



Another one rides the bus—Moving versus commuting decisions during the transition to higher education

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Abstract The present study explores students' decisions to either relocate or commute to their place of study depending on the availability of student tickets. By leveraging regional variations in the coverage of these subsidized public transport tickets, we explore whether their availability decreases students' likelihood of moving. We investigate how the importance of subsidized tickets changes with commuting time and how their relevance varies based on students' financial resources, social backgrounds, and risk attitudes. To do so, we use the MESARAS 2013 (Mobility, Expectations, Self-Assessment, and Risk Attitude of Students) survey, which queries university entrants in the field of economics at seven German universities. We link locational identifiers from the survey with the Google Distance Matrix API to assess commuting times and regional administrative data. Our logistic regression models suggest that the availability of student tickets may decrease the likelihood of moving. The association appears to be less pronounced as commuting time increases and seems to depend on parental academic status as well as students' budget. Thus, our study offers three contributions: First, we provide policy-relevant evidence on the importance of affordable public transportation. Second, we address (social) inequalities in the moving versus commuting decision. Third, we demonstrate how accurate spatial modeling of commuting times and integration of survey data with external data sources benefits socio-spatial analysis.

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Another One Rides the Bus – Umzug- versus Pendelentscheidungen am Übergang zur Hochschule

Zusammenfassung Vorliegender Artikel untersucht Bedingungen, unter denen sich Studierende zwischen Umziehen und Pendeln zum Studienort entscheiden. Wir nutzen regionale Variationen in der Verfügbarkeit von Semestertickets, um zu analysieren, ob diese die Umzugswahrscheinlichkeit senken. Wir analysieren, ob und wie sich Semesterticketeffekte in Abhängigkeit von der Pendelzeit, den finanziellen Ressourcen, dem sozialen Hintergrund und der Risikoeinstellung der Studierenden verändern. Dazu verwenden wir die Daten der MESARAS 2013 (Mobility, Expectations, Self-Assessment, and Risk Attitude of Students) Erhebung, die Studienanfänger*innen in den Wirtschaftswissenschaften an sieben deutschen Universitäten befragt. Wir verknüpfen kleinräumige Standortinformationen aus der Erhebung mit Google Distance Matrix API zur Messung von Pendelzeiten, Daten zur Verfügbarkeit von Semestertickets von der Plattform waybackmachine.org und regionalen Verwaltungsdaten. Unsere logistischen Regressionsmodelle zeigen, dass die Verfügbarkeit von Semestertickets die Wahrscheinlichkeit des Umziehens senken kann. Dieser statistische Effekt scheint mit zunehmender Pendelzeit abzunehmen und außerdem vom akademischen Status der Eltern sowie vom verfügbaren Budget abzuhängen. Zusammenfassend leistet unsere Studie drei Beiträge: Erstens liefern wir politisch relevante Erkenntnisse zur Bedeutung des bezahlbaren öffentlichen Nahverkehrs. Zweitens gehen wir auf (soziale) Ungleichheiten bei Pendel- und Umzugs-Entscheidungen ein. Drittens demonstrieren wir, wie präzise räumliche Modellierungen von Mobilität durch die Integration von Umfragedaten mit externen Datenquellen sozialräumliche Analysen bereichern können.

1 Introduction

The Deutschlandticket, launched in May 2023 at 49 euros monthly, enables unlimited regional public transport use in Germany. The ticket aims at reducing commuters' financial burdens and increasing public transport usage (Bundesregierung 2024). Initial studies suggest that this goal is partially met, as car users resist switching to public transport (Guajardo Ortega and Link 2025), particularly for commuting routes (Link et al. 2023). Yet, subscription rates rose among households without cars, low-income households, and in rural areas, which reportedly increased social participation as well as spatial and mental freedom (Loder et al. 2024, Rozynek 2024). Higher education students value the ticket because it reduces mobility costs and simplifies the previously fragmented regional ticketing system. Amid rising housing

costs (Voigtländer et al. 2024), commuting, despite being a significant burden, could serve as a necessary means of enabling participation in higher education.

Long before the Deutschlandticket, students benefited from public transport subsidies, often referred to as “student tickets”, with the first universities implementing regionally subsidized student tickets in the 1990s (Böck 2022). Given their limited income (Federal Statistical Office of Germany 2022), potential underage status, and sometimes the lack of a driver’s license, students rely heavily on public transport. However, empirical research on the impact of student ticket availability and affordability on students’ mobility behavior is lacking.

We address this by analyzing the role of student tickets for mobility decisions. Combining survey data with multiple data sources, we create a unique dataset, enabling detailed spatial analysis of students’ commuting and relocating behavior during the school-to-university transition. More specifically, our first research question reads: *To what extent is university entrants’ decision to move versus commute to their place of study influenced by availability and coverage of student tickets, and how is this influence related to commuting time?*

Previous research indicates that benefits of ticket subsidies are not equal for different social groups. demonstrates that only low-income households already using public transport benefited from the introduction of the predecessor of the Deutschlandticket, which was available between June and August 2022. For them, both the frequency of use and the spatial radius of their activities increased. Similarly, find that low-income groups benefited from the abolition of public transport fares in Tallinn, Estonia. Moreover, examines the first implementations of student tickets in Germany, showing that students with a lower valuation of commuting by public transport may experience a loss in individual utility.

Hence, to capture potential heterogeneities, we consider differences related to students’ social and economic backgrounds as well as their risk attitudes. Thus, our second research question reads: *Are effects of student tickets on university entrants’ decision to move versus commute equally relevant for students from different socioeconomic backgrounds and with different risk attitudes?*

Our analyses are based on the MESARAS (Mobility, Expectations, Self-Assessment, and Risk Attitude of Students) survey (Weisser 2016), which comprises first-year Bachelor-level students in economics at seven German universities in the year 2013. The data includes information on residencies on the level of ZIP codes, which allows for a linkage with geocoded travel-time information and thus to estimate travel times from the (prior) places of residence to the universities. Furthermore, the survey captures information on personality, sociodemographic, and household information. We link the survey based on students’ place of residence at the end of their secondary school career as compared to their place of study, with requests from the

¹ **Google Distance Matrix API:** A service that calculates travel distances and durations between locations, incorporating congestion data and multi-modal paths like driving, walking, and transit <https://developers.google.com/maps/documentation/distance-matrix/overview>.

² **Wayback Machine:** A digital archive by the Internet Archive that stores snapshots of websites over time, allowing users to access historical versions of web pages <https://help.archive.org/help/using-the-wayback-machine/>.

Google Distance Matrix API¹, data on tickets from waybackmachine.org², regional data from the INKAR (Indikatoren und Karten zur Raum- und Stadtentwicklung) database provided by the BBSR (Federal Institute for Research on Building, Urban Affairs and Spatial Development) (BBSR 2024) and data from the IÖR Monitor (Monitor of Settlement and Open Space Development) (Krüger et al. 2013). We use logistic regression models to analyze whether the availability and the spatial coverage of student tickets affect whether students move (closer) or commute to their place of study.

Our study contributes to the literature on spatial mobility and social inequality in three ways: first, we focus on the decision to move versus commute at a crucial stage in the individual life course and answer whether this decision is influenced by public transport availabilities, commuting time, and cost reductions. This is particularly relevant since research suggests that distance to university reduces study success (e.g., 37; 21; 55; 61). Second, we consider heterogeneities by socioeconomic background and risk attitude, thereby touching upon questions of social inequality. Third, by combining survey data in a highly innovative way with different data sources and by employing finer-grained spatial measures than usually possible when using survey data, we demonstrate how accurate measures of proximity and detailed usage of locations benefit socio-spatial analyses.

2 Contextual background

This study focuses on first-semester Bachelor's students in economics at German universities. In 2013, Germany had 110 universities, 221 universities of applied sciences (UAS), and 56 universities of art or music (Hochschulrektorenkonferenz 2013), with around 164 institutions offering economics programs at the Bachelor's and/or Master's level (Weisser 2019).

While UAS are spread regionally, universities are concentrated in large cities and classic university towns (Wikipedia 2024d). This has consequences for the regional accessibility of study opportunities and for student housing prices. It is more likely to reach a UAS from most places in Germany by daily commute compared to universities. Moreover, universities are often situated in high-cost areas. In 2024, monthly rents for student housing ranged from about 260 euros in Erfurt to over 800 euros in Munich (Voigtländer et al. 2024).

Germany is one of the few countries in which university education is (mostly) free of charge. Study fees of around 500 euros per semester were abolished in 2013. Since then, study-related fees, so-called semester fees, are the only direct study-related costs. Semester fees, ranging from 150 to 400 euros, vary by institution and include administrative fees, student union contributions, and often the subscription fees for student tickets.

Subsidized student tickets preceding the Deutschlandticket provided students with cheap access to local and regional transportation, which is an essential service for students living off campus. The introduction of student tickets consistently increased the overall welfare and ensures a Pareto-efficient level of public transport provision, provided no additional costs arise for the transport company (Stähler 2000). The

exact range of services covered by a student ticket was negotiated independently by each institution with local transport associations and, therefore, varied significantly. In 2013, for instance, the semester ticket for universities in Halle was only valid within the public transport network in the city of Halle, whereas student tickets at universities in North Rhine-Westphalia (NRW) covered the entire federal state (Weichbrodt 2001, Wikipedia 2024c).

While a reduction in student ticket prices may represent only a small share of overall living costs such as rent, consumption, and study material, their availability offers financial relief for students who rely on commuting instead of moving to the study place. At the time of data collection in 2013, the largest difference between regular and semester ticket prices could be found in NRW, with regular tickets costing 237 euros per month compared to just 27 euros for student tickets³. In Clausthal, the only included city without a student ticket, a regular monthly subscription cost between 64 and 143⁴ euros, depending on the commuting distance.

To fund their living expenditures, students mostly rely on their parents. If parents are unable to provide sufficient financial support, students can apply for Federal Training Assistance (BAföG), which is half grant, half interest-free loan. Hence, aside from the opportunity costs of studying, the overall financial burden for German students are comparatively low by international standards. Most importantly, for the present study, the direct costs of studying are dominated by living expenses.

Another feature of the German higher education system is that universities must admit all applicants with a university entrance diploma, typically earned through Abitur or Fachabitur. Selection is based on performance only when applications exceed program capacity (Autorengruppe Bildungsberichterstattung 2012). Since education in Germany is decentrally organized by the 16 federal states, these enrollment criteria differ by state, university, and/or field of study. While some universities and study fields grant access upon the final average grade (e.g., Numerus Clausus), others administer assessment tests, and again others combine these instruments. Although merit-based admissions disadvantage students from lower socio-economic backgrounds, all study programs must admit 20% of students based on waiting time, helping to mitigate these disparities (Finger et al. 2024).

The target group of this study is first-semester students in economics. As economics typically has access restrictions, one of the standard selection procedures was applied. Students can apply to multiple programs and locations, increasing their chances of admission. Consequently, study location choice reflects not only academic performance but also personal preferences such as cultural amenities, living conditions, proximity to home, and financial situation.

³ According to <https://avv.de/de/aktuelles/neuigkeiten/neue-preise-im-nrw-tarif-2013-und-mehr-mitnah-moeglichkeiten>.

⁴ The oldest available data we found dates back to 2015: <https://web.archive.org/web/20150711024553/https://www.kvg-braunschweig.de/tickets-und-preise/preisuebersicht/>.

3 Explaining students' mobility decisions

In the following, we will discuss conceptual arguments and present research on (study-related) mobility decisions, pointing out the lack of empirical evidence on how public transportation availability explains the moving versus commuting decision and why this is relevant for young people at the transition from school to study (Section 3.1). Furthermore, we discuss potential heterogeneities of the effect of public transport (Section 3.2).

