The incongruence between objective and subjective rental affordability: Does residential satisfaction matter?

Abstract

Addressing the rental affordability problem requires defining and measuring 'affordability' accurately. A variety of objective and subjective indicators have been suggested to measure rental affordability. However, several studies demonstrated that objective and subjective measures of rental affordability are not well aligned with each other, while the underlying cause of this mismatch is unknown. Drawing on Noll's (2013) objective and subjective social indicator framework, this paper examines the extent to which the objectively and subjectively measured levels of rental affordability are incongruent and the driver of the disparity. Using the longitudinal data of the Labor and Income Panel Study in Korea (2015-2020), we conducted a series of panel multinominal logistic regressions with fixed effects. The results show that there is a significant mismatch between objective and subjective rental affordability, and this incongruence is partly due to residential satisfaction, which influences subjective rental affordability. The paper calls for more in-depth exploration of residential satisfaction to benefit refined and nuanced policies to address rental affordability problems.

Keywords: housing affordability, rent-to-income ratio, residual income approach, perceived rent burden, residential satisfaction

Introduction

Rental affordability has received increasing policy attention in recent decades amid the rapid increase in market housing prices and stagnant income growth (Haffner and Hulse, 2021; Wetzstein, 2017). Addressing the rental affordability problem requires defining and measuring 'affordability' accurately. A variety of approaches to measure rental affordability and their relative (dis)advantages are well documented in the literature (e.g., Baker *et al.*, 2015; Bramley, 2012; Heylen, 2021; Kutty, 2005; Lerman and Reeder, 1987; Lux, 2007; Stone, 2006; Thalmann, 1999, 2003; Yip, 1995). Among them, the rent-to-income ratio measuring the share of rent to household income and the residual income measurement assessing after-housing income against the standard for non-housing basic needs have been the most widely used (Kutty, 2005; Stone, 2006; Yip, 1995).

However, the use of normative ratio standards has faced recent criticism. One of the primary concerns is its limited capacity to adequately account for the diverse circumstances within individual households which may hinder its ability to provide a comprehensive understanding of the rental affordability problem (Samarin and Sharma, 2021). Recognizing these shortcomings, some researchers have advocated for an examination of residents' perception of rent burden, as it takes into consideration their actual housing experiences and sentiments towards the housing market (Bramley, 2012; Heylen, 2021).

Notably, these studies have highlighted a discrepancy between objectively measured rental affordability and subjectively measured rental affordability (i.e., two households classified into the same group in terms of objectively measured rental affordability may perceive rent burden differently) (see Bramley, 2012; Heylen, 2021; Kearns *et al.*, 1993; Özdemir Sarı and Aksoy Khurami, 2018). In the housing policy domain, this misalignment between objective and subjective rental affordability may

affect designing housing assistance programs for rent-burdened households (Stiglitz *et al*., 2009). Most of the housing subsidy programs tend to target households with unaffordable rent measured by objective indicators, while the households whose rent is considered affordable by both objective and subjective measures are of less policy concern. That is, households who perceive a manifest rental burden are likely to be neglected in the policy discourse if their rent payment is below the normative thresholds (Lerman and Reeder, 1987; Noll, 2013). It indicates a significant concern particularly for low-income households. They may find themselves residing in housing where the rent falls below normative thresholds out of necessity, while perceiving a burden of costs. For this reason, it has been argued that objective indicators should be integrated with subjective indicators to better capture these hidden groups of households suffering housing affordability problems (Bramley, 2012; Heylen, 2021; Sunega and Lux, 2016). Understanding the meaning of the gap between objective and subjective rental affordability would provide useful insight into developing an integrated indicator of the two rental affordability measures. However, there have been insufficient published works to explain why this discrepancy occurs.

This article aims to examine two research questions: First, how much do the objectively and subjectively measured levels of rental affordability differ from each other? Second, if a significant mismatch between objective and subjective rental affordability is identified, what is the driver of the disparity? Given the limited research on this inquiry in the housing literature, the present study borrows a theoretical lens from Noll's (2013) objective-subjective social indicator framework to identify the households who have the matched objective-subjective rental affordability and those who do not. Noll (2013)

argues that the incongruence between objective and subjective measurements has to do with individuals' experience and expectation of the status concerned.

Following this reasoning, this article attempts to examine whether the incongruence between objective and subjective rental affordability can be explained by exploring the extent to which individuals are satisfied with their residential environment (Amerigo and Aragones, 1997; Galster, 1987), a fundamental determinant of residents' well-being (Phillips *et al*., 2005). Such insights not only enhance our ability to integrate and interpret the information derived from various rental affordability measurements but also inform the design of effective policy measures to address the rental affordability problem.

The linkage between objective rental affordability, perceived rent burden, and residential satisfaction

Understanding the gap between objective and subjective rental affordability

Extensive research has adopted normative ratio measurements to define rental affordability, concerning whether rent exceeds a certain threshold in household income, typically 25-40% (also known as the rent-to-income ratio method) (Hulchanski, 1995; McConnell, 2013); or whether after-housing income suffices to cover basic non-housing needs (known as the residual income method) (Stone, 2006; Thalmann, 2003). While the former allows for a ready comparison of affordability across different regions, groups, and years, the latter helps identify households faced with housing-induced poverty, providing useful references for implementing housing assistance programs (Baker *et al.*, 2015; Kutty, 2005; Lau and Li, 2006; Stone, 2006; Yip, 1995).

