Does Shared Housing Among Students Encourage Carpooling for Home-to-Campus Commuting? Interactions Between Sharing Economy Practices

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Preliminary version — not for quotation

Abstract

Over the past fifteen years, collaborative practices have expanded rapidly, driven by digital technologies and changes in urban lifestyles, they have contributed to the rise of the sharing economy, of which home-sharing and carpooling are two examples that are particularly widespread among students. This study analyzes the influence of student shared housing on the use of carpooling for home–campus commuting. While these two practices may be complementary, their relationship remains theoretically ambiguous due to coordination constraints, rebound effects, or moral licensing mechanisms. The analysis relies on original data from the MobiCampus-UdL survey conducted among around 9,000 students in the Lyon metropolitan area, using a recursive bivariate discrete choice model based on a copula approach to address the endogeneity. Results show a positive causal effect of shared housing on carpooling, but also reveal strong self-selection, suggesting shared housing alone is insufficient to generalize carpooling.

Key Words: Bivariate models; Student mobility; Residential choice; Carpooling; Collaborative practices.

JEL classification : R21 ; R41 ; C31

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1 Introduction

Over the past fifteen years, the expansion of digital technologies and evolving urban lifestyles have forested the development of the sharing economy, based on the temporary pooling of underutilized resources (Acquier et al., 2017; Botsman & Rogers, 2010). Among its main applications, shared housing and carpooling have become increasingly widespread, particularly among students, who face budget constraints, high mobility needs and strong digital engagement (Clewlow, 2016; Woo et al., 2019). These practices are often associated with economic, social, and environmental benefits (Schor & Vallas, 2021).

Despite their growing importance, the relationship between shared housing and carpooling remains largely unexplored. Existing studies typically analyze these practices separately, while both rely on similar mechanisms of resource sharing and coordination. They may therefore be complementary, as shared living arrangements can foster proximity, trust, and coordination, potentially facilitating shared mobility. However, this relationship may be constrained by key organizational differences: shared housing provides a stable framework for resource pooling, whereas daily carpooling depends on the synchronization of schedules, activity locations, and travel conditions, which may limit matching opportunities. Moreover, behavorial mechanisms such as moral licensing or rebound effects may further offset potential complementarities (Hymel et al., 2010; Merritt et al., 2010).

Against this backdrop, this paper investigates whether living in shared housing increases the likelihood of engaging in daily carpooling among students. By empirically testing the existence of complementarities or trade-offs between these two forms of collaborative consumption, the study aims to contribute to the literature on behavioral spillovers and to improve the understanding of how sharing practices interact across domains. In particular, it assesses whether the expansion of shared housing (Bricocoli & Sabatinelli, 2016; Cho et al., 2019) may act as a lever to foster the development of carpooling practices.

2 Methodology

2.1 Data

We use data from the MobiCampus-UdL survey, conducted between 2017 and 2019 among students from 17 institutions in the Lyon metropolitan areea (France), representing a target population of 87,677 students. The online questionnaire collects detailed information on socio-demographic characteristics, academic activities, transport mode access, daily travel behaviors, including carpooling, and residential conditions. Shared housing is defined as living arrangements excluding parental homes and cohabitation as a couple.

A key feature of the dataset is the availability of precise geolocation data for both students' residences and campuses, reported via interactive maps. This information allows us to compute home-to-campus distances and to enrich the dataset with spatial indicators describing the local environment. We construct several contextual variables related to transport accessibility, local amenities, and housing market conditions. Public transport accessibility is measured through proximity to stations and stops within walking distances (300 to 1,000 meters), in line with standard thresholds used in the literature (Millward et al., 2013; Poelman et al., 2020). Local amenities are proxied by the density of retail establishments within a 500-meter radius around residences and campuses, using SIRENE data (Ewing & Cervero, 2010; Handy, 1996). We also account for proximity to university residences, which

may act as a substitute for shared housing.

Housing cost constraints are captured using median rent data from the Lyon Local Rent Observatory at the IRIS level. To ensure consistency in the measurement of local housing conditions, the analysis is restricted to students located within a 5-kilometer buffer around the areas covered by the rent data, excluding observations in more remote locations. (Figure 1).