3.1 Moving versus commuting to higher education

A substantial body of research shows that increased distances to universities may negatively impact enrollment, academic performance, and longer-term earnings (Card 1993, Denzler and Wolter 2011, Frenette 2006, Frenette 2009, Kobus et al. 2015, Parker et al. 2016, Spiess and Wrohlich 2010, Tinto 1973, Vieira et al. 2018). Students who commute longer distances compared to those living close to campus participate less in student activities (Alfano and Eduljee 2013) and face higher dropout rates (Nelson et al. 2016). Despite the well-documented consequences of this mobility decision, less is known about the underlying causes that influence students' decision to commute instead of relocating to their place of study. This is problematic because the selection into mobility may at least in parts explain differences in study success.

The median commuting time of students across European countries is reported as being approximately 40 min for people living with their parents and between 15 and 20 min (one way) for others, depending on whether they live in student accommodation or elsewhere (Hauschildt et al. 2021). In Germany, approximately 40% of moves out of the parental home are associated with entering higher education (Nauck et al. 2017). However, the sharp increase in rental prices in urban areas and university towns makes it difficult for students to afford housing, thereby increasing the relevance of commuting options (Voigtländer et al. 2024).

Existing research on students' decision to move versus to commute shows that the availability of educational alternatives in the home region matters. Thus, the mobility decision is linked to the decision on what to study and if to do so at all (Weßling 2023). Since the availability of study options varies significantly across geographic contexts (Hillman 2016), young people may decide between relocating or commuting to access educational institutions elsewhere, or they adapt their educational plans by opting for educational alternatives available closer to home (Litmeyer and Hennemann 2024; Mulder and Clark 2002; Spiess and Wrohlich 2010; Sá et al. 2012; Weßling and Bechler 2019). Beyond the distance to opportunities, the decision to move or commute is subject to the need to access university services regularly (Rotaris et al. 2012). Thus, it also depends on the course organization in the study subject. For those who need to commute, argues that implementing collective public transport tickets, like the student tickets analyzed here, will lead to inefficient residential choice because of the zero marginal costs of commuting, shows that the proximity to public transport is an important determinant of students' housing choice and that discounts on student tickets encourage the usage of public transportation

for commuting. While not focusing on public transport per se, students are known to be cost-sensitive in their choice of transportation mode (Bamberg and Schmidt 1998; Mohammadzadeh 2020; Rotaris and Danielis 2015; Shannon et al. 2006; Zhou 2012).

Overall, studies examining the role of public transport for mobility decisions focus primarily on work-related mobility. A common assumption is that mobility decisions are made jointly within households. Thus, employees take the distance and travel duration from home to their workplace into account when deciding if and where to relocate to (Clark and Burt 1980), thereby considering the household-related trade-off between moving and commuting costs (Borgers and Timmermans 1993; Cameron and Muellbauer 1998; Tillema et al. 2010). For those unwilling or unable to relocate, public transport costs are direct drivers in the modal choice (Ulahannan and Birrell 2022), though car drivers are more reluctant to switch modes (Fearnley 2013; Guajardo Ortega and Link 2025; Link et al. 2023).

In this paper, we bridge arguments from studies on students' mobility decisions with research on the role of public transportation for mobility decisions. Drawing from these two research streams, we derive a first hypothesis:

H1 The likelihood of moving (closer) to the place of study versus commuting is lower if the student ticket is available at the student's place of residence.

Students who reside within the catchment area of the student ticket that covers their university are more likely to choose to commute, as this minimizes costs. However, this decision is naturally influenced by the distance involved. In larger federal states like NRW, numerous universities offer student tickets that cover the entire state. While this broadens public transportation options, one-way travel times across NRW can exceed two to three hours. Such long commutes are impractical for daily travel, making commuting less feasible even if the student ticket covered the entire route. Hence, we hypothesize further:

H2 The influence of the student ticket on the likelihood of moving (closer) to the place of study versus commuting decreases with increasing commuting time.

3.2 Individual-level heterogeneities in the decision to move or to commute

Previous research has shown that students' social and personal living circumstances play a role in the decision to move versus to commute (Comunian and Jewell 2018; Farre and Ortega 2021; Sánchez and González 2016). Students with greater financial resources and from academic backgrounds are more likely to move closer to the place of study because parents can more easily provide the social and economic support to do so (Rotaris et al. 2012; Weisser 2020). Since housing (or commuting) costs represent the largest expenses in German higher education, financial resources are relevant for the decision to live independently as a student. Furthermore, parents who hold academic degrees are more likely to support their children's decision to study (further away) since the perceived likelihood of (failing in) higher education

are lower and knowledge about the system are readily available (e.g., 8; Holm and Jæger 2008).

Studies adopting a spatial perspective on higher education choices suggest that proximity to study institutions shapes how important the influence of social status and financial resources is. Parental social status and income play larger roles when students live further away from study opportunities compared to those living nearby (Denzler and Wolter 2011; Frenette 2006, 2009; Gibbons and Vignoles 2012; van Oosterhout et al. 2024; Weßling 2023). Following from this, social and financial heterogeneities in the effect of student ticket availability on students' decision to move versus to commute can be expected. The existence of socioeconomic heterogeneities is supported by studies focusing on the choice between relocating for work. It could have been shown that the assessment of commuting costs depends on household characteristics, with women attaching greater weight to commuting distance than men (Barbanchon et al. 2021; Rouwendal 2021). Single households are much more likely to relocate compared to households with more people (Clark et al. 2003). Increases in fares are less negatively perceived for high-income groups (Tillema et al. 2010). Recent evidence on the effect of the Deutschlandticket shows its benefits for low-income households and those who do not own a car (Loder et al. 2024; Rozynek 2024).

Following from this, we hypothesize that the role of the student ticket for the decision on moving versus commuting varies by students' social background and financial resources:

H3a The influence of the student ticket on the likelihood of moving (closer) to the place of study versus commuting is stronger for students with lower budgets.

H3b The influence of the student ticket on the likelihood of moving (closer) to the place of study versus commuting is stronger for students from lower social backgrounds.

Beyond monetary costs of moving, studying at a more distant university may also entail non-pecuniary factors, such as psychological costs (Sjaastad 1962). These costs reflect students' emotional attachment to their home region, including connections to places and people. These psychological costs can be expected to be closely linked to an individual's attitudes (Weisser 2020).

Studies that explicitly considered personality and attitudes find that they are a significant factor in either facilitating or hindering mobility. For the German labor market, show that a greater self-reported willingness to take risks significantly increases the likelihood of migrating and this effect is not driven by reverse causality. While not directly assessing risk and , show that personality traits can act as moderators of structural factors that influence individuals' work mobility.

To the best of our knowledge, only one study utilizing the same dataset as the present study focuses on students' location choices and the role of attitudes and personality (Weisser 2020). The study finds that location-specific factors are valued differently by individuals with varying risk attitudes. More specifically, students with higher rates of risk aversion show a less distance-dependent sorting behavior. Despite

university choices, researchers have shown that students with a higher risk attitude towards moving (to another city) expect higher risk-premiums in future earnings for their choice to move (Weisser 2019). Following from this, we assume that risk attitudes might also play a mitigating or exacerbating role in the effect of a student ticket on the mobility decision. Students' risk attitude towards moving to another city directly captures this mobility-related risk dimension. Thus, we argue that students who are inclined to take risks, especially towards relocating to a different city, are more likely to move regardless of the commuting options provided by a student ticket.

H3c The influence of the student ticket on the likelihood of moving (closer) to the place of study versus commuting is stronger for risk-averse students.

4 Data and methods

4.1 Data sources

To test the above hypotheses, we combined (1) survey data with (2) public transport commuting times, (3) data on student ticket availability, and (4) regional administrative data.

1. The survey data stems from the MESARAS study (Weisser 2016). Unlike other surveys with coarse location data (e.g., federal states, (labor-market) regions), MESARAS provides fine-grained ZIP code-level information for multiple residences. Furthermore, it includes detailed data on respondents' social background, finances, risk attitudes, and relationships. A strength of the survey is its focus on a homogeneous target group, reducing potential endogeneity problems: MESARAS focuses on students in introductory economics courses in the year 2013 in seven German universities namely, Dortmund, Münster, Bielefeld, Hannover, Clausthal, Magdeburg and Halle. The initial MESARAS sample comprises 2589 students.

To further reduce endogeneity, we restricted the sample to students enrolled in a first-semester Bachelor's program, reducing it to 2340 respondents. Additionally, we excluded 118 students who did not report a ZIP Code for their place of residence⁵, 382 students whose current place of residence does not match the target of their last move, and 410 students who reported to not have moved after finishing school, yet their current place of residence differed from their last address during school. We excluded 43 students who never moved but currently live at a different location from their initially reported place of residence, leaving us with 1387 observations. We further restricted the sample to students residing within a 250-km-radius of their study location before their last move⁶, resulting in a sample of

⁵ This occurred, for example, for students that directly moved to university from abroad.

⁶ Due to data protection guidelines, we could not query the connections between place of residence and place of study within the dataset directly. Instead, we had to query every possible connection in Germany

1211 students. We did so to further restrict selectivity since it is reasonable to assume that students who live further away will almost certainly move to the place of study, regardless of student ticket and commuting options. After deleting students with missing values in control variables, we obtained a final analytical sample of 915 students.

MESARAS has so far supported three studies on student mobility (Weisser 2019, Weisser 2020, Weisser 2022). The 2019 study examined self-reported mobility premiums in future job markets, while the 2020 study investigated the role of personality and attitudes in shaping location choices. The most recent study, published in 2022, focused on students' application strategies. We add to this by evaluating the coverage of the places of residence by student tickets and its effect on moving versus commuting. To do so, we link MESARAS with external data sources. The central link variables are the ZIP codes of the places of residence at the end of secondary education and of the universities. The ZIP code data is available for students' current and retrospectively for prior places of residence. Whenever necessary for linkage with administrative data, we used the centroid of the ZIP code area for identification. For computing travel times, we calculated the centroid of the highest-density grid cell within the ZIP code area.

2. We use the Google Distance Matrix API to estimate public transport travel times between students' residences and study locations, querying the first Monday morning connection after 8 AM to reflect rush hour. A key limitation is the time lag: survey data is from 2013, but travel times were queried in 2023. Although his-

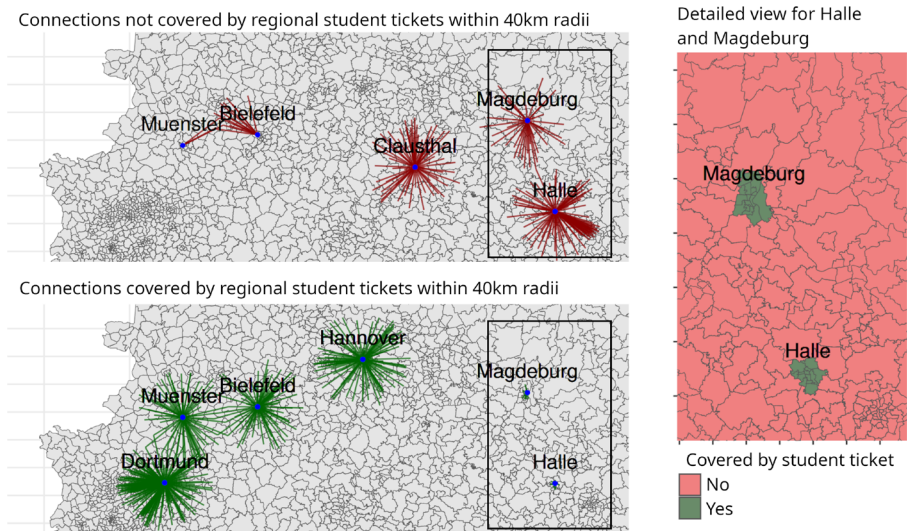


Fig. 1 Coverage of student tickets in Germany in 2013. (Highlighted connections by universities and postal codes within 40km radii; insets: Halle and Magdeburg for detailed local coverage; data: own research; map data: © Deutsche Post Direkt GmbH (2025))

to the seven university towns. To limit the costs associated with querying the Google Distance Matrix API, a 250km threshold was chosen as a priori limit. This limit was marginally above the free query allowance provided by Google.

torical timetables exist, the computational effort to integrate them was beyond this project's scope. A check for infrastructure changes suggests that newly introduced lines (e.g., near Halle and Dortmund⁷ (Wikipedia 2024b)) fall outside our study area. As an alternative, we calculated Euclidean distances, but these ignore geographic barriers (e.g., rivers), which can distort estimates with fine-grained location data. The distance-based results are included in the robustness checks.

