Hybrid Working and Residential Location Preferences as a result of Post-Pandemic Paradigm Shifts: Insights from a Discrete Choice Experiment

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Abstract

The COVID-19 pandemic disrupted nearly all aspects of our lives, including lifestyle, commuting and working. In this paper an investigation into consumers preferences for residential location choice alongside changing working patterns following COVID-19 was conducted. Employing a discrete choice experiment (DCE), we quantify the impact the pandemic has had through willingness to pay estimates obtained for attributes within the workplace and residential location consumption bundle. This data was analysed using both a McFadden Choice Model and a Mixed Logit Model. The study found that the public placed the most value on hybrid working and positively valued garden space. However, commuting time still provided disutility.

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1 Introduction

1.1 Background and Context

Two of the most fundamental decisions we make as humans are where we choose to work and live. The outbreak of the COVID-19 pandemic has resulted in many wider social impacts, a key observation of the pandemic is changes in residential and working preferences. Government restrictions and the fear of contagion reduced mobility and social contact. In response to the pandemic, people made radical changes to the way they worked and lived. These changes included working from home, online shopping, more time spent at home and in private gardens as well as minimal commuting. These changes severely affected the housing market, with potential long-lasting adapted preferences.

In the UK, there is evidence that people have an increased desire for space and lifestyle change which has been a dominating factor in the UK housing market since it exploded out of lockdown. The term used to describe this was “race for space” (Osborne, 2021). “Estate agents reported greater demand for large homes outside cities, as people working from home sought more space and placed less importance on living near to the office” (Osborne, 2021). This provides the basis of “a once-in-a-lifetime opportunity to revaluate people’s needs, and in turn housing preferences” as stated by strategic economist, Nitesh Patel (2021). However, alongside the “race for space” in the housing market, there is a lot of reluctance to return to work which stems from a commuting aspect. According to a study by transport management specialist Kura, 60 percent of workers across the UK hold real concerns about commuting (Kura, 2021). Commuting can be expensive, stressful, crowded and polluting. However, others express it may also act as a positive by being the circuit breaker differentiating home life from work life. A study by Redmond and Mokhtarian (2001) found that people disliked any

commute longer than 35 minutes. Therefore, in this study, people will have to make trade-offs between accessibility and space when evaluating residential location choices in a post-COVID-19 world with changes in working patterns. The housing market provides a useful and interesting setting to understand whether preferences observed during the pandemic have persisted.

Post pandemic, new data from Microsoft's 2022 Work Trends Index (Newman, 2022), highlights that the focus for people is being shifted to what is important. The report illustrates that 53% of employees will prioritise health and well-being over work and 47% will put family and personal life first. These shifts in perspective have had major impacts on working patterns, time spent commuting and residential preferences.

Therefore, alongside the vast amount of statistics for changing preferences, there is a growing need for research into the post-pandemic world. To ensure that these preferences are understood, research needs to be done to effectively break down these preferences into actionable insights that can be used by employers, businesses and local communities looking to interpret residential preferences.

1.2 Research Focus and Objectives

This study aims to explore residential preferences in a new, post-pandemic world through exploring and understanding the factors behind individuals' choices and linking these findings to recent reports and studies. The study utilises a discrete choice approach to determine the relative preference that people have for different location and workplace characteristics, specifically the relative pull of landscape and working pattern attributes compared with distance considerations. This is done through a hypothetical new scenario where participants

have the option to change their current residential situation, where internal housing characteristics will be kept constant for simplicity and focus will be placed on the location and working patterns present in a residential location. Therefore, people choosing to live further out of cities in peri-urban (town) and rural (village) locations must decide between attractions present in these landscapes and practical considerations which include distance to entertainment, schooling, surgeries and workplace. Alongside this, individuals also have a choice of working patterns which can be used as a trade-off for distance to their workplace.

The purpose of this study is to gain an understanding of what people are willing to pay for location-based residential attributes alongside a hybrid working model with differing commute times. The study will enable participants to consider a bundle of housing attributes associated with various residential locations. To achieve this, quantitative data will be collected on preferences and quantitative data will be calculated on respondents' willingness to pay for specific housing attributes that may have shifted post covid. This data will be gathered and analysed utilising methods to eliminate as many biases as possible. The scenario setting forms a part of avoiding some bias and is discussed further in the methodology in section 3, which also provides detail on the simple yet effective data collection method to ensure the accuracy of results. The final evaluation will be illustrated through in-depth results analysis providing implications for future studies, policy, government and business.

1.3 Importance of the Study

The radical change in ways of living and working brought on by the pandemic has had a knock-on effect on how people and companies are looking at the future. It is now easier than ever before to work and live in different areas which also has implications for local communities.

According to Microsoft's 2022 Work Trends Index, this paradigm shift of hybrid working patterns is here to stay. Leaders and businesses have opportunities to reimagine ways of working in a digital-first world. Employers may need to consider adapting working policy to include hybrid working and local communities and businesses may need to consider the importance of co-working spaces to attract residents and customers.

Through understanding preferences toward commuting to workplaces, working patterns and residential preferences, there may also be growing opportunities for rejuvenating local economies too. As more businesses shift to a hybrid working model, employees split their weeks between home working, in-office work and time spent in coworking space. A recent report from IWG and Arup found that the benefits of hybrid working are "four-fold: job creation, transfer of white-collar work to less densely populated areas, regeneration of local high streets through increased footfall and spending, and an increase in productivity for businesses using the centres" (IWG, 2021). This creates an opportunity for residential areas, buildings and businesses to offer everything locals may need for this new way of professional life as workers will spend more time in local areas. "The true enemy of many is the daily grind of commuting. That's what people want to avoid as people have appreciated more time at home, or closer to home during the pandemic. It's been extremely valued" explained IWG CEO Mark Dixon in an interview with Bloomberg Technology (IWG, 2021). All of this growth could lead the way for the 15-minute city planning concept where everything needed by residents could be reached within 15 minutes (IWG, 2021). The Welsh government has supported this, saying it wanted to explore the development of community-based working spaces within a short distance of residential homes. The UK government's High Streets Task

Force also expresses that flexible workplaces are vital for a multifunctional town centre post-pandemic.

Therefore, both localities and employers will potentially have to adapt to changing working patterns to attract workers. This may provide a basis for opportunities for localities usually viewed as unattractive peripheries, provided that both social and ecological issues are considered (The Remote Lab, 2021).

1.4 Overview of the Structure

Section 1 provides background for the study, illustrating the focus, main aims and importance. The literature review in section 2 discusses studies that have been done including existing residential location choice models alongside residential studies with joint workplace and commuting models. The literature also covers other methods, such as the hedonic pricing method, which can be used to value residential homes/areas. In section 3, the methodology for the study is laid out including the design of the survey, properties for attributes and criteria to ensure accuracy. The issue of residential preferences alongside hybrid working patterns is then examined in section 4, through the presentation and discussion of results from the discrete choice experiment completed by a sample of people living in the UK. In section 5, an evaluation and analysis of participants' answers was conducted. Finally, the conclusion summarises the results and provides relevant recommendations for businesses, local communities and government.

2 Literature Review

2.1 Definition

The selling and buying of houses either to live in or as an investment is referred to as the housing market (Bank of England, 2020). A house is a special commodity for several reasons.

It is spatially immobile meaning location is a key attribute of housing and forms a component of the housing bundle. Secondly, housing isn't a single commodity but rather a bundle of commodities such as accessibility to desired destinations, local public services, lot features, environment, costs of living and return to capital accumulation. It is a combination of these attributes that drive most residential location decisions (Turnbull, 1992). Differences among these attributes impact the decisions people make and result in a wide set of degrees of substitutability among residences.

2.2 Determinants of The Residential Location Decision

Most people's most valuable asset is their home and choosing a place to live is dependent on individual income and utility according to economic theory (G.Irwin, 2001). Housing provides an important role in the economy as it determines the supply and location of an integral resource: people. Therefore, residential location choice is a topic studied frequently. People want to buy a residential consumption bundle that maximises utility and in turn, well-being. In terms of income, housing tends to be more expensive in cities and lower in the outskirts. The costs also increase according to the intrinsic features of the property. Proximity to workplaces and to other services also affect income, because of the costs to access them (Biancamaria Torquati, 2020). Therefore, people's decisions are influenced by accessibility, space and environmental factors.

