Commuting and Well-Being in Germany: A Mediation Analysis of Work–Family Conflict and Life Satisfaction in Germany

Submission for 14th Symposium of the European Association for Research in Transportation

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SHORT SUMMARY

The influence of commuting on work–family conflict (WFC) and life satisfaction is rarely analysed within a unified framework. This study investigates the relationships between commuting, WFC, and life satisfaction using German data from the German Time Use Survey (GTUS 2012/13) and the German Family Panel (pairfam 2019). Two complementary structural equation modelling (SEM) mediation analyses are conducted, each addressing a different outcome due to data constraints. Results from the GTUS analysis show that commuting increases WFC indirectly through time-use mechanisms, particularly reduced leisure time, changes in personal care, and unpaid work, with clear gender differences in these pathways. The pairfam analysis further shows that commuting does not directly reduce life satisfaction but operates indirectly through WFC, while job and family satisfaction strongly enhance life satisfaction. Overall, commuting affects well-being primarily through indirect pathways involving time allocation and WFC rather than strong direct effects. The findings highlight the importance of reducing commuting distances, supporting flexible work arrangements, and addressing gendered divisions of care work, contributing to debates on the commuting paradox and transport–wellbeing linkages.

Keywords: Commuting, Gender, Leisure, Multitasking, Time use, Work-Family Conflict, Life Satisfaction

1. INTRODUCTION

Commuting shapes individuals' daily lives by enabling access to employment opportunities while simultaneously constraining time for family, social, and leisure activities, thereby contributing to work–life conflict (Bai et al. 2021) and lower life satisfaction (Chatterjee et al., 2020). Gender differences are particularly relevant in this context, especially for individuals combining paid work with household and care responsibilities.

In Germany, longer commutes have been found to negatively affect family life satisfaction, particularly among men, contributing to work–family conflict (WFC) (Fuchs et al. 2025). Time-use and transport research shows that women experience greater time poverty due to multiple roles, more fragmented leisure, and shorter commuting distances, while men—often in the

financial-provider role—tend to have longer commutes and more uninterrupted leisure time, contributing to a persistent gender gap in commuting (Chidambaram and Scheiner, 2021).
Numerous studies have examined the relationship between commuting and life satisfaction, often referred to as the "commuting paradox." While several studies find that longer commuting times are associated with lower life satisfaction due to time constraints, stress, and fatigue (Liu et al., 2021 for China; Stutzer and Frey, 2008 for Germany), other studies report no significant or consistent effects (Tao et al., 2023; Mytton et al., 2016). For example, Lorenz (2018) finds no significant association using SOEP data, whereas Ingenfeld et al. (2018), using the same dataset, identify a non-linear relationship. Murphy et al. (2023) further suggest a threshold effect, beyond which commuting negatively affects well-being.

These mixed findings highlight the need for a deeper understanding of the mechanisms linking commuting and life satisfaction. A key research gap is the role of mediating factors between commuting and well-being. Commuting affects multiple domains of daily life, including work, family time, leisure, and personal care, all of which may influence life satisfaction. For instance, long commutes may reduce quality time for family interaction, limiting emotional support and thereby lowering life satisfaction. Similarly, commuting can reduce time for personal care activities such as exercise, adequate sleep, and relaxation, while increasing stress levels (Murphy et al., 2023). It may also intensify work–family conflict by reducing the time available to balance paid work and family responsibilities, ultimately disrupting overall quality of life (Bai et al., 2021).

In this study, the main objective is to develop a comprehensive framework for analysing the relationship between commuting and well-being indicators: work-family conflict (WFC) and life satisfaction, using two complementary datasets. This two-dataset strategy is necessitated by data limitations: the GTUS 2012/13 dataset does not include a measure of life satisfaction, while the German Family Panel–Pairfam 2019 dataset does not contain detailed time-use information required to construct mediators such as leisure, personal care, and unpaid work. Therefore, each dataset is used to address a different component of the overall research question.

First, using GTUS 2012/13 data, the study provides baseline empirical evidence on the relationship between commuting and work–family conflict, and demonstrates the mediating role of primary time-use components. Building on these findings, a second analytical framework is developed using the German Pairfam 2019 dataset to examine the relationship between commuting and life satisfaction. This sequential approach allows for a more comprehensive understanding of how commuting shapes both domain-specific outcomes and overall wellbeing, despite limitations in individual datasets. In line with empircal background, the following hypotheses are proposed:

A direct and positive relationship between commute distance and WFC is expected (H1). Primary time use domains such as leisure availability, female gender, personal care, and unpaid care work mediate the relationship between commuting and work–family conflict (WFC) (H2).A direct and negative relationship between commute time and life satisfaction is expected (H3). Work-family conflict (WFC) mediate the relationship between commuting and life satisfaction (H4).

