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ABSTRACT

This paper explores the determinants of the choice of UK universities by overseas undergraduate applicants. We use data on overseas applicants in Business Studies and Engineering from 2002 to 2007, to 97 UK universities. Estimating using a Hausman-Taylor model to control for the possible correlation between our explanatory variables and unobservable university level effects, we find that the fees charged may influence the application decision of some students, but that any relationship between levels of fees and applications is nonlinear. The quality of education provided is positively and significantly related to the number of applications. Proximity to London and the existing popularity of a university among home applicants, are also significant predictors of university applications.

JEL Classification: I21, D12

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I. INTRODUCTION

The higher education sector continues to be an important contributor to the UK economy. In the 2004/5 academic year there were 2.48 million students in higher education in the UK, the sector enjoyed a total income of £18 billion and employed 346,000 people. Overseas students (students from outside of the EU) are an important part of the higher education sector. Again in the 2004/5 academic year, there were approximately 218,000 overseas students, having an estimated direct monetary impact on the UK economy of £2.87 billion (all figures from Vickers and Bekhradnia (2007), but see also Universities UK (2006)). This impact, comprising university fees and living expenditures, may also give rise to substantial multiplier effects, as estimated by Greenaway and Tuck (1995).[1] This impact is in addition to the fact that many overseas graduates find employment in the UK after graduation, thus adding to the pool of highly skilled labour and providing benefits for the UK economy. They can also have a positive impact on regional development, see Robson *et al.* (1997) and Universities UK (2001). Meanwhile, overseas students are expected to offer a number of non-monetary benefits to universities in terms of diversity of student cohorts, previous experiences and alumni networks.

Since the education of overseas students may impose some additional costs on universities, in 1980 the UK Government implemented new rules allowing universities to charge both undergraduate and postgraduate students from outside of the EU (referred to as overseas students) tuition fees reflecting the full cost of provision. This increase in fees had the immediate effect of reducing the number of overseas students choosing to study in the UK (see for example Williams (1987), Moore (1989)). As a result, universities were forced to consider the most effective strategies for regaining overseas student numbers (Woodhall (1989)). Attracting overseas students remains important today, for financial reasons as well as for the diversity of experience that they bring to undergraduate and postgraduate programmes.

Universities have had to consider much more seriously the information that is made readily available to help inform potential student choices. Simultaneously a number of changes have

[1] Overseas students may also impose costs on an economy, for example due to costs of health care provision and increasing pressures on the housing market. However, Vickers and Bekhradnia (2007) argue that due to the individual characteristics of university students (especially their age and lack of dependents), they are likely to impose few fiscal costs, and these are outweighed by the multiplier effects on the economy.

taken place in the higher education sector which have also resulted in an increase in the number of readily available potential quality indicators. For example, successive Research Assessment Exercises (RAEs) have provided information on research activities in academic departments, while the Quality Assurance Agency assessed and published information on the quality of teaching. Meanwhile, a number of University Guides, including the Times Guide, the Guardian Guide and the Virgin Guide, collate information on a wide range of factors that might influence student university choice, including RAE and teaching quality scores, but also investment in library, IT and facilities investment, cost and types of accommodation, and other factors. See HEFCE (2008) for a report evaluating five league tables, including The Sunday Times, The Times and The Guardian university guides. These guides provide students with a quick and easy way to compare institutions, and are especially useful to overseas students who do not have the opportunity to visit prospective universities before making their applications. However, the HEFCE (2008) report also identifies shortcomings of the guides and associated league tables, such as their focus on full-time undergraduate provision, and the impact of reputational factors rather than true quality indicators on institutions' standings.

This paper investigates the factors determining overseas students' decisions to apply for an undergraduate degree at a UK university. Understanding these determinants may enable both universities and policymakers to make better decisions in expanding the overseas market for UK higher education. Implicit throughout the analysis is the assumption that when overseas students select a university, this decision is made following two earlier decisions, namely what subject to study, and the country (UK) in which to study. Rather than rely on survey methods to deduce preferences for an overseas tertiary education, or a case study methodology as applied by Chapman and Pyvis (2006), we use UCAS (Universities and Colleges Admissions Service) data on overseas student applications and admissions. We are unaware of other analyses using this or comparable non-UK datasets to model the factors influencing the decision of overseas students to apply to particular universities for undergraduate degrees. The richness of data available on possible factors influencing UK undergraduate university choice explains our choice to focus on the undergraduate education sector, and also allows us to use regression methods to estimate the impact of potential explanatory variables.

There is a diverse literature examining the factors influencing the decisions relating to university study. Most similar to the present paper is Abbott and Leslie (2004) who use data from the same source (UCAS) for an analysis of both applications and acceptances in UK universities. Their analysis focuses on UK students, for whom common fees were imposed on all students, so that the impact of fees on demand was captured by year dummies. They were therefore unable to explore directly the impact of fees as we are able to in the present paper.