Traditionally, job accessibility in terms of commuting distance has been integral in understanding residential location choices (Van Ommeren, 2000). Therefore, accessibility is of interest in both residential and workplace choices (P. Waddell, 2007). The literature illustrates two viewpoints of housing and workplace location either "jointly" or "sequentially". "Jointly" means both are simultaneously chosen. "Sequentially" means one choice is

influenced by the other (Pandya, 2017). Ignacio Inoa (2015) conducted a study using a joint residential location, workplace and job type choice model which utilised a three-level nested logit model to predict location and workplace choice. Results illustrate that the individual-specific accessibility is an important determinant of the residential location choice, and this differs over respondent's life-cycle. Horner (2004) explains that this relationship can be understood as workers want to limit commuting and costs involved.

However, the opportunity to have a hybrid work pattern may shift this perception and thereby the residential location preferences (Mokhtarian L. P., 2004). There is an ongoing debate about the extent to which hybrid working affects the commute time people are willing to accept (Duco de Vos, 2018). In many studies hybrid working is seen as a policy instrument that can alleviate congestion and emissions (Salomon, 1985), It is argued that households have a fixed mobility budget and commuting may be substituted by leisure trips (De Graff, 2004). Duco de Vos (2018) conducted a study measuring working from home and willingness to accept a longer commute. The study used an ordinary least squares (OLS) model and found that moving from a situation of no telecommuting to telecommuting leads to 5% longer commuting and an additional 8 hours a week of home working was associated with 3.5% longer commutes. However, when using OLS models rather than choice models there is potential for bias through sorting based on residential preference and from the fact that commuting length and telecommuting are simultaneous choices. Residential choice is more naturally framed within a discrete choice experiment as a preference can be selected from discrete and heterogenous alternatives (Quigley, 1985).

In light of hybrid working and telecommuting, it can be argued that the utility arising from residential choice does not depend exclusively on the physical features or accessibility, but also on the benefits people gain from ecosystems (MEA, 2005). C.H Bullock (2011) conducted a discrete choice experiment in Ireland examining rural residential preferences. The motivation for the study was based on the counter-urbanisation observed in some countries around the world where people desired to live further out, away from cities, in rural areas with rural environments and landscapes. The study found that social and physical characteristics of the area (i.e. landscape, scenery etc.) followed by the home characteristics (i.e. bigger house, land etc.) and then to a much less extent, economic factors (i.e. prices being cheaper) (C.H Bullock, 2011). To complement the results found in this study, (Biancamaria Torquati, 2020) conducted a study utilising a Random parameter logit to analyse what effect ecosystem services (landscape, greenspace and farm shops) and urban services (accessibility to workplace, schools and surgeries) have on residential choice. The results illustrate benefits of living in areas with mostly agricultural or natural landscapes had the greatest effect on willingness-to-pay (WTP). Other literature has also shown that these landscapes contribute to well-being by improving emotional and physical state as these areas present a low-stress environment and more opportunities for physical activity (Bowler, Buyung-Ali, Knight, & Pullin, 2010), (Gascon, et al., 2016).

C.H Bullock (2011) also utilised a multinomial logit (MNL) which found that attributes with the greatest influence of choice were the garden size and work distance. Other significant attributes were views of the countryside and interior design. Higher housing prices were significant and exerted a negative influence. When effects codes were substituted with other values (i.e. currency and minutes) for price and distance, the fit of the model was slightly

improved, but there is some loss of interpretation. This resulted in another set of outputs which provided an improved log-likelihood. The results indicated a slight preference for a village. The garden attribute again had the greatest effect on choice and distance to work and social facilities were also influential factors. The study also found that the current property of the respondent exerts an influence on choice preferences.

The vast majority of literature covers intrinsic internal housing characteristics, green space and accessibility. However, there is a gap in the literature for shifts in working patterns from everyday workplace commuting to hybrid working patterns and literature aimed at analysing preferences post-pandemic. The importance for this has become more relevant after the pandemic as many businesses shift to hybrid working policies, resulting in potential adaptation to residential preferences.

2.3 Comparison of Hedonic and Discrete Choice Approaches

To value attributes, studies typically follow one of two approaches. Either, Hedonic pricing (HP) models of housing prices and wages (G.C Blomquist, 1988), (Roback, 1982), (D Albouy, 2016) or discrete choice experiments (DCE) of location choice (J.H Kim, 2005), (Kahn, 1997), (Paramita Sinha M. L., 2018), (C.H Bullock, 2011). The HP approach infers WTP by estimating for amenities, hedonic price functions for housing costs and wages as a function of attributes specific for location. Whereas, DCEs estimate the probability that people decide where to reside as a function of wages, housing prices, and attributes specific to location (Paramita Sinha M. C., 2021).

Many studies use HP to examine housing location preferences. (John R. Ottensmann, 2008) compared different residential factors such as distance to CBD and workplace, schooling,

effective tax rates as well as demographic data and median income to the intrinsic characteristics of the property. A semi-log model was used to reduce heteroskedasticity problems affecting the calculated price variable. The study found "measures of location were statistically significant predictors of sales price in the hedonic model". However, location measures created small increases in the R^2 value. Thus the main factors that determined the value of a property were mainly the physical characteristics of the property opposed to the location of the property in relation to the CBD and employment centres. Essentially, people were more willing to spend more on a property if it had more amenities such as number of rooms and size of plot. This approach assumes that a continuous function relates the price of a house to its attributes and people choose a residential location by equating the marginal utility of each of the residential attributes to its marginal price. The common criticism of DCEs (stated preference methods) is the hypothetical nature of the questions and respondent's choices in the experiment (Mitchell, 1989) whilst HP (revealed preference methods) is based off observed behaviour. However, HP analysis is dependent on control of factors behind location choices such as environmental, structural and neighbourhood factors (Freeman, 1993).

HP faces other limitations including: collinearity between explanatory variables specifically when a lot are included, which generates coefficients that have incorrect signs or implausible magnitudes and hedonic analysis of actual house purchases can't capture the influence of uncommon or unusual attributes or levels (Earnhart, 2002). Thus, residential decisions fit most effectively within a discrete choice framework as it is possible to define different housing types featuring various characteristics. Therefore, respondents are able to choose a preferred option allowing for part-worth utilities and WTP for each attribute level.

3 Methodology

3.1 The Approach

Housing is a complex commodity which consists of a bundle of attributes and there are almost limitless combinations of attributes that can be used to describe housing. Therefore, careful selection of attributes had to be undertaken. Lancaster (1996) Proposed that "*the satisfaction that consumers derive for goods could be disaggregated into the good's various attributes*" (Lancaster, 1966). To understand individuals' residential preferences in a post pandemic world, it was important to understand which preferences in the housing bundle may have adapted and what attributes would yield useful results for company policies, businesses, local communities and government.

The reasons for people's choices over where to live and work provide the basis for a discrete choice problem. In recent years, DCEs have been used in many cases to investigate residential choices. Therefore, a DCE was chosen to elicit individual preferences, allowing various attributes to be valued. As illustrated by Hoyos (2010), DCEs are created through a cyclical process which encompasses four vital steps: "definition of attributes and levels; experimental design; questionnaire development; and sampling strategy" (Hoyos, 2010) .

3.2 Survey Design

In order to conduct a DCE, a hypothetical scenario was posed to survey respondents. Participants were asked to imagine a situation where they have the choice to change the location of where they live and the new residence would be immediately inhabitable. Housing is very durable, however, modifiable in many ways and can be changed structurally. The situation posed to participants differed in terms of location, size of garden and working patterns but they were told that the internal investment and the size of the dwelling would

match that of the respondents' current home, in order to maintain simpler decision making for the respondent (Marcucci, Stathopoulos, Rotaris, & Danielis, 2011), (Roe, Irwin, & Morrow-Jones, 2004) (Rid & Profeta, 2011). Participants were also asked to assume no moving costs because changes in ownership can be extremely costly and may include a variety of costs from deciding among houses that are immobile and quite heterogenous to transactional and legal costs (G.Irwin, 2001).

