A methodology to understand student choice of Higher Education Institutions: The case of the UK

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Abstract

The need to understand how prospective students decide which Higher Education Institution to attend is becoming of paramount importance as the policy context for Higher Education moves towards market-based systems in many countries. This paper provides a novel methodology by which student preferences between institutions can be assessed, using the UK as a case study. It applies both revealed preference and discrete choice modelling techniques to estimate the priority attributes and potential trade-offs of students choosing between different UK universities. Whereas the former methodology has the advantage of being based on actual decisions, the latter provides an experimental setting for more nuanced findings to be elicited; the combination of approaches allows for a rich and detailed set of results. This methodology can also be used to ask detailed strategic questions of higher education institutions, and further applied to other international markets.

Keywords: student choice; university competition; league tables; university marketing; revealed preference; discrete choice modelling.

Introduction

The global Higher Education sector has undergone significant change in the last 10 years. Altbach (2009) highlighted the trend towards 'massification of higher education' with 26 per cent of post-secondary students entering higher education worldwide in 2009, rising from 19 per cent in 2000. More recent statistics (The Economist, 2015) suggest the global higher education enrolment rates have increased from 14 to 32 per cent of post-secondary students in the two decades to 2012. This has necessitated a changing policy context and social contract between the higher education institution and society, as funding responsibilities shift in large part from the state to the student in the form of fees. In line with global changes, the United Kingdom (and especially the English) higher education system has undergone transformational change in recent years, catalysed by the Browne Report (2010) moving the sector towards a 'marketized' system, characterised by: the removal of a single fee (replaced with an opportunity to charge up to £9,000); opportunities for non-traditional providers to gain degree awarding powers (e.g. Further Education colleges, private providers); and gradual removal of the student number control (quota) system. Whilst most universities have moved towards the maximum fee (OFFA, 2015) thus negating student choice on the grounds of tuition fee differences, the other changes have led to greater competition between institutions for student recruitment. In parallel, there has been increased availability to prospective students of information relating to quality of the university, currently through the Key Information Set (Unistats, 2016). This will increase as the outcomes of the 2015 Green Paper on UK Higher Education transform into statute, and the establishment of the Teaching Excellence Framework (Department for Business Skills and Innovation, 2015).

In light of the above, the purpose of this research is to investigate how the attributes that influence student choices between higher education institutions can be elicited. Whilst the UK has been used as a case study, the paper provides a core and significant contribution through the presentation of a novel methodology to establish student preferences, which can be readily applied to other countries. The methodology is of particular significance for those countries that are, or are becoming, 'marketized', where public funding for institutions is diminishing, and being replaced by student fees in full or in part. The research has used the methodology to assess higher education attributes relative to information available to prospective students but it could be easily applied to ask specific strategic questions of institutions.

The novel method used to assess student choice involves the use of revealed and stated preference techniques. First, a *revealed preference* analysis was undertaken using the UK University and Colleges Admissions Service (UCAS) application data between 2007 and 2013 to investigate the attributes that drive actual student preferences, proxied by the applications per place. Although this provided real decisions made by prospective students, the attributes which were driving preferences were highly correlated. The implication for institutions of this is that they are less able to understand the particular attributes driving a student's choice; information that limits their ability to adjust their proposition to increase attractiveness in the evolving 'market'. Therefore, a *stated preference* (choice modelling) analysis was employed, offering a sample of prospective students a choice between hypothetical universities in an experimental environment, using a range of attributes informed by data readily available to the student on application. Whereas this approach only considers hypothetical choices, the construction of the assessment allowed a clearer identification of those attributes that were of most importance to prospective students, using the format of data that was available to them. It is the combination of approaches that provides the novel methodology of this paper and, unusually, presents the use of a stated preference technique (intent to decide) as means to refine and unpack revealed (actual) preference, informing choice.

Literature review

In the literature there is a general consensus of a three stage process for student decision-making, which can be applied to student choice of higher education institution (Cabrera & La Nasa, 2000): first, deciding to go to university (predisposition stage); second, consideration of which universities to explore further (information search stage); finally, selection of a preferred university (choice stage).