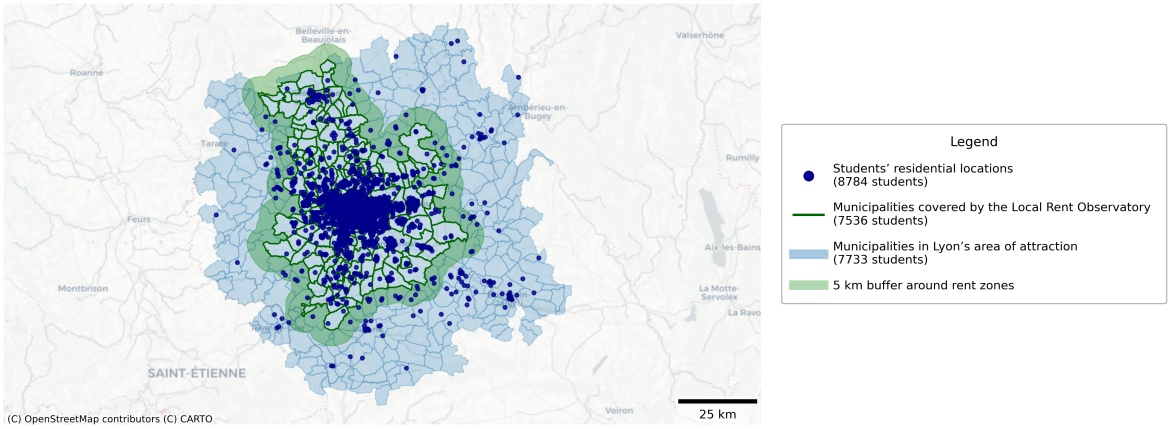


Figure 1: Location of students responding to the MobiCampus-UdL survey and perimeter of the final sample

The MobiCampus-UdL survey collected 9,325 student responses (10.6% response rate). Of these, 8,784 provided residence information, and 7,536 could be matched with rental data. After excluding observations with missing values, the final sample includes 7,072 complete observations (8.07% of the target population).

2.2 Empirical strategy

Student decisions to participate in different sharing economy practices may be interdependent. Shared housing may promote shared mobility, such as carpooling, via coordination, resource pooling, fixed cost reduction, and behavioral spillovers (Lanzini & Thøgersen, 2014; Nash et al., 2017), although opposing mechanisms such as rebound effects or moral licensing may weaken this relationship (Blanken et al., 2015; Hymel et al., 2010). Estimating the effect of shared housing on daily carpooling therefore requires accounting for the potentially endogenous nature of housing choices, which may arise from both unobserved common determinants and reverse causality between the two decisions. In particular, individual dispositions toward cooperation, social resources within household, or shared organizational constraints may jointly influence both residential and mobility choices.

We estimate a recursive system of simultaneous equations, including the shared housing decision as an explanatory variable in the carpooling equation and allowing dependence between the error terms. This bivariate binary choice model uses a flexible copula-based approach (Hasebe, 2013; Winkelmann, 2012):

$$\text{CoLive}_i = \begin{cases} 1 & \text{if } X_i\beta_1 + u_i > 0, \\ 0 & \text{otherwise,} \end{cases} \tag{1a}$$

$$\text{Carshare}_i = \begin{cases} 1 & \text{if } Z_i\beta_2 + \alpha\,\text{CoLive}_i + v_i > 0, \\ 0 & \text{otherwise.} \end{cases} \tag{1b}$$

with the joint distribution of the errors modeled via a copula:

$$F(u, v) = C(F_u(u), F_v(v); \theta). \tag{2}$$

The model is estimated by copula-based maximum likelihood, allowing for flexible dependence structure between the error terms. We compare several copula specifications (Gaussian, Frank, Clayton, Gumbel, FMG, and Joe) combined with alternative marginal distributions (normal and logistic). The preferred specification is selected based on its goodness-of-fit, as measured by the Akaike Information Criterion.

Exclusion restrictions are used to strengthen identification. In particular, housing conditions - captured by median rent levels at both residence and campus locations, as well as proximity to university residences - are assumed to affect shared housing decisions but not directly carpooling. The underlying assumption is that students are less likely to opt for shared housing when affordable university housing is readily available near the campus. Sociodemographic, spatial, and academic variables, as well as accessibility, transport access, and local amenities, are included in both equations. By contrast, transport-specific variables (public transport or bike-sharing subscription) are included only in the carpooling equation.