The process of choosing final attributes is relatively neglected in the literature and there is little consensus on the most effective way. According to Webb et al. (2021), it is important that attributes have the following properties:

- *"Complete: Attributes should be anticipated to be of high importance to participants' decision making.*
- *Specific: Attributes must address the research project's aims and be meaningful.*
- *Realistic: Attributes must form coherent and realistic descriptions of the issue in question.*
- *Minimum Size: The number of attributes must be kept be small enough that the cognitive burden would be reasonable, and that models could be effectively estimated given the expected sample size. "*

Another important considerations when attributes were decided upon were mutually dependent and causally related attributes. Mutually dependent attributes in this study are travel time to work and flexibility to work from home. For example, a respondent working from home two days a week will influence disutility for proximity to their workplace. However, if these attributes were joined, information would be lost, introducing correlation

and excluding an attribute is problematic as the missing attribute would be subjects to assumptions, resulting in an omitted variable bias. Therefore, both attributes were included to attempt to handle mutual dependency.

The design should aim to incorporate all plausible combinations of levels and attributes. This is a full factorial design, but when more attributes and levels are included, the number of alternatives increase exponentially. A factorial design is the factorial enumeration of plausible combinations of levels for attributes – there were 6 attributes in the design with three levels, therefore the factorial would be $3^6 = 729$, which means there was 729 possible combinations of levels for the attributes. In order to decrease the number of alternatives, a fractional factorial design was utilised to eliminate main-effect correlations between attributes by using only a subset of all the possible alternatives, permitting orthogonal estimation (Jae Hong Kim, 2005). A minimum number of choice cards was calculated using the formula below:

$$Minimum\ choice\ cards = k\ \times\ (\delta - 1)$$

K represents the amount of parameters present in the model which was 6 in this experiment and δ is the amount of levels , which is 3 in this case. Therefore, the minimum was calculated to be 12. The chosen number of choice cards was 30 as it is recommended to at least double the minimum to provide accuracy in the results whilst avoiding fatigue. The design was separated into two blocks, respondents were presented with one of the two blocks dependent on whether their birthday was on an odd or even day of the month. This was to reduce fatigue of respondents and improve accuracy of the results.

By following the characteristics and considerations mentioned above, six attributes were chosen to represent the residential location bundle: price, working patterns, commuting time

to work, accessibility to entertainment and services, landscape and garden size. These are show in table 1. The alternatives (levels) for each attribute needed to be plausible and needed to incite trade-offs from respondents. This an important aspect as an improper level range creates bias estimates. As explained by Green (1990) , levels should be acceptable such that levels which are dominated at any stage are removed. This was tested in the mock question to understand levels acceptable to respondents as discussed below.

Table 1- Attributes and Levels

	Level 1	**Level 2**	**Level 3**
Price levels	80%	100%	120%
Working Pattern	1/5	3/5	5/5
Distance to Workplace	30 mins	1 hr	2 hrs
Garden	60 square meters 	120 square meters 	200 square meters 
Landscape	Village 	Town 	Urban 
Distance to entertainment and services	10 mins	20 mins	40 mins

The price level attribute, shown in table 1, utilises a pivot-style design where the reference alternative is the respondent's current house value. This approach is used as it allows for more realism and greater specificity than the standard hypothetical price approach. The pivot

design technique is derived from theories based on “economics, behavioural and cognitive psychology, case-based decision theory and minimum regret theory” (Gilboa, 2002), (Kahnemann, 1979), (Starmer, 2000). The current house prices were calculated using postcodes and number of bedrooms given by each respondent, in initial survey questions, where a comprehensive UK residential property database valued each current home based on this given information. Therefore, the price attribute could also be defined in monetary terms by utilising calculated current house prices of the respondents.

Given the importance of working pattern changes following the pandemic, a working pattern attribute was used to represent a flexible working model. The levels included were varying days spent in the office or on site. The days in the office were represented as fractions which depicted the number of days out of five would be in the office or on site (e.g. 3/5 would mean 3 out of 5 days would be spent in the office). Commuting time is one of the key determinants of residential location. Household locations and workplaces are interdependent choices. Thus, distance from workplace was included, using time spent commuting from home rather than miles or kilometres. Travelling times are more important than the distance as even though distance may be less, after taking into account traffic and congestion it may take more time to reach at the destination (Pandya, 2017) (Biancamaria Torquati, 2020) (Ignacio Inoa, 2015). The commute time levels represent average commuting times from a village, town, city into a Central Business District (CBD) or city.

The garden and landscape attributes were described using pictures to allow respondents to visualise the levels. Then garden attribute visualised the square meters of the garden using the image and the landscape attribute used the pictures to allow the users to imagine a scenic

view from a window. The landscape attribute was included to estimate the value generated by aesthetic amenity of rural versus urban areas.

The distance to commonly used urban services (distance to entertainment and services) is considered as proxy of public services. Distance to entertainment represents proximity to entertainment which includes pubs, restaurants, theatres and clubs and distance to services represents proximity to good schools and medical advice (GP Practices and surgeries). Levels for this attribute is also in minutes as services and entertainment are used often and time allows for respondents to easily interpret the attribute.

The level of utility acquired from these attributes can be evaluated using a representative formula illustrated below, where β_i is the coefficient of the *i*th attribute :

$$\text{Utility}_{\text{njt}} = \beta_1 \text{Price} + \beta_2 \text{WorkPatt} + \beta_3 \text{WorkDist} + \beta_4 \text{Garden} + \beta_5 \text{Landscape} + \beta_6 \text{EntDist} + \varepsilon_{\text{njt}}$$

It was important to ensure the combination of the attributes and levels were clear to the respondent. To ensure this clarity, a preliminary experimental orthogonal design was created. The questionnaire was then tested on a focus group to gather feedback on whether the scenario, alternatives, levels and corresponding descriptions of the attributes were meaningful and made sense. The feedback was collected through 10-minute interviews and responses illustrated that the six attributes were indeed effective and important to the participants and although respondents mentioned other attributes that could be included in a housing bundle, attributes were carefully selected to avoid complexity.

The experimental design was then optimised by means of D-efficient design utilising the Stata software. Each participant was presented with a scenario, 15 choice sets with 3 choice options each. Particularly, the third option, in each choice set, corresponds to their current situation (status quo). This was done as the number of attributes and levels that can practically be in a choice card needs to provide a balance between realistic scenarios whilst avoiding unnecessary complexity. Each alternative consisted of the same six attributes for which three specific levels were presented. The orthogonal factorial mains effects design was used to vary the levels, avoiding correlation.

	Option 1	Option 2	Status Quo
Price	120%	80%	Neither Option 1 nor 2 (Current Situation)
Working Pattern	5/5	3/5	
Distance to Workplace	1 hour	2 hours	
Garden	120 square meters	60 square meters	
Landscape	Town	Village	
Distance to Services and Entertainment	10 minutes	20 minutes	

Figure 1- Example Choice Card for the survey

The survey was distributed through Google Forms (appendix 8.1) to reach participants in an effective and user-friendly way. Participants were not selected prior to the experiment, the survey was sent out to contacts and shared on social media platforms. The entire survey comprised of an introduction, socioeconomic and demographic initial questions, hypothetical scenario, attribute descriptions with visual illustrations and the choice task. The introduction includes the importance of the survey, a description of how long it would take to complete, the minimum age requirement of 18 and confirmation that respondents' would remain anonymous. The initial questions comprised of demographic questions as well as questions to determine the respondents current situation. The scenario and attribute description, as

discussed above, set the scene for the hypothetical situation and provided clarity on the choices and alternatives respectively.

3.3 Data Analysis

Raw data collected from the survey was converted into longform data in Microsoft Excel and labelled accurately, for the data to be correctly analysed and easily interpreted by the Stata Software. Each of the attributes were handled as variables that contained various levels. Each level was also coded to estimate attribute importance. For categorical variables, model estimation measures the utility of moving from one level to another. However, it is often impossible to estimate, for each level, a separate parameter. Stata is also unable to process non-numerical values. There are various approaches to this discussed in the literature, in particular dummy coding. Therefore, landscape and working patterns were dummy coded due to the qualitative interpretation of the attributes by respondents. For working patterns, hybrid and full week working patterns were included and remote working was omitted and for landscape, village and town were included and city was omitted. Once this process was complete, the readable data was imported into Stata and analysed. The McFadden Choice Model (conditional logit) was run as it is a commonly used discrete choice model, which enables ease of estimating willingness-to-pay. A Mixed Logit Model was also run using random estimated coefficients. Running the Mixed Logit Model allows for the independence of irrelevant alternatives assumption (IIA) which is one of the key limitations of the McFadden model. The Mixed Logit has the advantage of analysing a respondents' preference heterogeneity and probability of selecting an alternative can be estimated over time rather than modelling probability of selecting single alternative.