Since we can investigate the impact of price on the demand of overseas students for UK undergraduate degrees at competing institutions, our analysis contributes to the Student Demand Studies literature. Blaug (1981), as discussed in Woodhall (1991), offered an early UK contribution, estimating the impact on overseas student university demand from the introduction of full cost fees in the UK. Leslie and Brinkman (1987) discuss early contributions to the literature using US data, while Heller (1997) updated Leslie and Brinkman's US work and Cameron and Heckman (1999) provided a more recent US analysis. The consensus is that fee increases have a negative impact on student demand.

Psacharopoulos and Soumelis (1979) and Menon (1998) examine quantitatively the factors influencing school pupils' decisions to attend university (typically in their home nations) of Greece and Cyprus, respectively. However, the analyses do not relate to specific degree subjects, so attention focuses on individual and family characteristics influencing the decision to attend university, rather than university attributes. Oosterbeek *et al.* (1992) use survey data from the Netherlands to identify the factors that influence Economics students' university choices. Ford *et al.* (1999) look at the determinants affecting university choice for business students, but again they use survey data and for home rather than overseas students, in the US and New Zealand.

Another set of papers examines the factors determining the decision to study overseas, for example Altbach (1991), Mazzarol (1998), Mazzarol and Soutar (2002), Nattavud (2005), encompassing studies of both personal and family characteristics, and university attributes that influence student university choice decisions. Pyvis and Chapman (2007) focus on the decision to attend an offshore campus in the home country. Bourke (2000) offers one of the few analyses of the factors determining the choice of country in which to study, as well as the determinants of institution preference in which to study medicine.

The structure of the rest of this paper is as follows. In the next section we discuss our data and methods. Section III presents the results, while Section IV presents some concluding comments.

II. DATA AND METHODS

The objective of this paper is to uncover the determinants of applications by overseas students to UK universities for undergraduate studies. This may be estimated as a demand function for places in higher education, and therefore depends on the price and quality of the product being purchased, as well as other factors. We focus on applications as opposed to the number of students since the number of students is subject to supply-side capacity constraints, whereas the number of applicants is not. Our main estimated equation is:

$$log(y_{it}) = \alpha_i + \gamma_t + \beta_1 P_{it} + \beta_2 Q_{it} + \beta_3 X_{1it} + \beta_4 X_{2i} + \varepsilon_{it} \quad (1)$$

Where y_{it} is the number of applications by overseas students, α_i is the university-level effect, γ_t is the time effect, P_{it} is the fee charged to overseas students, Q_{it} is the quality of education provided, X_{1it} is a vector of time-varying variables, X_{2i} is a vector of time-invariant variables, the βs are the coefficients to be estimated and ε_{it} is a random error term.

Data

Our sample covers 97 UK universities from 2002 to 2007 (see Appendix 1 for a list of the universities included). The sample includes all UK universities at the start of the sample period; although new universities have been established since then, we retain the same universities in the sample throughout to ensure consistency of the data. Table 1 provides the descriptive statistics for our main variables of interest. Data for the number of undergraduate applications is from UCAS, and is available for 19 subject areas using the JACS (Joint Academic Coding System), divided into the domicile of the applicants (Home, EU, Overseas) and the gender of the applicants. In this paper we use the number of applicants for the subject areas of Business Studies and Engineering. There are several reasons for the choice of these two subjects. First, these are the two subjects with the largest populations of overseas students. Second, they are the subjects in which almost all of the universities in our sample are represented. Third, by having one laboratory-based subject and one classroom-based one, we are able to analyse any differences that exist between the behaviour of these two groups of applicants, for undergraduate degrees that often face different overseas student fee levels. Fourth, by restricting attention to individual subjects, we can to some extent overcome the problem that different universities may specialise in different subject areas, so that an analysis at the aggregate university level would capture not only differences in popularity across students, but also compositional differences in subjects across universities.

There are many applications by overseas students in both subjects. As shown in Table 1, there are slightly more applications by overseas male students in Business Studies as compared to female students, while there are many more male applicants in Engineering than female applicants. These patterns are also broadly reflective of the applications in these areas by Home students.

Our price variable is the fee charged by universities to overseas students. In most but not all universities, there are two fee bands at the undergraduate level for overseas students; a lower band for classroom-based subjects (including Business Studies), and a higher band for laboratory-based subjects (including Engineering). The data source is Reddin (2007). As shown in Table 1, the average fee for laboratory-based subjects is approximately £1400 more than the average fee for classroom-based subjects, with substantial variation both across universities and over time.

We use as our main measure of the quality of education provided, the rank of a university according to the relevant Times University Guide. A university's ranking is a composite measure based on teaching, student satisfaction, research, entry requirements, graduate employment, the proportion of good degrees awarded (i.e. 2.1 or first class), student/staff ratio, and the dropout rate.[2] We also use subject rankings published by the Times University Guide, which are a composite measure based on teaching, research, entry requirements, and graduate employment. Engineering is in turn divided into six specialisms (Aeronautical and Manufacturing, Chemical, Civil, Electrical and Electronic, General, and Mechanical Engineering). Since we only have data for overall engineering applications, we take the

[2] Consequently, a university's ranking will be at least partly a proxy for entry requirements.

average score of a university across all engineering specialisms in which it is represented, and construct a new ranking based on this average score.

