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ABSTRACT

Many universities strive to increase enrollment but this can put a strain on local housing markets, for both students and local residents. This study implements a stated preference discrete choice experiment to investigate how students trade off different housing features in the face of increasing rent due to higher demand, and ultimately estimates the resulting welfare effects on students. Random utility models are estimated, and suggest that when faced with increasing rent, most students prefer to move to cheaper housing that is farther away from campus, while some will decide to leave the university altogether. Results indicate, for example, that rent increases of $100 per month will lead to a 7.8 percentage point increase in students who move to an apartment that is farther from campus, and result in a 0.6-1.3 percentage point increase in students who would leave the university. By shedding light on the housing decisions of students, this study helps inform local governments and university officials trying to establish affordable housing options and sustainable student population growth.

JEL Codes: O18, R21, R31

Keywords: discrete choice experiment, housing choice, student housing, student welfare

1. INTRODUCTION

As many universities strive to increase enrollment, a combination of increased demand for housing, inflation, and housing scarcity in many college towns has caused a growing number of students to face difficult choices when making decisions about housing. For many students across the United States, their optimal housing choice is a matter of trying to balance cost, convenience, and security, with often limited options to choose between. Students must consider issues, such as, the distance they live from campus, the availability of transportation options, the safety and living conditions of apartments, the affordability of rent and utility costs, and the number of roommates allowed. Moreover, in areas with scarce housing supply, landlords can exploit students by raising rent and underperforming basic maintenance and service requests (Wilking et al. 2022).

Housing insecurity, food insecurity, and homelessness are on the rise for students in the United States. While schools may have programs in place that attempt to mitigate the effects of these adverse conditions, many students are often unaware of such programs (Olfert et al. 2021). Research indicates that housing insecurity and homelessness, along with long travel distances to campus, lead to lower academic achievement and increase the likelihood of a student dropping out of school (Olfert et al. 2021, Taylor & Mitra 2021). Moreover, these adverse conditions are more likely to affect those from historically underserved populations who would benefit the most from a college degree (Olfert et al 2021, Goldrick-Rab et al, 2016).

With these concerns at the forefront of college students' minds, it is important to investigate the tradeoffs students must make when they are looking for off-campus housing. To our knowledge, there are no studies in the literature that investigate the tradeoffs students make when choosing housing accommodations. This study focuses on how students trade off increases in rent, distance from campus, and their ability to remain enrolled at their current university. We develop a stated preference discrete choice experiment (DCE) to answer three main research questions. First, to what extent are increasing housing costs discouraging students from continuing college? Second, how do students trade off distance from campus with the increased costs of housing? With regards to students' preferences to remain near campus, we pay particular attention to potential nonlinearities in preferences and heterogeneity based on transportation mode. Third, what is the average student's willingness to pay (WTP) to avoid moving farther from campus, as well as to

avoid leaving and dropping out of their current university? Examining these questions is important given that many universities are seeking to increase enrollment and diversify their student body.

Our survey and DCE ask students about their current living arrangements and how they would react to changes in their housing bundle in terms of current rent and distance from campus. Based on the responses to the DCE, random utility models are estimated to determine how changes in rent and distance from campus affect the probability that students remain in their current apartment/house, move farther from campus for a lower cost housing option, or leave the university altogether.

The survey was administered to a sample of students (n=201) currently enrolled at Appalachian State University in Boone, North Carolina. Like many college towns, Boone faces issues with increasing housing costs, housing scarcity, and exploitative landlords. The Town of Boone's primary industry is higher education, with the town population doubling in size when school is in session. Like many universities, Appalachian State University has increased enrollment in the past decade, putting further strain on the local housing market (Appalachian State University, 2023). The Appalachian Mountains create topographical challenges that make Boone a particularly difficult place to build new housing, meaning that the supply is relatively inelastic and cannot readily respond to an increased demand for housing. The ongoing housing issues faced by students attending Appalachian State provide an ideal environment to investigate students' housing decisions when facing increasing costs and commuting distances. Results from this study could be potentially applicable to other college towns and university housing markets where students face similar tradeoffs.

Our results suggest that an increase in rent or distance from campus decreases the likelihood that a student will complete their university degree. Average marginal willingness to pay (MWTP) estimates suggest that students are willing to pay about $59 more per month to avoid living one mile farther from campus. We find that the estimated MWTP diminishes at farther distances, and that there is no evidence of observed heterogeneity in preferences based on transportation options. Perhaps more importantly, we find that the average student is willing to pay up to an additional $772 per month to continue to attend their university. Monthly rent increases beyond that would push the average student to leave the university.

These welfare estimates demonstrate the extent to which housing insecurity can adversely affect students' wellbeing. Students who live farther from campus are less integrated with their

college community, and tend to underperform relative to those that live closer (Taylor & Mitra, 2021). Our results provide insight into how students will respond to increased housing market strains, and policies to alleviate such effects. Anticipating students' responses to policies on student enrollment growth, housing, and transportation will help decision-makers assess the potential effectiveness of such interventions.

2. LITERATURE REVIEW

To our knowledge there has been little focus in the literature on how students will adjust their optimal housing choices when faced with an increasingly strained housing market. Much of the existing literature on college student housing focuses on the impacts to local communities and fulltime residents due to the externalities of "studentification" – a process by which neighborhoods become primarily dominated by students, changing the structure of urban communities (Smith, 2008). For example, Smith (2008) discusses concerns in Britain that studentification has led to the fragmentation of many communities. There is also an issue regarding what happens to neighborhoods once students leave. Student populations can be associated with negative consequences, such as litter and noise complaints, but also positive effects, such as economic prosperity (in terms of increased gross regional product or regional employment and labor income). Towns where student housing has been well planned have integrated their student community in a way that leads to urban regeneration and increased economic value (Macintyre, 2003).