3. We manually researched student ticket coverage for the seven MESARAS universities using archived sources from waybackmachine.org, which stores snapshots of university and transit websites⁸. Coverage information was derived from text descriptions, transport line lists, and station registers. For each university-residence pair, we recorded whether at least one station or street within the ZIP code was included in the student ticket's scope at the time of the survey. Figure 1 displays the geographic coverage of student tickets for the universities.
4. Regional socioeconomic conditions are key drivers of spatial mobility as they reflect local living and working conditions. To account for regional factors that might influence the moving decision between the previous place of residence and the university location, such as the attractiveness of a city, we use data from the INKAR database (BBSR 2024). The INKAR data is available at the level of NUTS 3 (Nomenclature of Territorial Units for Statistics) regions Eurostat.

4.2 Variables

Our dependent variable measures whether students move (closer) to their place of study or commute. The key independent variables of interest are whether the place of residence prior to this decision is covered by a student ticket, and additionally the commuting time to reach the place of study.

- Moving (vs. commuting). All places of residence are available at the ZIP code level. The MESARAS respondents were asked to provide birthplace, number of moves and locations of the moves during their school career and after completing school, and their current place of residence during the survey. The dependent variable is constructed based on the students' place of residence at the end of secondary school and the study location. Our binary dependent variable indicates whether a student moved (= 1) closer⁹ or continued to commute from their secondary school residence (= 0).
- Student ticket. Our key independent variable is calculated as a binary variable based on the coverage of the student ticket at the seven surveyed universities. This variable differentiates between places of residence where at least one station or stop within the ZIP Code area is covered by the student ticket of the respondent's university (student ticket available = 1) and ZIP Code areas outside the scope of the

⁷ The only exceptions are in Halle and Dortmund, where reactivated tracks, located 31.7 and 57.2 km away (Wikipedia 2024a), offered new indirect connections to both cities.

⁸ Archived URLs, as well as all parts of our analysis are documented in the code repository.

⁹ The case that students moved after completion of secondary school, but farther away from their initial residential location occurred 10 times, predominantly for students that moved within the city of their secondary education.

student ticket (student ticket not available = 0). Thus, it encodes for each student whether the place of residence they lived in prior to taking up studies is covered.

- **Commuting times.** We use for each student the route between their ZIP code of residence and the ZIP code of their university to calculate the commuting time. Since MESARAS concentrates on students in economics, we account for universities that are spread across multiple campuses by using the ZIP code of the department of economics. Using the *Google Distance Matrix API*, we obtain public transportation travel time in minutes between the place of residence and place of study. Since some ZIP codes have an uneven spatial distribution of settlement, using geographic centroids could introduce bias when calculating public transport commuting times. Therefore, we identified the 1-square-kilometer grids with the highest population density within each ZIP code area and used their centroids as reference points. The grid-based density data was obtained from the IÖR-Monitor to perform this recalculation (Krüger et al. 2013). The IÖR-Monitor is an online platform providing geospatial data on land use, settlement development, and environmental conditions.
- **Budget.** We expect the decision to move versus to commute to vary by students' financial resources. Students in the MESARAS survey were asked to provide their accommodation cost and their remaining budget. The sum is reported as the total budget. Students were also questioned about the share of their expenditure that is covered by Federal Training Assistance (BAföG), allowing us to include this information in the analyses.
- **Parental education.** We measure students' social background using a binary variable, encoding whether at least one parent has an academic degree (= 1).
- **Risk attitude.** Beyond socioeconomic background conditions, we expect heterogeneous student-ticket influences by individuals' risk attitude in relation to moving decisions. Risk attitude is measured on a 7-point Likert-scale ranging from 'strongly disagree' (= 1) to 'strongly agree' (= 7) evaluating the statement 'A move to a different city within the same federal state is risky.'
- **Control variables.** We include factors that may affect spatial mobility and living conditions, potentially confounding the relationship between our main variables of interest and students' mobility decision. These include whether students are enrolled at their preferred university (= 1), as this may influence their willingness to move. We control for gender (female = 1), based on evidence of gender-based differences in location choice (Cattaneo et al. 2017). We also include whether a student is an only child (= 1), which may affect family resources and preferences for moving out (Aparicio-Fenoll and Oppedisano 2016), and partnership status (partnered = 1), since personal relationships typically reduce mobility (Clark et al. 2003).

Besides individual-level control variables, we capture regional variables on the NUTS 3 level obtained from the INKAR database (BBSR 2024). We control for increasing agglomeration (represented by the net migration of a region) and attractiveness through demographic composition (represented by the average age of the population) as they are prominent push-pull factors (Chen et al. 2021, Tillema et al. 2010) and thus should also capture housing market pressure, especially for students. We constructed binary variables for each of the regional variables that

compare the place of residence with the place of study, indicating whether the university town has a higher net migration or a lower average age than the place of residence. By modeling not a single regional indicator measured for a specific city, but a dummy variable indicating the relative relation between study place and (prior) place of residence, we avoid implicitly calculating a fixed-effects regression at the university level. The concepts of age and net migration used here are chosen to be balanced across all tuples of students' places of residence and their

Table 1 Descriptive statistics of variables included in the analysis

Variable	Category	Percentage/Mean (SD) [min, median, max]	<i>N</i>	Conditional <i>N</i> (move closer/ commute)
Dependent Variable moving				
–	Move closer (<i>moving</i> = 1)	65.5%	599	(599/0)
	Commute (<i>moving</i> = 0)	34.5%	316	(0/316)
Independent Variables				
<i>Student ticket</i>	Available (= 1)	61.3%	561	(281/280)
	Not available (= 0)	38.7%	354	(318/36)
<i>Commuting time</i>	With public transport (in minutes)	124.7 (76.2) [0.0, —, —]	–	
<i>Total budget</i>	Financial resources (in 100 euros)	6.1 (3.6) [0.0, 6.0, 53.5]		
Parental education	At least one academic (= 1)	41.7%	382	(272/110)
	Non academic (= 0)	58.3%	533	(327/206)
Risk attitude	Moving is risky (= 7)	2.3 (1.4)	–	
	Moving is not risky (= 1)	[1.0, 2.0, 7.0]		
Individual Control Variables				
Gender	Female (= 1)	40.4%	370	(255/115)
	Male (= 0)	59.6%	545	(344/201)
Single child	No siblings (= 1)	14.4%	132	(72/60)
	Siblings exist (= 0)	85.6%	783	(527/256)
Partner status	Partnered (= 1)	41.7%	382	(246/136)
	Not partnered (= 0)	58.3%	533	(353/180)
Preferred university	Preferred (= 1)	78.6%	719	(450/269)
	Not preferred (= 0)	21.4%	196	(149/47)
Regional Control Variables				
Uni region faster growth	Higher migration(= 1)	73.1%	669	(479/190)
	Same or less (= 0)	26.9%	246	(120/126)
Uni region younger	Younger population (= 1)	71.6%	655	(440/215)
	Older average (= 0)	28.4%	280	(159/101)

[Min, median, max] values are reported only for non-binary variables; Conditional *N* values represent the number of observations for each category, based on the dependent variables “moving closer” and “commute”; “—” indicates values that were censored; data: MESARAS, INKAR, IÖR-Monitor, own calculations.

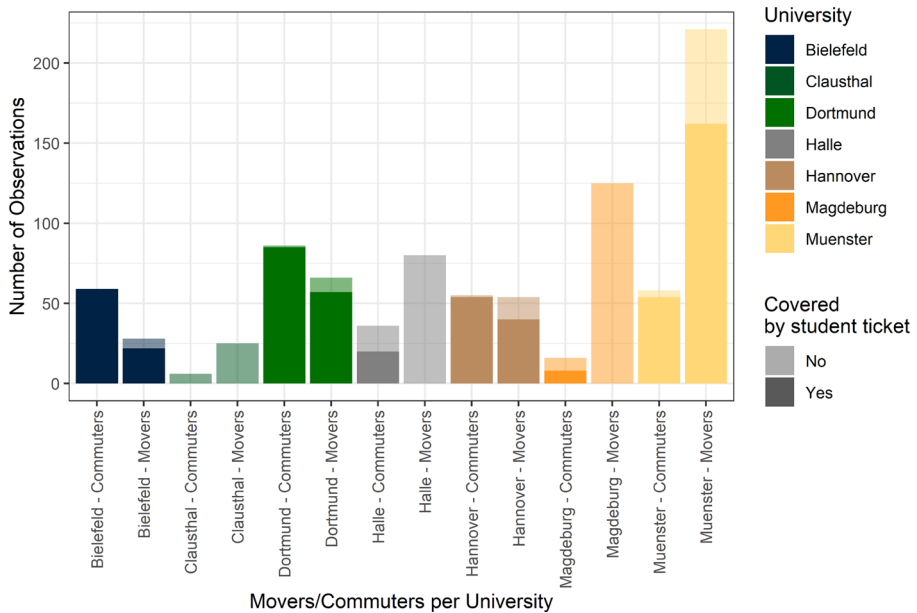


Fig. 2 Movers and commuters per university. (Universities and movers/commutes on the x-axis; counts on the y-axis; shaded with the coverage by student tickets; data: MESARAS, own calculations)

universities, and to be as uncorrelated as possible.

Table 1 summarizes the analytical variables used in this study, showing key independent and control variables conditional on the dependent variable. Notably, the majority of students move (closer) to their place of study, while only a smaller share of students lives in areas without student ticket coverage. In addition to the table, we include a detailed correlation table for the continuous variables (Table 2) and the conditional distribution of regional variables across the seven universities (Table 3).

Figure 2 illustrates the number of movers and commuters per university, along with student ticket coverage. While participation varies across universities, the distribution of movers and commuters largely reflects the remoteness of each institution, with Magdeburg, Münster, and Clausthal being the most remote.

4.3 Analytical strategy

To analyze our binary dependent variable (moving vs. commuting), we estimate logistic regression models, which are built up stepwise: first, we analyze the main effects to test our initial hypothesis (H1) in *Model 4*; second, we examine the two-way interaction between commuting time and the availability of student tickets to test H2 in *Model 5*; third, we analyze the two-way interactions for Hypotheses H3a to H3c, initially irrespective of an interaction with commuting time in *Model 6* to

Model 8, and subsequently within fixed commuting time ranges based on quartiles in *Model 6(a–d)* to *Model 8(a–d)*.