We recognise the potential problems of measures of quality as reported in published university guides, for example the measures published have been argued (HEFCE (2008)) to rely on information that is readily available rather than accurate measures of quality. Hence, these measures of quality may not be as closely correlated with National Student Survey (NSS) results as may have been expected. Nevertheless, official measures such as the NSS and the RAE capture only part of the overall quality of a university (teaching and research, respectively) and the NSS was only introduced in 2005, part way through the period captured in our dataset.

In addition to price and quality, we control for other factors that may be important determinants of the attractiveness of individual UK universities to overseas applicants. Our control variables are the following. Distance from London captures the importance of London as the economic, social and political capital of the UK (as well as its main transport hub). The (logged) number of applications in the same subject areas by home students captures the overall popularity of the university in that subject. The inclusion of these variables also offers the advantage that any other variables found to have an impact on overseas applications represent impacts different to those facing home students; otherwise the effect would be captured in the coefficient on the number of home students. The (logged) number of overseas students, lagged one year, captures the overall popularity of the university amongst overseas students, and is intended to capture word-of-mouth recommendations by students already studying in the UK. A set of year dummies is used to control for year-specific fluctuations in the number of overseas applications caused by exchange rate fluctuations and other factors.

We also collected data on the number of overseas British Council education exhibitions attended by the university. These exhibitions have the objective of raising the profile of British education as well as providing universities with an opportunity to recruit students. Data on this are available only for 2006 and 2007 so we were restricted to much smaller sample sizes. Nevertheless, this was the best proxy available for university international marketing activities, as data are typically not made publically available, even if collated by universities themselves.

We experimented with other possible control variables, such as the presence of an English Premier League football team in the town or city of a university to test whether this increases the attractiveness of a university to overseas students. We speculated that while some students may be particularly attracted to a town or city as it offers the opportunity to see premiership football games as well as study, for the majority of students the presence of a premiership football team may simply increase awareness of particular UK destinations. Dummy variables were created to indicate a member of The Russell Group of universities, which identifies itself as "… an Association of leading UK research-intensive Universities…", (see http://www.russellgroup.ac.uk/), a member of the '1994 group' of universities which are relatively small research universities and an alternative grouping to the Russell Group of universities, or a plate glass university (universities built in the 1960s following the Robbins report on higher education). See Appendix 1 for members of each (intersecting) group of universities. Other control variables included the age of the university,[3] dummy variables for whether the university has a medical school, whether the university is a new (post-1992) university[4], and climate variables such as temperature and average annual rainfall. However, the coefficients on all of these explanatory variables consistently turned out to be statistically insignificant, perhaps because of multicollinearity, and so the variables have been dropped in the analysis that follows.

Methods

Equation (1) may be estimated using OLS, pooling observations across universities and over time. However, OLS does not take into account the panel nature of the data and can yield invalid inferences (see Baltagi (2005)). Instead of OLS, we therefore use the Hausman and Taylor (1981) estimator which takes into account the panel structure of the data. Our model selection process follows Baltagi, Bresson and Pirotte (2003) in using the Hausman (1978) test to select between alternative panel data estimators. First, we perform a Hausman test comparing the fixed and random effects estimators. If the null hypothesis of no systematic differences is not rejected, the random effects estimator is preferred since it yields the most

[3] The age of universities in the data set is very diverse, so to control for outliers such as Oxford, Cambridge and St. Andrews universities a number of alternative age dummy variables were created. However, the coefficients on these variables were always insignificantly different from zero.
[4] The Further and Higher Education Act 1992 allowed polytechnics to become universities. This Act has to date led to the establishment of 60 new universities.

efficient estimator under the assumption of no correlation between the explanatory variables and the errors.

However, if the Hausman test between fixed and random effects is rejected, then a second Hausman test is performed comparing the Hausman and Taylor (1981) estimator and the fixed effects estimator. The Hausman and Taylor estimator allows for some but not all explanatory variables to be correlated with the unobserved individual effects, unlike the fixed effects model which assumes that all the explanatory variables are correlated with the individual effects (while the random effects estimator assumes that none of the explanatory variables are correlated with the individual effects). Failure to reject this second Hausman test implies the use of the more-efficient Hausman and Taylor estimator, whilst rejection implies the use of the fixed effects estimator. We report the results of these Hausman tests in the results section. The Hausman and Taylor estimator has the additional advantage over the fixed effects estimator in that it allows us to recover the parameter estimates of any time-invariant explanatory variables (such as distance from London, or membership of the Russell Group) which would otherwise be removed in the fixed effects transformation.