2. METHODOLOGY

Data

The German Time Use Survey (GTUS) 2012/13 data (FDZ, 2013) comprise socioeconomic, demographic, and three-day activity, travel, and mode-use information. In the travel time diary, respondents from 4,775 households self-reported their daily activities (primary and secondary) using time plan sheets for a continuous 24-hour period (i.e., from 4:00 AM to 4:00 AM the next day) over three randomly assigned days (two weekdays and one weekend day), in ten-minute intervals. The dataset includes information on commuting distance, time spent on primary and secondary activities (including paid work, unpaid work, leisure, and travel multitasking), and satisfaction with personal care, work, and family domains, allowing for the analysis of work–family conflict (WFC), which serves as the dependent variable in this study.

In addition, the German Family Panel (pairfam 2019) dataset (Brüderl, 2019) extends this perspective by including a direct measure of life satisfaction on a 0–10 scale, enabling the analysis of broader subjective well-being. This survey began in early 2019, with a Wave 12 study population comprising approximately 6,000 individuals aged 18 to 49 years and their partners. This provides an opportunity to move beyond work–family conflict and examine how commuting affects overall life satisfaction.

Sample and Variables used

In GTUS 2012/13 data, the WFC scale comprises items from distinct three life domains (personal, work, and family time), the observed reliability ($\alpha = 0.758$) indicates sufficient internal consistency for use as a composite indicator in SEM. In line with recommendations for multidimensional constructs, moderate inter-item correlations are expected, and alpha values in the mid-.70 range are considered acceptable for structural path modeling where constructs are treated at a latent or composite level.

In the German Pairfam 2019 data, WFC is assessed using an 8-item scale ($\alpha = 0.77$) capturing bidirectional interference between work and private life, including personal life strain due to work, difficulty concentrating at work due to personal matters, lack of time for work, frequent thoughts about work, and work–family role conflicts. Other variables, such as life satisfaction, work satisfaction, and family satisfaction are measured using single-item indicators asking respondents to rate their satisfaction on a scale from 0 (completely dissatisfied) to 10 (completely satisfied). Perception of household fairness is measured using self-reported items on fairness in domestic arrangements. Commute time is recorded in minutes, and gender is coded as a binary variable (female = 1).

Method

The causal mediation analysis was conducted using structural equation modelling (SEM), estimated in Stata using the *medsem* package. In addition, the *lavaan* package in R (Rosseel, 2012) was used to estimate the SEM and to generate path diagrams for visualization. The mediation framework allowed for the decomposition of total effects into direct and indirect pathways, enabling the assessment of potential causal mechanisms linking the variables of interest.

In the first causal mediation analysis using GTUS 2012/13 data, the outcome variable is the WFC index, which was constructed using seven item indicators capturing time inadequacy across

family and work domains, perceived time pressure, and preferences for additional personal and family time. The scale demonstrates good internal consistency (Cronbach's $\alpha = 0.85$), indicating that the items reliably measure a common underlying construct. These results support the use of the composite index as a valid measure of work–family conflict in subsequent analyses.

The mediating effect of commute distance on WFC was investigated by decomposing the total effect into a direct effect (long commuting time → WFC) and an indirect effect (long commuting time → primary time-use domains, including time spent on leisure, personal care, paid work, and unpaid or care work → WFC) (see Figure 1). The combined indirect effect (joint indirect effect) capturing both strain-related and time-related pathways was also estimated.