Although the U.S. Higher Education Act of 1965 was passed with the explicit goal of making higher education more accessible to those who could not afford it, costly living expenses, a lack of resources, and difficulties in navigating the complexities of the financial aid system continue to make it difficult for students from lower income families and minority populations to complete a degree (Goldrick-Rab et al, 2016). Olfert et al. (2021) measured food and housing insecurity across 22 colleges and universities, and out of their sample of 22,153 students, found that 44.1% were classified as being food insecure and 52.3% as housing insecure. Furthermore, Olfert et al. found that 1.8% of students were homeless. Students who experienced basic need insecurities as children were more likely to experience similar insecurities in college. Food and

housing-insecure students also had lower rates of academic success and were more likely to participate in coping strategies, such as selling personal items to pay for food or begging (Olfert et al, 2021).

When faced with natural disasters, finding adequate and affordable housing can be even more difficult, especially for students. Many college towns will face increased risks of wildfires, hurricanes, and/or flooding due to climate change. Our study area in Boone, NC is no exception, with the supply of housing becoming further limited in the aftermath of Hurricane Helene in 2024. University officials in general must be aware of the additional obstacles and exploitive behaviors students may face in the housing market following such disasters. For example, in Chico, California, a wildfire burnt down 14% of the county's homes. Wilking et al. (2022) found that the sudden shortage of homes caused a power imbalance between students and landlords. Landlords were able to charge higher rents and do less in terms of basic services and maintenance because students were more limited in how they could respond, with limited resources to pursue other housing options (Wilking et al, 2022). Unlike other residents who may decide to find new employment and move from an area if the cost of living becomes too high, students are relatively more bound to their college's town if they would like to continue in their program of choice.

Given that students are tied to the area where their college is located, they may consider the distance from their apartment or house to campus as a key factor in choosing the optimal housing bundle. Students may need to rely on walking, riding a bike, or local public transportation (e.g., the bus) to get to school (Schnarre et al, 2022). Further, the amount of time and quality of a commute is correlated with barriers to academic participation (Taylor & Mitra, 2021). Students who must travel longer distances to campus tend to participate less in academic and cocurricular activities – such as classes and clubs – because the long commute can make access more problematical (Taylor & Mitra, 2021). Personal, weather, and distance-related factors also affect the way students get to campus and may cause efficiency or congestion problems to the local transportation network (Hossain et al, 2022). As such, it may be important that students have different transportation opportunities available to them to get to campus so that academic success can be promoted (Hossain, 2022). Most importantly, students need to have access to affordable housing that is close to their campus. The majority of studies in the literature suggest that student

housing costs and transportation issues are due to increases in college enrollment and there needs to be a focus on building new, affordable student housing near college campuses.

Finding an apartment or house near campus can be difficult, especially given that many college campuses are in downtown areas where housing is usually more expensive. One intervention that may allow (or force) students to live near campus is zoning. Brigham Young University (BYU) requires that all students live on campus or in a small, localized area near campus. This limits the negative externalities students can create on the surrounding urban area and the local housing market, but hurts the students because it limits the housing supply and further raises housing costs (Munneke et al, 2014). Zoning laws such as the R-2A law in Whitewater, Wisconsin have sought to increase student housing near campus by increasing the number of unrelated adults permitted to live in a housing unit (Kashian et al, 2020). This zoning ordinance helped to increase the supply of student housing while maintaining property values in the area (Kashian et al, 2020). Others believe the way to alleviate housing insecurity is to make college more broadly affordable, by lowering tuition costs and increasing financial aid to cover the costs of living, or by increasing funding for campus initiatives that support students facing housing insecurity (Wilking et al 2022; Olfert et al 2021).

This study aims to understand the key factors in university students' housing decisions, and to examine how students will respond to increasing rents and limited housing options near campus. We estimate students' WTP to avoid living farther from campus and to remain at the university, with the hope that our results will inform strategies for college towns and universities to grow in a sustainable fashion, while also maintaining the wellbeing of students.

3. DATA DESCRIPTION

To answer our research questions, we collected primary data based on responses to an online survey administered to students at Appalachian State University, in Boone, NC. The survey was developed in the Qualtrics, Inc. survey platform and administered through a combination of (i) in-person recruitment at university campus bus stops and (ii) posted fliers displayed around campus. Students were provided a QR code that linked to the online survey. Survey responses were collected in March and April, 2024. Data for a total of 208 student respondents who lived off

campus were collected.[1] Our DCE design and estimating equations (see Section 4) require information on students' current monthly rent and the distance of their current home from campus. Four and three respondents, respectively, did not report this information and dropped from our sample. The final sample for analysis includes n=201 respondents. About 59% of the respondents were recruited from campus fliers and 41% from the in-person bus stop interceptions. Two sample t-tests were conducted to compare responses from these two samples, and revealed few differences.[2] Therefore, we pool the two samples for the analysis.

The survey elicited information about students' current rent, number of roommates, primary transportation mode to campus, and distance from their apartment or house to campus. As shown in Table 1, students report that it took anywhere from one to six months to find an apartment, with an average of 2.8 months. The average student individually pays $772 per month in rent, with a range from $230 to $1,500. We emphasize that this is individual rent, and it is not the total monthly rent summed across multiple tenants. The average student has 2.2 roommates and their apartment has 3.2 bedrooms, 2.5 bathrooms, and is 2.48 miles from campus. There is substantial variation in how close students live to campus, however, ranging from 0.1 to 20 miles. About 43% of respondents identify as male (about 45% as female).[3] The average respondent is 21.6 years old and anticipates about 3.5 semesters left until they finish their college degree. Most respondents in our sample are undergraduates (97.4%, see Figure A1 in the Appendix for details).

Figure 1 shows that the majority of respondents (56%) take the bus to get to campus. Only 23% drive to campus, despite the fact that 88.6% own a car (see Table 1). About 18% of students in our sample primarily walk to campus, and about 4% report using other transportation modes (e.g., bike, or use a scooter or skateboard).