Initial research considered the possibility that price is endogenously determined, rather than an exogenous explanatory variable that may impact on applications. For instance, it may be that universities set their fees in response to demand conditions, so that there is a two-way relationship between applications and fees. Therefore, a 2SLS (Two Stage Least Squares) model was developed in which university overseas fees were instrumented using the other overseas fee level of a university (i.e. laboratory fees are instrumented using class-based fees, and vice versa) and a post-1992 university dummy. An efficient, 2-step GMM (Generalised Method of Moments) model was employed, with standard errors clustered by university to control for within-university correlation and heteroskedasticity in the error term. The Hansen (1982) J-test of overidentification suggests that the chosen instruments are appropriate. However, a Hausman test comparing OLS and 2SLS results indicated no systematic differences between the estimates. Results from the C-test of exogeneity (see Baum, Schaffer and Stillman (2003)) indicated that fees could be treated as exogenous and hence 2SLS methods were not required. The results of the 2SLS estimates are reported in Appendix 2.

III. RESULTS

Tables 2 and 3 report simple correlations between the variables used in the econometric analysis. Table 2 shows that, whilst there is high correlation between the number of male and female overseas applicants in both Business and Engineering, the correlation across domiciles (e.g. between male overseas and male home applicants), and across subject areas (e.g. between overseas Business and overseas Engineering applicants) is much lower. Hence, although there is positive correlation in the number of applicants of different gender, subject and domicile, capturing the overall popularity of each institution in each subject, there is also sufficient variation in the pattern of applications to suggest that institutional-level effects are not the whole story.

Table 3 reports the correlation between the log of total overseas applicants (our dependent variable) and the principal independent variables used in the analysis. The correlations are strong and suggestive; fees are positively correlated with the number of applications. This appears to be contrary to standard demand theory, although of course the correlation table does not control for the effects of other variables. University rankings are negatively correlated with the number of applications; since university rankings are decreasing in quality with the best university ranked 1, this negative correlation indicates that better-ranked universities get more applications. Table 3 also shows that the number of overseas applications is positively correlated with existing stocks of overseas students and the number of British Council exhibitions attended by the university, and negatively correlated with the distance of a university from London. In our econometric analysis we will seek to explore whether all these variables have the same effects on the number of overseas applications, controlling for the effects of the other variables. Note also from Table 3 that many of the independent variables are highly correlated with each other; multicollinearity is a problem with this dataset, hence our relatively parsimonious model specification.

Table 4 reports the results of regression equation (1). The results are obtained using the Hausman-Taylor estimator discussed above, with standard errors clustered by university to control for heteroskedasticity and within-university correlation in the error term. All regressions include year dummies to control for time-specific shocks such as exchange rate fluctuations which should impact all universities equally. All time-varying variables and all university-specific variables are assumed to be potentially correlated with the unobserved university effects. Columns (1) and (2) report the results for male and female Business applicants respectively, with columns (3) and (4) for male and female Engineering applicants respectively. The Hausman diagnostic test results reported at the bottom of the table for most part confirm the appropriateness of the Hausman-Taylor model especially for Engineering students: for these students, the first Hausman test rejects at less than 1% significance or better the random effects estimator in favour of the fixed effects estimator, while the second Hausman test never rejects the Hausman-Taylor estimator in favour of the fixed effects estimator. For Business Studies students the Hausman test does not reject random effects in favour of fixed effects estimation, but neither does it reject the Hausman Taylor estimator in favour of fixed effects. This pattern is fairly consistent in the remaining tables. In the interest of consistency we report Hausman-Taylor results for all groups of students.

The fee charged by universities is never a statistically significant determinant of the number of applications for any group of students. This is an interesting result, as all the regressions control for the quality of the university, so that higher prices are not proxying for higher quality. There are several possible explanations for this result. First, as can be seen in Table 3, fees are closely related to quality measures and hence the insignificance of fees may reflect the multicollinearity between these variables. Second, there may be other factors that influence both university fees and the number of applications that we are not capturing in our regressions. Third, it may simply be that, having decided to incur the expense of going to the UK for higher education, the difference in fees across universities plays little role in students' decision-making process. Fees also only represent part of the total cost of attending university, with living costs and the opportunity cost associated with foregone earnings also possible factors, although their measurement would present numerous difficulties.

An alternative explanation for the non-significance of fees may be obtained from signalling theory. Signalling theories such as that of Milgrom and Roberts (1986) and more recently Fluet and Garella (2002) suggest that a positive relationship between price and quality may be expected. Similarly, empirical evidence has confirmed that for a broad range of products price and quality are positively correlated, although as in the current analysis, the correlation is not perfect, for example Caves and Greene (1996). It may be that the positive effects of signalling completely offsets the negative effects that would be expected from consumer choice theory.