The predisposition stage tends to be associated with sociological influences such as whether parents have attended university, the encouragement of teachers, and the students' potential career interests (Brooks, 2002, and Cabrera & La Nasa, 2000). Foskett & Johnston (2010) also emphasised the importance of social networks in the decision to participate in higher education, finding that family, friends and teachers have an influential role in this choice as well as relationships with current and previous employers.

In the information search stage, both the medium of information transmission as well as type of information are considered relevant. With regard to the former, Briggs (2006) identified that the university prospectus was the most influential source, although with the advent of greater online engagement, Obermeit (2012) demonstrated that the internet has become more important, and Simoes & Sõares (2010) suggest that university websites are becoming the most influential information source for students. Other information sources found to be valued by prospective students include the opinions of friends and family, teachers, career advisors, UCAS and visits to the university (Renfrew et al., 2010).

The influences and processes involved in both the 'predisposition stage' and 'information search stage' (Cabrera & La Nasa, 2000) are many and complex and have been studied extensively in the literature in relation to a student's university choice (for instance, Mangan et al., 2010; Winter & Chapleo, 2015; and Renfrew et al., 2010). It is the choice stage which is the subject of this paper, and specifically, what attributes provided during the 'information search stage' have the greatest influence on university choice. As such, we have concentrated on this aspect of decision making below.

Various stated preference approaches to understanding choice are prevalent in the literature, which seek to identify from potential or existing students the important university attributes affecting their decision making process. Within this, academic reputation appears as a recurring theme of importance. Whitehead et al. (2006) surveyed 1,019 high achieving school students and found that the main choice dimension to apply to the University of Cambridge was the prestige of the university. Briggs (2006) surveyed first year science and engineering students in Australian universities to identify attributes of most importance, (through 22 factors on a 10 point Likert scale), finding 'academic reputation' as the prevalent factor of importance. Drayson et al. (2013) further supported this, finding that reputation of the course and of the university as the two important characteristics of institutions.

Despite its frequency as an important attribute, the concept of 'academic reputation' is not formally defined. Whitehead et al. (2006) provided a nuanced way to consider this abstract concept, discussing institutions: (i) where obtaining a place would be considered an achievement; (ii) where the institution alone would enhance the employment prospects of the student; (iii) where influential people could be met; and, (iv) with national and international prestige. Briggs (2006) likens high reputation universities as ones where demand exceeds supply, suggesting this is more likely in more established institutions that have developed more cultural capital; conversely, poor progression rates are seen to weaken academic reputation. In most stated preference surveys, however, academic reputation is often left to the individual participants to interpret.

Lawton & Moore (2011) concurred on the importance of reputation and also found that fees were significant in the new UK market, but only to lower socio-economic groups, who also placed a higher importance on job prospects; similar results were found by Callender & Jackson (2008), who used multivariate analysis to assess whether fee levels impacted on variables such as proximity to home and prospects for part-time employment. These findings were contradicted by Wilkins et al. (2013) who identified through a large scale survey and factor analysis that fees/cost of university, whilst the key deciding factor, was not significantly differentiated by socio-economic group. Kaye & Bates (2016) found that, since the introduction of higher fees in the UK, greater focus in graduate career opportunities was the key focus for students, contrasting to the significance of wider cultural factors previously. The focus of prospective students on value for money and their position as 'service-user' as a student was highlighted by Tomlinson (2016) through a series of in-depth interviews with current students.

Given the complexities of higher education markets, more rigorous investigations confronting students with trade-offs between university attributes could be performed using conjoint analysis or choice models (see for example Hooley & Lynch, 1981, Murphy, 1981, Soutar & Turner, 2002, Hagel & Shaw, 2010, and Dunnett et al., 2012). This technique is widely used in market research to elicit the most important attributes of a product from customers. Participants choose from a set of experimentally produced alternative products which vary by specific attributes; by modelling the choice between different alternatives as a function of the difference in these changing attributes, implicit valuations of the product characteristics can be elicited. The higher education institution conjoint analysis literature to date typically employ a small number of qualitative descriptors for these university attributes; for example, Soutar & Turner (2002) vary reputation between 'poor', 'average' and 'strong' and Dunnett et al. (2012) between 'low', 'average' and 'high'. These categorisations suffer from being both 'value-laden' in its use of language, and also non-specific compared to data provided to

prospective students through the Key Information Set, league tables or other data sources (e.g. prospectus, website).

