Given the great time pressure from commuting and childcare for working parents, we recommend that adequate and reliable childcare facilities are equipped not only in residential neighbourhoods but also around parents' workplaces. In this way, the responsibility for providing childcare services can be partially transferred to the enterprises. Working parents can also combine commuting trips with chauffeuring trips more easily. Besides the physical facility planning, policy designs should play a role in transforming gender role ideologies and thus reshaping the gendered commuting-SWB relationship. This does not mean that men and women should commute or work the same, but rather they deserve more freedom to arrange their job-housing relationships as desired. For example, the paternity and parental leave policies conducted in some European countries (e.g., the Netherlands and Germany) grant husbands and wives similar rights to temporarily leave the job after having a child. This contributes to not only sharing the childcare responsibility between both partners but also fostering a gender-neutral social norm among the public.

5.3. Research limitations

There are several limitations of our study and suggestions for future research. First, even if there was a negative effect of commuting time on life satisfaction, we would not like to overstate this influence because of the moderate-to-small effect size. According to De Vos et al. (2013) and Mokhtarian (2019), the modest influence of commuting time may be the reason for individuals to stay in a disequilibrium state but not to change their job-housing relationships. Second, our study focused exclusively on the married heterosexual couples that are in the great majority in Chinese societies. It will be interesting to validate the gendered commuting-SWB relationships for homosexual couples, single persons and parents, among others, because traditional gender role is more likely to be compromised in these families. Besides, the survey did not follow the divorced couples after at least one of the partners moved out of their former residences. This might underestimate the commuting disutility because couples who had commuted for a long time were more likely to have conflicts and get divorced. Third, SWB outcomes were measured by a single item of overall life satisfaction, which is, to our knowledge, the only longitudinal, nationwide and publicly accessible data source in China. Considering that commuting does constitute a threat to people's long-term life satisfaction as found in our study, we advocate for more refined measures of life satisfaction (e.g., the Satisfaction with Life Scale; Diener et al., 1985) and satisfaction with life domains (e.g., housing and job satisfaction). This will be helpful in identifying nuanced mechanisms underlying the gendered commuting-SWB relationships. Fourth, our study drew from the 4-wave CHNS surveys from 2006 to 2015 when rapid urbanisation and increasing job-housing mismatch took place in China. We recommend that future research should use updated survey waves to validate our findings, especially regarding the extent to which commuting behaviours evolve and resultant commuting-SWB relationships change after the COVID-19 outbreak.

5.4. Concluding remarks

Our study revisited the commuting paradox from the household perspective to propose that gender, housing and household structure are fundamental to understanding the commuting utility in the context of Chinese societies. Drawing on Jarvis et al. (2009)'s view that the household "stretches through communities, social and kin networks and a multiplicity of formal and informal economic opportunities", we come to a conclusion that the experienced utility of commuting time cannot only be conceived as an outcome of individual travel choices but involves the influence of traditional gender role in the household and dynamic interactions with other family members. In the socialist market system of China, women's economic and social statuses are on the rise but the gender equality issue is still an ongoing debate. A remarkable aspect of the gendered commuting-SWB relationship, as discussed in our study, is that the commuting utility for men depends on both partners' commuting time, while that for women is largely shaped by the motherhood and a traditional form of household structure, i.e., intergenerational co-residence.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors would like to thank Dr. Zidan Mao from Sun Yat-Sen University for providing instruction on the model adjustment.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.tra.2023.103640>.

References

- Alonso, W., 1964. Location and land use: Toward a general theory of land rent. Harvard University Press, Cambridge, MA.
 Bielby, W.T., Bielby, D.D., 1992. I will follow him: Family ties, gender-role beliefs, and reluctance to relocate for a better job. *Am. J. Sociol.* 97 (5), 1241–1267.
 Biorn, E., 2004. Regression systems for unbalanced panel data: A stepwise maximum likelihood procedure. *J. Econom.* 122 (2), 281–291.