3.4 Limitations of the Methodology

Discrete Choice Experiments (DCEs) are a commonly used method in residential choice analysis, addressing a wide range of questions. An important consideration when creating a DCE is the required sample size. In this study 202 participants, yielding 3030 choices, completed the survey. Other residential discrete choice sample sizes vary drastically, the study by Pandya (2017) had a sample of 287 and Biancamaria Torquati (2020) had 300 whereas that of C.H Bullock (2011) had 1000. Although, Pearmain D (1991) explains that any sample size greater than 100 provide a good enough basis to model preference data. The general rule of thumb proposed by Johnson (2003) and Omre (1998) suggests that the size of the sample is dependent on the number of choice tasks (t), alternatives (a) and number of analysis cells (c): $N > 500c/(t \times a)$. With this in mind, more respondents would allow for more accurate results and would eliminate the potential of bias from a small sample size.

Respondents currently enrolled in the survey helped recruit other subjects for the survey. This technique is effective, however there is little control over the sampling representativeness. Therefore, there is an uneven demographic split amongst respondents, where 116 out of 202 respondents were between 18-24 years old (57%), which creates potential for bias and skewness of results especially because many 18-24 year olds haven't experienced renting or owning a home. To identify any major issues this may have caused, models have been run for various age groups to understand the difference in responses. To avoid this uneven split, a group of participants representative of the population demographics can be selected prior to the study.

Another limitation specifically for an asset like housing is the hypothetical nature of the scenario. Although, the respondents were asked at the start of the survey to answer as if they

were making this choice in reality, and were asked to choose which of the choices would make them the happiest. The participants know that they would not be paying in reality, and given that moving homes and purchasing a home is only done very seldom in a lifetime, participants may potentially overestimate their willingness-to-pay.

3.5 The Contribution

In this paper, the aim is to contribute to literature on residential preferences by examining the factors behind peoples' residential choices. Individuals' choosing a residence in a post pandemic environment must make a choice between practical considerations (distance to workplace, schools and surgeries), physical characteristics of the area (i.e. greenspace, landscape and scenery) and garden size alongside hybrid working patterns. There is a history of studies that explore residential trade-offs, in particular between intrinsic house design and location (C.H Bullock, 2011) (Hennebury, 1998). Many studies examine trade-offs between house price and travel costs. Adair (2000) and Beckman (1973) argue that these are purchased jointly. However, an unexplored area of research is to examine preferences and housing choices post pandemic, which created a shock to the housing market, or the extent to which hybrid working patterns , physical characteristics of the area and accessibility are important factors in relocation decisions. These themes are addressed in this study and provide important input for policy, business, government and local communities enabling an evidence-informed basis for residential choice and location decision.

4 Results

4.1 Initial Survey Questions

In order to collect data from respondents, online surveys were conducted during the month of February 2022. 202 responses were collected which resulted in 3030 choices in total. The

socioeconomic, demographic and situational questions illustrate the demographic and current situation of the respondents', this is shown in figures 3 to 11.

The age and gender of the sample (202 respondents) used to estimate the choice model are illustrated and compared with the UK total population in table 2 . As illustrated in the table, the gender demographic of survey participants was closely reflective of the population gender. However, the age distribution differed more significantly to the UK's population age structure. As illustrated in table 2 and figure 3, the percentage of respondents aged 18-24 in the study was 57.4% versus the UK population proportion of 8.35% there was also a significant difference in the 54+ age category where the survey had 7.4% whereas, the UK population has 52.27% of the population in this age group. Figure 2 illustrates that there was a relatively evenly spread of respondents' current residential location in the sample, which allows for more diverse perspectives on housing location.

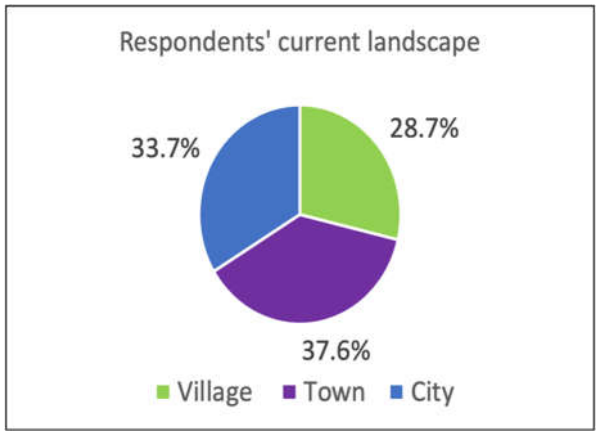

Figure 3 - Respondents'' current residential landscape

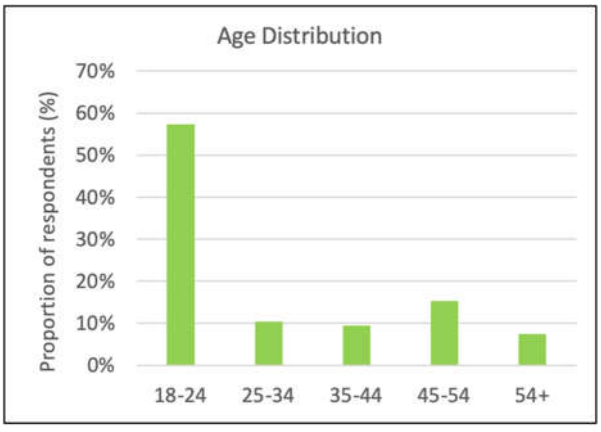

Figure 2 - Age distribution of survey participants

Table 2 - Survey demographics versus UK population demographics (Office for National Statistics, 2021)

Demographics	Survey Respondents	UK population
Gender		
Female	50.50%	50.60%
Male	49.50%	49.40%
Age Distribution		

18-24	57.40%	8.35%
25-34	10.40%	13.41%
35-44	9.40%	12.66%
45-54	15.30%	13.30%
54+	7.40%	52.27%

The wealth distribution of respondents shown in figure 4 indicates that 47% of respondents current house values are between £250,000 and £449,999 which is expected as the average UK population house price sits in this interval at £277,000 (Office for National Statistics, 2022).

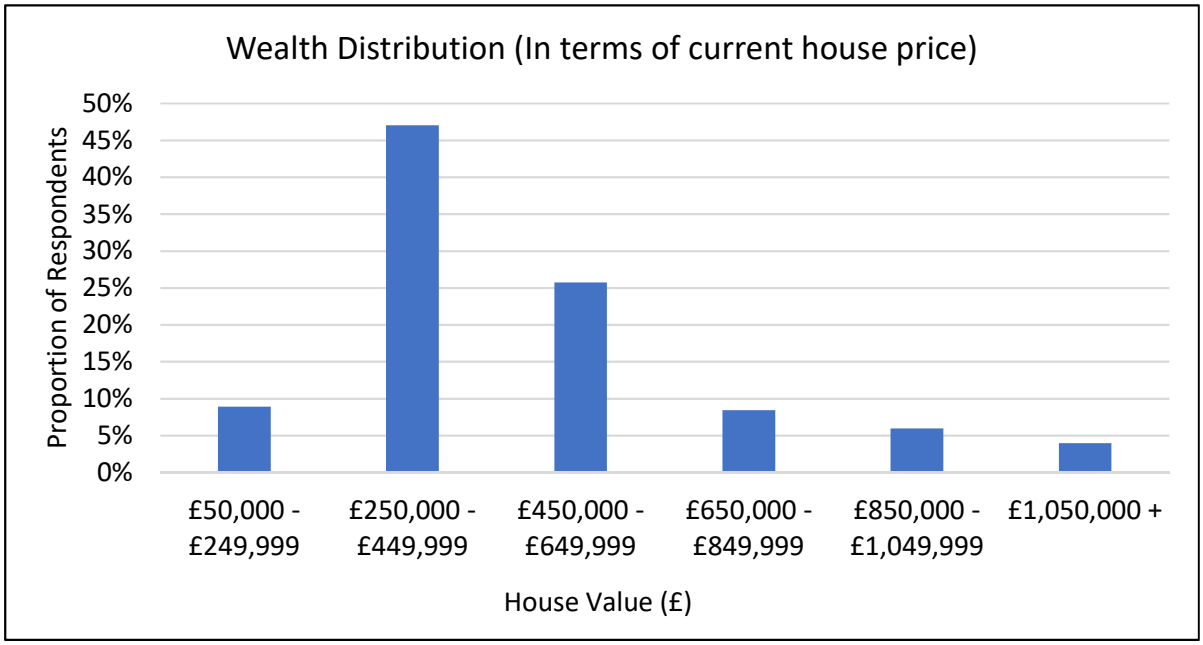

Figure 4 -Wealth distribution of respondents

A total of 35.6% of respondents work under a hybrid working pattern and 20.8% work in the office full-time, shown in figure 6. It is interesting to note that despite a high proportion of hybrid and remote working, majority of respondents, 42% live between 5-30 minutes from their office, shown in figure 5.