In *Model 1*, we include only the availability of student tickets and commuting time in a logistic regression model. Equation 1 depicts this base model, with ϵ representing the unobserved characteristics, which we assume to be random and normally distributed.

$$\text{logit}(P(\text{moving} = 1)) = \beta_0 + \beta_1(\text{student ticket}) + \beta_2(\text{commuting time}) + \epsilon \quad (1)$$

Since limited financial resources constrain moving and living simultaneously, we introduce students' total budget in *Model 2*. In *Model 2a* through *2d*, we further decompose the budget. *Model 2a* includes a binary variable encoding whether students received BAföG. *Model 2b* and *Model 2c* refine the analysis by modeling the amount of BAföG as a relative percentage of the total budget (*Model 2b*) and as an absolute amount in euros (*Model 2c*). *Model 2d* decomposes the total budget into two components: the amount of BAföG and the total budget, excluding BAföG. In *Model 3*, we additionally capture whether the student originates from an academic household, risk attitudes toward moving to another city, and control variables. *Model 4* further extends the framework by incorporating regional-level control variables. *Model 4* includes all variables covered in this study. The full model specification corresponds to Eq. 2 and the subsequently presented interaction models are based on *Model 4*.

$$\begin{aligned} \text{logit}(P(\text{moving} = 1)) = & \beta_0 + \beta_1(\text{student ticket}) + \beta_2(\text{commuting time}) \\ & + \beta_3(\text{total budget}) + \beta_4(\text{parental education}) \\ & + \beta_5(\text{risk aversion}) \\ & + \sum_{i=1}^4 \gamma_i(\text{individual}_i) + \sum_{j=1}^2 \delta_j(\text{regional}_j) \\ & + \epsilon \end{aligned} \quad (2)$$

Since the decision to move versus commute should be influenced by commuting time, we hypothesize that the effect of the student ticket diminishes with increasing commuting time (H2). *Model 5* tests this interaction between student ticket availability and commuting time. *Model 6* through *Model 8* explore conditional effects corresponding to Hypotheses H3a, H3b, and H3c: the effect of the student ticket is stronger for students with lower budgets (H3a), for students from lower social

backgrounds (H3b), and for risk-averse students (H3c). Equation 3 describes these interactions for *Model 5* to *Model 8*.

$$\begin{aligned}
 \text{logit}(P(\text{moving} = 1)) = & \beta_0 + \beta_1(\text{student ticket}) + \beta_2(\text{commuting time}) \\
 & + \beta_3(\text{total budget}) + \beta_4(\text{parental education}) \\
 & + \beta_5(\text{risk aversion}) \\
 & + \sum_{i=1}^4 \gamma_i(\text{individual}_i) + \sum_{j=1}^2 \delta_j(\text{regional}_j) \\
 & + \beta_6(\text{<interaction variable>}) \times (\text{student ticket}) + \\
 & + \epsilon \\
 \text{with <interaction variable> } = & \text{commuting time} \vee \text{total budget} \\
 & \vee \text{parental education} \vee \text{risk aversion}
 \end{aligned} \tag{3}$$

Since each effect may also depend on commuting time, potentially with a different diminishing rate than estimated in *Model 5*, we refine our analysis by accounting for variations in commuting time. To do so, we divide our observations into quartiles based on commuting time. This allows us to estimate two-way interactions and compare the corresponding regression coefficients across these commuting groups. Thus, we test our hypothesis specifically for students with moderate commuting distances, where we expect the strongest statistical effect of student tickets. Formally, these models are also estimated with Eq. 3, but use smaller sample sizes.

We evaluate model fit for all models using pseudo- R^2 measures, including those proposed by and, as well as the Hosmer-Lemeshow Goodness-of-Fit (Hosmer et al. 2013). Individual parameter significance is assessed using Wald's Test, while overall model adequacy is tested using the Likelihood Ratio (LR) Test and Wald's Test. For straightforward interpretations of the coefficients, we report Average Marginal Effects (AMEs) (Mood 2010). We present predicted probability plots with local 95-percent confidence intervals to interpret the interaction effects, including the predicted probability plots of *Model 4* (without interactions). The plots are displayed against commuting time to facilitate better visual interpretation.

5 Results

5.1 Does the student ticket availability enhance the moving versus commuting decision?

Models 1 to *4* sequentially include budget, individual-level, and regional-level controls. Furthermore, *Model 5* includes an interaction effect between commuting time and student ticket availability. Table 4 provides the AME results of the regression models, while logit estimates and odds ratios can be found in Table 5.

Across all models, student ticket availability is significant and associated with a 12.3 to 14.4 percentage point decrease in the likelihood of moving. This strongly

supports our first hypothesis that student ticket availability decreases students' likelihood of moving in favor of commuting to their place of study.

The link between commuting time and moving is consistent across all models. The probability of moving increases by approximately 4 percentage points with each additional 10 min of commuting time. To depict the relationships between commuting time and ticket availability, *Model 5* includes an interaction effect between commuting time and ticket.

We illustrate in the left panel (a) of Fig. 3 the association between student tickets and the probability of moving for the distribution of commuting times, without modeling an interaction effect, thus without a decaying effect of student tickets. The right panel (b) shows the association when including the interaction. In both cases, moving is more likely in areas not covered by a student ticket. When the interaction is included in the model, this association becomes more pronounced and significant, especially for commuting times below 75 min. Thus, differences between areas with and without a student ticket are statistically significant for shorter commuting times, whereas no significant differences are observed for longer commutes. Thus, above a certain threshold in commuting time, students are likely to move regardless of the ticket availability.

Overall, we find results similar to those of who reported a break-even range of 65 to 75 km (50% isoclines) between moving and commuting for Italian students. Figure 3 shows these isoclines at 105 min for routes covered by student tickets, corresponding to roughly 60 km when assuming an average speed of 33.23 km/h, as in our dataset.

Besides ticket availability and commuting time, we observe strong effects of budgetary constraints across all models. This aligns with prior research showing influences of commuting costs on mobility decisions (Tillema et al. 2010). The association suggests that ticket availability may affect students who lack the resources to relocate.

More detailed results from *Models 2a to 2d* (Table 6) show that students' moving decisions depend on their total budget and not so much on the income source. There is no difference between those receiving BAföG and those supported by parents. *Model 2d* confirms this, with identical coefficients for BAföG and non-BAföG sources.

5.2 Does the relationship between the student ticket and the moving versus commuting decision vary with social background and personality?

We expected the student ticket's relevance to vary by individual characteristics, such as social background and risk attitudes. We derived three hypotheses, each of which was modeled by estimating a two-way interaction based on the full model (*Model 4*) between the variables in question and the ticket availability. The interactions were included separately into Model 4. The full models with interaction terms can be found in Table 7.

Figure 4 illustrates the association between ticket availability and the probability of moving dependent on students' budget (a), parental education (b) and students' risk attitude (c). As noted earlier, higher student budgets tend to be associated with

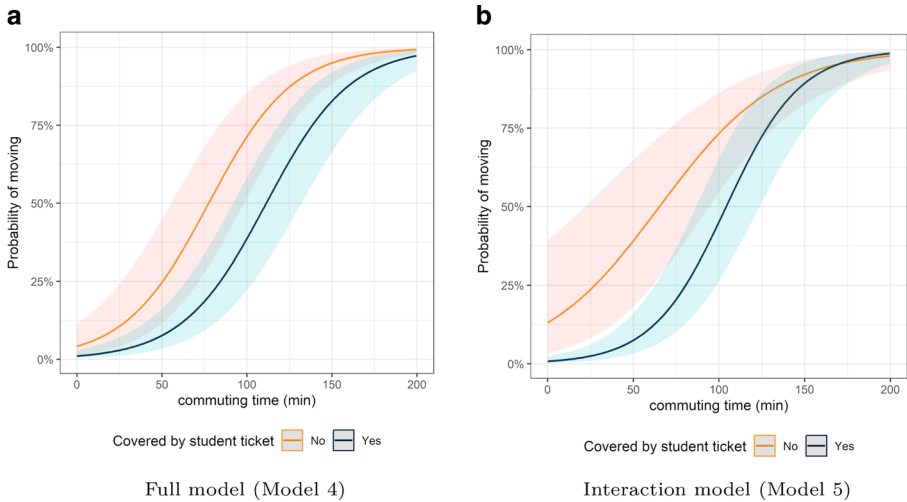


Fig. 3 Predict probability of moving by student ticket coverage and commuting time. (Probability on the y-axis; commuting time on the x-axis; coverage of student tickets by colors; 95% CIs are plotted alongside the predicted values; Facets based on **(a)** *Model 4* (full model including all variables) and **(b)** *Model 5* (full model with interaction between student ticket and commuting time); data: MESARAS, own calculations)

a greater likelihood of moving. Besides this general trend, we present a potential heterogeneous association of ticket availability across different budget groups in Fig. 4a. The blue line represents the probability of moving when there is a ticket available, and the orange line indicates the same probability when no ticket is available. On the x-axis, students' budgets are displayed. The confidence intervals for both low and high budgets are wide and overlapping, indicating that no significant effect differences can be identified in these budget ranges. For medium budgets, the overlap is minimal, which does not rule out significant effects of student tickets. However, we do not find a general presence of an interaction, as we do not observe any differences in the functional forms. Moreover, the parameter estimates (Table 7) also show no statistical significance.

Figure 4b displays the interaction between parental educational status and ticket availability. Since parental education is a binary variable, indicating whether at least one parent holds an academic degree, the illustration differs from the one in Fig. 4b. The blue point estimates represent the probabilities of moving when a ticket is available, while the orange point estimates show the probabilities when no ticket is available. On the left side of the x-axis, the probabilities are shown for students with non-academic parents; on the right side, for those with academic parents. Again, we observe overlapping confidence intervals. However, students with a ticket and non-academic parents (blue point estimate on the left) are significantly less likely to move compared to students without a ticket and with academic parents (orange point estimate on the right). This tentatively supports Hypothesis 3b that students from lower social backgrounds favor commuting when tickets are available, as relocating entails greater risks beyond financial burdens. Students from non-

academic backgrounds are less familiar with university life and often fear failure, making commuting a more likely choice than moving.

Figure 4c displays the interaction between the availability of a student ticket and students' risk attitudes. The blue line represents the association when there is a ticket available, while the orange line shows the probability of moving when no ticket is available. The confidence intervals overlap across the entire distribution of the risk attitude measure (x-axis). As the two lines run nearly parallel, we do not

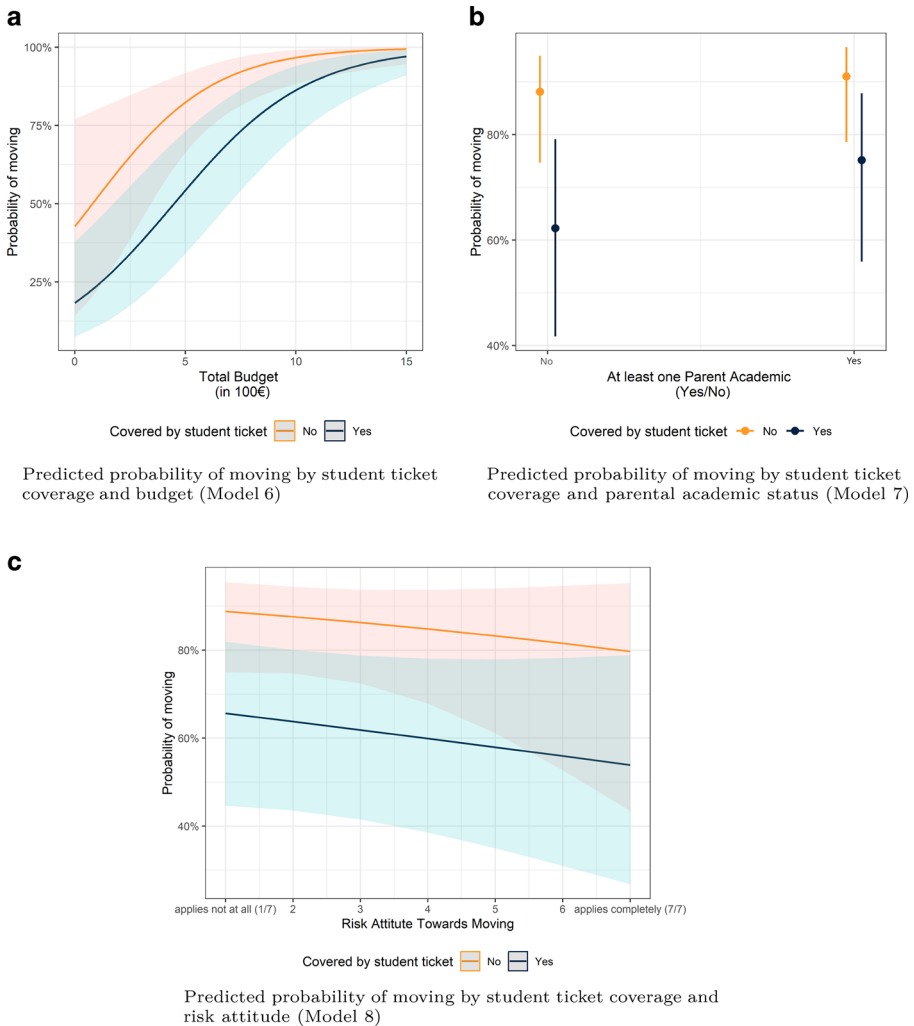


Fig. 4 Predicted probabilities of moving. (The y-axis shows the predicted probability of moving; the x-axis represents individual social backgrounds; lines are colored by the coverage level of student tickets; 95% confidence intervals are shown; Facets based on (a) Predicted probability of moving by student ticket coverage and budget (Model 6), (b) Predicted probability of moving by student ticket coverage and parental academic status (Model 7) and (c) Predicted probability of moving by student ticket coverage and risk attitude (Model 8); data : MESARAS; own calculations)