In contrast, subjective rental affordability measured by perceived rent burden has been underexplored in housing research. It is arguably because subjective social indicators are considered to rely on an individual's constantly changing aspirations (so-called 'hedonic treadmill effect') (Bramley, 2012; Brickman and Campbell, 1971) and the resultant low reliability and comparability (OECD, 2013). However, subjective measures of affordability have gradually come into play in the housing and social research conducted in European Union, Belgium, and England (see Acolin and Reina, 2022; Bramley, 2012; Brandolini *et al.*, 2013; Heylen, 2021; Sunega and Lux, 2016). It is noted that subjective information derived from social indicators, such as perceptions and self-assessments, bears its own value in that people's well-being should be understood through their eyes (Campbell and Convers, 1972). It is also suggested that subjective social indicators can directly reflect an individual's experience, evaluation, and preferences, which cannot be captured by objective measures (OECD, 2013; Veehnhoven, 2002). Therefore, researchers have increasingly called for integrating objective and subjective housing affordability indicators to grasp the rental affordability situations more comprehensively (Bramley, 2012; Heylen, 2021; Sunega and Lux, 2016).

While combining objective and subjective indicators should be based on ample understanding of the implications of each indicator, far too little attention has been paid to how the incongruence between objective and subjective rental affordability should be interpreted. Researchers have found that a considerable portion of households paying less (more) than the normative thresholds in the ratio or residual income approaches do (not) feel the rental cost burden (Acolin and Reina, 2022; Bramley, 2012; Brandolini *et al.*, 2013; Heylen, 2021; Sunega and Lux, 2016). For instance, in a study based on the EU-2016 survey, Heylen (2012) found that the correlation between objective and subjective

118 measures is weak—the two affordability measures have matched only among 30% of the
119 surveyed households.

120 However, the existing literature cannot adequately explain why such a mismatch
121 emerges. Some researchers attempted to take the quality of housing and household size
122 into consideration to identify households inaccurately classified by objective rental
123 affordability (Lerman and Reeder, 1987; Thalmann, 1999). They demonstrated that not
124 all households with high rent-to-income ratio should be considered a policy target because
125 objectively measured unaffordability may be attributable to the household's preference
126 for luxurious housing; the households who pay a large proportion of their limited income
127 for rent should be distinguished from those who deliberately choose housing cost burden
128 on account of their strong taste for high standard housing (Lerman and Reeder, 1987;
129 Thalmann, 2003). This quality-based approach allows for classifying households that
130 overconsume housing (i.e., bearing high rent burden to afford appropriate housing) and
131 those deemed to underconsume housing (i.e., enduring inappropriate housing for low rent
132 burden) and hints at identifying who needs housing assistance. However, this approach
133 relies primarily on a normative method to define the appropriateness of housing quality
134 and the affordability thresholds and thus lacks an account of how it relates to rental
135 affordability from the residents' perspectives (i.e., subjective affordability).

136 Amid the paucity of housing affordability literature that can inform the
137 classification of the matched and mismatched groups, Noll's (2013) framework of
138 objective and subjective social indicators seems to provide a relevant theoretical lens to
139 our inquiry. His framework classifies the status of the quality of life into four types by
140 objective and subjective dimensions (Berhe *et al*., 2014). The first category, 'well-being',
141 denotes households in which the favorable objective living conditions go together with

positive subjective well-being. On the other hand, the combination of inadequate objective living conditions and poor subjective well-being is classified as the 'deprivation' category. These two categories demonstrating consistency between objective and subjective measures present an easily anticipated outcome, and the 'deprivation' group usually receives most of the policy attention (Berhe *et al*., 2014). However, the remaining two groups that show a conflicting assessment between objective and subjective measures are challenging to identify: 'Dissonance' category (also known as 'satisfaction dilemma') indicates a low level of subjective well-being despite the favorable objective conditions, and 'adaptation' represents a high level of subjective well-being despite unfavorable objective conditions (also called as 'satisfaction paradox'). From Noll's (2013) point of view, the 'adaptation' group in the housing affordability context can be described as households who pay more than the normative thresholds yet perceive no housing cost burden. Conversely, the 'dissonance' group can be understood as households whose rent is within the normative thresholds but feel rent burden (Table 1).

[Table 1 here]

Noll (2013) sees that 'adaptation' reflects an individual's tendency to adapt to unfavorable objective conditions by lowering aspirations and expectations. In a similar vein, Festinger (1957) argues that when people encounter an inconsistency between their cognition and reality, they tend to use cognitive dissonance reduction by lowering their expectations for cognition consistency (known as 'cognitive dissonance theory'). Therefore, the 'adaptation' group in rental affordability can be understood that individuals who have limited choices to resolve their unfavorable housing problems are likely to perceive that what they currently have is good enough (i.e., affordable) (Hui *et al*., 2014; Jansen, 2014). While this account seems applicable to low- or middle-income households

that have constrained resources for improving their housing conditions, the quality-based approach to housing affordability appears to hint at why the better-off overconsume housing but feel no rental burden.

However, the emergence of the 'dissonance' group concerning rental affordability does not seem to be fully comprehended through these explanations because perceiving an objectively affordable rent as unaffordable indicates the presence of sustained (or heightened) cognitive dissonance rather than its alleviation. While the 'dissonance' group with limited income is possibly attributed to their underconsumption of housing to save housing costs, the same account can hardly explain those in the upper-income bracket. Considering that Noll (2013) suggests that dissonance emerges when the favorable objective conditions fall short of an individual's aspirations and expectations, it is possible that individuals who have a strong aspiration for a rent-to-income ratio below 10% but end up paying 20% would feel a rent burden. Another plausible explanation might be that people perceive rental burden when their dwelling conditions fall short of their aspirations and expectations. That is, residents may have a tendency to discern whether their house is *worth the rent*, which may affect their judgement of rental affordability. However, the latter assumption has not been closely examined in the literature.