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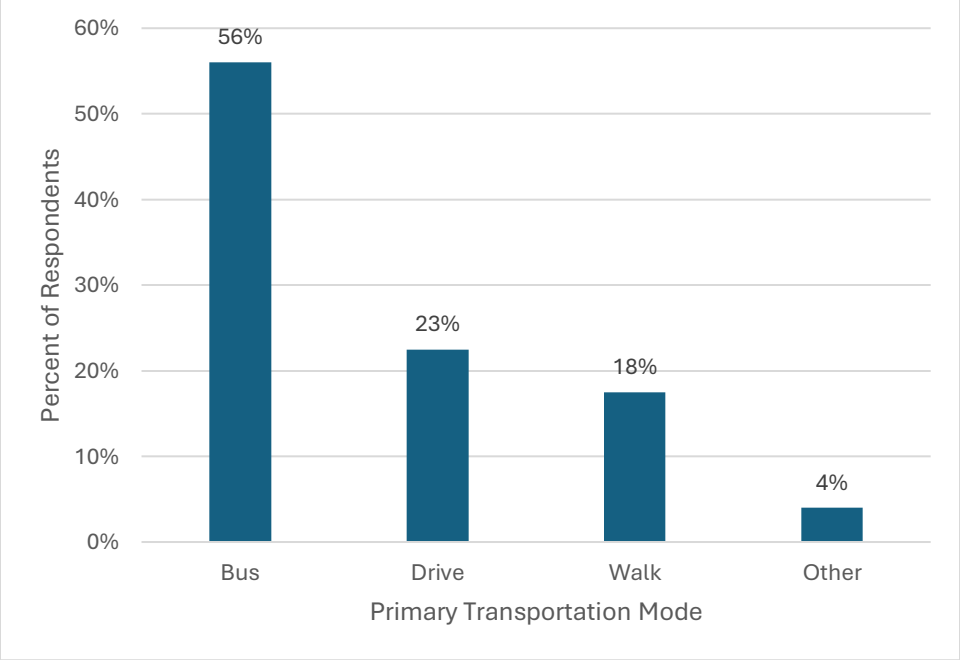
[1] All respondents were 18 years of age or older, and voluntarily consented to participate in this research.
[2] The two-sample t-test comparisons are displayed in Table A1 of the Appendix. Most variable means are not statistically different across the two samples. Monthly rent is slightly higher for the flier sample, but this difference is only marginally significant (p=0.09) and may not be economically significant (just $43). The bus stop sample is less likely to have a car (82% versus 93%, p=0.02).
[3] The remaining 12% identify as non-binary or preferred not to answer.

Table 1. Summary Statistics.

Variable	Observations[a]	Mean	Std. dev.	Min	Max
Months to find apartment	201	2.81	1.65	1	6
Monthly rent	201	772	181	230	1500
Miles from campus	201	2.48	2.21	0.1	20
# Roomates	201	2.20	1.18	0	5
# Bedrooms	200	3.15	1.18	0	6
# Bathrooms	200	2.50	1.09	1	5
Male (dummy)	201	0.43	0.50	0	1
Age (years)	189	21.62	1.40	19	29
# of semesters left	188	3.45	1.80	1	9
Have car (dummy)	201	0.89	0.32	0	1
Minutes to complete Survey	201	12.27	97.83	1.07	1389.82

Note: (a) Descriptive statistics reported only for students that responded to the corresponding question.

Figure 1. Breakdown of Primary Transportation Mode to Campus.



The most-central component of the survey presents respondents with a series of four housing choice scenarios. In each scenario, respondents are asked to choose between three alternative housing options. Under option 1, students can remain in their current apartment but

face a randomly assigned increase in their monthly rent. By design, this cost increase can take a value of $50, $100, $150, or $200 per month. Option 2 is that a respondent can choose to move to an apartment where the rent is the same as their current rent, but the new place of residence is located farther from campus. Here, the increase in distance is randomly assigned and can take a value of an additional 0.5 miles, 1 mile, 2 miles, or 5 miles from campus. Under the third option, respondents can choose to leave the university altogether (e.g. dropout, or transfer).[4] An orthogonal experimental design is applied across the choice scenarios, so any combination of monthly rent increases or change in miles from campus could be posited for housing options 1 and 2. There are 16 possible combinations of rent increases and distance measures across the two options. Four out of the possible 16 scenarios were randomly assigned to each respondent. The responses to these choice questions are used to estimate the random utility model discussed in the next section.

After the four housing choice scenarios, we ask respondents a series of Likert scale questions to assess the validity of their responses and general opinions of the student housing situation. More specifically, they are asked how much they agree or disagree with each of the statements in Table 2. Most respondents (95.2%) agreed or strongly agreed that they answered the choice questions as if the posited rent increases were real, and that they would make the same decision if faced with the stated tradeoffs in reality (95.8%). These questions were meant to flag respondents who may have potentially treated the questions as inconsequential, and/or exhibited hypothetical bias. It is re-assuring that most respondents agreed with these statements, suggesting that they responded to the housing choice scenarios truthfully and as if they were actual choices and not just hypothetical scenarios within a survey. The remaining three statements in Table 2 were intended to assess students' general attitudes towards the housing situation and the university. Most respondents disagree or strongly disagree with the statement that the costs of student housing are reasonable and that landlords treat them fairly. Simultaneously, most students agree that the university's general objective of increasing student enrollment is putting a strain on the local

[4] An example choice question is presented in Figure A2 of the Appendix.

housing market and economy. Together, these responses demonstrate that students believe that the housing situation around the university is a major concern.