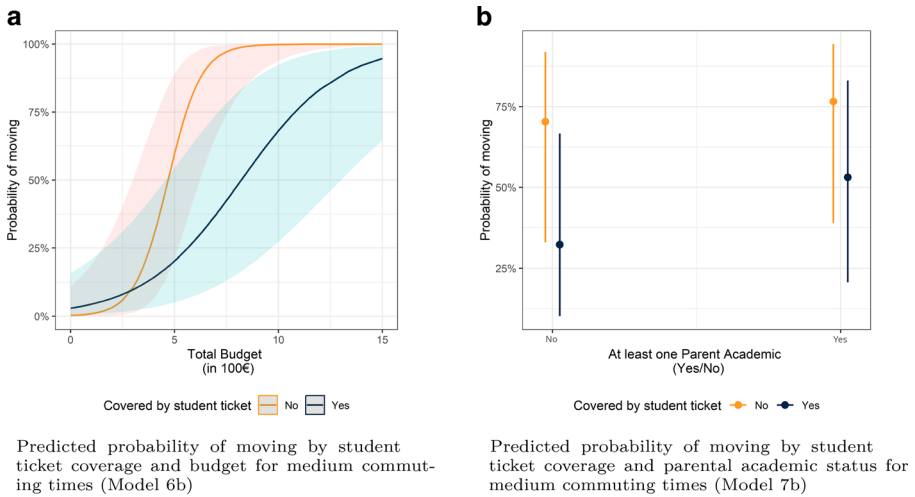


Fig. 5 Predicted probabilities of moving for medium commuting times (2nd quartile, 65 to 111 min). (The y-axis shows the predicted probability of moving; the x-axis represents the social or individual background; Lines are colored by the coverage level of student tickets; 95% confidence intervals are shown; Facets based on (a) Predicted probability of moving by student ticket coverage and budget for medium commuting times (Model 6b) and (b) Predicted probability of moving by student ticket coverage and parental academic status for medium commuting times (Model 7b); data: MESARAS; own calculations)

observe indications of an interaction between risk attitude and ticket availability in predicting the probability of moving versus commuting.

In Hypothesis 2, we argued that ticket availability cannot be analyzed independently of the commuting distance. As shown in Fig. 3, ticket availability reduces the likelihood of moving, particularly within a range of 75 min of travel time. Hence, it is reasonable to assume that commuting distance is also relevant for the interaction between ticket availability and personal characteristics. To explore this further, Fig. 5 presents the interactions between ticket availability and students' budget and parental educational status but for a selected commuting range. We divided commuting distances into quartiles and conducted the analyses separately for each. Meaningful results were only found for the first (*Model 6a to 8a*) and the second quartile (*Model 6b to 8b*), below 65 min and between 65 and 111 min of commuting. We did not display these subgroup analyses for students' risk attitudes, as Fig. 4c showed no meaningful differences by risk preference. Table 8 contains the estimation parameters for this quartile-based analysis.

Figure 5a shows the interaction between students' budget and ticket availability on the probability of moving versus commuting to the place of study, within the second quartile of the measured commuting time (65–111 min). Compared to Fig. 4a, we now observe a difference in the association between ticket availability. This pattern provides tentative support for our Hypothesis 3a. However, the observed pattern appears more complex, since students with low budgets have a consistently lower

probability of moving, regardless of whether a ticket is available. The probability of moving increases more slowly with additional budget when a ticket is available. For students with medium budgets (above 800 euros), we observe a difference in probabilities dependent on ticket availability. At the high end of the budget distribution, the probabilities converge again, indicating that students with high budgets move (closer) to their place of study regardless of student tickets.

Figure 5b displays the interaction between parental education and ticket availability within the second quartile of the commuting time. The results resemble those shown in Fig. 4b. We interpret this pattern as tentative support for Hypothesis 3b: Students with non-academic parents are less likely to move when a ticket is available. The difference between estimates is far higher, but confidence intervals in Fig. 5b are also much wider and now overlap. We attribute this to the small number of cases, as the reduced sample for the second commuting quartile includes only 227 observations. The relatively small sample size presents a general challenge for the analyses, which we discuss in more detail in the limitations section below.

6 Limitations and robustness checks

Although the results offer meaningful insights, certain limitations, particularly related to data structure and sample size, need to be mentioned.

First, generalizability is limited due to missing information on key variables, which reduces the number of observations. In particular, the lack of statistical power complicates the identification of heterogeneities in mobility behavior. Moreover, the dataset lacks control variables, such as possession of a driver's license or access to a car.

Second, the 2013 survey data introduces uncertainty. While archival web sources approximate conditions, they may miss nuances. However, this likely does not affect our findings, as no major transport changes have occurred since then.

Third, clustering at the university level may affect results, as students share local conditions like housing markets. We addressed this using regional dummies based on students' origins and balanced distribution.

Besides those limitations that are induced by the data, we address additional concerns via robustness checks and provide four tables presenting them. Each table corresponds to one of our hypotheses: Table 9 for Hypothesis H1, Table 10 for Hypothesis H2, Table 11 for Hypothesis H3a (focused on middle commuting times), and Table 12 for Hypothesis H3b. We will discuss all robustness checks and their underlying assumptions separately for each hypothesis.

We did not include housing prices for three reasons. First, individual-level data on participants' housing search behavior and preferences are unavailable. Second, including housing prices alongside regional controls would have introduced city-level fixed effects. Third, constructing indicators to compare rent levels between university towns and students' former residences was infeasible, as detailed rent statistics exist only for Germany's largest cities and do not cover students' living conditions (e.g., living with parents, sharing a flat). While housing prices likely

affect moving decisions, such considerations and the risk of not finding housing are typically factored into students' initial university choice.

Beyond that, in Robustness Check 1, we further restrict the sample to students who reported securing long-term accommodation, excluding those who failed to find affordable or appropriate housing.

Furthermore, our analysis may be affected by selection bias. Students might have considered factors such as student ticket availability, commuting time, and housing when choosing a university. While we cannot directly assess whether some commuting students would have enrolled without access to a student ticket, we provide conceptual arguments and robustness checks suggesting that university choice is not strongly driven by the availability of student tickets. Monthly savings from student tickets are capped at 210 euros (the case for NRW) and often lower. These costs are small compared to relocation costs like rent, deposits, and furnishing. These savings are also modest relative to key factors in university choice, such as academic programs, institutional reputation, and proximity to home. Thus, we argue that ticket availability has little influence on university selection.

To address these endogeneity issues further, we propose several robustness checks. First, we focus on students who enrolled in the university closest to their place of residence, eliminating choices driven by aversion to long commuting (Robustness Check 2). Second, to account for preferences related to moving out, we restrict the sample to students who explicitly reported no risk attitude toward moving out (coded as = 1), indicating complete indifference toward relocation (Robustness Check 3). Finally, we examine students who did not enroll in their preferred university but attended a less favored option (Robustness Check 4).

Besides replacing commuting times with distances (Robustness Check 5), we conduct two further checks to refine results for H3. They address the possibility that parental education influences the total budget, which may affect risk attitudes. First, we re-estimate the association of budget without controlling for parental education (Robustness Check 6). Second, we examine the association of parental education without adjusting for the total budget, testing its independence from financial resources (Robustness Check 7).

The estimates for student tickets that we found in Model 4 remain strongly significant across all but one variation of our study sample (see Table 9). When focusing on students attending their non-preferred university, we observe even larger estimates for student tickets, although only weakly significant. Thus, we consider the evidence robust, and in support of a direct influence of student tickets on the decision to relocate.

The interaction between commuting time and student ticket availability (Table 10) remains robust across multiple sample specifications and measurement approaches. The robustness checks 2 to 4 lose statistical significance, which is likely because of smaller samples that exclude medium commuting times, where the interaction is strongest. However, the overall estimate and direction still show comparable results to Model 5. Thus, although caution is advised in interpreting these specific results, the findings remain consistent.

For Hypothesis H3a, we report the results only of the robustness checks 1, 5, and 6, due to the substantial reduction in cases¹⁰ in robustness checks 2 to 4 (Table 11). The interactions remain significant in robustness check 6, where parental education is not controlled for, but not in checks 1 and 5. Although the interaction is not significant in robustness check 5, we still observe a negative trend indicating a slower increase.

For Hypothesis H3b, the robustness checks show results similar to those presented in the main results section. Depending on the specific robustness check applied, we observe both increases and decreases in the estimates of the interaction; however, the interaction estimates remain statistically non-significant (see Table 11). Notably, in robustness checks 3 and 4, where the analysis is restricted to students not studying at their preferred universities and to students with high-risk attitudes, respectively, the interaction appears stronger. When removing the budget from our analysis, the interaction disappears.

The substantial reduction in sample size across robustness checks limits our ability to conclusively assess the robustness of interactions. Yet, the consistently significant results, especially when assessing the robustness of Model 4, highlight the direct influence that access to a student ticket has on students' mobility decisions.

7 Summary and conclusion

Since students have (mostly) little income (Federal Statistical Office of Germany 2022), are sometimes underaged, and may lack a driver's license, affordable and accessible public transport is crucial for their mobility. As housing costs rise, relocations become increasingly unaffordable (Voigtländer et al. 2024) and commuting becomes an even more important means for students to access higher education. Initiatives, such as the Deutschlandticket and targeted ticket subsidies for students (i.e., "student tickets"), provide such support. However, only limited research exists on the impact of ticket subsidies and the spatial range at which such tickets impact on students' mobility.

The present study addresses this gap in the literature using data from the MESARAS survey linked with spatial and regional data from several sources. Considering commuting times, we analyzed whether the availability of student tickets influences students' decision to move (closer) or to commute to their university. Furthermore, we draw attention to heterogeneities in the relevance of the student ticket availability by students' socioeconomic background and risk attitudes. Our results show that the availability of a student ticket increases the likelihood of students commuting rather than moving (closer) to university. As expected, this effect diminishes, and eventually disappears, as the commuting time increases. Thus, within an accessible range, student tickets provide easier access to higher education when relocation is not possible, affordable, or desirable. We find that the association might be more pronounced among students with medium budgets and

¹⁰ Less than 10 observations per variable.

for students with nonacademic parents. Yet, no difference in the ticket impact by students' risk attitudes was found.

Considering endogeneities due to the potential simultaneity in choosing a field of study, a study location, and in moving out of the parental home, we are cautious with strong causal claims. However, the MESARAS sample is highly homogenous because it is restricted to students in only one field of study, i.e., economics. We further restrict the sample by focusing on students who enrolled at their preferred institution or the closest university from home. We are therefore confident that key endogeneity concerns have been addressed. Beyond that, our robustness analyses continue to show significant associations of a student ticket across several subsamples and thus, further reduce endogeneity biases.