Residential satisfaction and rental affordability

In the housing literature, residents' overall or discrete assessment of their housing conditions is embodied in the concept of 'residential satisfaction' (Amerigo and Aragones, 1997; Jansen, 2014). Residential satisfaction is defined as the 'residents' appraisal of their residential environment based on their needs, expectations, and achievements' (Emami and Sadeghlou, 2021, p. 512). Residential satisfaction is an important aspect of people's

lives as it serves as an essential benchmark for assessing housing outcomes. This assessment can be conducted at the individual, household or regional level, offering invaluable insights for making informed housing policy decisions (Bonaiuto and Fornara, 2017).

The literature exhibits that residential satisfaction is understood mainly from three perspectives (Amole, 2009; Emami and Sadeghlou, 2021; Galster, 1987). First, residential satisfaction is seen as an indicator of the extent to which the residential environment fulfils residents' goals, commonly referred to as a 'purposive approach' (Canter and Ress, 1982). Second, some researchers consider residential satisfaction as a measure of the (in)congruence between what residents aspire to and what they actually have, called the 'aspiration-gap approach' (Galster, 1987; Jansen, 2014). This approach involves a process in which individuals' evaluation of the residential situation is compared to specific standards of comparison, presumed as 'aspired' needs—also referred to as *"reference"* (Balestra and Sultan, 2013; Galster, 1987). That is, if the current housing conditions correspond to the reference point, they feel satisfied. Conversely, if the housing conditions are not congruent with the reference point, residential dissatisfaction appears salient. The process of constructing reference points exhibits variations among different groups of theorists. While housing needs theorists are concerned with the extent to which the housing environment fits the family's needs (Rossi, 1955), housing deficit theorists focus on cultural and familial housing norms (Morris and Winter, 1975). On the other hand, social comparison theory highlights the importance of a household's past experience or peer groups' housing conditions (Huang and Du, 2015; Vera-Toscano and Ateca-Amestoy, 2008), and Glaster (1985, 1987) suggests that people tend to cognitively construct a reference point for specific parts of

214 residential settings. The third approach concerns cognitive, affective, and conative
215 dimensions of satisfaction and accounts for the relationship between the residential
216 environment and users' residential behaviors (Fang, 2006; Francescato *et al.*, 1989).
217 Researchers have adopted these three approaches to elucidate the determinants of
218 residential satisfaction, such as objective attributes of housing (e.g., size, prices, building
219 typologies, availability of services), objective characteristics of the residents (e.g., age,
220 gender, income, length of residency), and subjective measures of the housing
221 environment (e.g., perceived density, relationship with neighbors, security), and the
222 consequences of residential satisfaction often manifested in residential mobility (see
223 Amerigo and Aragones, 1997; Amole, 2009; Balestra and Sultan, 2013; Fang, 2006;
224 Galster, 1987; Jansen, 2014; Riazi and Emami, 2018; Vera-Toscano and Ateca-Amestoy,
225 2008).
226 However, research on the relationship between residential satisfaction and
227 housing affordability is inconclusive. First, with respect to its relationship with objective
228 affordability, while a few studies asserted that residential satisfaction is associated with
229 higher housing costs or higher household income (Frank and Enkawa, 2009; Lu, 1999;
230 Vera-Toscano and Ateca_Amestoy, 2008), its association with rental affordability may
231 vary due to the complex interplay between housing costs and household income. Pagliari
232 and Webb (1996) and Lim (2016) showed that a household with higher satisfaction with
233 their housing conditions is more likely to embrace unaffordable rent. Varady and his
234 colleagues (2001) also found that a higher rent-to-income ratio is related to higher
235 satisfaction with home. Concerning its connection to subjective affordability, Varady
236 (1980, 1983) demonstrated in other studies that residential satisfaction is not associated
237 with the rent-to-income ratio but with the perceived rent burden. Elsinga and Hoekstra

(2005) also showed that people who think their housing costs are problematic are less likely to be satisfied with their housing. Yet, none of these studies proved the causality between rental affordability and residential satisfaction. It is also unclear *a priori* what the relationship between residential satisfaction and objective affordability is due to the inconsistent findings of the previous studies.

In this regard, we formulate hypotheses pertaining to the association between residential satisfaction and the measures of objective and subjective affordability. The paper hypothesizes that a low level of residential satisfaction causes the perceived rent burden among the households paying objectively affordable rent (the 'dissonance' group), and a high level of residential satisfaction mitigates the perceived rent burden among those paying objectively unaffordable rent (the 'adaptation' group), regardless of income levels.

The Korean context

We used the longitudinal dataset of Republic of Korea to validate the hypothesis. Since the early 1990s, Korea has achieved significant qualitative and quantitative improvements in housing outcomes. However, as rising housing prices have outpaced wage growth in recent decades, Korea's housing prices have increasingly become unaffordable; While the median equivalized household income grew by 29.7% between 2011 and 2020 (Statistics Korea, 2021), the prices of high-rise apartments, the most common type of housing in Korea, increased by 82% in the capital region during the same period (KOSIS, 2022). The recent spike in *Jeonse* rental prices, Korea's unique tenure model utilizing a lump-sum deposit rental system, has exacerbated the housing affordability problem for private renters. Particularly, the limited share of public housing (7.8%) in the national

housing stock (MoLIT, 2021) has channeled low-income renters into great housing difficulties. The bottom 10% of households in income distribution spend 47% of their income on housing, and over 370,000 households live in non-residential structures susceptible to severe weather (Kang *et al*., 2019).