Table 2. Responses to Likert Scale Questions.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Answered as if rent increases real.	1.6%	0.0%	3.2%	41.8%	53.4%
Would make same decision if reality.	1.1%	1.6%	1.6%	46.6%	49.2%
Believe housing costs unreasonable.	42.3%	41.3%	12.2%	1.6%	2.7%
Landlords and rental companies treat tenants fairly.	28.0%	28.6%	28.0%	12.2%	3.2%
University's increase in enrollment is straining local economy and housing market.	3.7%	1.6%	2.7%	18.5%	73.5%

4. METHODOLOGY

Using the data collected from the discrete choice questions, a random utility model is estimated as a conditional logistic regression. Within this framework, we examine how an increase in rent influences students' housing choices (i.e., whether they would (1) stay in their current home and pay the additional rent; (2) move to a different apartment that is farther away; or (3) leave the university all together. The utility u_{itj} that respondent *i* receives from housing option *j* in choice occasion *t* is posited to be a function of the monthly rent $cost_{itj}^{1}$, distance from campus $dist_{itj}^{1}$, and whether the student is able to remain at the university or has to leave $(leave_{itj})$. For alternative *j=1* in each choice question, where respondents remain in their current home, the increase in rent is equal to their current rent $cost_{itj}^{0}$, plus the randomly assigned change in rent $\Delta cost_{itj}$ (i.e., $cost_{itj}^{1} = cost_{itj}^{0} + \Delta cost_{itj}$); and the distance from campus is the same as the current distance $(dist_{itj}^{0})$ since they are remaining in the same home $(dist_{itj}^{1} = dist_{itj}^{0})$. For alternative *j=2*, where respondents move to a new home further away, the rent is stated to be the same as their current rent $(cost_{itj}^{1} = cost_{itj}^{0})$, but they would now live $\Delta dist_{itj}$ miles farther from campus (i.e.,

$dist^1_{itj} = dist^0_{itj} + \Delta dist_{itj}$). For both housing alternatives (*j=1,2*), students can continue to be enrolled at the university and do not need to leave $\left(leave_{itj} = 0\right)$. Under the "opt out" alternative *j=3*, however, students would leave the local housing market and no longer continue their education at the university $\left(leave_{itj} = 1\right)$. Additionally, under alternative *j=3* both $cost^1_{itj}$ and $dist^1_{itj}$ are set to zero.[5]

The formal model random utility model to be estimated is as follows, where ε_{itj} is the idiosyncratic, unobserved portion of utility.

$$u_{itj} = \beta_{i0} + \beta_1 cost^1_{itj} + \beta_2 dist^1_{itj} + \beta_3 leave_{itj} + \varepsilon_{itj} \quad (1)$$

The coefficients to be estimated are β_1, β_2, and β_3.[6] The first hypothesis is that as rent or distance from campus increases, students receive lower utility (i.e., $\beta_1 < 0$ and $\beta_2 < 0$, respectively). We also hypothesize that utility is less if a student leaves the housing market and is no longer able to pursue their college education at the university ($\beta_3 < 0$).

A student will choose the alternative *j* that yields the highest utility – i.e., $u_{itj} \geq u_{itk}$, for *k=1,2,3,4*. We assume ε_{itj} is drawn from a type I extreme value distribution, allowing equation (1) to be estimated as a conditional logit model (Maddala 1983; Greene, 2003; Train, 2009). We can then estimate the probability that respondent *i* chooses housing option *j* in choice occasion *t* as:

$$\Pr(u_{itj} \geq u_{itk}) = \frac{\exp\left(\beta_1 cost^1_{itj} + \beta_2 dist^1_{itj} + \beta_3 leave_{itj}\right)}{\sum_k \exp\left(\beta_1 cost^1_{itk} + \beta_2 dist^1_{itk} + \beta_3 leave_{itk}\right)} \quad (2)$$

From the estimated parameters β_1 and β_2, we can infer estimates of students' average marginal willingness to pay (MWTP) to avoid moving to an apartment that is one mile farther from campus ($MWTP_{dist}$), all else constant.

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[5] Essentially, if students opt out of the local housing market (i.e., choose alternative *j=3*), then they no longer pay rent nor are located within a reasonable distance from campus. In the formal model, one can think of $cost^1_{itj}$ and $dist^1_{itj}$ as being implicitly interacted with $\left(1 - leave_{itj}\right)$, but we omit such interaction terms from the formal equations for notational ease.

[6] The individual-specific constant term β_{i0} later cancels out through our estimation procedure (as can be seen in equation (2)), and is thus not estimated. This term is not relevant given our focus on relative tradeoffs across housing attributes.

$$MWTP_{dist} = \frac{\beta_2}{\beta_1} \quad (3)$$

Non-marginal welfare effects can also be easily derived by taking the utility differential and dividing by the marginal utility of income (Holmes and Adamowicz 2003). For example, for a given rent (r) and housing distance (d), the average student's willingness to pay (WTP) to stay at the university can be calculated as:

$$WTP_{stay} = \frac{\beta_3 - (\beta_1 r + \beta_2 d)}{\beta_1} \quad (4)$$

WTP_{stay} reflects the increase in rent a student would be willing to tolerate for a home at a given distance d before they are effectively priced out of the housing market and leave the university. If monthly rent increases beyond WTP_{stay} than the average student would leave the university.

In subsequent models we include interaction terms with $dist_{itj}^{1}$ to investigate observed heterogeneity in student preferences for distance to campus based on their primary mode of transportation and whether they own a car. We also include a quadratic distance term to investigate potential nonlinearities – e.g., does the marginal premium students hold for being near campus diminish at farther distances?

5. RESULTS

Following equations (1) and (2) the primary conditional logistic regression results are presented in Table 3.[7] Across all four models in Table 3, we see that students are less likely to choose an apartment when the monthly rent is higher, all else constant. We also see that students are less likely to choose a housing option that is at a greater distance from campus. Finally, we

[7] The number of respondents used to estimate these models drops from 201 to 194 students because seven students (3.5%) did not answer any of the four choice questions . Note that 190 (94.5%) students completed all four choice questions presented to them, two (1.0%) completed three of the four choice questions, one (0.5%) completed two, and 1 (0.5%) completed just one.

find that students have a strong preference to choose a housing option that allows them to remain at the university and continue their education.