Overall, we are confident that our research contributes to the existing literature in three ways: first, while previous studies on transportation modes have primarily focused on commuting to work, we extend the scope to students' mobility by examining how public transportation options influence their decision to move versus commute. Second, by exploring how the impact of student tickets varies based on social background, financial resources, and personality, we address critical issues of social inequality. Third, by innovatively combining survey data with diverse external data sources and incorporating more precise spatial measures than typically possible when using survey data, we highlight how accurate assessments of distance, commuting times and location enhance socio-spatial analyses.

To situate our study in the context of existing and future research, it is important to note that while prior studies suggest commuting students may experience lower academic success, our findings should not be interpreted as evidence that subsidized public transportation negatively affects academic outcomes. In contrast, our findings highlight the need for further research on the selection mechanisms underlying the choice between moving and commuting for study purposes. In particular, our results suggest that students with commuting times exceeding one hour might have chosen different institutions or might not have pursued higher education at all without access to affordable public transportation. Moreover, students with non-academic parents and medium budgets are particularly affected by the availability of a ticket, whereas students with very limited budgets almost exclusively commute regardless of the availability of a ticket. This, in turn, might suggest that the availability of subsidized tickets may be essential for them to access higher education in the first place.

The findings of our paper carry broader implications, particularly concerning growing skills shortages, because improving spatial accessibility to universities through affordable transportation may enable more young people to pursue higher education. Given the uncertain future of the Deutschlandticket (tagesschau.de 2024), our findings have implications for policymakers because an available and affordable ticket could affect students' decisions both to study and to relocate. However, we acknowledge that student transport discounts alone are insufficient to ensure equal

access to higher education, as low-income students are minimally affected in their decision to relocate—most choose not to move at all. To address this, stronger measures are needed, such as expanding affordable student housing in university areas.

8 Appendix

8.1 Tables

Table 2 Correlation matrix between selected variables.

	Commuting time	Commuting distance	Bafoeg share	Total budget	Bafoeg amount
Commuting time	1.000	0.885	0.047	0.195	0.062
Commuting distance	0.885	1.000	0.058	0.211	0.075
Bafoeg share	0.047	0.058	1.000	−0.031	0.919
Total budget	0.195	0.211	−0.031	1.000	0.124
Bafoeg amount	0.062	0.075	0.919	0.124	1.000

Pearson correlation coefficients for continuous variables; data: MESARAS, INKAR, own calculations

Table 3 Counts of regional changes by moving to a university.

University	Student ticket	Uni region faster growth	Uni region slower growth	Uni region younger	Uni region older
Bielefeld	Available	42	39	23	58
Clausthal	Not avail.	1	30	8	23
Clausthal	Available	0	0	0	0
Dortmund	Not avail.	3	7	6	4
Dortmund	Available	30	112	49	93
Halle	Not avail.	32	64	30	66
Halle	Available	20	0	20	0
Hannover	Not avail.	4	11	0	15
Hannover	Available	22	72	16	78
Magdeburg	Not avail.	52	81	73	60
Magdeburg	Available	8	0	8	0
Muenster	Not avail.	5	58	8	55
Muenster	Available	24	192	19	197

Counts of moves per regional dummy, conditional on university and student ticket status; Clausthal has no observations with student ticket coverage. For Magdeburg and Halle, student tickets cover almost exactly the city boundaries, such that regional variables align; data: MESARAS, INKAR, own calculations

Table 4 Binary logit models on the probability of moving closer to university (AME).

	Model 1	Model 2	Model 3	Model 4	Model 5
Student ticket (available)	−0.134*** (0.028)	−0.123*** (0.026)	−0.123*** (0.026)	−0.127*** (0.026)	−0.144*** (0.028)
Commuting time (in minutes)	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)
Total budget (in 100 euros)	—	0.030*** (0.003)	0.029*** (0.003)	0.029*** (0.003)	0.030*** (0.003)
Parental education (at least one aca- demic)		—	0.051* (0.021)	0.047* (0.021)	0.045* (0.020)
Risk attitude (1 to 7)			−0.008 (0.007)	−0.008 (0.007)	−0.008 (0.007)
Gender (female)			0.036 ^ (0.020)	0.037 ^ (0.020)	0.036 ^ (0.020)
Single child (no siblings)			−0.055* (0.027)	−0.059* (0.027)	−0.061* (0.027)
Partner status (partnered)			0.012 (0.020)	0.013 (0.020)	0.014 (0.020)
Preferred university (preferred)			0.020 (0.026)	0.015 (0.026)	0.012 (0.025)
Uni region faster growth (faster growth)			—	0.019 (0.028)	0.009 (0.028)
Uni region younger (younger population)				0.040 (0.028)	0.032 (0.028)
<i>N</i>	915	915	915	915	915
Cox-Snell R^2	0.459	0.508	0.517	0.520	0.523
Nagelkerke R^2	0.633	0.702	0.714	0.717	0.721
LR Test (χ^2)	561.78	649.82	666.56	670.85	676.40
<i>p</i> -value	< .001	< .001	< .001	< .001	< .001
Wald Test (<i>F</i>)	106.42	72.49	23.76	19.26	18.41
<i>p</i> -value	< .001	< .001	< .001	< .001	< .001
Hosmer-Lemeshow Test (χ^2)	3.04	12.90	6.76	10.66	3.37
<i>p</i> -value	0.081	0.0003	0.009	0.0011	0.066

Presented are average marginal effects (AMEs); S.E. in parentheses, significance level: ^ $p < 0.1$, * $p < 0.05$, ** $p < 0.005$, *** $p < 0.001$; data: MESARAS, INKAR, IÖR-Monitor, own calculations

Table 5 Binary logit models on the probability of moving closer to university.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
(Intercept)	−2.524*** (0.343)	−4.254*** (0.450)	−4.590*** (0.633)	−4.984*** (0.670)	−3.801*** (0.805)
Student ticket (available)	−1.173*** (0.249) [0.309]	−1.276*** (0.271) [0.279]	−1.314*** (0.278) [0.269]	−1.375*** (0.279) [0.253]	−2.936*** (0.704) [0.053]
Commuting time (in minutes)	0.041*** (0.003) [1.042]	0.041*** (0.003) [1.042]	0.042*** (0.003) [1.043]	0.041*** (0.004) [1.042]	0.029*** (0.005) [1.029]

Table 5 (Continued)

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Total budget (in 100 euros)	–	0.335*** (0.043) [1.398]	0.327*** (0.043) [1.387]	0.338*** (0.045) [1.402]	0.349*** (0.046) [1.418]
Parental education (at least one academic)		–	0.578* (0.234) [1.783]	0.537* (0.237) [1.711]	0.531* (0.240) [1.701]
Risk attitude (1 to 7)			–0.092 (0.080) [0.912]	–0.091 (0.080) [0.913]	–0.091 (0.081) [0.913]
Gender (female)			0.411 (0.232) [1.509]	0.427 (0.234) [1.532]	0.427 (0.236) [1.532]
Single child (no siblings)			–0.629* (0.304) [0.533]	–0.679* (0.307) [0.507]	–0.702* (0.307) [0.496]
Partner status (partnered)			0.138 (0.231) [1.148]	0.148 (0.232) [1.159]	0.170 (0.235) [1.185]
Preferred university (preferred)			0.234 (0.294) [1.264]	0.168 (0.297) [1.183]	0.146 (0.298) [1.157]
Uni region faster growth (faster growth)			–	0.213 (0.320) [1.238]	0.104 (0.324) [1.110]
Uni region younger (younger population)				0.461 (0.322) [1.586]	0.372 (0.326) [1.451]
Commuting time × Student ticket				–	0.017* (0.007) [1.017]
<i>N</i>	915	915	915	915	915
Cox-Snell R^2	0.459	0.508	0.517	0.520	0.523
Nagelkerke R^2	0.633	0.702	0.714	0.717	0.721
LR Test (χ^2)	561.78	649.82	666.56	670.85	676.40
<i>p</i> -value	< .001	< .001	< .001	< .001	< .001
Wald Test (<i>F</i>)	106.42	72.49	23.76	19.26	18.41
<i>p</i> -value	< .001	< .001	< .001	< .001	< .001
Hosmer-Lemeshow Test (χ^2)	3.044	12.899	6.758	10.657	3.374
<i>p</i> -value	0.081	0.0003	0.009	0.0011	0.066

Presented are regression estimates; S.E. in parentheses (), Odds-Ratios in brackets [], significance level: $^{\wedge}p < 0.1$, $^*p < 0.05$, $^{**}p < 0.005$, $^{***}p < 0.001$; data: MESARAS, INKAR, IÖR-Monitor, own calculations

Table 6 Binary logit models on the probability of moving closer to university in dependence of sources of income (AME).

(intercept)	Model 1	Model 2	Model 2a	Model 2b	Model 2c	Model 2d
Student ticket (available)	-0.134*** (0.029)	-0.123*** (0.027)	-0.125*** (0.027)	-0.125*** (0.027)	-0.124*** (0.027)	-0.124*** (0.027)
Commuting time (in minutes)	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)	0.004*** (0.000)
Total budget (in 100 euros)	—	0.030*** (0.003)	0.030*** (0.003)	0.030*** (0.003)	0.030*** (0.003)	—
Bafoeg available (available)	—	—	-0.020 (0.022)	—	—	—
Bafoeg share (in %)	—	—	—	-0.000 (0.000)	—	—
Bafoeg amount (in 100 euros)	—	—	—	—	-0.000 (0.000)	0.030*** (0.003)
Total budget without bafoeg (in 100 euros)	—	—	—	—	—	0.030*** (0.003)
<i>N</i>	890	890	890	890	890	890
Cox-Snell R ²	0.459	0.508	0.508	0.508	0.508	0.508
Nagelkerke R ²	0.633	0.700	0.701	0.701	0.700	0.700
LR Test (χ^2)	546.19	630.55	631.40	631.59	630.88	630.88
<i>p</i> -value	< .001	< .001	< .001	< .001	< .001	< .001
Wald Test (<i>F</i>)	103.92	71.26	53.21	53.18	53.33	53.33
<i>p</i> -value	< .001	< .001	< .001	< .001	< .001	< .001
Hosmer-Lemeshow Test (χ^2)	3.00	12.65	9.92	9.87	9.59	9.59
<i>p</i> -value	0.083	0.0003	0.0016	0.0017	0.0020	0.0020

Presented are average marginal effects (AMEs); S.E. in parentheses, significance level: ^ $p < 0.1$, * $p < 0.05$, ** $p < 0.005$, *** $p < 0.001$; data: MESARAS, INKAR, IÖR-Monitor, own calculations

Table 7 Binary logit models (with interactions) on the probability of moving closer to university.