Considering the other principal explanatory variables included in the model, Business Studies students appear to be influenced by the overall ranking of the university, a feature shared with female but not male Engineering students. Further, Business Studies students seem to consider the subject specific rankings of universities, while Engineering students do not.[5] We can only speculate as to the reason for this result, but presume that if Engineering students do consult quality rankings then the result reflects multicollinearity between explanatory variables. These results also indicate that different groups of students may value different characteristics of universities when making their applications. Both Engineering and Business Studies students typically apply to universities that also attract higher numbers of Home applications in the same subject areas, but interestingly students do not seem to be as attracted to universities that already have greater existing overseas student populations. Any positive relationship between applications and existing overseas student populations may reflect the possibility of direct word of mouth recommendations, or the perception that these universities are better-equipped to deal with the needs of overseas students, but only for male Engineering students is the positive coefficient significantly different from zero at at least a 5% significance level. The positive relationship between overseas and Home applications may reflect the overall popularity of the university or some reputational advantage which is not captured by the university rankings. All overseas students also appear to be attracted to universities with greater proximity to London, thus confirming the hypothesis that students are attracted to the city.

Although possible explanations for the finding that fees do not have a significant impact on overseas applications have been put forward, the result may reflect an incorrect assumption that the relationship between fees and applications is linear. To explore the possibility that this relationship is in fact non-linear, in Table 5 the analysis of Table 4 is repeated, including the relevant squared fees variable when modelling both Business Studies and Engineering overseas applications. A non-linear relationship between fees and applications can be identified for Business Studies students (columns (1) and (3)) but not for Engineering students. This non-linear relationship is significant at the 5 percent level for female Business Studies students, and just misses the 10 percent significance level for male Business Studies students. The turning point of the relationship is approximately £8,000, so that higher fees are associated with fewer applications below £8,000, but with more applications above this

[5] We also have data on the individual components of the rankings. Whilst it may be of interest to explore which of these individual components have the greatest impact on application numbers, these components are very highly correlated with one another so that a multiple regression controlling for all components simultaneously may not be informative, while including each component separately would mean that we are not appropriately controlling for other potential determinants and so would not be able to determine the relative importance of different components.

threshold. Returning to the literature on signalling discussed above, this suggests that price may become a signal of quality only for Business Studies students, and only when it exceeds the threshold of £8,000.

When the squared fees variable is replaced by an interaction variable formed by multiplying the relevant fees variable by Times ranking to test if fees have a significant impact on demand in the face of high/low rankings, again differences between students emerge, with the coefficient on the variable being significantly different from zero for female Business Studies students only.[6] That the coefficient is negative suggests that universities with higher rank (lower quality) are more adversely affected in terms of female Business Studies application numbers by an increase in fees. That is, this group of students appears to be more price-sensitive when deciding to go to lower-quality universities. Other results remain similar to those reported in Table 4, attesting to the robustness of the results.

In Table 6, we re-run the regressions in Table 5, but include the number of British Council exhibitions attended by each university, as a proxy for the international marketing activities of the universities. Unfortunately, data were only available for the last two years of our dataset, considerably reducing the number of observations available. The results for the other variables of interest are broadly similar to those in Table 5, for example the non linear significance of fees for female Business Studies students, and the positive relationship between home applications and overseas applications. Nevertheless, the striking result emerges that the number of British Council exhibitions attended does not have a statistically significant impact on overseas applications. We speculate that this can be at least partly explained by students increasingly having recourse to a greater number of alternative sources of information, including university web pages and university guides. Attendance at exhibitions may then be in the hope of obtaining a favourable impression of a university, reinforcing information messages already received by an applicant.

IV. CONCLUSIONS

This paper investigates empirically the factors influencing overseas students' decisions to apply to UK universities to study Business Studies and Engineering, using an original dataset

[6] Performing the regressions with both squared fees and fees interacted with Times rank yielded insignificant results which may be due to multicollinearity.

of 97 UK universities from 2002 to 2007. The analysis considers the impact on applications of fees, university characteristics and quality indicators reported in university guides. The analysis indicates which information and factors students use when selecting UK universities to apply to. Overseas students are found to be influenced by quality indicators such as quality rankings, although interestingly Engineering and Business Studies students are influenced by different quality indicators, with Business Studies students typically significantly influenced by university and subject specific guide rankings. Nevertheless, there is some evidence that overseas students in the sample prefer to be close to London, and are found to have similar preferences to home students, when selecting universities to apply to. Of particular note are two results: first, if fees have any significant impact on application decisions then the relationship is nonlinear and may depend on the quality of the university; and second, a university's attendance at British Council exhibitions does not have a significant effect on student applications to study either Business Studies or Engineering.

These results are expected to be particularly relevant to university policymakers. While universities cannot move nearer to London, they can consider the nature of the marketing activities undertaken, with an awareness that some forms of marketing may be ineffective. One promising alternative to participation in British Council exhibitions may be to form partnerships with foreign institutions of higher education, which, if successful, may attract greater numbers of overseas students, which may have positive effects on future overseas applications.