Following equation (3), the results from Model 1 in Table 3 suggest a marginal willingness to pay of about $59 per month [95% CI: $32-$85] to avoid moving one mile farther to campus.[8] Similarly, following equation (4) we can calculate the average student's WTP to remain at the university. Based on the sample means shown in Table 1, we assume a rent of $775 per month and distance from campus of 2.5 miles. We estimate an average WTP of $772 per month [$438-$1,106] to remain at the university. If monthly rent increased beyond this point, then the average student would leave the university.

We recalculate WTP_{stay} from equation (4) at various distances ranging from zero to ten miles from campus. As shown in Figure 2, students living closer to campus are willing to tolerate higher increases in rent to remain at the university. This is because of the amenity value associated with living near campus. Students living farther from campus are willing to tolerate a lot less in terms of increases in rent. For example, students living ten miles from campus are willing to pay just an additional $332 per month [$2-$663] to continue their education at the university. Together these results demonstrate the magnitude by which increases in rent and distance from campus will push students out of the local housing market and lead them to leave the university.

In the next two models in Table 3 we add interaction terms to investigate potential heterogeneity in students' preferences for distance from campus based on their primary mode of transportation (Model 2) or if they have a car (Model 3). Both models suggest no statistically significant evidence of observed heterogeneity with respect to distance, and the previous results remain robust to the inclusion of these interaction terms.

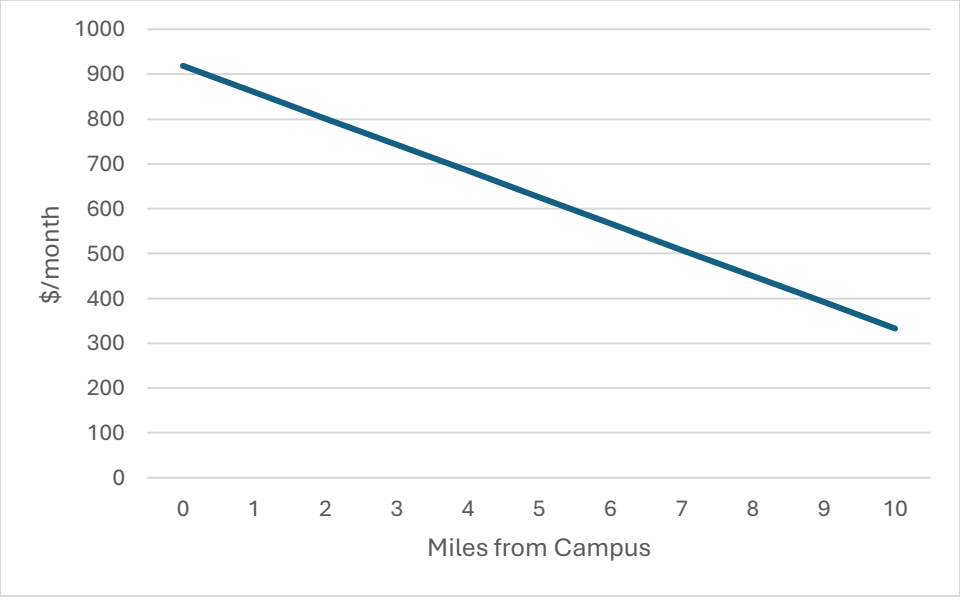
[8] The 95% confidence intervals are presented in brackets in the main text.

Table 3. Conditional Logistic Regression Model Results.

	(1)	(2)	(3)	(4)
Monthly rent	-0.0034***	-0.0035***	-0.0034***	-0.0044***
	(0.0009)	(0.0008)	(0.0009)	(0.0010)
Distance from campus	-0.1988***	-0.3186***	-0.1819**	-0.4790***
	(0.0572)	(0.0974)	(0.0893)	(0.0985)
Leave university	-5.7476***	-5.8307***	-5.7446***	-7.2100***
	(0.9990)	(0.8857)	(0.9985)	(1.1460)
Distance × Bus		0.1329		
		(0.1046)		
Distance × Drive		0.1475		
		(0.1211)		
Distance × Have Car			-0.0185	
			(0.0992)	
Distance^2				0.0225***
				(0.0067)
Observations	2,307	2,307	2,307	2,307
Number of respondents	194	194	194	194
Log-likelihood	-650.2558	-647.4672	-650.2242	-638.4459

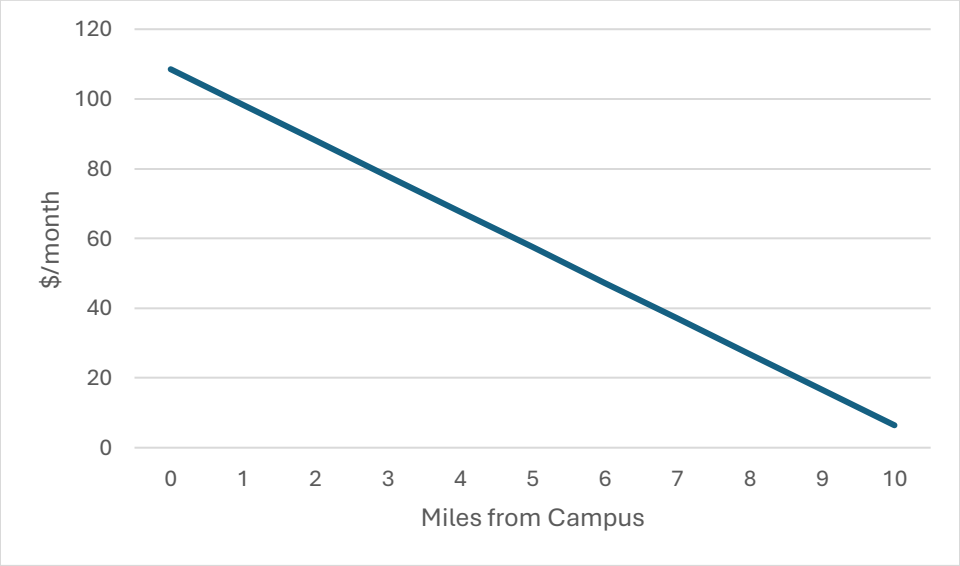
Note: Standard errors in parentheses, clustered at the respondent level. * p<0.10, **p<0.05, ***p<0.01.