Common throughout the conjoint analysis research is that academic reputation plays an important role in the decision making process: for example, Hagel & Shaw (2010) and Dunnett et al. (2012) found reputation to be the most influential attribute of an institution. Hooley & Lynch (1981) and Soutar & Turner (2002) also found academic reputation to be significant; however, their results suggest that course suitability is more important, and Murphy (1981) found the influence of friends and family and costs to have an influence. The problem with the research to date, at least from a UK perspective, is that the majority of it is out-dated and relates to higher education systems operating under different regulatory and market conditions. Further, a greater number of covariates with more tangible values (beyond 'low', 'average' and 'high') could be employed. The approach, countering these issues, is discussed in the methodology section below.

Methodology

This research makes two distinct contributions, both with respect to the methodology of identifying what determines students' choice of universities.

- First, we incorporate an innovative revealed preference methodology to identify important institution characteristics in student choices. A revealed preference methodology evaluates actual decisions made by individuals and compare these against other available choices. This is generally perceived to be more robust than stated preference methods discussed above, as decisions based on real actions are considered more reliable than those based on hypothetical circumstances. As will become apparent below, there is a high degree of collinearity between preference attributes of UK universities so that, although revealed preference techniques can elicit some conclusions, they cannot fully evaluate the subtle trade-offs in the decision making process. For example, a university high in the league table rankings also tends to have higher entry tariffs, higher research quality, and so on.
- Second, we combine with this revealed preference approach a discrete choice modelling (stated preference) study, which is both relevant to the UK market and more appropriate than the stated preference (through conjoint analysis) literature discussed above. Although the premise of conjoint analysis and discrete choice models are similar (offering participants the choice of different hypothetic products and eliciting what drives these choices from observed data) they are different in nature. Conjoint analysis provides relative importance of characteristics, whereas discrete choice models allow trade-offs between these characteristics to be explored; it is for this additional nuance why we employ choice modelling techniques. Specifically, we improve on the conjoint analysis approach to university choice in three clear ways: first, we present these attributes in line with how they are in the real world; second, our study provides more attributes than are typically found in the above studies; and third, we provide our potential students with more alternatives within these attributes.

This combination of the two approaches provides a richer and more realistic understanding of how students make choices between institutions than the research presented to date. Indeed, this type of discrete choice modelling technique is what is called for by the Higher Education Academy and the National Union of Students in Diamond et al. (2013: p25) '*only through designing [discrete choice] experimental research could we really start to establish how prospective students actually behave'*.

Revealed preferences methodology
To reveal preferences from actual decisions, application and acceptance data for UK higher education programmes were obtained from UCAS between 2007-2013. The data were disaggregated by institution, gender, domicile (UK, EU or International), and course (by general heading, for example 'combined sciences'). From this, a proxy for institution demand was obtained by dividing total applications by total acceptances, a ratio which controls for the size of institution. With over 17 million applications, the dataset provided a rich source with which to compare student choices across both university characteristics and student demographics.

To elicit important characteristics driving student choices, the applications per place proxy for institution demand was used as the dependent variable and was compared against university characteristics, using random effects panel regressions including control variables for: specific university groups (for example, the Russell Group); the geographical location of the university by country in the UK; and factor variables for each year. In addition, university characteristics available in league tables published in the UK were used as independent variables. Specifically, the following regression specification was applied:

$$App_{i,t} = \alpha + \beta LT_{i,t} + \gamma Control_{i,t} + z_{i,t} \qquad (1)$$

where $App_{i,t}$ represents the applications per place of university i in year t, α is a constant, $LT_{i,t}$ and $Control_{i,t}$ are university league table statistics and control variables respectively, with β and γ representing vectors of estimated coefficients on the importance of these variables; $z_{i,t}$ is an error term. The data were applied as they are openly available information used by prospective students, provided standardised data over the full time horizon of our analysis, and covered most institutions.