Once the model estimated, average marginal effects are computed to assess the impact of explanatory variables on both shared housing and daily home-to-campus carpooling decisions. For variables appearing in both equations, the total marginal effect on the probability of carpooling is decomposed into a direct effect through the carpooling equation and an indirect effect operating through shared housing (Hasebe, 2013), while accounting for the dependence structure between the error terms induced by the copula. Our model further allows us to quantify the causal effect of shared housing on daily home-to-campus carpooling for the overall population (ATE), as well as for students in shared housing (ATT) and those not in shared housing (ATU).

To better assess the policy relevance of these effects, we simulate the impact of an exogenous 5 percentage point increase in the share of students in shared housing. This simulation is conducted using a Monte Carlo approach (1,500 repetitions), applied to non-shared housing students, in order to evaluate the resulting change in the aggregate carpooling rate based on model-derived counterfactual probabilities.

3 Results and discussion

In our sample, 26.9% of students live in shared housing, while 3.3% report regular carpooling. However, carpooling is twice as frequent among students in shared housing (5.37%) compared to others (2.48%), a statistically significant difference ($p < 0.001$). While this descriptive patterns suggests a potential complementarity between shared housing and shared mobility, it remains to be confirmed through

econometric analysis controlling for other factors, in a ceteris paribus framework. To this end, we estimate and compare a set of 20 bivariate binary choice models combining alternative copula functions and marginal distributions. The comparison based on the AIC criterion indicates that the model with a Gaussian copula and logit margins provides the best fit to the data. The corresponding estimates are reported in Table 1.

Table 1: Results of the recursive bivariate logit model

	House-sharing		**Carpooling**	
	Coeff	p-value	Coeff	p-value
Intercept	-2.153^{*}	(0.037)	-4.082^{***}	(< 0.001)
SOCIO-DEMOGRAPHIC CHARACTERISTICS				
Gender (Ref : Female)				
Male	-0.029	(0.633)	-0.143	(0.254)
Age (Ref : 18–19)				
Age 20–21	0.741^{***}	(< 0.001)	-0.457^{*}	(0.013)
Age 22–23	1.228^{***}	(< 0.001)	-0.742^{***}	(< 0.001)
Age 24–25	0.890^{***}	(< 0.001)	-0.670^{**}	(0.009)
Age 26+	0.330^{*}	(0.032)	-0.929^{*}	(0.019)
Scholarship	$0.128^{(.)}$	(0.051)	-0.389^{*}	(0.013)
ACADEMIC AND PROFESSIONAL ACTIVITIES				
Type of institution (Ref : Grande ecole)				
University	-0.479^{***}	(< 0.001)	-0.153	(0.382)
Weekly class hours	-0.010^{**}	(0.001)	$0.013^{(.)}$	(0.052)
Present 5 days/week on campus	-0.030	(0.695)	0.117	(0.503)
Work while studying (Ref : None)				
Weekend only	$0.192^{(.)}$	(0.096)	-0.137	(0.530)
During the week	0.312^{***}	(< 0.001)	-0.176	(0.238)
Work-study alternation (courses and company/internship)	-0.016	(0.864)	-0.648^{**}	(0.003)
OWNERSHIP AND SUBSCRIPTION TO TRANSPORT MODES				
Has a public transport pass	–	–	-0.924^{***}	(< 0.001)
Has a bike-sharing subscription	–	–	0.057	(0.693)
Owns a personal bike	0.585^{***}	(< 0.001)	-0.836^{***}	(< 0.001)
Has a driving license and car available	0.106	(0.124)	0.795^{***}	(< 0.001)
CHARACTERISTICS OF PLACE OF RESIDENCE				
House-sharing	–	–	$\mathbf{4.100}^{***}$	(< 0.001)
Residential area (Ref : City center)				
Inner suburbs	-0.605^{***}	(< 0.001)	1.099^{***}	(< 0.001)
Outer suburbs	-1.336^{***}	(< 0.001)	1.265^{***}	(< 0.001)
Outside metropolitan area	-1.175^{***}	(< 0.001)	1.485^{***}	(< 0.001)
Home-to-campus distance (km)	$0.019^{(.)}$	(0.094)	0.055^{***}	(< 0.001)
Number of shops nearby	0.002^{***}	(< 0.001)	$-0.001^{(.)}$	(0.052)
Train station within 1 km	0.193^{**}	(0.005)	0.506^{***}	(< 0.001)
Public transport nearby	0.414^{*}	(0.034)	$0.447^{(.)}$	(0.087)
Median rent (euros/m^2)	$0.115^{(.)}$	(0.094)	–	–
CHARACTERISTICS OF PLACE OF STUDY				
Number of shops nearby	-0.002^{*}	(0.030)	-0.008^{**}	(0.003)
University residence within 500 m	-0.300^{**}	(0.003)	–	–
Train station within 1 km	0.172	(0.171)	0.624^{*}	(0.019)
Public transport nearby	0.192	(0.287)	-0.853^{**}	(0.003)
Median rent (euros/m^2)	-0.093	(0.140)	–	–
Correlation coefficient of the error terms ρ	-0.614 (< 0.001)			
Number of observations	7072			