To alleviate the housing challenges the vulnerable group faces, the national and local governments have been expandingvarious housing subsidy programs. However, Korea's housing policies for renters have not been driven by systematic assessments of rental affordability. There has been insufficient effort to translate these two indicators into housing policy (Bae and Kim, 2014; Kang *et al*., 2019). Given the Korean government's plan to expand the housing welfare programs promulgated in the 2017 Housing Welfare Roadmap, it is essential to work toward a more thorough and refined understanding of rental affordability that would lead to the development and implementation of effective housing policies.

Data

This study used the Korean Labor and Income Panel Study (KLIPS) data set, a nationally representative longitudinal annual survey. Since 1998, The Korea Labor Institute, a government-funded research organization, has been compiling a wealth of information on income, education, employment, and demographic characteristics of urban Korean households and their members.

According to a recent Korean housing market study (Chun, 2019), housing prices, started to increase significantly in 2014, and the rising trend stayed constant until 2019. Therefore, to control for the housing market cycle and its influence, especially on the

subjective affordability measure[1], we chose the study period from 2015 to 2020.[2] Our sample includes private renters only. In longitudinal surveys, the difficulty in following up with respondents over time poses a potential for attrition bias if participants who drop out of the study systematically differ from those who remain. Thus, to prevent possible bias, we opted to use the balanced sample in the main analysis.[3] Given that rental unaffordability is more challenging to low-income households, the main policy target groups, (Park and Seo, 2020), we also created a subgroup that is in the bottom 40% of the household income distribution (3,462 observations) and compare the results to the full sample (5,814 observations) (for the justification of using a 30/40 rule, see Baker *et al*., 2015; Bentley *et al.,* 2011).

Using the KLIPS data has a couple of key advantages for this study. Because it is longitudinal, it enables us to mitigate the influence of different attitudes towards perception and assessment of affordability by using the within-household variations. Also, the data set contains both a subjective affordability indicator and information that allows for the construction of two objective affordability indicators (i.e., rent-to-income ratio and residual income). Yet it is a limitation of using the KLIPS that measuring perceived housing cost burden should only be based on a single-item measure[4] (i.e., whether or not the respondent feels housing cost burden).

[1] As Sunega and Lux (2016) mention, for example, a larger share of households may report that they feel housing cost burden when the housing expenses increase nationally over time regardless of their actual housing cost ratio. Exposure of households to multiple business cycles increases the likelihood of divergent responses and varying impacts. As a result, the cumulative observation of biases in household responses, as proposed by Sunega and Lux (2016), becomes more plausible. Confining the study period to a single business cycle provides the advantage of effectively managing or mitigating the diverse impacts associate with different cycles.

[2] The KLIPS contains the information compiled a year before it is released (e.g., 2015 KLIPS data set shows 2014 information).

[3] The results with unbalanced panel are also tested and included in the supplemental file.

[4] The specific question in the KLIPS is: "Respond to all of the items that impose a burden on your household."

Variables

Dependent variables

Our outcome of interest measures whether the objective and subjective rental affordability indicators match. We formulated two alternative dependent variables using the rent-to-income ratio and residual income approach, each of which consists of three categories. For the first dependent variable, we use the *ratio* of the monthly rent to reported monthly household income. Following the previous housing affordability studies (Baker *et al*., 2020; McConnell, 2013), if the ratio is equal to or higher than 30%, it is coded as 1 (unaffordable), and 0 otherwise. Next, the objective indicator is compared with the subjective indicator to see if the two indicators are aligned. For the subjective indicator, we use a self-reported assessment on the housing cost burden. As a result, a three-category dependent variable is created: households that are cost-burdened when measured using the objective indicator yet are not subjectively cost-burdened (coded as 2); households that are not cost-burdened based on the objective indicator but subjectively cost-burdened (coded as 1); households that show matching indicators, serving as a reference group in our multinomial logistic regressions (coded as 0).

The formulation of the second dependent variable follows the same logic but uses the *residual income* approach. Households whose residual income after paying monthly rent is below the minimum income level necessary to afford other non-housing expenses[5]

[5] In accordance with the previous studies (Oh and Oh, 2018), the minimum levels of income for non-housing expenses by household size are calculated using the following formula: Median Income ×0.6 ×0.833. One-sixth of the median income level is the minimum cost of living set by guidelines on personal financial workout cases, and the share of non-housing needs (i.e., 83.3%) is based on Ministry of Health and Welfare (2017).

are considered cost burdened and coded as 1 and 0 otherwise. Then the objective indicator is compared with the subjective measure. Again, as a result, three categories are created.

Independent variables

A central independent variable for the analysis is residential satisfaction. The residential satisfaction question in the KLIPS offers a series of statements that respondents may choose from on a 5-point Likert scale (from very satisfied (1) to very dissatisfied (5)). For the sake of a more intuitive interpretation, we reversed the scale so that a higher value corresponds to a higher level of residential satisfaction.

We also included several household and housing attributes, and the geography variable in the analyses, following the lead of the previous studies on rent burden (Colburn and Allen, 2018; Samarin and Sharma, 2021; Seo *et al.,* 2022). As for the household attributes, age, education, annual income, number of children, and number of household members are included. The age and education information are obtained from the head of household as in the literature (Moore and Skaburskis, 2004; Meltzer and Schwartz, 2016). When the head of the household possesses a diploma that is higher than high school, the education variable is equal to 1 and 0 otherwise. The reported annual income is log-transformed to address the skewness of income.

Apartment, housing size, and *Jeonse* variables are included to measure the effects of housing attributes. Apartments are coded as 1 and other types are coded as 0. Housing size is a continuous variable, and when households use *Jeonse*[6] it is equal to 1 and 0 otherwise. Lastly, we dummy-coded the Seoul metropolitan area (i.e., Seoul, Incheon,

[6] '*Jeonse'* is generally regarded as a more affordable tenure choice than monthly rentals in Korea because tenants pay no monthly rent during the tenancy and can have the lump sum deposit back upon the contract termination.

and Gyeonggi province) as 1 and 0 otherwise to reflect the regional heterogeneity and different level of market activity.