- Brömmelhaus, A., Feldhaus, M., Schlegel, M., 2020. Family, work, and spatial mobility: The influence of commuting on the subjective well-being of couples. *Appl. Res. Qual. Life* 15 (3), 865–891.
- Cao, X.J., Mokhtarian, P.L., Handy, S.L., 2009. The relationship between the built environment and nonwork travel: A case study of Northern California. *Transp. Res. Part A Policy Pract.* 43 (5), 548–559.
- Carta, F., De Philippis, M., 2018. You've come a long way, baby: Husbands' commuting time and family labour supply. *Reg. Sci. Urban Econ.* 69, 25–37.
- Chatterjee, K., Chng, S., Clark, B., Davis, A., De Vos, J., Ettema, D., Handy, S., Martin, A., Reardon, L., 2020. Commuting and wellbeing: A critical overview of the literature with implications for policy and future research. *Transp. Rev.* 40 (1), 5–34.
- Chiappori, P.A., Mazzocco, M., 2017. Static and intertemporal household decisions. *J. Econ. Lit.* 55 (3), 985–1045.
- Chidambaram, B., Scheiner, J., 2020. Understanding relative commuting within dual-earner couples in Germany. *Transp. Res. Part A Policy Pract.* 134, 113–129.
- Choi, J., Coughlin, J.F., D'Ambrosio, L., 2013. Travel time and subjective well-being. *Transp. Res. Record* 2357 (1), 100–108.
- Clark, B., Chatterjee, K., Martin, A., Davis, A., 2020. How commuting affects subjective wellbeing. *Transportation* 47 (6), 2777–2805.
- Cooke, T.J., 2013. All tied up: Tied staying and tied migration within the United States, 1997 to 2007. *Demogr. Res.* 29, 817–836.
- Coulter, R., Van Ham, M., Findlay, A.M., 2016. Re-thinking residential mobility: Linking lives through time and space. *Prog. Hum. Geogr.* 40 (3), 352–374.
- Crane, R., 2007. Is there a quiet revolution in women's travel? Revisiting the gender gap in commuting. *J. Am. Plan. Assoc.* 73 (3), 298–316.
- De Vos, J., Schwanen, T., Van Acker, V., Witlox, F., 2013. Travel and subjective well-being: A focus on findings, methods and future research needs. *Transp. Rev.* 33 (4), 421–442.
- Dickerson, A., Hole, A.R., Munford, L.A., 2014. The relationship between well-being and commuting revisited: Does the choice of methodology matter? *Reg. Sci. Urban Econ.* 49, 321–329.
- Diener, E.D., Emmons, R.A., Larsen, R.J., Griffin, S., 1985. The satisfaction with life scale. *J. Pers. Assess.* 49 (1), 71–75.
- Ettema, D., Gärling, T., Olsson, L.E., Friman, M., 2010. Out-of-home activities, daily travel, and subjective well-being. *Transp. Res. Part A Policy Pract.* 44 (9), 723–732.
- Feng, Z., Boyle, P., 2014. Do long journeys to work have adverse effects on mental health? *Environ. Behav.* 46 (5), 609–625.
- Frey, B.S., Stutzer, A., 2014. Economic consequences of miscalculating utility. *J. Happiness Stud.* 15 (4), 937–956.
- Friman, M., Gärling, T., Ettema, D., Olsson, L.E., 2017. How does travel affect emotional well-being and life satisfaction? *Transp. Res. Part A Policy Pract.* 106, 170–180.
- Guan, X., Wang, D., 2019. Influences of the built environment on travel: A household-based perspective. *Transp. Res. Part A Policy Pract.* 130, 710–724.
- Gutiérrez-i-Puigarnau, E., Van Ommeren, J.N., 2015. Commuting and labour supply revisited. *Urban Stud.* 52 (14), 2551–2563.
- Hirte, G., Illmann, U., 2019. Household decision making on commuting and the commuting paradox. *Empirica* 46 (1), 63–101.
- Hochschild, A., Machung, A., 2012. *The second shift: Working families and the revolution at home*. Penguin.
- Ibraeva, A., de Almeida Correia, G.H., Silva, C., Antunes, A.P., 2020. Transit-oriented development: A review of research achievements and challenges. *Transp. Res. Part A Policy Pract.* 132, 110–130.
- Ingenfeld, J., Wolbring, T., Bless, H., 2019. Commuting and life satisfaction revisited: Evidence on a non-linear relationship. *J. Happiness Stud.* 20 (8), 2677–2709.
- Jacob, N., Munford, L., Rice, N., Roberts, J., 2019. The disutility of commuting? The effect of gender and local labor markets. *Reg. Sci. Urban Econ.* 77, 264–275.
- Jacob, N., Munford, L., Rice, N., Roberts, J., 2021. Does commuting mode choice impact health? *Health Econ.* 30 (2), 207–230.
- Jain, J., Lyons, G., 2008. The gift of travel time. *J. Transp. Geogr.* 16 (2), 81–89.
- Jarvis, H., Cloke, J., Kantor, P., 2009. *Cities and gender*. Routledge.
- Kwan, M.-P., 1999. Gender, the home-work link, and space-time patterns of nonemployment activities. *Econ. Geogr.* 75 (4), 370–394.
- Kwon, K., Akar, G., 2021. Have the gender differences in commuting been shrinking or persistent? Evidence from two-earner households in the US. *Int. J. Sustain. Transp.* <https://doi.org/10.1080/15568318.2021.1971345>.
- Lorenz, O., 2018. Does commuting matter to subjective well-being? *J. Transp. Geogr.* 66, 180–199.