Discrete choice modelling methodology
Revealed preference analysis could only shed partial light on the specific attributes most valued by prospective students to UK universities. Drawbacks included: the high correlation between league table attributes (providing statistical difficulties to isolate which of these are most important); the proxy for demand is imperfect; and the approach only considers the current choice set of universities. As such, we combined the insights obtained through revealed preference techniques to results from a discrete choice modelling experiment. Although choice modelling techniques have been applied elsewhere (see the literature review above), this application was limited and is outdated.

Within choice modelling, participants are offered the option between hypothetical products from which they choose which to (hypothetically) consume. This enables collinearity between attributes to be minimised as it is controlled for in an experimental setting. Moreover, this technique enables the consideration of a range of hypothetical universities, again due to the flexibility provided by the experimental setting; this is important as it could allow universities to consider the implication of large strategic changes and novelty.

Key attributes likely to influence decisions on universities were obtained through: the literature review; the revealed preference analysis; evaluation of information on university websites; the Key Information Set (Unistats - a government established provider of university information); expertise from university senior management and surveys units; and through discussion with peers and students. Attributes were included which, by consensus, were

considered to be most relevant for the hypothetical institutions in the survey. These were: tuition fees and accommodation costs; university, course and People & Planet (a measure of social responsibility and sustainability performance of an institution) league table rankings; overall and teaching student satisfaction; the post-graduating employment record of students; and contact hours. The characteristics largely represented those which were available in the Key Information Set and represented variables for which the revealed preference analysis above could not discriminate between with the issue of collinearity. Although more could have been included in these experiments, there is a trade-off between including further comparators for participants to evaluate across and their ability and willingness to do so; that is, participants may get overwhelmed by having too many characteristics with which to compare the hypothetical institutions. For all other university attributes, instructions given to the participants stated that 'imagine that any other characteristics and attributes which may be important to you are the same across both universities'.

Participants were presented with two hypothetical universities that varied over these nine attributes and were asked which of these (if either) would be most desirable to them: an example of this choice is presented in the Appendix. Each participant was presented with twelve pairwise choices. Students in their final year of secondary education were targeted through school visits as they were in the process of applying to universities. In total, 355 students participated from eight different schools which varied both geographically and in terms of the average grades of students.

With these data, similar techniques to the revealed preference methodology could be applied. A conditional logistic regression was applied which evaluated the probability of a participant choosing one hypothetical university over another as a function of the differences in attributes between these institutions:

$$log\left(\frac{\pi_{A,i}}{1-\pi_{A,i}}\right) = \omega + \varphi AttDiff + \varepsilon_i \qquad (2)$$

where $\pi_{A,i}$ represents the probability of choosing 'University A' over 'University B', ω and ε_i are a constant and error term respectively and $AttDiff$ represents a matrix of differences in attributes between 'University A' and 'University B' and φ a vector of estimated coefficients of the relative importance of these differences.

Results and discussion

Revealed preference results

Table 1 presents correlation coefficients between university characteristics collected from UK league tables (from The Guardian and The Sunday Times newspapers, the Good University Guide and The People & Planet University League). The correlations between league table ranking and all other variables, with the exception of the value added and the People & Planet league score, were all with the expected direction and above 0.5. That is, universities which are high performing in one aspect (for example, their league table ranking) tend to be high performing in others (for example, entry tariffs, teaching and research scores, etc.). This extent of collinearity is an issue because it is hard to statistically isolate which independent variables are leading to changes in the dependent variable. The only variable for which a university's performance in one variable is negatively correlated with that of others is the People & Planet league ranking.

Table 1. Correlation coefficients between university characteristics.