Figure 2. Willingness to Remain at the University Depending on Distance of Home from Campus.



Model 4 adds a quadratic term with respect to distance, allowing for potential nonlinearities in marginal utility with respect to distance. The results suggest that the marginal disutility from living farther from campus diminishes at farther distances. In other words, as economic theory suggests, and as demonstrated in Figure 3, the average student's demand to live one mile closer to campus decreases the farther away they live from campus. For example, a student who lives adjacent to campus (i.e., a distance of zero) would be willing to pay $109 per month [$70-$147] to avoid living one mile away. On the other end, a student currently living 10 miles away from campus would be willing to pay just $6 a month [$-20-$33] to avoid living an additional mile away (i.e., 11 miles away), which statistically speaking is indistinguishable from zero in our results.

Figure 3. Marginal Willingness to Pay to Live One Mile Closer to Campus at Different Distances.

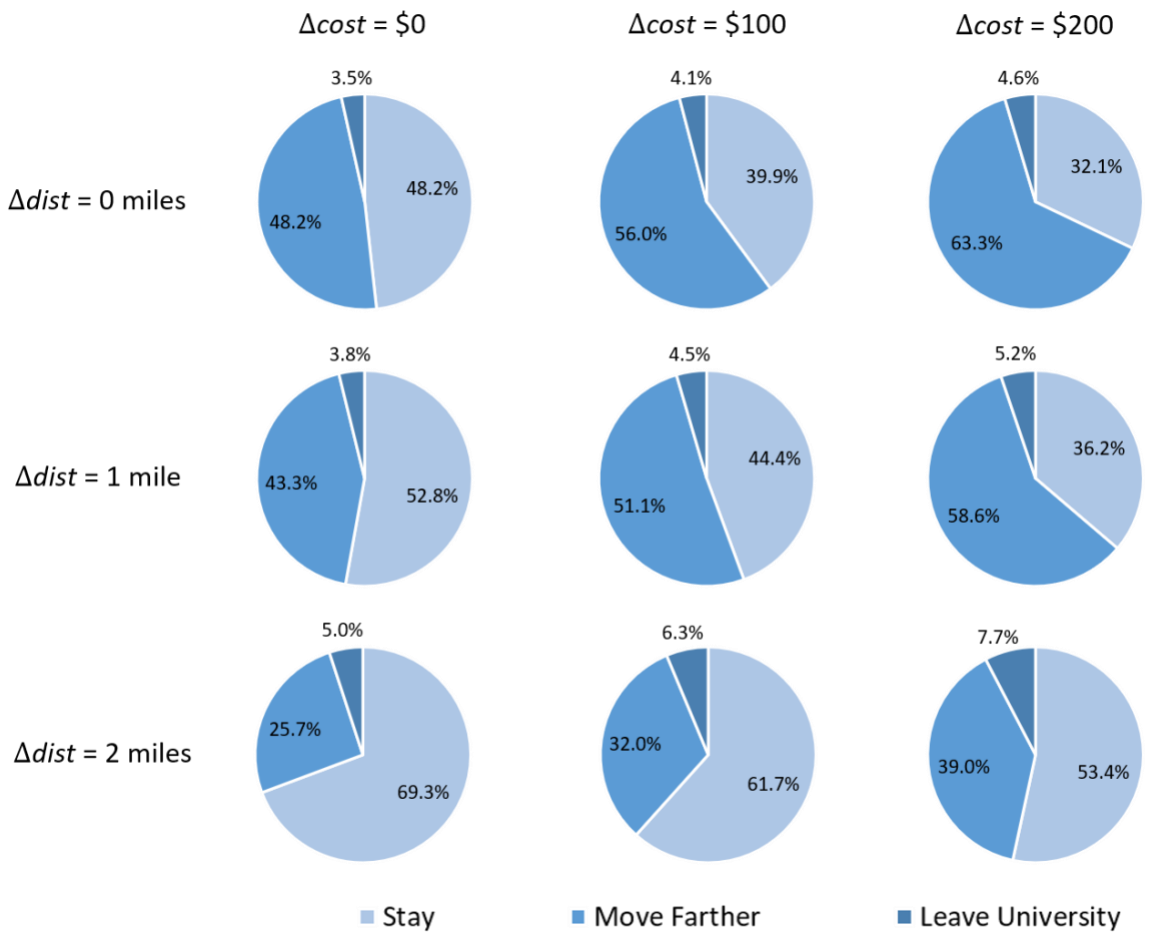


To illustrate the magnitude of the results, we take the parameter estimates from Model 1 and then, following equation (2), estimate the average predicted probabilities a student chooses each housing alternative under a range of illustrative scenarios – i.e., a change in rent of $0, $100, and $200 per month, and a change in distance at of zero, one, and five miles further from campus. We set the baseline rent and distance at $775 per month and 2.5 miles, which are roughly equal to the sample averages in Table 1. The estimated probabilities under each of the nine scenarios from all pairwise combinations are displayed in Figure 4. Holding distance constant, and moving

horizontally along each row, we can see that the probability of a student remaining at their current home decreases with greater increases in rent. For example, holding distance at its baseline level of 2.5 miles (i.e., $\Delta dist = 0$), we can see in the top row of Figure 4 that even at a rent of $775 per month (i.e., ., $\Delta cost = 0$, no change from the average rent), the average respondent is equally as likely to stay in their current home (48.2%) or move farther away and pay a lower rent (48.2%). In this simulated scenario, there is only a 3.5% probability that the student would opt out of the housing market and leave the university. If rent increases an additional $100, we see that the likelihood of remaining in their current home decreases by almost 10 percentage points, down to a 39.9% probability. In contrast, under this higher rent scenario, the probability of moving to a home that is farther away to avoid the rent increase goes up, to about 56.0%. The probability of leaving the university altogether also increases, to 4.1%. This pattern continues if rent increases further, by up to $200 per month, as can be seen in the top-right cell of Figure 4.