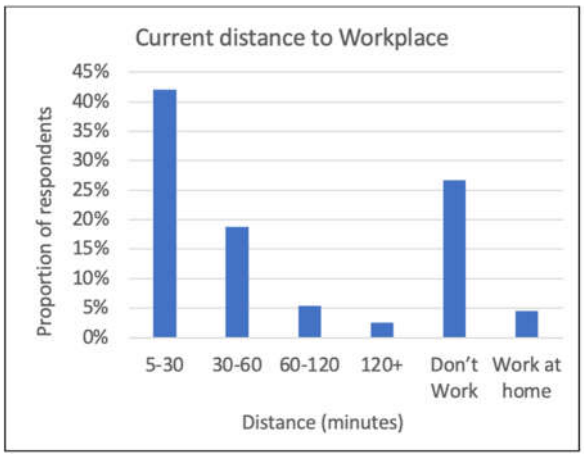

Figure 6 - Respondents' current workplace distance

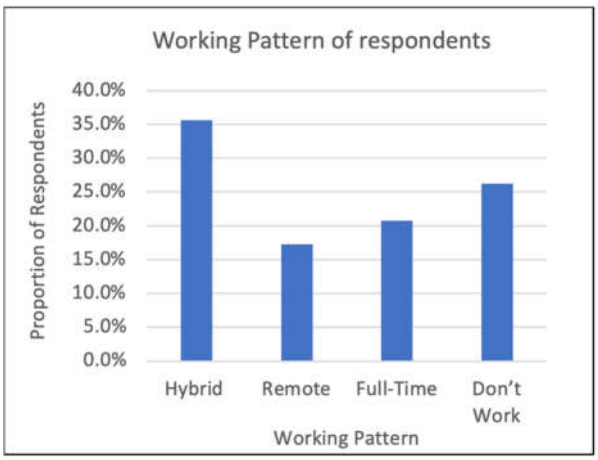

Figure 5 - Working pattern of respondents

Figures 7 and 8 illustrate that majority respondents live less than 10 minutes from outdoor activities and entertainment, 48% and 53% respectively . Outdoor activities include: nature walks, climbing and paddling and entertainment includes: pubs, restaurants, theatres and clubs.

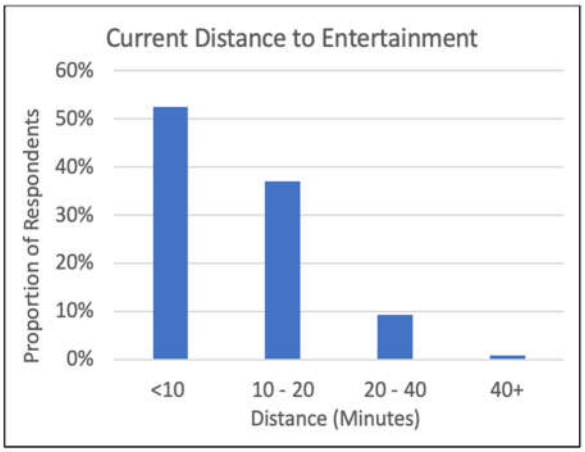

Figure 8 - Respondents' current distance to entertainment

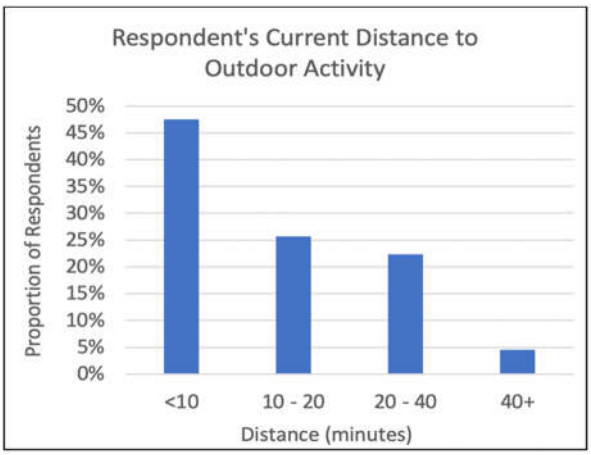

Figure 7 - Respondents' current distance to outdoor activity

Other socioeconomic factors considered number of bedrooms and garden size. Majority of respondents, 67% have 3 or 4 bedroom houses, shown if figure 9. 33% of respondents have a small to medium sized garden (60-120 square meters) and very few, 6% have an extra-large garden (180+ square meters), this is illustrated in figure 10.

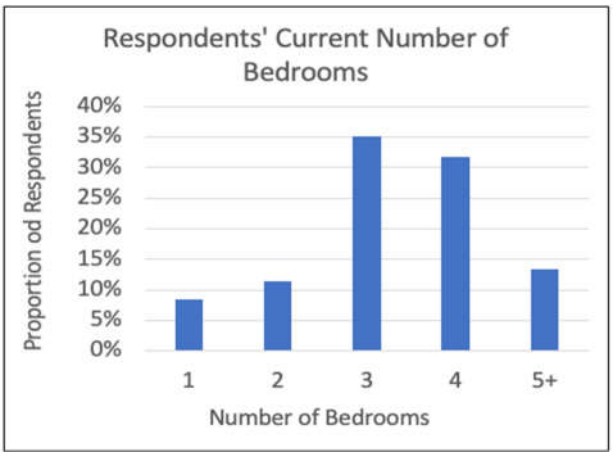

Figure 10 - Respondents' current number of bedrooms

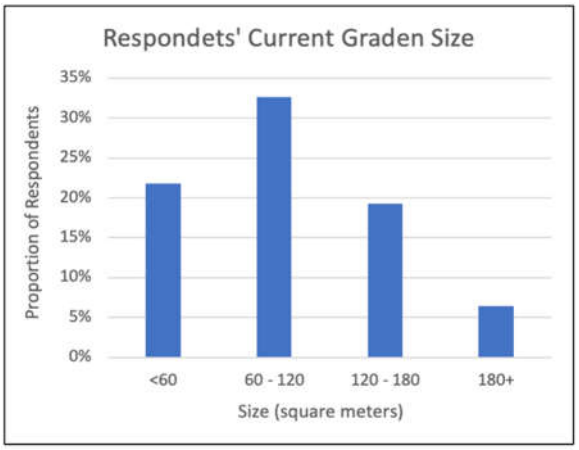

Figure 9 - Respondents' current garden size

Figure 11 below is important in understanding whether people think that their preferences for residential location and working patterns have adjusted after the pandemic. The chart illustrates that a large portion, 37.3% believed that their choices would have been different prior to the pandemic.

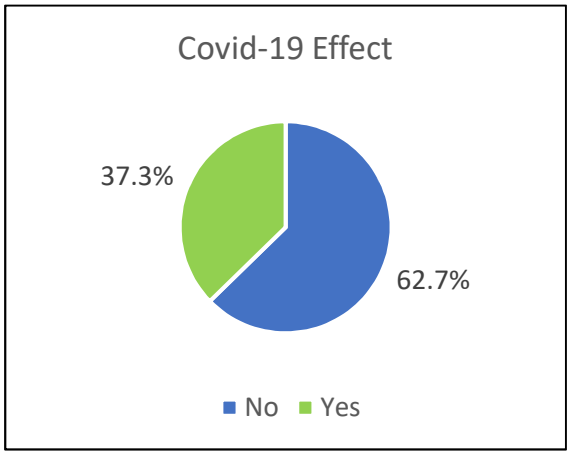

Figure 11 - The effect of covid-19 on preferences

4.2 McFadden Model

Statistical analysis was initially done using the McFadden choice model and secondly using the mixed logit model. After each model was done the Akaike information criterion (AIC) was

run. AIC is utilised frequently as a model selection method which evaluates how well a model fits. It is an estimator of prediction error and allows for relative quality estimates. Lower AIC values indicates a better fit model. The AIC is calculated from the amount of independent variables within the model and the model's maximum likelihood estimate. The AIC for the McFadden Choice Model was larger than that of the Mixed Logit Model, therefore, the Mixed Logit was a better fit and was thus the chosen model.