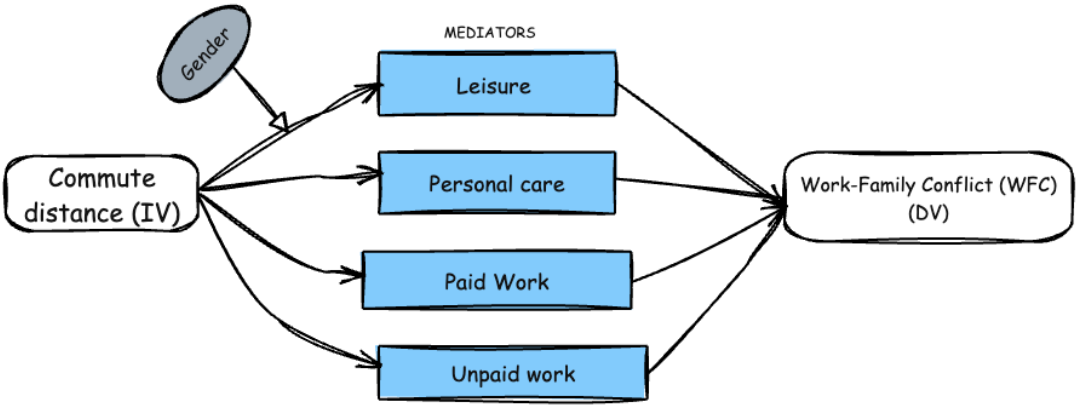


Fig.1: Variables used in analysis, using GTUS (2012/13) data (n=8,636)

Further, the second causal mediation analysis using the German Family Panel (pairfam–FReDA, 2019) data examines how commute time influences life satisfaction through work–family conflict, job and family satisfaction, and perceived fairness in the division of household labor (see Figure 2). The questions of the items measuring life, work, and family satisfaction in the German pairfam questionnaire is as follows: "On a scale from 0 to 10, where 0 means 'completely dissatisfied' and 10 means 'completely satisfied', how satisfied are you with your life/work/family?". Work–family conflict is measured using an 8-item scale ($\alpha = 0.77$).

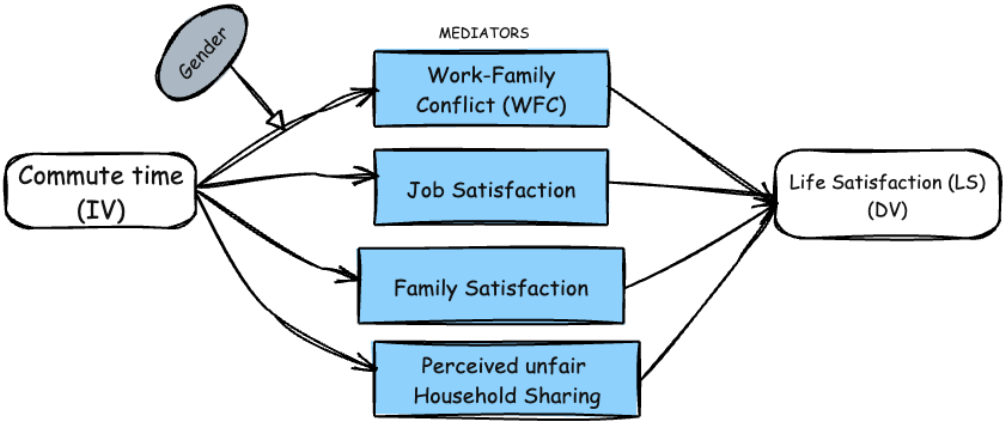


Fig.2: Variables used in analysis, using German pairfam 2019 data (n=5793)

3. RESULTS AND DISCUSSION

The variables from GTUS data (see Figure 3) show strong and statistically significant gender differences across all variables (Figure 3). Men report higher commute distances (20.9 km vs 14.3 km), paid work hours (3.33 vs 2.04 h/day), and leisure time (5.84 vs 5.34 h/day), while women report higher personal care work (11.1 vs 10.8 h/day) and substantially higher unpaid work (3.91 vs 2.38 h/day). All differences are highly significant ($p < 0.001$). Women also show slightly higher WFC (1.82 vs 1.78), which is statistically significant but small in magnitude. Overall, the findings indicate a clear gender division of labor: men are more engaged in paid work and commuting, while women carry a greater burden of unpaid and care responsibilities.