Now considering changes in the distance from campus, we can see within any one column of Figure 4 that as you move down, increasing distance but holding cost constant, the probability of choosing the farther housing option decreases, but the probability of remaining at the current home or leaving the university altogether increases. For example, holding the monthly rent at the current sample average (first column of Figure 4), we see that as distance increases by say, two miles, the probability of choosing a farther home decreases from 48.2% to just 25.7%. In contrast, the probability of staying in the current home increases, from 48.2% to 69.3%; as does the probability of opting out of the housing market and leaving the university, increasing from 3.5% to 5.0%. If this student then also faces higher rents, we can see that the likelihood of leaving the university increases to up to 7.7% (bottom-right cell in Figure 4), which is more than double that of our most conservative scenario based on the current sample average rent and distance (top-left cell in Figure 4).

Figure 4. Predicted Probabilities: Based on Model 1 (Table 2).



We assess the robustness of our results in several ways. Numerous variants of Model 1 are re-estimated, and the results of this sensitivity analysis are presented in Table 4. The results from Model 1 are also re-presented in Table 4 to facilitate comparison. To allow for potential unobserved preference heterogeneity, Model 5 is estimated as a Mixed Logit Model (Train 2009). The parameters β_1, β_2, and β_3 are allowed to randomly vary across students following a normal distribution. The estimated standard deviation terms demonstrate that there is statistically significant heterogeneity across students, but on average the coefficient estimates are similar in sign and significance. The magnitudes are also similar for most parameters. For example, the mean MWTP to avoid a one-mile increase in distance is $51 per month, which is only slightly less than the $59 suggested by Model 1. The starkest difference, however, pertain to estimates of β_3 and the average WTP to remain at the university. Again, following equation (4) and assuming a rent of

$775 per month and distance of 2.5 miles from campus, we see that the average WTP based on Model 5 is $1,664 per month [$1,019-$2,309], suggesting that the average student would be willing to pay up to that additional amount each month to remain at the university. Put another way, this suggests that students being priced out of the housing market and having to discontinue their education at the university would decrease their welfare by about $1,664 each month. This estimate is more than double that of our base model (Model 1), but the 95% confidence intervals do overlap.

In Models 6 through 8 in Table 4, we revert back to a conditional logistic model, but investigate alternative sample screening criteria to eliminate respondents who may have exhibited potentially biasing behaviors. The 30 students who expect to graduate the following semester are eliminated from the estimating sample for Model 6. Such students may not have treated the stated change in rent, distance, and remaining at the university as consequential, and/or exhibited hypothetical bias, because they are leaving the university soon anyway. Model 7 includes those students in the estimating sample, but instead only maintains students who agreed or strongly agreed with the statement that they made their choices as if they would actually face these costs. Applying this inclusion criterion results in a sample where we can be more confident that students treated the choice scenarios as consequential and did not exhibit hypothetical bias. Only nine students were eliminated, lending further support towards the validity of our survey instrument and the collected data in general. Model 8 further constrains the estimating sample to, in addition to the criterion under Model 7, only include respondents who agreed or strongly agreed that they would make similar choices in reality. Applying this criterion led to an additional four respondents being dropped from the sample. The results from Models 7 and 8 are quite similar to the earlier conditional logistic regression results, demonstrating that our overall findings are robust.

Table 4. Sensitivity Analysis: Regression Results and Willingness to Pay Estimates.

	(1)	(5)	(6)	(7)	(8)
Monthly rent	-0.0034***	-0.0140***	-0.0035***	-0.0032***	-0.0036***
	(0.0009)	(0.0023)	(0.0010)	(0.0008)	(0.0008)
Distance from campus	-0.1988***	-0.7197***	-0.2078***	-0.1884***	-0.2469***

	(0.0572)	(0.1257)	(0.0645)	(0.0547)	(0.0450)
Leave university	-5.7476***	-36.0291***	-5.9429***	-5.5183***	-6.0597***
	(0.9990)	(4.4657)	(1.1023)	(0.9698)	(0.9379)
Std Dev: Monthly rent		0.0209***			
		(0.0031)			
Std Dev: Distance from campus		0.3404**			
		(0.1557)			
Std Dev: Leave university		-4.4911***			
		(0.6687)			
Mean Marginal WTP					
Avoid one mile increase	58.58***	51.27***	58.80***	59.64***	68.57***
	(13.62)	(9.55)	(14.39)	(14.45)	(13.60)
Avoid leaving university	772.16***	1663.59***	759.61***	823.02***	736.50***
	(170.40)	(329.04)	(174.03)	(184.88)	(137.55)
Observations	2,307	2,307	1,947	2,199	2,151
Number of respondents	194	194	164	185	181
Log-likelihood	-650.2558	-509.7649	-548.5646	-620.0281	-602.1010

Note: Standard errors in parentheses, clustered at the respondent-level. * p<0.10, **p<0.05, ***p<0.01. Model 1 shows the base model for comparison. Model 5 is the same, but estimated as a Mixed Logit model with 1,000 Halton draws. Model 6 excludes respondents who plan to remain at the University for only one semester. Model 7 includes only respondents who agree or strongly agree that they made their choices as if they would actually face the costs, and Model 8 adds an additional criteria further including only respondents who also stated they would make the same choice in reality.