	League table	NSS Teaching	NSS Overall	Expenditure	Student/Staff ratio	Career prospects	Value Added	Entry Tariff	People & Planet League	Research	Completion
League table	1.000										
NSS Teaching	-0.566	1.000									
NSS Overall	-0.620	0.884	1.000								
Expenditure	-0.679	0.192	0.237	1.000							
Student/Staff ratio	0.677	-0.416	-0.490	-0.606	1.000						
Career prospects	-0.789	0.353	0.479	0.569	-0.637	1.000					
Value Added	-0.365	0.069	0.053	0.158	-0.055	0.210	1.000				
Entry Tariff	-0.825	0.534	0.574	0.661	-0.718	0.772	0.214	1.000			
People & Planet League	-0.115	0.090	0.071	0.102	-0.109	0.072	0.076	0.185	1.000		
Research	-0.789	0.546	0.599	0.662	-0.757	0.677	0.136	0.902	0.146	1.000	
Completion	-0.732	0.526	0.522	0.514	-0.642	0.644	0.151	0.816	0.087	0.765	1.000

Data obtained from 'The Guardian' with the exception of the 'Completion' and 'Research' scores which were obtained from 'The Sunday Times'.

Initially, to avoid collinearity issues, the link between overall league table position and the application rate was obtained through a random effects panel regression including control variables discussed above: Table 2 presents the analysis. The expected coefficients were obtained, a higher league table ranking leading to a larger application ratio, and were statistically significant. The results estimate that for every ten positions higher in the league table a university is they will receive a further 0.1 applications per place; for example, the University of Glasgow was on average in 20th place in the Guardian league table over our sample period and received 0.27 more applications per place compared with the Cardiff University, ranked on average 10 places lower.

Table 2. University choice and league table position.

	All	Female	Male	UK	EU	Int
League table	-0.010***	-0.004**	-0.005***	-0.005**	-0.001*	-0.002***
	(0.001)	(0.023)	(0.000)	(0.045)	(0.060)	(0.000)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.423	0.286	0.460	0.179	0.500	0.614
n	654	654	654	654	654	654

Results obtained from a random effects panel regression (equation (1)) where the dependent variable for 'All' represents the number of applications for eventual acceptances, and for all subsequent columns the numerator of this fraction is for specific gender and country of origin group. Other control variables include the country within the UK the university sits, the group of universities the institution is aligned to, and whether the institution offers only specific courses, rather than a general range. The star convention is where *** represents significance to at least 1% confidence, ** to 5%, and * to 10%, where p-values are presented in parenthesis. Data obtained from the Guardian newspaper with authors' calculations; sensitivity was performed on data from the Complete University Guide with no significant differences noted.

Comparing by student gender and origin, where the dependent variable is the number of students applying from a cohort divided by total acceptances for the institutions, males were

more responsive to league tables than females (by more than a fifth: columns (2) and (3) of Table 2), with domestic students more responsive than international students (columns (4), (5) and (6) of Table 2). The model including only league table ranking with controls for year, country-location and university group explains much of the variation in the application rate, with the model performing best for international students (demonstrated by the high R^2-statistic in column (6) in Table 2).

Table 3. University choice and further attributes.

	All	Female	Male	UK	EU	Int
NSS Teaching	-0.099*	-0.099*	-0.014	-0.054	-0.009	0.002
	(0.053)	(0.053)	(0.647)	(0.201)	(0.404)	(0.799)
NSS Overall	0.075**	0.075*	0.013	0.046	0.006	0.008
	(0.072)	(0.072)	(0.594)	(0.184)	(0.516)	(0.267)
Expenditure	-0.109	-0.109	-0.062	-0.120*	0.008	0.031*
	(0.209)	(0.209)	(0.233)	(0.089)	(0.639)	(0.071)
Student/Staff Ratio	0.072*	0.072*	0.040	0.081**	-0.004	0.005
	(0.088)	(0.088)	(0.109)	(0.021)	(0.626)	(0.476)
Career Prospects	0.005	0.005	0.001	0.001	0.000	0.002
	(0.715)	(0.715)	(0.949)	(0.917)	(0.957)	(0.461)
Value Added	0.172**	0.172**	0.100**	0.113*	0.040**	0.033**
	(0.033)	(0.033)	(0.035)	(0.089)	(0.016)	(0.019)
Entry Tariff	-0.001	-0.001	-0.003	-0.005*	0.002**	0.002***
	(0.741)	(0.741)	(0.209)	(0.099)	(0.033)	(0.009)
People & Planet League	-0.002	-0.002	-0.001	-0.002	0.000	0.000
	(0.197)	(0.197)	(0.281)	(0.147)	(0.447)	(0.242)
Research	0.051	0.051	0.014	0.016	0.014**	0.023**
	(0.106)	(0.106)	(0.484)	(0.533)	(0.031)	(0.015)
Completion Rate	-0.002	-0.002	-0.003	0.017	-0.024***	0.001
	(0.958)	(0.958)	(0.895)	(0.564)	(0.001)	(0.959)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.493	0.359	0.578	0.176	0.654	0.735
n	328	328	328	328	328	328