Note: $^{(.)}$, *, **, *** *denote significance levels at 10%, 5%, 1%, and 0.1%, respectively.*

In this model, the dependence between the error terms, captured by the correlation coefficient ρ, is statistically significant. This suggests that unobserved factors, such as preferences for different collaborative practices, jointly influence both shared housing and daily carpooling decisions. However, the estimated dependence is negative, pointing to potentially conflicting underlying preferences. This result is more consistent with mechanisms such as moral licensing (Blanken et al., 2015; Merritt et al., 2010) than with positive behavioral spillovers or attitudinal consistency across sharing practices (Lanzini & Thøgersen, 2014; Nash et al., 2017; Thøgersen, 1999).

3.1 Socio-economic, academic, and spatial determinants of shared housing

The results in Table 1 show that the probability of living in shared housing is primarily structured by economic, academic, and residential location factors, in line with mechanisms documented in the literature. Age exhibits a non-linear effect, with students aged 22–23 being the most likely to live in shared housing, followed by those aged 24–25 and 20–21. Economic constraints play a central role: scholarship recipients, students holding weekday jobs, and those living in higher-rent areas are more likely to share housing, confirming its role as an economic adjustment strategy (Bricocoli & Sabatinelli, 2016; Cho et al., 2019; Wang & Otsuki, 2016).

Students enrolled in Grandes Ecoles are more likely to live in shared housing than university students, likely reflecting higher geographic mobility, smaller and more cohesive cohorts, and stronger social integration, which facilitate shared living arrangements (Masse, 2002; Pihan, 1998; Tenret & Ferry, 2019; Trarieux, 2023). In contrast, university students are more often locally rooted and more likely to live with their parents, reducing the need for shared housing (Nicourd et al., 2011; Pihan, 1998). In addition, a higher weekly course load is associated with a lower probability of shared housing, suggesting that academic intensity and coordination constraints may favor more individual living arrangements (Clark et al., 2019).

Spatial factors further reinforce these patterns. Shared housing is more prevalent in central and dense areas with greater access to amenities and public transport, where cost-sharing opportunities are highest. Overall, shared housing appears as a rational response to economic and spatial constraints rather than a purely lifestyle-driven choice.

3.2 From Shared Housing to Shared Mobility: The Causal Effect of Shared housing on Carpooling

The results in Table 2 highlight substantial heterogeneity in the effects of shared housing on the regular use of home-to-campus carpooling.

Table 2: Effects of shared housing on the regular practice of home-to-campus carpooling

Treatment Effects	Effect	Std. Dev.	p-value
Average Treatment Effect (ATE)	0.307	(0.049)	< 0.001
Average Treatment Effect on the Treated (ATT)	0.053	(0.005)	< 0.001
Average Treatment Effect on the Untreated (ATU)	0.401	(0.066)	< 0.001