The McFadden Model is a discrete choice model which utilises the conditional logit. Thus this model is referred to as the "the workhorse model for analysing discrete choice data" (Hole, 2013). The conditional logit model, which forms the basis of McFadden's choice model, are effective where there is choice among alternatives which is modelled as a function of the characteristics of the various alternatives rather than the individual's characteristics who are making the choice. Therefore, it is most effective for estimating behavioural models. The conditional logit works by adding a row for each category of a variable that could be chosen by a respondent, in this case, option 1, 2 or status quo where a respondent can choose one. This choice model estimates, given information like the logit model, the probability that a respondent will choose a certain choice. The results for the McFadden Model are shown in table 3 and 4 which will be discussed in detail in section 5.

Table 3 - Statistics for alternative specific variables for McFadden Choice Model

Attribute	Coefficient	Confidence Interval 95%	P-Value	WTP
Price	-0.567	-0.991 <--> -0.144	0.009	N/A
Full Week	-0.337	-0.669 <--> -0.005	0.047	-0.594
Hybrid	0.327	0.133 <--> 0.522	0.001	0.577
Distance to Workplace	-0.008	-0.011 <--> -0.006	0.000	-0.014
Garden Size	0.002	0.000 <--> 0.004	0.028	0.003
Village	-0.095	-0.296 <--> 0.106	0.355	-0.167
Town	0.075	-0.109 <--> 0.260	0.423	0.133
Distance to Entertainment and Services	-0.007	-0.014 <--> -0.001	0.028	-0.013

Table 4 - Statistics for case specific variables in McFadden Choice Model

Attribute	Coefficient	Confidence Interval 95%	P-Value
1 (Base Alternative)			
2			
Gender	-0.088	-0.268 <--> 0.092	0.338
age	0.000	-0.009 <--> 0.010	0.992
Distance to Countryside	0.006	-0.013 <--> 0.025	0.537
Current No. of Bedrooms	0.092	0.011 <--> 0.174	0.027
Current House Price	0.000	0.000 <--> 0.000	0.036
Current frequency of Entertainment	-0.046	-0.113 <--> 0.020	0.172
Current Outdoor Activity Frequency	0.023	-0.037 <--> 0.082	0.453
Current Distance to Green Space	-0.002	-0.013 <--> 0.008	0.695
Effect of Covid	-0.069	-0.236 <--> 0.097	0.415
_cons	0.082	-0.431 <--> 0.596	0.753
3			

Gender	-0.102	-0.548 <--> 0.344	0.654
age	0.034	0.014 <--> 0.055	0.001
Distance to Countryside	-0.023	-0.070 <--> 0.024	0.345
Current No. of Bedrooms	-0.259	-0.502 <--> -0.015	0.037
Current House Price	0.000	0.000 <--> 0.000	0.148
Current frequency of Entertainment	0.080	-0.115 <--> 0.276	0.421
Current Outdoor Activity Frequency	0.179	0.020 <--> 0.337	0.028
Current Distance to Green Space	-0.016	-0.045 <--> 0.013	0.272
Effect of Covid	0.209	-0.232 <--> 0.650	0.352
_cons	-0.772	-2.126 <--> 0.582	0.264

McFadden's Choice Model is widely used for discrete choice experiments. However, there are some well-known limitations of the model: It cannot account for preference heterogeneity amongst individuals (except if it's related to observables) and the Independence of Irrelevant Alternatives (IIA) property can result in unrealistic predictions (Hole, 2013). This has resulted in studies in considering more flexible alternatives. Therefore, a mixed logit model was run and selected as the best fit model.

4.3 Mixed Logit Model

Modelling of discrete choice experiments comply with Lancaster's individual utility maximisation in consumer theory and random utility theory (McFadden D. , 1974). Lancaster's approach explains that consumers derive their utility from characteristics/attributes of the product or situation rather than the situation or product itself (Lancaster, 1966). Manski (1977) explains that utility is a latent construct that can't be observed directly but exists in a consumer's thinking. It assumes this can be separated into two components: representative

utility (V) and a component (ε) which illustrates an unexplainable component/random. A Mixed Logit Model was chosen as it is a highly flexible model that has the capability to approximate any random utility model (McFadden D. a., 2000).The random component arises due to individuals' random preferences and because attributes don't cover all potential individual preferences. This leads to formation of expressions for probability of choice. The repeated observations of choices in discrete choice experiments, allow examination of how attribute levels affect probability of choice. Random utility theory assumes utility maximisation, where utility of the chosen alternative is greater than the other unselected alternatives. Therefore, as mentioned previously, the objective of discrete choice modelling is to analyse respondents' choices relative to attributes. If A respondent chooses among J options. The utility of alternative j for a respondent can be expressed as a linear combination of, non-random, observed factors $[X_{j1}, X_{j2}, \dots, X_{jH}] = x'_j$ with parameters $\beta' = [\beta_0, \beta_1, \dots, \beta_H]$ and random, unobserved factors ε_j where j = 1,2, …, J. Together, the factors represent utility for respondent i, i= 1,2,..,n as: $U_{ij} = V_{ij} + \varepsilon_{ij} = X'_{ij}\beta + \varepsilon_{ij}$ (Vojáček, 2010). Instead of assuming that β is fixed, β is assumed to vary among respondents.

The Mixed Logit Model removes three of the limitations that the standard logit assumes through allowing for: variation and relaxing the assumption that all individuals behave in the same way, unrestricted substitution patterns, and correlation of factors that are unobserved over time. Alongside this, the derivation of the Mixed Logit is straightforward and the probabilities of choice is simple to evaluate. Thus, this model was chosen. All attributes in this model were treated as randoms and hence this model may also be referred to as a Random Parameters Logit Model (RPL). The results of the Mixed Logit are illustrated in table 5 and 6.

Table 5 - Statistics for alternative specific variables for Mixed Logit Model

Attribute	Coefficient	Confidence Interval 95%	P-Value	WTP
Price	-0.772	-1.224 <--> -0.319	0.001	N/A
Full Week	-0.360	-2.506 <--> 1.785	0.742	-0.467
Hybrid	0.492	0.264 <--> 0.720	0.000	0.638
Distance to Workplace	-0.018	-0.021 <--> -0.014	0.000	-0.023
Garden Size	0.003	0.001 <--> 0.005	0.011	0.004
Village	-0.010	-0.242 <--> 0.222	0.931	-0.013
Town	0.191	-0.008 <--> 0.390	0.060	0.247
Distance to Entertainment and Services	-0.017	-0.026 <--> -0.009	0.000	-0.022

Table 6 - Statistics for case specific variables in Mixed Logit Model

Attribute	Coefficient	Confidence Interval 95%	P-Value
1 (Base Alternative)			
2			
Gender	-0.050	-0.301 <--> 0.202	0.699
age	0.002	-0.010 <--> 0.013	0.802
Distance to Countryside	0.012	-0.013 <--> 0.037	0.329
Current No. of Bedrooms	0.075	-0.047 <--> 0.198	0.228
Current House Price	0.000	0.000 <--> 0.000	0.032
Current frequency of Entertainment	-0.062	-0.162 <--> 0.037	0.219
Current Outdoor Activity Frequency	0.025	-0.067 <--> 0.116	0.593
Current Distance to Green Space	-0.005	-0.020 <--> 0.010	0.504
Effect of Covid	-0.045	-0.295 <--> 0.205	0.725
_cons	0.207	-0.549 <--> 0.963	0.592
3			
Gender	0.209	-0.147 <--> 0.565	0.717
age	0.054	0.037 <--> 0.070	0.000
Distance to Countryside	-0.030	-0.067 <--> 0.008	0.033
Current No. of Bedrooms	-0.189	-0.374 <--> -0.003	0.000
Current House Price	0.000	0.000 <--> 0.000	0.002
Current frequency of Entertainment	0.044	-0.090 <--> 0.178	0.868
Current Outdoor Activity Frequency	0.098	-0.036 <--> 0.231	0.066
Current Distance to Green Space	-0.018	-0.039 <--> 0.004	0.527
Effect of Covid	-0.048	-0.404 <--> 0.307	0.877
_cons	-1.825	-2.926 <--> -0.724	0.324

5 Discussion

5.1 Interpretations and Implications

The price level was measured using pivot-style design where the reference alternative is the respondent's current house value. Therefore, the price was represented as a percentage change. All attributes are one level movements, these levels are illustrated in table 1 above. Each of the levels represents an increase in size, decrease in commuting time or qualitative change. Table 3 indicates that all attributes are significant at a 95% confidence interval for the McFadden model apart from landscape, shown by village and town. Similarly, table 5 indicates that all attributes were significant for the Mixed Logit Model except for landscape and full week.