- Ma, K.R., Banister, D., 2006. Excess commuting: A critical review. *Transp. Rev.* 26 (6), 749–767.
- Manning, A., 2003. The real thin theory: Monopsony in modern labour markets. *Labour Econ.* 10 (2), 105–131.
- Mao, Z., Wang, D., 2020. Residential relocation and life satisfaction change: Is there a difference between household couples? *Cities* 97, 102565. <https://doi.org/10.1016/j.cities.2019.102565>.
- Martin, A., Goryakin, Y., Suhrcke, M., 2014. Does active commuting improve psychological wellbeing? Longitudinal evidence from eighteen waves of the British Household Panel Survey. *Prev. Med.* 69, 296–303.
- Mills, E.S., 1967. An aggregative model of resource allocation in a metropolitan area. *Am. Econ. Rev.* 57 (2), 197–210.
- Milner, A., Badland, H., Kavanagh, A., LaMontagne, A.D., 2017. Time spent commuting to work and mental health: Evidence from 13 waves of an Australian cohort study. *Am. J. Epidemiol.* 186 (6), 659–667.
- Mokhtarian, P.L., 2019. Subjective well-being and travel: Retrospect and prospect. *Transportation* 46 (2), 493–513.
- Morris, E.A., Zhou, Y., 2018. Are long commutes short on benefits? Commute duration and various manifestations of well-being. *Travel Behav. Soc.* 11, 101–110.
- Muth, R.F., 1969. *Cities and housing*. University of Chicago Press, Chicago.
- Nguyen, M., Nguyen, H., 2010. Stata module: Estimation of system of regression equations with unbalanced panel data and random effects. Boston College Department of Economics Statistical Software.
- Nie, P., Sousa-Poza, A., 2018. Commute time and subjective well-being in urban China. *China Econ. Rev.* 48, 188–204.
- Perrons, D., 2003. The new economy and the work-life balance: Conceptual explorations and a case study of new media. *Gen. Work Organ.* 10 (1), 65–93.
- Rapino, M.A., Cooke, T.J., 2011. Commuting, gender roles, and entrapment: A national study utilizing spatial fixed effects and control groups. *Prof. Geogr.* 63 (2), 277–294.
- Roberts, J., Hodgson, R., Dolan, P., 2011. "It's driving her mad": Gender differences in the effects of commuting on psychological health. *J. Health Econ.* 30 (5), 1064–1076.
- Simón, H., Casado-Díaz, J.M., Lillo-Bañuls, A., 2020. Exploring the effects of commuting on workers' satisfaction: Evidence for Spain. *Reg. Stud.* 54 (4), 550–562.
- Stutzer, A., Frey, B.S., 2008. Stress that doesn't pay: The commuting paradox. *Scand. J. Econ.* 110 (2), 339–366.
- Sun, B., Lin, J., Yin, C., 2021. How does commute duration affect subjective well-being? A case study of Chinese cities. *Transportation* 48 (2), 885–908.
- Sun, A., Zhang, C., Hu, X., 2019. Boys, girls, and grandparents: The impact of the sex of preschool-aged children on family living arrangements and maternal labor supply. *Demography* 56 (3), 813–833.
- Ta, N., Liu, Z., Chai, Y., 2019. Help whom and help what? Intergenerational co-residence and the gender differences in time use among dual-earner households in Beijing, China. *Urban Stud.* 56 (10), 2058–2074.
- Tao, Y., Ma, J., Shen, Y., Chai, Y., 2022b. Neighborhood effects on health: A multilevel analysis of neighborhood environment, physical activity and public health in suburban Shanghai. *Cities* 129, 103847. <https://doi.org/10.1016/j.cities.2022.103847>.
- Tao, Y., Petrović, A., van Ham, M., 2022a. Commuting behaviours and subjective wellbeing: A critical review of longitudinal research. *Transport Reviews*. <https://doi.org/10.1080/01441647.2022.2145386>.
- Thomas, M.J., Mulder, C.H., Cooke, T.J., 2017. Linked lives and constrained spatial mobility: The case of moves related to separation among families with children. *Trans. Inst. Br. Geogr.* 42 (4), 597–611.
- Wang, F., Mao, Z., Wang, D., 2020. Residential relocation and travel satisfaction change: An empirical study in Beijing, China. *Transp. Res. Part A Policy Pract.* 135, 341–353.
- Wang, L., Qin, P., 2017. Distance to work in Beijing: Institutional reform and bargaining power. *Urban Stud.* 54 (6), 1385–1406.
- Wheatley, D., 2014. Travel-to-work and subjective well-being: A study of UK dual career households. *J. Transp. Geogr.* 39, 187–196.

- Yao, M., Wang, D., 2021. Modeling household relocation choice: An egalitarian bargaining approach and a comparative study. *J. Transp. Land Use* 14 (1), 625–645.
- Zhu, Z., Li, Z., Liu, Y., Chen, H., Zeng, J., 2017. The impact of urban characteristics and residents' income on commuting in China. *Transp. Res. Part D Transp. Environ.* 57, 474–483.
- Zhu, Z., Li, Z., Chen, H., Liu, Y., Zeng, J., 2019. Subjective well-being in China: How much does commuting matter? *Transportation* 46 (4), 1505–1524.