Variable	Model 6	Model 7	Model 8
(Intercept)	-5.126*** (0.858)	-4.896*** (0.690)	-4.921*** (0.744)
Student ticket (available)	-1.203 (0.699) [0.300]	-1.503*** (0.369) [0.222]	-1.462** (0.526) [0.232]
Commuting time (in minutes)	0.040*** (0.004) [1.041]	0.040*** (0.004) [1.041]	0.041*** (0.004) [1.042]
Total budget (in 100 euro)	0.367** (0.116) [1.443]	0.339*** (0.045) [1.404]	0.339*** (0.045) [1.404]
Parental education (at least one academic)	0.533* (0.237) [1.704]	0.310 (0.485) [1.363]	0.540* (0.238) [1.716]
Risk attitude (1 to 7)	-0.092 (0.080) [0.912]	-0.088 (0.080) [0.916]	-0.117 (0.158) [0.889]
Gender (female)	0.431 (0.234) [1.539]	0.424 (0.234) [1.528]	0.429 (0.234) [1.536]
Single child (no siblings)	-0.681* (0.308) [0.506]	-0.682* (0.307) [0.506]	-0.679* (0.307) [0.507]
Partner status (partnered)	0.151 (0.232) [1.163]	0.139 (0.232) [1.149]	0.149 (0.232) [1.161]
Preferred university (preferred)	0.171 (0.298) [1.186]	0.172 (0.297) [1.188]	0.164 (0.298) [1.178]
Uni region faster growth (faster growth)	0.217 (0.321) [1.242]	0.237 (0.324) [1.267]	0.216 (0.320) [1.241]
Uni region younger (younger population)	0.461 (0.322) [1.586]	0.450 (0.322) [1.568]	0.460 (0.322) [1.584]

Table 7 (Continued)

Variable	Model 6	Model 7	Model 8
Student ticket × Total budget	−0.034 (0.125) [0.967]	—	—
Student ticket × Parental education	—	0.296 (0.554) [1.344]	
Student ticket × Risk attitude		—	0.036 (0.183) [1.037]
<i>N</i>	915	915	915
Cox-Snell R ²	0.520	0.520	0.520
Nagelkerke R ²	0.717	0.717	0.717
LR Test (χ^2)	670.92	671.13	670.89
<i>p</i> -value	< .001	< .001	< .001
Wald Test (<i>F</i>)	17.65	17.63	17.64
<i>p</i> -value	< .001	< .001	< .001
Hosmer-Lemeshow Test (χ^2)	10.26	10.78	6.75
<i>p</i> -value	0.0014	0.0010	0.0094

Presented are regression estimates; S.E. in parentheses (), Odds-Ratios in brackets [], significance level: $\wedge p < 0.1$, $*p < 0.05$, $**p < 0.005$, $***p < 0.001$; data: MESARAS, INKAR, IÖR-Monitor, own calculations

Table 8 Binary logit models (with interactions) on the probability of moving closer to university for multiple commuting time quartiles (Models 6a to 8c).

Variable	M. 6a	M. 6b	M. 6c	M. 7a	M. 7b	M. 7c	M. 8a	M. 8b	M. 8c
(Intercept)	-7.284*** (1.954)	-9.148*** (2.388)	13.943 (2276.86)	-7.462*** (1.922)	-5.023*** (1.516)	13.145 (2230.68)	-7.726*** (2.084)	-5.054*** (1.527)	13.438 (2241.39)
Student ticket (available)	-3.353*** (0.943)	2.409 (1.725)	-0.871 (3.546)	-2.694*** (0.915)	-1.605** (0.581)	-0.139 (0.781)	-1.423 (1.142)	-1.653 (0.869)	0.062 (1.351)
	[0.035]	[11.123]	[0.419]	[0.068]	[0.201]	[0.870]	[0.241]	[0.191]	[1.064]
Commuting time (in minutes)	0.081** (0.030)	0.038*** (0.013)	-0.002 (0.022)	0.081* (0.032)	0.035*** (0.012)	0.000 (0.023)	0.062* (0.028)	0.036*** (0.013)	-0.003 (0.022)
	[1.084]	[1.039]	[0.998]	[1.084]	[1.036]	[1.000]	[1.064]	[1.037]	[0.997]
Total budget (in 100 euros)	-0.010 (0.105)	1.259*** (0.357)	1.669* (0.672)	0.281*** (0.059)	0.532*** (0.090)	1.752*** (0.399)	0.267*** (0.057)	0.529*** (0.089)	1.733*** (0.397)
	[0.990]	[3.522]	[5.307]	[1.324]	[1.702]	[5.766]	[1.306]	[1.697]	[5.657]
Parental education (at least one academic)	0.554 (0.505)	0.756* (0.376)	1.386 (0.884)	-1.301 (1.118)	0.323 (0.746)	2.578 (1.453)	0.316 (0.482)	0.760* (0.373)	1.361 (0.857)
	[1.740]	[2.130]	[3.999]	[0.272]	[1.381]	[13.171]	[1.372]	[2.138]	[3.900]
Risk attitude (1 to 7)	-0.129 (0.167)	-0.040 (0.132)	-0.046 (0.238)	-0.175 (0.170)	-0.031 (0.128)	-0.086 (0.244)	-0.063 (0.332)	-0.127 (0.256)	0.157 (0.444)
	[0.879]	[0.961]	[0.955]	[0.840]	[0.969]	[0.918]	[0.939]	[0.881]	[1.170]
Gender (female)	0.699 (0.493)	0.270 (0.373)	1.777* (0.798)	0.509 (0.494)	0.097 (0.364)	1.790* (0.814)	0.655 (0.480)	0.095 (0.364)	1.816* (0.807)
	[2.012]	[1.310]	[5.912]	[1.664]	[1.102]	[5.989]	[1.925]	[1.100]	[6.147]

Table 8 (Continued)

Variable	M. 6a	M. 6b	M. 6c	M. 7a	M. 7b	M. 7c	M. 8a	M. 8b	M. 8c
Single child (no siblings)	-1.134 (0.758) [0.322]	-0.469 (0.467) [0.626]	-2.193* (0.974) [0.112]	-1.136 (0.757) [0.321]	-0.388 (0.453) [0.678]	-2.105* (0.997) [0.122]	-1.244 (0.768) [0.288]	-0.391 (0.454) [0.676]	-2.199* (0.973) [0.111]
Partner status (partnered)	0.330 (0.493) [1.391]	-0.031 (0.361) [0.969]	0.001 (0.728) [1.001]	0.257 (0.500) [1.293]	-0.080 (0.354) [0.923]	0.064 (0.760) [1.066]	0.408 (0.488) [1.504]	-0.054 (0.355) [0.947]	0.075 (0.735) [1.078]
Preferred university (preferred)	0.366 (0.775) [1.442]	0.932 (0.483) [2.540]	-1.049 (1.067) [0.350]	0.596 (0.796) [1.815]	0.824 (0.459) [2.280]	-1.135 (1.079) [0.321]	0.425 (0.778) [1.530]	0.822 (0.462) [2.275]	-0.987 (1.047) [0.373]
Uni region faster growth	0.429 (0.624) [1.536]	-0.065 (0.582) [0.937]	-18.999 (2276.86) [0.000]	0.437 (0.613) [1.548]	-0.248 (0.565) [0.780]	-19.234 (2230.67) [0.000]	0.339 (0.608) [1.404]	-0.285 (0.561) [0.752]	-19.156 (2241.39) [0.000]
Uni region younger (younger population)	2.207 (1.304) [9.088]	0.337 (0.550) [1.390]	-0.770 (0.845) [0.463]	1.891 (1.188) [6.626]	0.237 (0.540) [1.267]	-0.632 (0.868) [0.532]	2.177 (1.176) [8.820]	0.254 (0.539) [1.289]	-0.790 (0.855) [0.454]
Student ticket × Total budget	0.329** (0.125) [1.390]	-0.834* (0.367) [0.434]	0.060 (0.744) [1.062]	—	—	—	—	—	—

Table 8 (Continued)

Variable	M. 6a	M. 6b	M. 6c	M. 7a	M. 7b	M. 7c	M. 8a	M. 8b	M. 8c
Student ticket × Parental education	–			2.071 (1.299) [7.933]	0.544 (0.855) [1.723]	–1.956 (1.775) [0.141]	–		
Student ticket × Risk attitude				–			–0.075 (0.376) [0.928]	0.114 (0.297) [1.121]	–0.289 (0.527) [0.749]
<i>N</i>	229	227	230	229	227	230	229	227	230
Cox-Snell R^2	0.274	0.383	0.309	0.265	0.363	0.313	0.256	0.362	0.310
Nagelkerke R^2	0.482	0.515	0.646	0.466	0.487	0.654	0.451	0.486	0.648
LR Test (χ^2)	73.24	109.69	84.89	70.44	102.25	86.19	67.84	101.99	85.19
<i>p</i> -value	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001	< .001
Wald Test (<i>F</i>)	2.80	4.41	1.97	2.68	4.67	1.96	2.71	4.66	1.98
<i>p</i> -value	0.0014	< .001	0.0282	0.0022	< .001	0.0292	0.0020	< .001	0.0270
Hosmer-Lemeshow (χ^2)	0.234	11.86	0.701	0.331	5.43	0.774	0.509	6.86	0.764
<i>p</i> -value	0.629	0.00057	0.402	0.565	0.0197	0.379	0.476	0.0088	0.382

Presented are regression estimates; S.E. in parentheses (), Odds-Ratios in brackets [], significance level: $\wedge p < 0.1$, $*p < 0.05$, $**p < 0.005$, $***p < 0.001$; data: MESARAS, INKAR, iÖR-Monitor, own calculations

Table 9 Robustness checks Model 4.

Variable	Check 1	Check 2	Check 3	Check 4	Check 5	Check 6	Check 7
(Intercept)	-4.563*** (0.941)	-5.442*** (1.047)	-3.857*** (1.087)	-6.923*** (2.286)	-4.434*** (0.680)	-4.673*** (0.647)	-3.000*** (0.554)
Student ticket (available)	-1.329*** (0.391)	-1.952*** (0.410)	-1.825*** (0.508)	-2.075* (0.831)	-0.975*** (0.291)	-1.416*** (0.277)	-1.221*** (0.255)
Commuting time (in minutes)	0.048*** (0.005)	0.040*** (0.006)	0.047*** (0.006)	0.059*** (0.013)	—	0.040*** (0.004)	0.041*** (0.003)
Commuting distance (in km)	—	—	—	—	0.068*** (0.006)	—	—
Total budget (in 100 euros)	0.185*** (0.043)	0.263*** (0.046)	0.172*** (0.050)	0.436* (0.171)	0.301*** (0.044)	0.347*** (0.045)	—
Parental education (at least one academic)	0.516 (0.320)	0.655^ (0.341)	0.441 (0.396)	0.881 (0.684)	0.545* (0.246)	—	0.652*** (0.216)
Risk attitude (1 to 7)	-0.021 (0.115)	0.012 (0.116)	—	-0.205 (0.251)	-0.083 (0.083)	-0.115 (0.079)	-0.136^ (0.073)
Gender (female)	0.342 (0.305)	0.428 (0.346)	0.363 (0.401)	0.144 (0.685)	0.423^ (0.247)	0.385^ (0.232)	0.347 (0.214)
Single child (no siblings)	-0.441 (0.411)	-0.838^ (0.456)	-0.915 (0.562)	-0.920 (0.963)	-0.734* (0.336)	-0.713* (0.305)	-0.497^ (0.280)

Table 9 (Continued)

Variable	Check 1	Check 2	Check 3	Check 4	Check 5	Check 6	Check 7
Partner status (partnered)	0.247 (0.310)	0.499 (0.339)	0.752 [^] (0.404)	0.819 (0.681)	0.170 (0.243)	0.151 (0.230)	0.134 (0.211)
Preferred university (preferred)	0.178 (0.437)	-0.062 (0.454)	-0.482 (0.536)	- (0.771)	-0.060 (0.311)	0.137 (0.296)	0.237 (0.278)
Uni region faster growth (faster growth)	0.493 (0.390)	0.248 (0.477)	0.012 (0.584)	0.629 (0.771)	0.280 (0.339)	0.190 (0.320)	0.084 (0.291)
Uni region younger (younger population)	0.837* (0.400)	1.550* (0.622)	0.510 (0.562)	0.473 (0.853)	0.788* (0.352)	0.544 [^] (0.321)	0.250 (0.299)
<i>N</i>	712	369	334	196	915	915	915
Cox-Snell R^2	0.455	0.482	0.460	0.539	0.542	0.517	0.495
Nagelkerke R^2	0.710	0.661	0.676	0.807	0.748	0.713	0.675
LR Test (χ^2)	431.830	242.615	205.669	151.596	714.558	665.660	616.000
<i>p</i> -value	< .001	< .001	< .001	< .001	< .001	< .001	< .001
Wald Test (<i>F</i>)	11.534	7.659	6.769	3.194	17.033	21.050	24.515
<i>p</i> -value	< .001	< .001	< .001	0.001	< .001	< .001	< .001
Hosmer-Lemeshow Test (χ^2)	11.716	0.637	2.012	0.168	37.185	17.172	11.486
<i>p</i> -value	0.001	0.425	0.156	0.682	< .001	< .001	0.001

Presented are regression estimates; S.E. in parentheses (). significance level: [^] $p < 0.1$, * $p < 0.05$, ** $p < 0.005$, *** $p < 0.001$; data: MESARAS, INKAR, IÖR-Monitor, own calculations

Table 10 Robustness checks Model 5.