Education is an example of an experience good, for which much information can be collected in advance, but perfect information can never be obtained. It is therefore interesting to identify the weights attached by possible overseas applicants to general and subject specific quality rankings as are published in guides such as The Times University Guides. Our results suggest that universities have some flexibility to charge fees higher than rival institutions without adversely affecting application numbers, but the relatively small range of fees within the dataset implies that this result should be acted upon with caution.

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Table 1: Descriptive Statistics

Variable	Obs	Mean	Std Dev	Min	Max
Degree applications, Business Studies, Overseas Male	571	244.22	241.98	0	1414
Degree applications, Business Studies, Overseas Female	571	202.30	212.99	0	1186
Degree applications, Engineering, Overseas Male	571	220.91	272.97	0	1435
Degree applications, Engineering, Overseas Female	571	43.979	66.95	0	332
Degree applications, Business Studies, Home Male	571	925.82	678.52	0	3574
Degree applications, Business Studies, Home Female	571	824.03	665.12	0	3589
Degree applications, Engineering, Home Male	571	681.78	627.72	0	3388
Degree applications, Engineering, Home Female	571	85.294	91.503	0	454
Undergraduate Overseas fees, classroom-based	570	8105.1	1358.1	5900	17350
Undergraduate Overseas fees, laboratory-based	570	9530.2	1868.4	6300	18500
Times rank	560	49.618	29.143	1	109
Ranking in Business Studies	512	44.764	25.779	1	97
Average Engineering rank	477	40.218	22.944	1	82
Distance from London (Miles)	570	152.43	124.97	1	412
Number of overseas students	564	862.76	572.7	15	3645
Number of British Council exhibitions attended	191	15.152	8.9926	0	42

Table 2: Correlation between applications

	Male OS Bus	Female OS Bus	Male OS Eng	Female OS Eng	Male H Bus	Female H Bus	Male H Eng	Female H Eng
Male OS Bus	1.0000							
Female OS Bus	0.9652	1.0000						
Male OS Eng	0.3509	0.3818	1.0000					
Female OS Eng	0.2604	0.3145	0.9548	1.0000				
Male H Bus	0.4669	0.4382	0.0640	-0.0364	1.0000			
Female H Bus	0.2882	0.2592	-0.0879	-0.1680	0.8948	1.0000		
Male H Eng	0.2271	0.2585	0.7431	0.6943	0.2635	0.1242	1.0000	
Female H Eng	0.1930	0.2277	0.7459	0.7480	0.1449	0.0171	0.9499	1.0000

Note: Sample size is 571 for all correlations reported.

Table 3: Correlation between the independent variables

	Log OS apps	OS fees class	OS fees lab	Times rank	Business rank	Average Eng rank	OS students	Dist to London	Exhibits
Log OS apps	1.0000								
OS fees class	0.2133	1.0000							
OS fees lab	0.3612	0.8620	1.0000						
Times rank	-0.4369	-0.5486	-0.7798	1.0000					
Business rank	-0.4832	-0.4456	-0.6327	0.8078	1.0000				
Average Eng rank	-0.3707	-0.4905	-0.7340	0.8348	0.6881	1.0000			
OS students	0.5001	0.2671	0.2139	-0.1247	-0.1111	-0.0504	1.0000		
Distance to London	-0.4860	-0.2051	-0.1010	-0.0542	0.0295	-0.0556	-0.3844	1.0000	
Exhibitions	0.4943	-0.2383	-0.0782	-0.1111	-0.1903	-0.1753	0.3992	-0.2356	1.0000

Note: Sample size is 435 for all correlations reported except for the correlation between exhibitions and all other variables, for which the sample size is 147.

Table 4: Regressing applications on price, quality and other variables

	(1) Male Bus	(2) Female Bus	(3) Male Eng	(4) Female Eng
Fees, class	0.038	0.045		
	(0.64)	(0.89)		
Fees, lab			-0.035	-0.005
			(1.33)	(0.14)
Times rank	-0.005	-0.009	-0.000	-0.008
	(2.02)*	(3.69)**	(0.04)	(2.13)*
Business rank	-0.006	-0.005		
	(5.68)**	(4.79)**		
Engineering rank			0.003	-0.002
			(1.21)	(1.09)
Bus Home apps	0.683	0.746		
	(6.66)**	(7.32)**		
Eng Home apps			0.685	0.676
			(5.93)**	(4.67)**
Log overseas	0.033	0.145	0.161	0.178
	(0.48)	(1.83)+	(2.41)*	(1.23)
Distance to London	-3.691	-3.783	-3.092	-2.901
	(6.75)**	(7.54)**	(4.15)**	(4.18)**
Year=2003	0.192	0.158	0.154	0.319
	(4.58)**	(4.56)**	(4.13)**	(4.65)**
Year=2004	0.325	0.055	0.268	0.286
	(6.24)**	(1.03)	(6.25)**	(3.70)**
Year=2005	0.432	-0.022	0.347	0.254
	(5.99)**	(0.36)	(6.35)**	(3.41)**
Year=2006	0.218	-0.080	0.206	0.071
	(2.69)**	(1.03)	(3.51)**	(0.79)
Year=2007	0.180	-0.161	0.182	0.199
	(1.77)+	(1.73)+	(2.60)**	(2.18)*
Observations	492	492	471	461
Universities	87	87	82	81
Hausman FE-RE	14.54	6.57	46.78	51.47
p-value	0.15	0.77	0.00	0.00
Hausman HT-FE	1.49	1.32	3.67	4.76
p-value	1.00	1.00	0.96	0.91