Table 2 presents summary statistics of the variables. The dependent variables show similarities in mean levels and standard deviations. On average, approximately 42% hold higher than a high school diploma, and the average age is about 53. 62% of the respondents live in Seoul metropolitan region, while nearly half of the households live in *Jeonse*. The average residential satisfaction score is moderate, 3.2 on a scale of 5.

[Table 2 here]

Empirical Analysis and Results

The first primary goal of the analysis is to explore whether and to what extent the objective and subjective rental affordability indicators match. Figure 1 shows the relationships between the measures, in which the X-axis represents the rent-to-income ratio and the Y-axis shows residual income. Households that perceive cost burden are represented by blue cross-shaped marks. The plot (Panel a) for the entire household presents a much longer tail than for the bottom 40% income group (Panel b), apparently due to the income gaps between the two groups.

The data highlights that neither objective indicator appears to be well aligned with perceived cost burden: 40.2% (50.8%) of the entire (bottom 40% income group) households do not have matching indicators when measured with rent-to-income and the subjective indicator, whereas 41.3% (49.8%) of the households (bottom 40% income group) are not aligned when measured with residual income and the subjective indicator. Both groups with and without 'perceived rental burden' are almost evenly distributed along the X- and Y-axis in the full sample and subsample (bottom 40%). It means that a

considerable number of households feel rental cost burden although they pay below the normative thresholds of affordability, or perceive no burden although they pay more than the thresholds.

[Figure 1 here]

What factors, then, contribute to the discrepancy between objective and subjective rental affordability? We used panel multinomial logistic regressions with fixed effects to study the question. The specification adopted is as follows:

$$Discrepancy\ between\ the\ objective\ and\ subjective\ measures_{it} = \beta_0 + \beta_1(Household\ attributes_{it}) + \beta_2(Housing\ attributes_{it}) + \beta_3(Geography_{it}) + v_i + v_t + \mu_{it}$$

where i denotes a household, and t is a year. The dependent variable is one of the above-explained three categories for household i in year t and the base category is *both objective and subjective indicators are either 0 or 1*. $Household\ attributes_{it}$ is a matrix of age, education, log-transformed annual income, number of children and household members, and residential satisfaction. $Housing\ attributes_{it}$ is a matrix of residential type, tenure, and housing size. $Geography_{it}$ indicates whether a household lives within the Seoul metropolitan area. The model also includes households (v_i) and time-fixed effects (v_t). The household fixed effects allow us to control for the inherent and unobserved fixed attitudes towards perception and assessment of affordability. Not accounting for such an arguably time-invariant factor may be subject to the omission of

393 a critical component and estimation bias. The year fixed effects control for shocks in the
394 housing market that occurred in that specific year. Lastly, μ_{it} denotes the idiosyncratic
395 error.

396 To begin with, we analyzed the relationship between each affordability measure
397 and residential satisfaction in order to explore potential mechanisms that contribute to the
398 discrepancy between objective and subjective affordability measures. The results (Table
399 A1 in the supplemental file) demonstrate that households with higher levels of residential
400 satisfaction are less likely to feel cost-burdened, whereas the two objective affordability
401 measures and residential satisfaction show no such association.[7] The finding does not
402 establish a causal relationship. However, it is consistent with our hypothesis regarding
403 the possible mechanism contributing to the discrepancy, suggesting that residential
404 satisfaction may influence the perceived rent burden, not the objectively measured
405 affordable level.[8] Additionally, it provides further support to the studies conducted by
406 Varady (1980, 1983) and Elsinga and Hoekstra (2004).

407 Next, we proceeded to the analysis aimed at revealing the determinants underlying
408 the observed discrepancy. Regression results are presented in Table 3 in which we include
409 odds ratios obtained by regressing the first dependent variable on the explanatory
410 variables. The results reveal that when *residential satisfaction* increases by 1 unit,
411 households are 0.748 times less likely to be in an *objectively affordable but subjectively*
412 *unaffordable* state (hereafter dissonance), compared to the basic state of having two
413 matching affordability indicators. On the flip side, households with higher residential

[7] The relative decomposition of the observations based both on subjective affordability and the levels of residential satisfaction in Figure A in the supplemental file also shows that the share of households who perceive themselves as cost-burdened decreases as residential satisfaction increases.
[8] Following a reviewer's suggestion, we additionally assessed the linearity of the relationship between residential satisfaction and subjective affordability using the Box-Tidwell test. The analysis does not reject the null hypothesis that residential satisfaction is a linear term (p-value=0.178).

satisfaction are more likely to feel that they are not cost-burdened (or less likely to feel cost-burdened) even when their rent-to-income ratio is above 30% as seen in column 3 (hereafter adaptation). Although the *residential satisfaction* coefficient in column 3 is not statistically significant, when the coefficients are taken together, it implies that even if rent-to-income ratio exceeds the widely accepted threshold of the housing cost burden, the households do not necessarily perceive that they are paying more than they should. Households may regard the seemingly high rent level as appropriate for their residential environments.

[Table 3 here]

The income variable shows positive effects on the probability of being in the dissonance group. It may be due to dissonance between what they expect and the actual quality of the house: The current residential environments may not measure up to their expectations which are heightened as income rises, or their housing becomes more objectively affordable in relation to their increased financial capacity. Alternatively, a more likely scenario is a combination of these two.