Variable	Check 1	Check 2	Check 3	Check 4	Check 5	Check 6	Check 7
(Intercept)	-2.838* (1.115)	-6.145*** (1.439)	-4.191** (1.517)	-7.810* (3.326)	-3.045*** (0.758)	-3.489*** (0.782)	-2.085** (0.714)
Student ticket (available)	-3.545*** (0.946)	-1.165 (1.131)	-1.430 (1.328)	-1.132 (2.594)	-2.757*** (0.557)	-2.988*** (0.696)	-2.351*** (0.636)
Commuting time (in minutes)	0.030*** (0.008)	0.049*** (0.014)	0.051*** (0.014)	0.067** (0.025)	—	0.028*** (0.005)	0.033*** (0.005)
Commuting distance (in km)	—	—	—	—	0.042*** (0.008)	—	—
Total budget (in 100 euros)	0.193*** (0.044)	0.258*** (0.046)	0.171*** (0.050)	0.448* (0.176)	0.312*** (0.045)	0.357*** (0.046)	—
Parental education (at least one academic)	0.545^ (0.330)	0.636^ (0.342)	0.442 (0.395)	0.894 (0.682)	0.567* (0.252)	—	0.646** (0.218)
Risk attitude (1 to 7)	-0.012 (0.118)	0.007 (0.116)	—	-0.190 (0.256)	-0.089 (0.085)	-0.115 (0.080)	-0.137^ (0.074)
Gender (female)	0.295 (0.311)	0.439 (0.346)	0.373 (0.401)	0.158 (0.683)	0.441^ (0.252)	0.382 (0.234)	0.339 (0.216)
Single child (no siblings)	-0.449 (0.415)	-0.846^ (0.458)	-0.939^ (0.570)	-0.984 (0.993)	-0.743* (0.339)	-0.735* (0.306)	-0.512^ (0.280)
Partner status (partnered)	0.271 (0.317)	0.488 (0.339)	0.741^ (0.405)	0.804 (0.680)	0.181 (0.248)	0.173 (0.233)	0.144 (0.213)

Table 10 (Continued)

Variable	Check 1	Check 2	Check 3	Check 4	Check 5	Check 6	Check 7
Preferred university (preferred)	0.147 (0.439)	-0.021 (0.460)	-0.475 (0.537)	-	-0.078 (0.314)	0.118 (0.297)	0.220 (0.277)
Uni region faster growth (faster growth)	0.324 (0.404)	0.277 (0.479)	0.038 (0.591)	0.683 (0.783)	0.053 (0.344)	0.088 (0.324)	0.007 (0.295)
Uni region younger (younger population)	0.728 [^] (0.411)	1.646 ^{**} (0.639)	0.529 (0.564)	0.520 (0.863)	0.642 [^] (0.359)	0.444 (0.326)	0.190 (0.302)
Commuting time × Student ticket	0.027 ^{**} (0.010)	-0.011 (0.015)	-0.005 (0.015)	-0.011 (0.028)	-	0.018 [*] (0.007)	0.013 [^] (0.007)
Commuting distance × Student ticket	-	-	-	-	0.044 ^{***} (0.012)	-	-
<i>N</i>	712	369	334	196	915	915	915
Cox-Snell R ²	0.460	0.483	0.460	0.539	0.549	0.520	0.495
Nagelkerke R ²	0.718	0.662	0.676	0.807	0.757	0.718	0.676
LR Test (χ^2)	438.114	243.199	205.774	151.751	727.852	671.443	616.436
<i>p</i> -value	< .001	< .001	< .001	< .001	< .001	< .001	< .001
Wald Test (<i>F</i>)	11.500	6.734	6.057	2.789	16.447	19.994	22.378
<i>p</i> -value	< .001	< .001	< .001	0.002	< .001	< .001	< .001
Hosmer-Lemeshow Test (χ^2)	4.786	2.349	2.136	0.259	16.852	3.896	8.172
<i>p</i> -value	0.029	0.125	0.144	0.611	< 0.001	0.048	0.005

Presented are regression estimates; S.E. in parentheses, significance level: [^] $p < 0.1$, ^{*} $p < 0.05$, ^{**} $p < 0.005$, ^{***} $p < 0.001$; data: MESARAS, INKAR, IÖR-Monitor, own calculations

Table 11 Robustness checks Model 6(b).

Variable	Check 1	Check 5	Check 6
(Intercept)	−5.183 [^] (3.113)	−4.810*** (1.638)	−8.364*** (2.263)
Student ticket (available)	−3.131 (2.405)	0.390 (1.239)	2.165 (1.653)
Commuting time (in minutes)	0.060** (0.023)	—	0.036** (0.013)
Commuting distance (in km)	—	0.015* (0.006)	—
Total budget (in 100 euros)	0.290 (0.376)	0.766** (0.234)	1.241*** (0.346)
Parental education (at least one academic)	1.439* (0.701)	0.440 (0.343)	—
Risk attitude (1 to 7)	−0.078 (0.225)	0.004 (0.115)	−0.088 (0.129)
Gender (female)	−0.562 (0.598)	0.390 (0.350)	0.247 (0.369)
Single child (no siblings)	−0.272 (0.779)	−0.435 (0.476)	−0.636 (0.461)
Partner status (partnered)	0.005 (0.611)	−0.216 (0.331)	−0.049 (0.357)
Preferred university (preferred)	1.155 (0.772)	0.036 (0.421)	0.888 [^] (0.482)
Uni region faster growth (faster growth)	0.091 (0.850)	0.188 (0.540)	−0.127 (0.584)
Uni region younger (younger population)	1.059 (0.744)	0.413 (0.546)	0.502 (0.546)
Total budget × Student ticket	0.179 (0.421)	−0.354 (0.247)	−0.809* (0.357)
<i>N</i>	147	230	227
Cox-Snell R^2	0.276	0.520	0.372
Nagelkerke R^2	0.475	0.717	0.500
LR Test (χ^2) χ^2	47.349	671.134	105.584
<i>p</i> -value	< .001	< .001	< .001
Wald Test (<i>F</i>) χ^2	2.112	17.629	4.672
<i>p</i> -value	0.020	< .001	< .001
Hosmer-Lemeshow Test (χ^2)	1.016	10.778	4.912
<i>p</i> -value	0.313	0.0010	0.027

Presented are regression estimates; S.E. in parentheses, significance level: [^] $p < 0.1$, * $p < 0.05$, ** $p < 0.005$, *** $p < 0.001$; data: MESARAS, INKAR, IÖR-Monitor, own calculations

Table 12 Robustness checks Model 7.

Variable	Check 1	Check 2	Check 3	Check 4	Check 5	Check 7
(Intercept)	-4.896*** (0.690)	-5.361*** (1.064)	-3.445** (1.158)	-6.710** (2.349)	-4.361*** (0.978)	-2.998*** (0.579)
Student ticket (available)	-1.503*** (0.369)	-2.109*** (0.547)	-2.494** (0.806)	-3.210** (1.203)	-1.602** (0.522)	-1.224*** (0.336)
Commuting time (in minutes)	0.040*** (0.004)	0.040*** (0.006)	0.047*** (0.006)	0.061*** (0.013)	-	0.041*** (0.003)
Commuting distance (in km)	-	-	-	-	0.048*** (0.005)	-
Total budget (in 100 euros)	0.339*** (0.045)	0.265*** (0.047)	0.181*** (0.051)	0.497** (0.183)	0.188*** (0.044)	-
Parental education (at least one academic)	0.310 (0.485)	0.372 (0.724)	-0.463 (0.898)	-1.046 (1.442)	0.006 (0.690)	0.647 (0.456)
Risk attitude (1 to 7)	-0.088 (0.080)	0.014 (0.116)	-	-0.175 (0.250)	-0.016 (0.116)	-0.136 ^ (0.073)
Gender (female)	0.424 ^ (0.234)	0.405 (0.351)	0.363 (0.401)	0.024 (0.698)	0.326 (0.306)	0.347 (0.214)
Single child (no siblings)	-0.682* (0.307)	-0.845 ^ (0.456)	-0.976 ^ (0.567)	-1.351 (1.069)	-0.444 (0.412)	-0.497 ^ (0.280)
Partner status	0.139	0.481	0.762 ^	1.108	0.220	0.134

Table 12 (Continued)

Variable	Check 1	Check 2	Check 3	Check 4	Check 5	Check 7
(partnered)	(0.332)	(0.341)	(0.406)	(0.738)	(0.312)	(0.212)
Preferred university	0.172	-0.037	-0.463	-	0.169	0.237
(preferred)	(0.297)	(0.460)	(0.538)	-	(0.437)	(0.278)
Uni region faster growth	0.237	0.256	0.173	0.780	0.545	0.085
(faster growth)	(0.324)	(0.477)	(0.605)	(0.797)	(0.396)	(0.294)
Uni region younger	0.450	1.556*	0.465	0.398	0.825*	0.249
(younger population)	(0.322)	(0.623)	(0.565)	(0.860)	(0.401)	(0.300)
Student ticketx	0.296	0.368	1.134	2.542	0.644	0.006
Parental education	(0.554)	(0.834)	(1.012)	(1.725)	(0.780)	(0.516)
N	915	369	334	196	712	915
Cox-Snell R ²	0.520	0.482	0.462	0.544	0.455	0.473
Nagelkerke R ²	0.717	0.661	0.679	0.815	0.711	0.652
LR Test (χ^2)	671.13	242.81	206.95	153.89	432.50	585.59
p-value	< .001	< .001	< .001	< .001	< .001	< .001
Wald Test (F)	17.63	7.01	6.07	2.78	10.52	19.38
p-value	< .001	< .001	< .001	0.002	< .001	< .001
Hosmer-Lemeshow Test (χ^2)	10.78	0.59	1.91	0.45	11.69	4.13
p-value	0.001	0.442	0.167	0.502	0.001	0.042

Presented are regression estimates; S.E. in parentheses, significance level: $\wedge p < 0.1$, $*p < 0.05$, $**p < 0.005$, $***p < 0.001$; data: MESARAS, INKAR, IÖR-Monitor, own calculations

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Data Availability The survey data supporting the findings of this study (Weisser 2016) are available from GESIS (Leibniz-Institut für Sozialwissenschaften). However, restrictions apply to the availability of these data, and an application for data access is required for academic purposes. More information is available at <https://access.gesis.org/dbk/59674>.

For data subject to other restrictions, we provide the code for querying digital services (e.g., Google Distance Matrix API) and documentation on how to obtain datasets (e.g., INKAR, IÖR, waybackmachine.org) at <https://github.com/DennisKubitzka/AnotherOneRidesTheBus>.

Code Availability The repository <https://github.com/DennisKubitzka/AnotherOneRidesTheBus> includes the code used for preparing the datasets and running the analysis of this paper. Due to data protection regulations, full replication of the results is only possible when visiting the Secure Data Center (SDC) of GESIS.

Conflict of interest D.O. Kubitzka and K. Weßling declare that they have no competing interests.

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