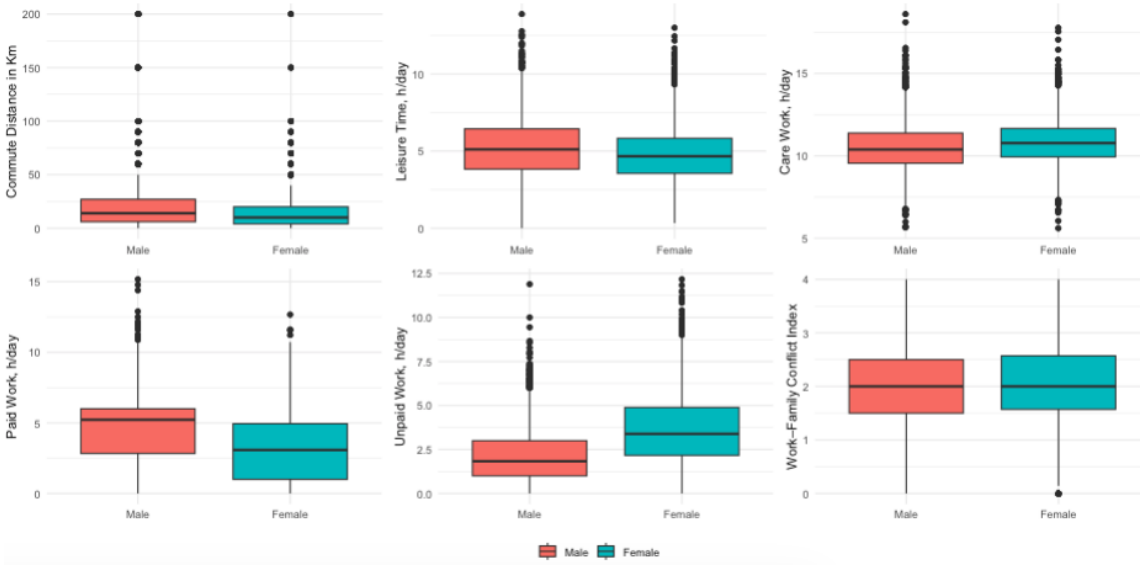


Fig.3: Gender Differences in Time Use and Commuting, GTUS data, N = 8,636 (M = 3,947; F = 4,689)

The variables from German Pairfam data (see Figure 4) show modest but meaningful gender differences across several domains. Life satisfaction does not differ significantly between men and women, although women report slightly higher values (7.63 vs 7.56). Family satisfaction is significantly higher among women (8.38 vs 8.28), suggesting stronger perceived satisfaction with family life. Work satisfaction shows no statistically significant gender gap, with nearly identical averages for men (7.38) and women (7.32, $p = 0.194$). A clear and significant difference appears in commuting time, with men experiencing longer commutes (21.4 vs 20.1). The strongest disparity is in perceived household unfairness, where women report substantially higher levels (0.586 vs 0.454). Work–family conflict is slightly higher for men (2.03 vs 2.00), but not significant. Overall, gender differences are concentrated in time use and fairness perceptions rather than well-being or work satisfaction.

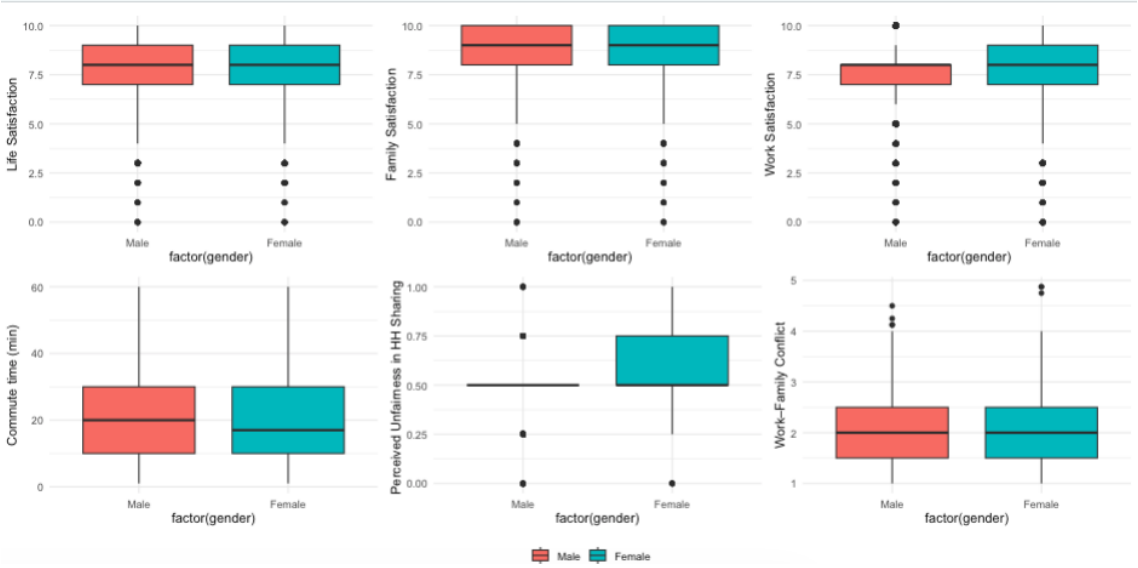


Fig.4: Gender Differences in variables using German Pairfam data, N = 5,793 (M = 2,718; F = 3,075)