The average treatment effect on the treated (ATT = 0.053) indicates that, among students living in shared housing, this arrangement increases their probability of daily carpooling by 5.3 percentage points. This effect is substantial given that the observed carpooling rate among this group is 5.6%, while their counterfactual rate would be close to zero (0.006%) if they were not in shared housing. This result reflects the fact that students in shared housing have, on average, characteristics that are unfavorable to carpooling. The negative and significant dependence parameter ($\rho = -0.614$) indicates adverse selection on unobservables, meaning that, all else equal, these individuals have a lower intrinsic propensity to carpool. When this selection is neutralized ($\rho = 0$), the counterfactual carpooling rate increases to 1.17%, suggesting that part of the gap is driven by unobserved factors. Overall, the ATT can be decomposed into two components. Most of the effect (around 77%) is explained by observable characteristics - such as residential location, transport access, and vehicle ownership - which structurally limit carpooling in the absence of shared housing. The remaining share (about

23%) reflects adverse selection on unobservables. Shared housing therefore acts as a compensating mechanism for both observed and unobserved disadvantages, although its effect operates primarily through the former.

The average treatment effect on the untreated (ATU = 0.401) is substantially larger. For students not in shared housing, switching to this living arrangement would increase their individual probability of carpooling by 40.1 percentage points. This reveals a strong latent potential for shared mobility among non-shared housing students. At the aggregate level, if all of them were to adopt shared housing (a clearly unrealistic scenario), their carpooling rate would increase from 2.5% to 42.6%. This potential is primarily driven by observable characteristics, which account for about 82% of the total effect.

The asymmetry between ATT and ATU highlights a double inefficiency in the spontaneous allocation of the treatment: the students who would benefit the most from shared housing in terms of carpooling are precisely those who do not choose it or cannot access it. Thus, shared housing appears to be a particularly effective policy lever for this group, provided that access to such housing is expanded for those who currently do not have it.

To better assess the policy relevance of these effects, we simulate the impact of an exogenous 5 percentage point increase in the student shared housing rate, an assumption that roughly corresponds to the trend observed over five years in the Lyon metropolitan area. This increase, which would raise the shared housing rate from 26.8% to 31.8%, is simulated using a Monte Carlo approach applied to all non–shared housing students, based on the individual counterfactual probabilities derived from the model.

The results indicate that such a change would lead to a significant increase in the carpooling rate of 1.58 percentage points, corresponding to a 48.7% relative increase compared to the observed rate of 3.2%. Although modest in absolute terms, this result illustrates that a large individual causal effect (ATE = 0.307) translates into a limited aggregate impact when the baseline prevalence of the behavior is structurally rare and when the policy shock affects only a fraction of the population.

4 Conclusion

To analyze the interdependencies between shared housing and carpooling among students, we estimated a recursive bivariate discrete choice model accounting for reverse causality and common unobserved heterogeneity.

The results highlight a direct, positive, and substantial causal effect of shared housing on the probability of engaging in daily home–campus carpooling. They also reveal the existence of complex self-selection mechanisms: a set of observable and unobservable characteristics that promote entry into shared housing simultaneously tend to limit actual carpooling. This negative dependence suggests that students inclined to shared housing are not necessarily those for whom carpooling is most readily mobilized, possibly due to preferences for autonomy, moral licensing phenomena, rebound effects, or organizational constraints inherent to their lifestyle.

Thus, benefits of residential sharing, such as lower costs, social capital, and behavioral spillovers, coexist with opposing forces. This heterogeneity suggests that policies promoting shared housing to increase carpooling will be effective only if they influence mobility behaviors beyond mere residential arrangements.

Overall, results advocate for better coordination between student housing, mobility, and university policies. Generic carpooling incentives may be inefficient, while targeted, territorially-informed measures aligned with students' residential and organizational contexts are more likely to foster sustainable complementarities between sharing-economy practices.

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References

Acquier, A., Daudigeos, T., & Pinkse, J. (2017). Promises and paradoxes of the sharing economy: An organizing framework. *Technological Forecasting and Social Change*, *125*, 1–10.

Blanken, I., van de Ven, N., & Zeelenberg, M. (2015). A meta-analytic review of moral licensing. *Personality and Social Psychology Bulletin*, *41*(4), 540–558.

Botsman, R., & Rogers, R. (2010, September). *What's mine is yours the rise of collaborative consumption.*

Bricocoli, M., & Sabatinelli, S. (2016). House sharing amongst young adults in the context of mediterranean welfare: The case of milan. *International Journal of Housing Policy*, *16*(2), 184–200.