Both the McFadden and Mixed Logit Model, illustrated in table 3 and 5respectively, have the signs that were expected from the study. The coefficient for price was negative illustrating that survey respondents lose utility from an increase in price. Hybrid working had a positive coefficient illustrating that utility for hybrid working increases in comparison to remote working and participants prefer hybrid working. The McFadden and Mixed Logit was also run omitting full week instead of remote and in both cases, hybrid working is preferred to remote and full week, in the office, working patterns. Garden size had a positive coefficient, indicating increasing utility with larger gardens. Both proximity attributes, distance to work and distance to entertainment and services had negative coefficients, meaning participants lose utility as distance increases.

The case variables specify the variables which are case-specific for each of the cases. This illustrates the effect of socioeconomic and demographic questions which were not used to

form part of the status quo. The base alternative is used as the alternative that normalises utility. For the McFadden Model case variables in table 4, option 1 is the base alternative in this case. Number of bedrooms and current house price are significant for the second option and age, number of bedrooms and outdoor frequency are significant for option 3 at a 95% confidence interval. This illustrates that older people are more likely to choose the status quo and stick to their current situation rather than move. People who participate in outdoor activities are also more likely to stay in their current situation. Individuals whose houses have more bedrooms and are more expensive, are less likely to choose the status quo and more likely to choose option two. For the Mixed Logit Model case variables in table 6, option 1 was also the base alternative. Only current house price was significant for option 2, indicating more expensive homes are more likely to choose option 2. Current house price and age were also significant for option 3, showing that older people with more expensive homes are more likely to choose the status quo (current situation) option. However, the coefficient for house price is very small illustrating a small effect. Distance to countryside and number of bedrooms are also significant for option 3 and both coefficient signs are negative therefore respondents with more bedrooms in their home and living further from the countryside are less likely to choose status quo and more willing to relocate.

Margins were calculated for the Mixed Logit model to illustrate the effect of a change in price for one of the options in comparison to the original (appendix 8.3) . The Tables below illustrate changes in demand given a change in price of one of the options and illustrates elasticity of demand. Where price is increased by 25% for option 1, table xxx illustrates a 2.5% decrease for option 1 meaning 2.5% less people would choose option 1. Option 2 and 3 increase by 1.3% and 1.2% respectively, showing that more people would choose these two options.

People would still be slightly more willing to choose relocation over sticking to their current situation. Similarly, table xxx shows that for a 50% increase in price for option 1, 4.9% less people would choose option 1. For option 2 and 3 2.5% and 2.4% more individuals would choose these options instead. Table xxx shows the same relationship, price increases result in a decrease in demand. Tables xxx shows that for a 25% decrease in price there's a 13.4% increase in demand and for a 50% decrease there is a 16.1% increase in demand. Consequently, demand for the other two options decreases.

Table 7 - Shows a 25% increase in the price attribute of option 1

For a 25% increase in the marginal Cost for Option 1	
Change in 1	-2.5%
Change in 2	1.3%
Change in 3	1.2%

Table 8 - Shows a 50% increase in the price attribute of option 1

For a 50% increase in the marginal Cost for Option 1	
Change in 1	-4.9%
Change in 2	2.5%
Change in 3	2.4%

Table 9 - Shows a 100% increase in the price attribute of option 1

For a 100% increase in the marginal Cost for Option 1	
Change in 1	-9.4%
Change in 2	4.7%
Change in 3	4.7%

Table 10 - Shows a 25% decrease in the price attribute of option 1

For a 25% decrease in the marginal Cost for Option 1	
Change in 1	13.4%
Change in 2	-6.9%
Change in 3	-6.5%

Table 11- Shows a 50% decrease in the price attribute of option 1

For a 50% decrease in the marginal Cost for Option 1	
Change in 1	16.1%
Change in 2	-8.3%
Change in 3	-7.9%

The willingness to pay (WTP) calculations, utilising the equation represented by equation xxx below, are illustrated in table xxx for the McFadden choice model and table xxx for the Mixed Logit.

$$\overline{WTP_i} = -\frac{\beta_i}{\beta_{Price}}$$

The WTP is the maximum a consumer would be willing to pay in exchange for certain attributes. This can vary from consumer to consumer and can change and fluctuate on a variety of factors. Figure xxx was created to visualise the WTP of all attributes for both of the models. The figure illustrates how much certain attributes were valued over others. For the chosen Mixed Logit Model, the attribute with the highest WTP is hybrid working, this was significantly high and shows that the participant may be willing to pay 63.8% of the value of their current house more for a house that enables the ability to work for home. This WTP is also significantly high for McFadden at 57.7%. The value of the distance attributes is very similar for both models and for both distance to workplace and distance to entertainment

and services, where WTP is negative. Therefore, the participant would need to be compensated or would be WTP 2.3% of the value of their current home less for the new residence if the commute to their workplace was longer and 2.2% less if cinemas, theatres, schools and surgeries were further away. The value placed on garden size is relatively small but participants would be WTP 0.4% of their current house value more for a larger garden.

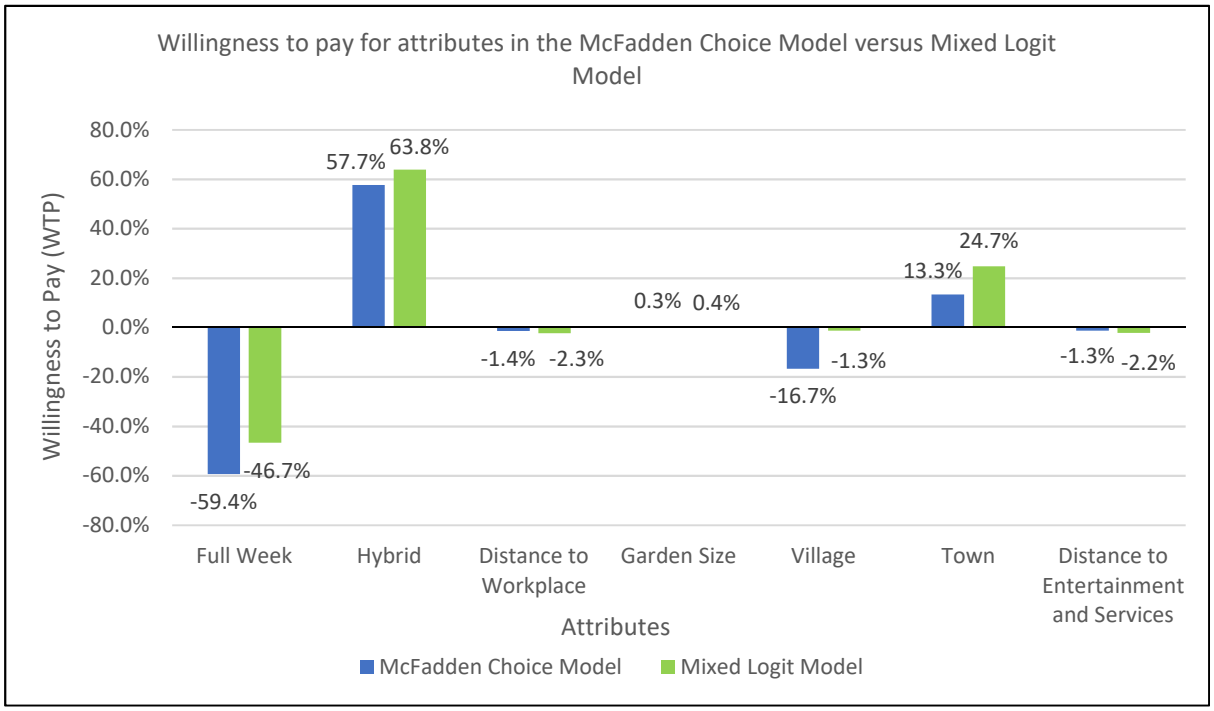

Figure 12 - Willingness to pay for McFadden versus Mixed Logit Model

The results found are contrary to that of C.H Bullock (2011) and Biancamaria Torquati (2020) who found that landscapes and the benefits associated with agricultural, rural and natural landscapes were one of the main factors influencing WTP. In this study WTP for landscapes was insignificant. Although, in a discrete choice experiment insignificance doesn't necessarily mean that it is an unimportant attribute but rather that given the other five attributes and multiple levels to consider, the attribute may not have influenced their choices for the given levels. The negative WTP for commuting is consensus with other studies such as that of Toll (2019) and Biancamaria Torquati (2020). However, Given, hybrid working patterns, the

expectation was that participants would be more willing to accept longer commutes. Therefore, perhaps the negative WTP may be less negative than it could have been had there not been hybrid working. This is the consensus of other telecommuting studies such as that of Muhammad (2006) who found that people are willing to live in more peripheral areas with longer commutes in they have a hybrid working pattern.