The results from causal mediation analysis using GTUS 2012/13 data (see Figure 5) show a clear pattern of stronger evidence for indirect mechanisms than for direct effects. H1 is not fully supported in its proposed form, as while commuting shows associations with gendered time-use patterns, there is no clear evidence of a direct positive relationship between commute distance and WFC (not in line with H1). Commute distance has small but consistent associations with all mediators, most notably a stronger negative relationship with female gender (β = -0.160) (support H2). In the second stage, leisure stands out as the strongest predictor of WFC (β = -0.279), indicating a key pathway in the model (supports H2). Personal care and unpaid work also show smaller negative effects, while paid work is not significant (not in line with H2). Overall, the results highlight a primary indirect structure driven mainly through leisure, with additional minor contributions from care and unpaid work domains.

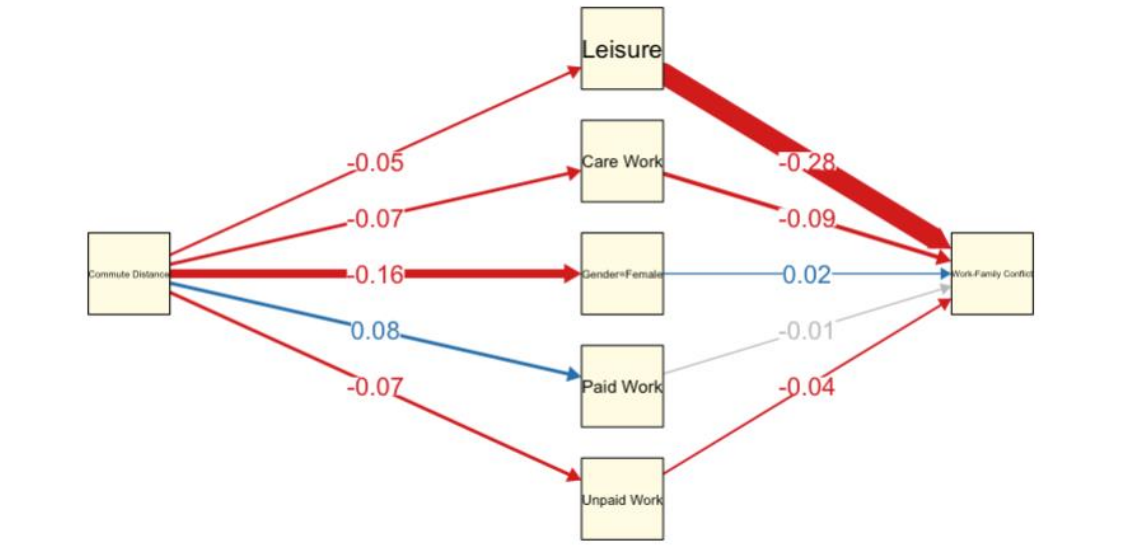


Fig.5: Gender Differences in Time Use and Commuting, GTUS data, N = 8,636 (M = 3,947; F = 4,689)

The results from causal mediation analysis using German Pairfam 2019 data (see Figure 6) indicate that there is no direct negative relationship is observed between commute time and life satisfaction (not in line with H3). This indicates that commuting does not directly reduce life satisfaction in a linear manner. Commuting is most strongly shaped by three direct predictors. Job satisfaction shows the strongest positive association with life satisfaction (β=0.32, p<.001), suggesting that higher levels of positive feeling with job correspond to higher life satisfaction (supports H4). Family satisfaction also demonstrates a substantial positive relationship with life satisfaction (β=0.26, p<.001), reinforcing its importance as a supportive contributor to life satisfaction (supports H4). In contrast, WFC is negatively associated with ls (β=-0.17, p<.001), indicating that higher work–family conflict corresponds to lower satisfaction (supports H4). Female gender has a small but statistically significant positive association with life saisfaction (β=0.04, p=.040) (partially supports H4).