Cho, G.-H., Woo, A., & Kim, J. (2019). Shared housing as a potential resource for community building. *Cities*, *87*, 30–38.

Clark, V., Tuffin, K., Bowker, N., & Frewin, K. (2019). Rosters: Freedom, responsibility, and cooperation in young adult shared households. *Australian Journal of Psychology*, *71*(3), 232–240.

Clewlow, R. R. (2016). Carsharing and sustainable travel behavior: Results from the san francisco bay area. *Transport Policy*, *51*, 158–164.

Ewing, R., & Cervero, R. (2010). Travel and the built environment: A meta-analysis. *Journal of the American Planning Association*, *76*(3), 265–294.

Handy, S. L. (1996). Understanding the link between urban form and nonwork travel behavior. *Journal of Planning Education and Research*, *15*(3), 183–198.

Hasebe, T. (2013). Marginal effects of a bivariate binary choice model. *Economics Letters*, *121*, 298–301.

Hymel, K. M., Small, K. A., & Van Dender, K. (2010). Induced demand and rebound effects in road transport. *Transportation Research Part B*, *44*(10), 1220–1241.

Lanzini, P., & Thøgersen, J. (2014). Behavioural spillover in the environmental domain: An intervention study. *Journal of Environmental Psychology*, *40*, 381–390.

Masse, B. (2002). Rites scolaires et rites festifs : les « manieres de boire » dans les grandes écoles. *Sociétés contemporaines*, *47*(3), 101–129.

Merritt, A. C., Effron, D. A., & Monin, B. (2010). Moral self-licensing: When being good frees us to be bad. *Social and Personality Psychology Compass*, *4*(5), 344–357.

Millward, H., Spinney, J., & Scott, D. (2013). Active-transport walking behaviour: Destinations, durations, distances. *Journal of Transport Geography*, *28*, 101–110.

Nash, N., Whitmarsh, L., Capstick, S., Thøgersen, J., Gouveia, V., de Carvalho Rodrigues Araújo, R., Harder, M., Wang, X., & Liu, Y. (2017). Reflecting on behavioral spillover in context: How do behavioral motivations and awareness catalyze other environmentally responsible actions in brazil, china, and denmark? *Frontiers in Psychology*, *10*, 788.

Nicourd, S., Samuel, O., & Vilter, S. (2011). Les inégalités territoriales à l'université : effets sur les parcours des étudiants d'origine populaire. *Revue française de pédagogie. Recherches en éducation*, (176), 27–40.

Pihan, J. (1998). Les étudiants et leurs parents : Cohabitation familiale et temps de déplacement. *Espace Populations Sociétés*, *16*(2), 181–198.

Poelman, H., Dijkstra, L., & Ackermans, L. (2020). How many people can you reach by public transport, bicycle or on foot in european cities? measuring urban accessibility for low-carbon modes. *Working Papers of Regional and Urban Policy*, (01).

Schor, J. B., & Vallas, S. P. (2021). The sharing economy: Rhetoric and reality. *Annual Review of Sociology*, *47*(1), 369–389.

Tenret, É., & Ferry, O. (2019). Les classes préparatoires aux grandes écoles : Sélectivité sociale et diversité territoriale. In J.-F. Giret, F. Belghith, & É. Tenret (Eds.), *Regards croisés sur les expériences étudiantes*. La Documentation française.

Thøgersen, J. (1999). Spillover processes in the development of a sustainable consumption pattern. *Journal of Economic Psychology*, *20*(1), 53–81.

Trarieux, M. (2023, December 1). *Faire sa grande école. La construction sociale de la grandeur par les étudiantes et étudiants d'écoles de commerce.* [Doctoral dissertation, Université Paris Cité].

Wang, Y., & Otsuki, T. (2016). A study on house sharing in chinas young generation—based on a questionnaire survey and case studies in beijing. *Journal of Asian Architecture and Building Engineering*, *15*(1), 17–24.

Winkelmann, R. (2012). Copula bivariate probit models: With an application to medical expenditures. *Health Economics*, *21*, 1444–1455.

Woo, A., Cho, G.-H., & Kim, J. (2019). Would you share your home? the multifaceted determinants of preference for shared housing among young adults. *Applied Geography*, *103*, 12–21.