Households in *Jeonse* and those with larger household sizes are less likely to fall into a state of dissonance. Also, having a higher number of children tends to put more pressure on the cost burden.

As expected, the explanatory variables in column 3 in Table 3 that compare *objectively unaffordable but subjectively affordable* (hereafter adaptation) to the base category of matching two affordability indicators show opposite effects. *Apartment* and

437 *Jeonse* variables increase the probability of being in the adaptation group while *income*
438 decreases the probability.

439 Next, columns 4 and 5 in Table 3 present the results with an alternative dependent
440 variable based on the residual income approach. For a few variables, the magnitudes and
441 significance of the coefficients show a slight change; however, key findings and signs of
442 the coefficients are not reversed.[9] For instance, *residential satisfaction*, again, decreases
443 the odds of being in a state of dissonance. In contrast, the more satisfied households are
444 with their residential environments, the more likely they are to be in the adaptation group,
445 though the effect does not achieve significance.

446 Then, we ran the same multinomial logistic regressions for the bottom 40%
447 income group to see if possible varying effects emerge. The conclusions are largely
448 unaffected for both dependent variables. In column 2 of Table 4, which uses the rent-to-
449 income ratio for the objective indicator, *residential satisfaction,* once again, has
450 mitigating effects on being in the dissonance group whereas the variable has a positive
451 but insignificant effect on the probability of being in the adaptation group. Again, *income*
452 and *Jeonse* variables significantly contribute to the model along with *age.* But the
453 magnitudes of the coefficients are more modest relative to the model for the entire sample
454 in Table 3. The effect of income, in particular, is now much weaker, as the income level
455 is constrained to the bottom 40%.

456 [Table 4 here]

[9] Since the rent-to-income ratio is computed without considering household size and their varying preferences, it can hardly identify households paying more than 30% of their income for rent due to their deliberate choice. In contrast, the residual income approach considers household size, (though the preferences are not taken into account) and identifies households with insufficient income left for non-housing expenses for their family after paying rent (housing-induced poverty). Hence, the residual income approach is more sensitive to differences in household composition and income, compared to rent-to-income ratio (Stone, 2006). We think that this is why the effects of income and household size are generally more pronounced in Table 3 and 4.

457

458 The models estimated based on the residual income approach show similar results.
459 In columns 4 and 5 of Table 4, *residential satisfaction, log annual income,* and *Jeonse*
460 continue to have significant effects on both dependent variable categories and the *number*
461 *of household members* becomes a significant effect as well.

462

463 **Additional analyses**

464 To ensure that the main results are robust, we carried out several additional analyses. First,
465 we estimated the regressions without removing observations that have missing data over
466 time to show that our results are robust to an unbalanced panel of households. Table B.1
467 and B.2 in the supplemental file confirm the findings. The variables with significant
468 effects in the main models remain unchanged. Also, the *Seoul metro area* and *housing*
469 *size* now indicate significant effects, especially for the entire income group model. That
470 is, living in Seoul metropolitan area raises the likelihood of being in the state of adaptation
471 while *housing size* shows significant effects on both categories. The results for the bottom
472 40% income group are also likewise comparable, with slightly less significant *Seoul*
473 *metro area* and *housing size.* Other variables including *residential satisfaction, Jeonse,*
474 and *log annual income* show the same significant effects identified in the main results.

475 Second, there may be concerns regarding the possibility of reverse causality.
476 Contrary to our hypothesis, it is plausible that people's perception on affordability may
477 exert a significant influence on the overall level of residential satisfaction. To address this
478 potential issue of reverse causality, we regressed residential satisfaction on the 1-year
479 lagged dependent variables and reported the results in Table C in the supplemental file.
480 The outcomes of this analysis indicate that the lagged dependent variables have no

significant impact on residential satisfaction, suggesting that the observed results are unlikely to be driven by reverse causality.

Third, as part of our sensitivity analysis, we additionally assessed whether the findings are robust to other rent-to-income ratio thresholds. The results are consistent when using 25% and 35%, instead of 30%, as a threshold (see Tables D.1 and D.2 in the supplemental file). Finally, we demonstrated that our results are robust to excluding observations with the extreme values of the dependent variables as shown in Figure 1, with a meagre change in significance and the magnitudes of the coefficients in Table E in the supplemental file.

Discussion

The current paper reaffirmed that objective rental affordability, whether measured based on a ratio approach or a residual income approach, is significantly incongruent with subjectively measured affordability, as identified by Heylen (2021) and Sunega and Lux (2016) elsewhere. This finding serves as a clear indication that subjective rental affordability is influenced by factors beyond the mere interaction of rent and income (and household size). As a result, it provides valuable additional information that enhances our understanding of housing affordability dynamics. As argued by Sunega and Lux (2016) and Bramley (2012), subjective affordability might be indicative of what the current housing cost means to various types of households and residents' sentiments towards the housing market and their likely future housing decisions.

The salient difference between objective and subjective rental affordability represents the gap between policymakers' and tenants' perspectives in interpreting housing affordability. However, the majority of current policies addressing housing

affordability have adopted normative measurements to measure affordability (Hilber and Schöni, 2016)). Moreover, prior research has up until now relied heavily on the use of objective indicators, primarily the 30% rent-to-income threshold, to examine the adverse effects of housing cost burden, (for example, Acolin and Reina, 2022; Baker *et al*., 2020; Bentley *et al*., 2016; Meltzer and Schwartz, 2016). This conventional approach is unlikely to capture households belonging to the 'dissonance' group who experience distinct types of housing cost issues and thus may neglect the concurrent effects of subjective rental affordability on our overall well-being.