5.2 Implications

This paper shows the willingness to pay for the location-based attributes of a residential property in the post-pandemic world, as well as estimating these attributes accurately and as close to their true value as possible. The results found in the study indicate that respondents' residential location choice is influenced by multiple factors including: hybrid working patterns, garden size, distance to workplace and distance to services. The study has shown that hybrid working following the pandemic has had a significant impact on residential choice. The benefit of hybrid working is the main factor influencing willingness to pay in the study area. There is a growing demand to understand the post pandemic world and the implication this has for various industries. Therefore, this study provides an important contribution in understanding whether preferences have changed post-pandemic and what consumers value most, providing a basis for understanding the future implications of residential and workplace preference. The results found in this study help workplaces, local areas, governments and businesses identify the value for certain residential attributes and working patterns which they could use to invest in relevant residential or local amenities, adapt policies and understand future priorities.

5.3 Limitations

This study is an in-depth estimation on the valuation consumers place of location-based residential attributes and hybrid working patterns post-pandemic. However, the study does come with limitations. The first being the hypothetical nature of a discrete choice experiment (DCE) especially in a residential choice experiment. Hypothetical bias is arguably the most fundamental issue in a DCE. The participants of the survey are not having to spend the money in reality and hence participants may have a bias to overstate how much they would be willing to pay.

Another vital limitation present in DCEs, specifically those with more attributes present is attribute non-attendance (ANA). In DCEs respondents choose between a variety of options with a variety of attributes, in this case 6 attributes with 3 levels. DCEs assume rationality and that respondents have complete, monotonic and continuous preferences. However, this may not be the case in reality and respondents might use simple strategies or heuristics to select an option resulting in one or more attributes being ignored. Furthermore, the inclusion of many case variables in the modelling may also mean that some of these may be correlated with the status quo levels.

There is a sample bias present in the study as mentioned in section 3.4. The sample used for the study has a large number of respondents between the ages of 18 – 24 years old which may distort the data as it is not reflective of the UK population. However, this age group encompasses an age group that will be relocating due to university or graduate jobs.

The limitations mentioned above should be treated with caution rather than negation of the research. These limitations could serve as an aide to assist future studies in avoiding some of these limitations. The study is still able to provide an accurate valuation of residential and workplace preference and is vital to understanding future implications of these preferences post-pandemic.

5.4 Recommendations for future studies

A suggestion for future research is to potentially attempt to conduct an experiment to understand willingness to pay for amenities related to hybrid working such as co-working space and additional office space inside homes. Literature and data suggests that the "race for space" may include demand for in-home working space. Due to the extent to which the consumption bundles of residential choice can vary and encompass many different attributes, various other attributes could be used to build upon this research to evaluate other preference changes post-pandemic. Thus, this study is informative and acts as a piece of literature which could be furthered in a slightly differing direction, understanding other implications the pandemic may have had on preferences. In order to further understand the role the pandemic has played in these preferences, initial questions for the survey could deep-dive more into what their preferences were before the pandemic and what residential preference they felt was effected the most. Individuals' current careers could also be considered as some career options may still highly value a short commute time due to the nature of their job for example: doctors, vets and engineers.

A limitation mentioned in section 3.4 is that respondents who were currently enrolled in the survey passed the survey on to other subjects resulting in a potential bias for the sample. This

bias is extended due to the large proportion of 18-24 year olds. Future studies could avoid this by pre-selecting a sample to conduct the survey allowing for a pool of respondents that are representative of the population and more evenly distributed.

6 Conclusion

6.1 The public's value of working pattern and residential location post-pandemic

The aim of this study was to understand the public's value of working pattern and residential location post-pandemic. This will enable policy decisions and investment decisions for businesses and local governments, in the scenario of changing preferences after Covid-19. Based on results found in the study it can be concluded that hybrid working is highly valued and commuting still provides disutility to respondents perhaps because people enjoyed time being at home or close to home during the pandemic. Garden space also provided value to participants. Therefore, the study provides the valuation set out in the aim of the study.

6.2 Reflections of Research

The discrete choice experiment method of evaluation was undertaken as it enables estimation of true willingness to pay estimates. Respondents are forced to trade-off preferred attribute levels with less preferred levels present within each option which allows for effective estimation of utility derived for certain attribute levels in relation to others. It is simpler and more effective to elicit willingness to pay estimates through a survey approach than to directly ask participants their willingness to pay. This approach also enables the ability to test to what effect differing socioeconomic and demographic characteristics as well as attitudes and routines result in significantly different preferences. The hypothesis of the study was that the presence of hybrid working may result in participants being more willing

to choose more environmental benefits that come from natural landscapes and larger gardens whilst accepting a slightly longer commute due to telecommuting. As shown in the research the hybrid working was highly valued and the garden attribute was valued positively. Commuting still provided disutility but perhaps to a lesser extent than it may have, had hybrid working not been considered in tandem.

6.3 Recommendations

Based on the research conducted in this study, there is potential for businesses and local communities to take advantage of these adjusting preferences and use them as a springboard for growth and investment. Businesses can utilise both the workplace and residential choice attributes to understand preferences of employees which may be integral in policy creation around hybrid working patterns. Employers have incredible opportunities and new ways of working before them in this digital first world whereas illustrated in this study, employees want to work wherever and whenever. Therefore, if employers want to retain and hire top talent, offering flexible working patterns is a non-negotiable. However, alongside this paradigm shift, employers need to set out policy, expectations, strategic positioning and new practices to maintain productivity and employee well-being and satisfaction in the future.

The commuting valuation conducted in the study supports the claim made by the IWG CEO in section 1.1 which explained that people want to avoid commuting as statistics from the pandemic reveal that people valued being at home or closer to home during the pandemic (IWG, 2021). This finding supported in this study highlight the value people place on having

everything they need for personal and professional life within their local communities. This provides a basis for apartment buildings to invest in co-working amenities and for dormant towns and villages to explore and invest in vibrant local communities offering co-working space and trendy cafés with thriving businesses at the heart.

6.4 Contributions of this study

The study illustrates that both the McFadden Choice Model (Conditional Logit) and Mixed Logit Model can be utilised in a residential location choice. However, a Mixed Logit Model is more fitting due to the nature of residential choice, where not all individuals behave in the same way. The paper also examined the public's value of residential settings in various locations alongside the new hybrid working "normal", which up until now, this has not been studied. The creation of this paper creates the foundation for future literature to build upon and the current gap in the literature can be explored in future studies where the topic can be explored if differing avenues.

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8 Appendices

8.1 Google Forms Survey

https://docs.google.com/forms/d/18CtT6IASuXxFUtGYoDu6wtGyioZuiMNk6VHSk_ZNVhA/prefill

8.2 McFadden and Mixed Logit Regressions

https://docs.google.com/spreadsheets/d/1LZ8dSZbq72hU6eSfihKzztznk4YluUDr/edit?usp=sharing&ouid=112633086212671073604&rtpof=true&sd=true

8.3 Margins

https://docs.google.com/spreadsheets/d/12NVnJEnPffVyuxGIkiiBKEolpUvWS086/edit?usp=sharing&ouid=112633086212671073604&rtpof=true&sd=true

8.4 Initial Questions – Socioeconomic and demographic data

https://docs.google.com/spreadsheets/d/1olzfeV7OaDYALpn0dPfMG2Tv8dYLX_EZ/edit?usp=sharing&ouid=112633086212671073604&rtpof=true&sd=true

8.5 Original and Longform Data

https://docs.google.com/spreadsheets/d/1YhK77kMIUWkNGjMOBKViuXeMhiUzehBk/edit?usp=sharing&ouid=112633086212671073604&rtpof=true&sd=true