6. CONCLUSION

This study develops a stated preference discrete choice experiment to investigate how students trade off different housing features when faced with increasing rents. We find that when faced with rent increases, many students will consider moving farther from campus or even consider leaving their university. Results from conditional logit models are used to estimate the resulting welfare effects on students. We first estimate the dollar value students place on living in close proximity to campus. In our base model, the average marginal willingness to pay to live one-mile closer to campus is almost $60 per month. This can reflect preferences for reduced commuting time and costs and is in agreement with Taylor and Mitra (2021), who found that being near campus is correlated with university engagement and academic success. Students are likely aware of these benefits and account for them when making their housing choices. We also find nonlinearities with respect to distance – the marginal disutility from living farther from campus

diminishes at greater distances, and so the average student's demand to live one-mile closer to campus decreases the farther away they already live from campus.

We find that students have a large willingness to pay to avoid being priced out of the local housing market and having to leave the university. Our base model suggests a willingness to pay of about $772 per month, on average. Put another way, if student enrollment and demand, and in turn rent, for student housing near Appalachian State University continue to rise, then the annual loss in welfare could be about $9,264 (=$772×12 months) per student, on average. We further investigate students' willingness to pay to remain in university at varying distances from campus. Results indicate that students living closer to campus are willing to tolerate larger increases in rent to continue their education. Our results highlight the magnitude at which increases in rent and limited housing options near campus will push students out of the market and lead them to leave the university.

If Appalachian State and universities in similar situations wish to maintain their goals of increasing student enrollment, while still maintaining a content and academically successful student body, then local governments and university officials must work together to put forth policies to maintain affordable student housing options, especially in areas where the local housing supply may be relatively inelastic. This study can help shape those policy decisions by giving more information on the severity and specifics of this complex issue, and in particular, by helping stakeholders anticipate how students may respond to changing market conditions, as well as housing and transportation policies.

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APPENDIX

Figure A1. Breakdown of Student Standing.

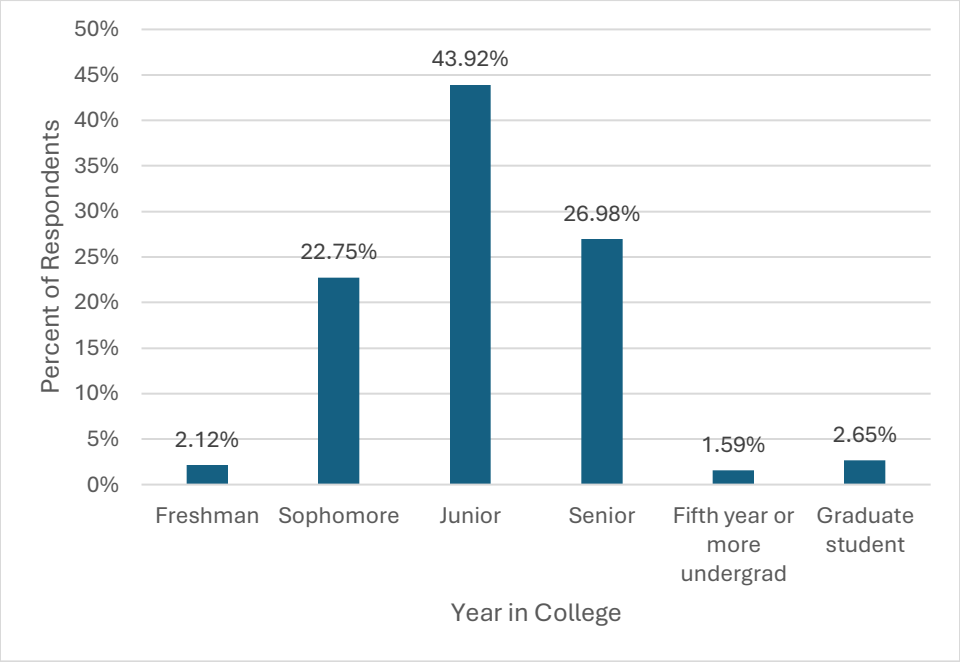

Figure A2. Example Choice Question.

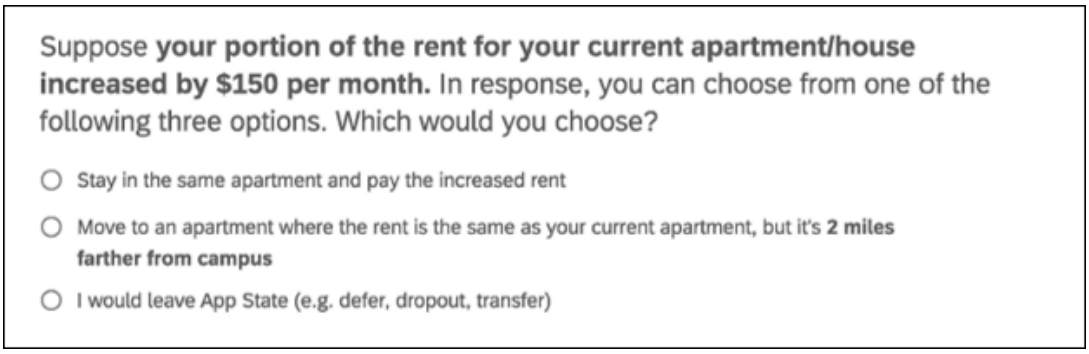

Table A1. Two-sample t-test Comparisons across Sample Recruitment Methods.

Variable	Flier Sample Mean	Bus Stop Sample Mean	tstat	p-val
Months to find apartment	2.77	2.87	-0.40	0.6889
Monthly rent	789	746	1.71	0.0896
Miles from campus	2.40	2.60	-0.64	0.5207
# Roomates	2.26	2.11	0.92	0.3574
# Bedrooms	3.19	3.10	0.54	0.5896
# Bathrooms	2.53	2.46	0.48	0.6308
Age (years)	21.72	21.48	1.17	0.2425
Male (dummy)	0.39	0.50	-1.59	0.1139
# of semesters left	3.29	3.70	-1.48	0.1406
Have a car (dummy)	0.93	0.82	2.37	0.0191
Minutes to complete Survey	16.41	6.26	0.87	0.3861