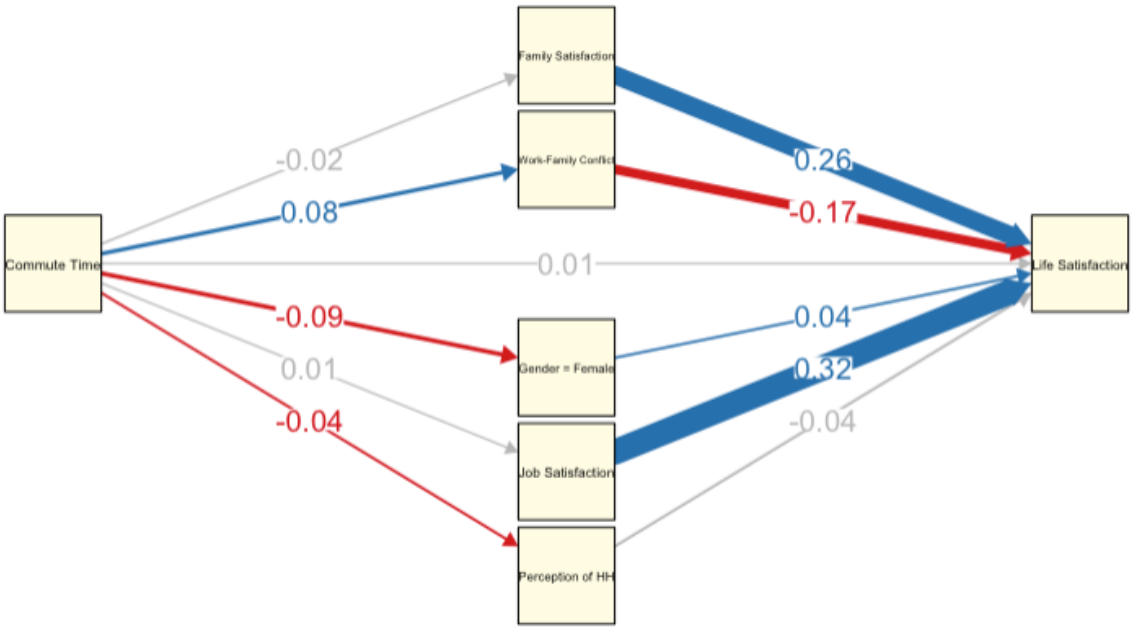


Fig.6: Causal mediation analysis between commute time and life satisfaction using German Pairfam data, N = 5,793 (M = 2,718; F = 3,075)

4. CONCLUSIONS

This paper develops a comprehensive framework for analysing commuting and well-being using two German datasets. The GTUS 2012/13 analysis provides baseline evidence on work–family conflict and highlights the mediating role of time-use domains. The German Family Panel (Pairfam) 2019 dataset extends this framework by incorporating life satisfaction, thereby enabling an analysis of broader subjective well-being outcomes.

Taken together, the findings demonstrate that commuting primarily affects work–family conflict through its impact on daily time allocation, particularly paid work and leisure, with clear gender differences across domains. These results provide strong empirical support for the underlying mechanisms through which commuting reshapes individuals' daily activity patterns and generates time pressure. Building on this, the present analysis forms a first empirical step toward

understanding how commuting influences the cognitive component of subjective well-being, particularly overall life satisfaction.

In line with the commuting paradox hypothesis and spillover effects across life domains, the identified mediation pathways suggest that changes in paid work, unpaid care, leisure, and personal care not only drive work–family conflict but also translate into differences in overall life satisfaction. Overall, the findings suggest that commuting operates mainly as a time-use restructuring mechanism that shapes well-being indirectly through changes in daily activity patterns and the generation of work–family conflict, rather than exerting strong direct effects on either work–family conflict or life satisfaction.

Policy implications include promoting flexible work arrangements, reducing commuting distances through spatial planning, and supporting gender equality in household and care responsibilities. Future research should apply the proposed framework to GTUS 2022 and examine post-pandemic commuting patterns and their implications for life satisfaction.

ACKNOWLEDGEMENTS

This research was funded by the German Research Foundation (DFG-CH 3436/2-1) as part of the project “Die Auswirkungen des Pendelns auf das subjektive und objektive Wohlbefinden: Eine quantitative Studie in Deutschland” (The Impact of Commuting on Subjective and Objective Wellbeing: A Quantitative Study in Germany, 2026-2032).

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