A particularly intriguing finding of this study was the identification of residential satisfaction as one of the significant determinants of the disparity between objective and subjective affordability. Notably, this effect was observed exclusively among the 'dissonance' group. In other words, when residential satisfaction is lower, there is a higher probability that a household with affordable rent perceives burden from housing cost, whereas higher levels of residential satisfaction decrease the likelihood of belonging to the 'dissonance' group. Theoretically, this finding adds to the existing 'quality-based' affordability approach in the housing affordability scholarship (for example, Lerman and Reeder, 1987; Thalmann, 1999, 2003) by engaging with residential satisfaction by which the 'quality' of housing is defined by residents, not by policymakers or researchers. It also contributes to the existing literature by shedding light on the previously unexplained emergence of the 'dissonance' group within the context of the adaptation theory (Diener and Ucas, 1999; Noll, 2013) or cognitive dissonance theory (Festinger, 1957; Jansen, 2014). In the event of low residential satisfaction, it is likely for individuals to re-evaluate their initially perceived affordable rent and experience a sense of burden related to rental costs. Given the nature of residential satisfaction as a post-occupancy evaluation (Jiboye,

529 2012), this causal inference seems valid on the ground of the assumption that subjective
530 rental affordability is formed over a certain period of time after they occupy the dwelling.
531 This assumption seems to require further investigation in future research.

532 The consistent pattern observed within both the lowest 40% of income distribution
533 and the entire sample serves as a clear indication that residential satisfaction holds
534 significance to the dissonance group, regardless of residents' economic status. However,
535 our analysis revealed that households with higher income demonstrate a greater likelihood
536 of belonging to the dissonance group while displaying a lower likelihood of being in the
537 adaptation group. Although prior research suggests that higher income groups tend to be
538 generally satisfied with their housing due to their capacity to afford the adequate quality
539 of housing (Frank and Enkawa, 2009; Lu, 1999), it is worth noting that income and
540 residential satisfaction were found to have opposite effects on the objective-subjective
541 rental affordability mismatch in our study. Drawing upon the 'aspiration-gap' perspective
542 (Galster, 1987) and the adaptation perspective (Jansen, 2014; Noll, 2013), this result can
543 be interpreted as indicating that individuals with more financial capacity tend to have
544 higher expectations for housing. Consequently, even if both higher- and lower-income
545 households demonstrate the same level of residential satisfaction, those with more
546 financial resources may experience a more pronounced rent burden.

547 Another implication apart from residential satisfaction pertains to the tenure status
548 within the private rental housing market. Renters in Korea prefer to live in *Jeonse* rental
549 housing over monthly rentals due to the absence of additional rent charges during the
550 lease period and the convenience of utilizing the lump sum deposit for future home
551 purchases. Therefore, *Jeonse* renters tend to perceive their rent as affordable, despite the
552 requirement of a substantial upfront deposit payment (placing them in the adaptation

group). On the other hand, monthly renters are more prone to experiencing rent burden, even if their housing cost represents less than 30% of their income.

Lastly, it should also be noted that the influence of residential satisfaction on the disparity between objective and subjective rental affordability primarily stems from subjective rental affordability rather than objective affordability. This result is well-aligned with the literature suggesting that residential satisfaction is more closely related to the subjective aspects of housing than to objective ones since different residents may perceive the same objective conditions in different ways (Jansen, 2014; Marcuse, 1971). It also adds significant knowledge to the scant literature with mixed views on the linkage between housing affordability and residential satisfaction (see Elsinga and Hoekstra, 2005; Pagliari and Webb, 1996; Lim, 2016; Varady, 1980, 1983, 2001), in that it corroborates the proposition that residential satisfaction affects residents' assessment of the appropriateness of their housing cost (i.e., whether their house is worth the rent) and in turn influences the incongruence between objective and subjective rental affordability.

The lack of significant effect of residential satisfaction on objective rental affordability may be attributed to the fact that renters in Korea usually make a two-year tenancy agreement, which limits their ability to promptly relocate to alternative housing options in order to reduce their rent, even if they perceive it as excessively high. However, it is not our intention to completely refute the possibility that rental affordability affects residential satisfaction (for example, Balestra and Sultan, 2013). Instead, our findings compellingly affirm that residential satisfaction can be regarded as a determinant of subjective rental affordability, an aspect that has not been adequately substantiated to date.

Conclusions

Objective measurements present a different picture of housing affordability situations from what residents' perception of their housing cost draws. Although discussing the integration of objective and subjective indicators to comprehensively capture housing affordability falls beyond the scope of this study, this article offers valuable insights into interpreting the gap between these two measurements through the lens of residential satisfaction. While we argue that enhancing residential satisfaction is conducive to subjective rental affordability, it is inherently difficult to formulate simple strategies for enhancing residential satisfaction given its subjective nature (Galster and Hesser, 1981). Residential satisfaction is heterogeneous across different households even in the same housing estate or neighborhood. We could, however, benefit from the accumulated knowledge of the determinants of residential satisfaction to build an understanding of how to alleviate the perceived rental burden through enhanced residential satisfaction (for example, Amerigo and Aragones, 1997; Amole, 2009; Balestra and Sultan, 2013; Boschman, 2018; Fang, 2006; Galster, 1987; Jansen, 2014; Riazi and Emami, 2018; Vera-Toscano and Ateca-Amestoy, 2008).

The study is limited by the fact that it only investigated private renters, and it is possible that the relationship between objective and subjective housing affordability and residential satisfaction might be different when homeowners and public renters are concerned. It is also important to note that there may exist significant factors beyond the scope of residential satisfaction that yield influence over both objective and subjective rental affordability. Regrettably, these factors were not accounted for in our models due to the limitations of the dataset. Consequently, this article advocates for additional empirical research aimed at identifying the relevant measurements, determinants, and impacts of subjective housing affordability, particularly in relation to residential

satisfaction. Such research can be vital in informing the efficient allocation of public resources to tackle housing affordability problems.