Notes: Absolute value of z statistics in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%. Estimation method is Hausman-Taylor with standard errors clustered by university. Hausman FE-RE is the chi-squared of the Hausman test comparing the fixed effects and random effects estimator. p-value is the p-value of this test. Hausman HT-FE is the chi-squared of the Hausman test comparing the fixed effects and Hausman-Taylor estimator. p-value is the p-value of this test.

Table 5: Investigating further the relationship between applications and price

	(1) Male Bus	(2) Male Bus	(3) Female Bus	(4) Female Bus	(5) Male Eng	(6) Male Eng	(7) Female Eng	(8) Female Eng
Fees, class	-0.458	0.091	-0.747	0.150				
	(1.46)	(1.38)	(2.96)**	(2.39)*				
Fees, class squared	0.029		0.046					
	(1.64)		(3.18)**					
Class fees * Times rank		-0.001		-0.003				
		(1.39)		(3.76)**				
Fees, lab					-0.077	-0.050	-0.057	-0.027
					(0.65)	(1.61)	(0.39)	(0.56)
Fees, lab squared					0.002		0.002	
					(0.40)		(0.36)	
Lab fees * Times rank						0.001		0.001
						(0.64)		(0.71)
Times rank	-0.004	0.007	-0.008	0.015	0.000	-0.005	-0.008	-0.015
	(1.80)+	(0.77)	(3.35)**	(2.23)*	(0.00)	(0.59)	(2.08)*	(1.30)
Business rank	-0.006	-0.006	-0.005	-0.004				
	(5.38)**	(4.89)**	(4.61)**	(3.81)**				
Engineering rank					0.003	0.003	-0.002	-0.002
					(1.21)	(1.24)	(1.09)	(1.05)
Bus Home apps	0.659	0.685	0.709	0.750				
	(6.71)**	(6.77)**	(7.45)**	(7.63)**				
Eng Home apps					0.683	0.692	0.674	0.682
					(5.93)**	(5.96)**	(4.68)**	(4.73)**
Log overseas	0.031	0.015	0.142	0.109	0.163	0.162	0.180	0.180
	(0.40)	(0.20)	(1.51)	(1.24)	(2.45)*	(2.41)*	(1.27)	(1.23)
Distance to London	-3.690	-3.697	-3.781	-3.794	-3.082	-3.130	-2.887	-2.956
	(6.81)**	(6.79)**	(7.45)**	(7.44)**	(4.08)**	(4.21)**	(4.13)**	(4.32)**
Observations	492	492	492	492	471	471	461	461
Universities	87	87	87	87	82	82	81	81
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hausman FE-RE	16.50	16.44	10.47	12.49	49.19	44.33	56.11	47.09
p-value	0.12	0.13	0.49	0.33	0.00	0.00	0.00	0.00
Hausman HT-FE	1.40	1.54	1.22	1.41	3.66	3.43	4.84	4.65
p-value	1.00	1.00	1.00	1.00	0.98	0.98	0.94	0.95

Notes: Absolute value of z statistics in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%. All regressions include (unreported) year dummies. Estimation method is Hausman-Taylor with standard errors clustered by university. Hausman FE-RE is the chi-squared of the Hausman test comparing the fixed effects and random effects estimator. p-value is the p-value of this test. Hausman HT-FE is the chi-squared of the Hausman test comparing the fixed effects and Hausman-Taylor estimator. p-value is the p-value of this test.