Results obtained from a random effects panel regression (equation (1)) with control variables and star convention as in Table 2. Data obtained from the Guardian newspaper with the exception of completion rates and research scores which were obtained from the Times newspaper for 2014.

Table 3 presents similar analysis, widening to all data included in university league tables. The results demonstrate that the collinearity between variables makes it impossible to differentiate between their relative performances in influencing student choice (demonstrated by high R^2-statistics from the analysis with limited significance for specific variables). Of those significant independent variables, teaching scores enter with the 'wrong' direction (lower teaching satisfaction scores are estimated to lead to more applications) and value added is found to be significant as it shares the least correlation with other independent variables, as is evidenced in Table 1.

Despite this high amount of collinearity, further inference can be made from the results in Table 3. Specifically, that the revealed preference model better explains the preferences of non-domestic students, compared to UK students, by a factor of 4 (this can be seen by comparing R^2-statistics in columns (4), (5) and (6) in Table 3). This is an intuitive result as: First, UK students have more heterogeneity in their university preferences as they will focus on other factors beyond league table statistics, for example, closeness to home; and second, international students are less likely to be aware of the market prior to deciding to study in the UK and will therefore be more reliant on league tables. Further, the model explains male preferences 60 per cent better than female preferences (this can be seen by comparing R^2-statistics in columns (2) and (3) in Table 3), suggesting that in general, males are more sensitive to these league table parameters.

Similar analysis using discipline specific data provided by UCAS delivered similar results. Students studying specialist subjects such as medicine and dentistry, veterinary studies and education tend to be less sensitive to overall university league table positions. Beyond this there is limited variation from those reported on the aggregate data. Further, quantile regression techniques provided evidence that the impact of the league table position was increasing with the desirability of the institution (measured through the applications per place variable); that is, the league table position is more important the more popular the university. For example, a ten place league table elevation for an institution like the University of Southampton (with average Guardian league table position in our dataset of 20) is estimated to increase applications per place by 0.15 compared with 0.02 for an institution such as the University of Greenwich (average league table position of 100 in our sample). This suggests that there is more competition at the higher end of the university market than at the lower end.

Discrete choice modelling results

Although the revealed preference analysis has provided insights on student choices it has its limitations, as discussed above. Therefore, we now present analysis from our discrete choice modelling experiments. Table 4 presents results which evaluate the probability of choosing one hypothetical university over another as a function of the differences in attributes between these institutions. These results are presented for (i) the whole sample; (ii) between female and male students, and (iii) between students for whom at least one parent went to university or not. The former was found to be important in the revealed preference analysis above (and in Briggs, 2006) and the latter an important determinant found in the literature (for example Dunnett, 2012).

Table 4. Discrete choice experiment results.