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Table 1. Relationship between objective and subjective rental affordability

Objective rental affordability	Subjective rental affordability	
	Affordable	*Unaffordable*
Affordable	Less policy concern	Dissonance ('Satisfaction dilemma')
Unaffordable	Adaptation ('Satisfaction paradox')	Major policy target

Source: Authors, adjusted from Noll (2013).

Table 2. Summary statistics

Variable	Obs	Mean	Std. dev.	Min	Max
Dependent variable 1 (rent-to-income)	5,814	0.52	0.69	0.00	2.00
Dependent variable 2 (residual income)	5,814	0.59	0.78	0.00	2.00
Age	5,814	53.02	14.67	20.00	96.00
Education	5,814	0.42	0.49	0.00	1.00
Marriage	5,814	0.21	0.41	0.00	1.00
Log annual income	5,814	7.91	0.85	1.61	11.14
Seoul metro area	5,814	0.62	0.48	0.00	1.00
Number of kids	5,814	0.36	0.71	0.00	4.00
Number of household members	5,814	2.36	1.28	1.00	7.00
Apartment	5,814	0.42	0.49	0.00	1.00
Housing size	5,814	19.16	9.28	1.00	300.00
Jeonse	5,814	0.48	0.50	0.00	1.00
Residential satisfaction	5,814	3.23	0.63	1.00	5.00

Notes: Data come from Korean Labor and Income Panel Study and covers the years 2015 to 2020; Housing size is measured with Pyeong which is equivalent to 3.3 square meter; Survey weights are applied

Table 3. Regression results for the entire observations with balanced panel data, 2015-2020

	Dependent variable is calculated using rent-to-income ratio		Dependent variable is calculated using residual income	
	Obj. affordable & sub. unaffordable	*Obj. unaffordable & sub. affordable*	*Obj. affordable & sub. unaffordable*	*Obj. unaffordable & sub. affordable*
	Odds ratio	Odds ratio	Odds ratio	Odds ratio
Residential satisfaction	0.748***	1.168	0.793***	1.051
	(0.055)	(0.144)	(0.068)	(0.101)
Age	0.956	0.995	1.001	1.042
	(0.030)	(0.029)	(0.035)	(0.029)
Education	0.682	0.836	0.672	2.988
	(0.532)	(0.784)	(0.537)	(3.021)
Log annual income	2.349***	0.106***	5.521***	0.123***
	(0.258)	(0.020)	(0.810)	(0.018)
Seoul Metro Area	0.969	3.207	0.787	1.169
	(0.506)	(2.389)	(0.469)	(0.869)
Number of kids	1.373**	0.828	1.178	0.971
	(0.221)	(0.212)	(0.215)	(0.190)
Number of household members	0.691***	1.465	0.512***	1.832***
	(0.091)	(0.380)	(0.078)	(0.343)
Apartment	0.76	2.967***	0.661*	1.217
	(0.154)	(1.011)	(0.156)	(0.318)
Housing size	0.996	1.036	1.000	1.001
	(0.006)	(0.023)	(0.006)	(0.017)
Jeonse	0.162***	3.274***	0.114***	2.844***
	(0.027)	(0.901)	(0.022)	(0.631)
Household fixed effects	Yes			
Year fixed effects	Yes			
Observations	5,245		5,411	
Likelihood Ratio Chi^2	626.995***		847.893***	

Notes: Numbers in parentheses show standard errors; ***p<0.01, **p<0.05, *p<0.1; The reference category is both objective and subjective indicators are either 0 or 1.

Table 4. Regression results for the bottom 40% income group with balanced panel data, 2015-2020

	Dependent variable is calculated using rent-to-income ratio		Dependent variable is calculated using residual income	
	Obj. affordable & sub. unaffordable	*Obj. unaffordable & sub. affordable*	*Obj. affordable & sub. unaffordable*	*Obj. unaffordable & sub. affordable*
	Odds ratio	Odds ratio	Odds ratio	Odds ratio
Residential satisfaction	0.752***	1.006	0.655**	1.063
	(0.080)	(0.147)	(0.114)	(0.117)
Age	0.934*	1.009	1.061	1.032
	(0.038)	(0.035)	(0.061)	(0.031)
Education	0.742	0.513	0.257	2.542
	(0.795)	(0.550)	(0.395)	(3.021)
Log annual income	1.001***	0.998***	1.002***	0.999***
	(0.000)	(0.000)	(0.000)	(0.000)
Seoul Metro Area	1.751	2.022	3.026	0.836
	(1.502)	(2.137)	(4.112)	(0.862)
Number of kids	1.415	1.169	2.336	0.809
	(0.454)	(0.506)	(2.276)	(0.254)
Number of household members	0.774	1.811	0.173***	2.743***
	(0.183)	(0.679)	(0.085)	(0.682)
Apartment	1.157	1.546	1.128	0.891
	(0.354)	(0.695)	(0.544)	(0.290)
Housing size	0.971	1.020	0.976	1.011
	(0.022)	(0.038)	(0.033)	(0.024)
Jeonse	0.32***	2.274**	0.190***	3.853***
	(0.079)	(0.791)	(0.071)	(1.063)
Household fixed effects	Yes			
Year fixed effects	Yes			
Observations	2,530		2,581	
Likelihood Ratio Chi^2	268.815***		453.287***	

Notes: Numbers in parentheses show standard errors; ***p<0.01, **p<0.05, *p<0.1; The reference category is both objective and subjective indicators are either 0 or 1.