	All	Female	Male	Parent Attend	Parent Not Attend
Fees	-0.409***	-0.493***	-0.379***	-0.371**	-0.458***
	(0.000)	(0.003)	(0.001)	(0.011)	(0.001)
Accommodation	-0.231***	-0.232***	-0.225***	-0.231***	-0.187***
	(0.000)	(0.003)	(0.000)	(0.001)	(0.003)
University league	-0.110***	-0.093***	-0.119***	-0.151***	-0.071***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Course league table	-0.112***	-0.078***	-0.134***	-0.178***	-0.061***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
People & Planet league	-0.134	-0.098	-0.198	0.015	-0.356**
	(0.211)	(0.602)	(0.137)	(0.927)	(0.021)
Student satisfaction	0.062***	0.054***	0.066***	0.076***	0.055***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Teaching score	0.035***	0.022**	0.041***	0.033***	0.036***
	(0.000)	(0.024)	(0.000)	(0.000)	(0.000)
Employability	0.068***	0.071***	0.069***	0.091***	0.051***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Contacts hours	0.101***	0.143***	0.070***	0.084***	0.091***
	(0.000)	(0.000)	(0.002)	(0.003)	(0.000)
Pseudo-R^2	0.128	0.112	0.143	0.195	0.084
n	3,389	1,097	2,227	1,509	1,547

Results obtained through a conditional Logit (equation (2)) where numbers in parenthesis represent p-values and the star convention is the same as in Table 2. Each column represents a separate sub-set of the sample: 'All' representing all the sample, 'Female' and 'Male' representing the two genders, and 'Parent Attend' and 'Parent Not Attend' representing those potential students who have at least one parent who has attended a higher education or neither respectively.

All variables, with the exception of the People & Planet league ranking, were strongly statistically significant and with the expected direction; that is, all university characteristics except the People & Planet league ranking were important in determining student choice (higher league table rankings, student satisfaction and contact hours, and lower fees and accommodation costs, positively affecting preferences). This was true for all separate demographic subsamples. Fees were found to be nearly twice as important as accommodation costs, and student satisfaction was estimated to be twice as important as teaching scores (results consistent across demographic subsamples), whereas differences in the post-graduate employment attributes were estimated more important than either student or teaching satisfaction, especially for students for whom at least one parent attended university. For example, over our sample period, The Universities of York and Southampton held similar league table positions (on average 13th and 20th respectively during our sample) and whereas the former has 4% better teaching scores, the latter has 2% better employability score (during our sample period) which is an acceptable trade-off according to the estimations above.

Comparing across demographics, there were limited differences between the preferences by gender. Statistically significant differences were identified with females being more concerned with contact hours (both genders preferring more contact hours to fewer) and less

influenced by the course league table position. Bigger differences were observed between students whose parents either did or did not go to university. Those students for whom at least one parent attended university were estimated to be more sensitive to the league table position of the institution and the course (by a factor of over two) and to future employment prospects (statistically significant differences). Students for whom neither parent attended university also appeared to be less specific in their preferences: all characteristics were statistically significant, and their preferences more spread than the more discriminating cohort whose parents had attended university. Further, potential students whose parents did not attend university seem to be a more heterogeneous group with respect to their preferences, demonstrated by their lower pseudo-R^2 coefficient relative to other demographics. This demonstrates that the model explains less of the variation in these potential students' decisions, suggesting that this cohort was not acting as consistently as others.

Willingness to pay

Table 5 presents willingness to pay statistics for each of the attributes across the different demographics. All figures represent the estimated amount potential students would be willing to pay for a 10 per cent improvement in each variable. This analysis is not performed for a marketing exercise in determining price strategy (the regulation of fees in the UK prohibits this to a large extent); however, it is done in order to make comparisons across different attributes measured using different units.

Table 5. Willingness to pay for a 10 per cent improvement in specific attributes.

	All	Female	Male	Parent Attended	Parent Not Attended
University league table	268***	189***	313***	408**	155***
Course league table	273***	159**	354***	479**	132***
People & Planet league	3	20	52	-4	78**
Student satisfaction	128***	93***	146***	171**	100***
Teaching score	73***	38*	93***	77**	67***
Employment	142***	123***	154***	208**	95***
Contacts hours	25***	29***	18**	23**	20**

Results obtained using the regressions performed in Table 4 with the sub-samples and star convention the same, where the delta method is applied to calculation the standard error in the coefficients. Willingness to pay is calculated by dividing the estimated coefficient (φ_j) in Table 4 for the respective attribute by the estimated coefficient attached to 'Fees' (a monetary variable).

The two attributes which were consistently estimated to be the most important were the university and course league table positions, followed by employment scores. On average, students were estimated to be willing to pay £270 in extra fees for a 10 per cent improvement in the league table ranking of the institution, whereby this number rises to over £400 for students with at least one parent who attended university. These figures were twice as high as the next most important - employability statistics. These results further highlight the difference between those potential students whose parents attended university and those who did not: the former have higher willingness to pay values (especially with respect to future employment prospects and league table positions), whereas for those potential students whose parents did not attend university preferences are more spread. Having a parent who has previously attended university makes the potential student more discerning with respect to what they are looking for in a university; specifically, these students are much more concerned with league table positions compared to student and teaching satisfaction results.

Summary

Key findings can be taken from this combined approach analysis. From the revealed preference methodology, the confirmation of strong collinearity between university attributes in Table 1 limited key findings to those comparing between demographic groups. The increased ability of league table statistics to predict better international and male students' choices implies that for these students league table factors are of importance. By extension, domestic and female students possess more specific preferences not observed in our methodology. From a strategic perspective, universities targeting either growth in international or domestic students should target league table characteristics to attract the former (who may have lower preconceptions of the different institutions) and should seek to better understand specific unexplained preferences for domestic students. Further, the analysis identified that for those institutions which are less attractive to prospective students (measured by applications per place) competition was based less on league tables; this suggests that for these institutions more niche, or targeted, strategies could be applied.

To identify these unexplained preferences and niche/targeted strategies, and to better understand the trade-offs between specific league table attributes, discrete choice modelling techniques as applied above offers a valid option. The results from this method suggested a key difference in preferences between prospective students depending on whether their parents attended university; those potential students whose parents did attend university were strongly influenced by league table rankings, those whose parents did not were more holistic in attributes considered relevant. It also implied that, whereas teaching satisfaction was important to potential students, employment characteristics were estimated to be twice as desirable. This has implications for the Teaching Excellence Framework ('TEF'), a system to evaluate university teaching quality currently being designed by the UK government, with recent proposals including both measures for teaching satisfaction and graduate employment (Department for Business, Innovation & Skills, 2015).

Conclusions

This paper provides a valuable addition to the literature, and a novel methodology, to understand and measure student preference between higher education institutions, which is increasingly relevant in the newly established university market in the UK. The combination of revealed and stated preference techniques provided triangulation between actual and hypothetical choices, a factor missing in literature to date. Importantly, for institutions it provides a method to understand the nuances of students' choice beyond league table position, enabling them to assess – for their student population type – the most appealing attributes to invest in, whether contact hours, employability initiatives, subsidised accommodation and so on. In this respect, the methodology is also of interest to other international higher education markets, in particular, those who operate in a market-informed manner (e.g. USA and Australia).

This research robustly tested the two-stage methodology, combining revealed and stated preference techniques with some significant early stage results. Further work could be undertaken expanding the sample sizes tested for different student types, subjects studied etc. Moreover, performing similar analysis on an institution's existing student population would provide information on where to allocate resources for their benefit. Finally, this methodology provides a helpful and informative means for institutions and the wider industry stakeholders to understand more meaningfully the preferences of their prospective student body.

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Appendix: example pairwise choice

Below is presented a representative sample of the pairwise choice which participants of the discrete choice survey were shown where the numbers within the table were altered for different individuals and where the ordering of the characteristics was also varied.

	University A	University B
Overall student satisfaction	86 per cent	76 per cent
Teaching satisfaction	88 per cent	88 per cent
Employment prospects	85 per cent	85 per cent
Contact hours (per weeks)	10.5	9
Fees (per year)	£9,000	£9,000
Accommodation costs (per year)	£4,300	£3,010
University league ranking (out of 100)	46	35
Course league ranking (out of 100)	57	57
Environmental performance ranking (out of 100)	59	74