Table 6: The (non)impact of attendance at British Council exhibitions

	(1) Male Bus	(2) Male Bus	(3) Female Bus	(4) Female Bus	(5) Male Eng	(6) Male Eng	(7) Female Eng	(8) Female Eng
BC Exhibitions	-0.003	-0.001	-0.003	0.002	0.004	0.004	0.005	0.006
	(0.65)	(0.16)	(0.81)	(0.35)	(0.75)	(0.80)	(0.54)	(0.59)
Fees, class	-0.445	0.363	-1.361	0.439				
	(1.05)	(4.48)**	(1.98)*	(4.58)**				
Fees, class squared	0.038		0.088					
	(1.57)		(2.50)*					
Class fees * Times rank		-0.004		-0.008				
		(2.72)**		(3.24)**				
Fees, lab					0.041	-0.000	0.339	-0.158
					(0.32)	(0.01)	(1.14)	(1.88)+
Fees, lab squared					-0.001		-0.015	
					(0.12)		(1.57)	
Lab fees * Times rank						0.001		0.005
						(0.98)		(1.62)
Times Rank	-0.002	0.034	-0.008	0.062	-0.001	-0.013	-0.004	-0.047
	(0.92)	(2.48)*	(2.98)**	(2.95)**	(0.30)	(1.01)	(0.55)	(1.72)+
Business Rank	0.003	0.005	0.008	0.012				
	(0.75)	(1.45)	(1.84)+	(4.00)**				
Engineering Rank					0.006	0.006	0.004	0.005
					(1.10)	(1.14)	(0.54)	(0.71)
Bus Home apps	0.651	0.613	0.758	0.694				
	(3.52)**	(3.22)**	(3.68)**	(3.17)**				
Eng Home apps					0.594	0.605	0.606	0.647
					(4.68)**	(4.59)**	(1.56)	(1.64)
Log % overseas	0.090	0.025	-0.077	-0.207	0.649	0.652	0.338	0.360
	(0.72)	(0.20)	(0.56)	(1.60)	(3.04)**	(3.08)**	(0.55)	(0.61)
Distance to London	-2.884	-3.064	-3.521	-3.909	-1.631	-1.690	-2.570	-2.738
	(3.88)**	(4.10)**	(5.04)**	(4.85)**	(2.00)*	(2.08)*	(1.51)	(1.63)
Year=2007	-0.134	-0.105	-0.138	-0.080	-0.053	-0.057	0.149	0.149
	(2.56)*	(2.07)*	(2.41)*	(1.41)	(1.22)	(1.33)	(1.73)+	(1.77)+
Observations	168	168	168	168	157	157	154	154
Universities	85	85	85	85	79	79	78	78
Hausman FE-RE	13.37	18.27	24.34	39.14	13.70	13.34	11.28	16.64
p-value	0.10	0.02	0.00	0.00	0.09	0.10	0.19	0.03
Hausman HT-FE	1.41	1.09	1.15	0.64	0.36	0.72	0.70	1.08
p-value	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Notes: Absolute value of z statistics in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%. Estimation method is Hausman-Taylor with standard errors clustered by university. Hausman FE-RE is the chi-squared of the Hausman test comparing the fixed effects and random effects estimator. p-value is the p-value of this test. Hausman HT-FE is the chi-squared of the Hausman test comparing the fixed effects and Hausman-Taylor estimator. p-value is the p-value of this test.

Appendix 1: Universities included in the sample.

Anglia Ruskin University	* University of Cambridge
Aston University	University of Central Lancashire
Bournemouth University	University of Derby
Brunel University	University of Dundee
* Cardiff University	^ University of Durham
City University	^ # University of East Anglia
Coventry University	University of East London
De Montfort University	* University of Edinburgh
Glasgow Caledonian University	^ # University of Essex
Goldsmiths College	^ University of Exeter
Heriot-Watt University, Edinburgh	University of Glamorgan
* Imperial College London	* University of Glasgow
Keele University	University of Gloucestershire
* Kings College London	University of Greenwich
Kingston University London	University of Hertfordshire
^ # Lancaster University	University of Huddersfield
Leeds Metropolitan University	University of Hull
Liverpool John Moores University	# University of Kent
London Metropolitan University	* University of Leeds
London South Bank University	^ University of Leicester
^ Loughborough University	University of Lincoln
* London School of Economics	* University of Liverpool
Manchester Metropolitan University	University of Nottingham
Middlesex University	* University of Oxford
Napier University	University of Paisley
Newcastle University	University of Plymouth
Northumbria University	University of Portsmouth
Nottingham Trent University	^ University of Reading
Oxford Brookes University	University of Salford
^ Queen Mary, University of London	* University of Sheffield
* Queen's University Belfast	* University of Southampton
Roehampton University	^ University of St Andrews
^ Royal Holloway	University of Stirling
Sheffield Hallam University	University of Strathclyde
^ School of Oriental & African Studies	University of Sunderland
Staffordshire University	^ University of Surrey
Thames Valley University	^ # University of Sussex
The Robert Gordon University	University of Teesside
* The University of Manchester	University of Ulster
UCE Birmingham	University of Wales Aberystwyth
* University College London	University of Wales Bangor
University of Aberdeen	University of Wales Lampeter
University of Abertay, Dundee	University of Wales Swansea
^ University of Bath	* # University of Warwick
* University of Birmingham	University of West of England
University of Bradford	University of Westminster
University of Brighton	University of Wolverhampton
* University of Bristol	^ # University of York
University of Buckingham	

Notes: * indicates a member of The Russell Group of universities. # indicates a plate glass university. ^ indicates a 1994 group university.

Appendix 2: 2SLS Estimation Results

	(1) Male Bus	(2) Female Bus	(3) Male Eng	(4) Female Eng
Fees, class	0.542	0.399		
	(1.76)+	(1.42)		
Fees, lab			-0.099	0.009
			(1.36)	(0.15)
Times rank	-0.002	-0.007	-0.009	-0.011
	(0.40)	(1.73)+	(2.44)*	(2.75)**
Business rank	-0.003	-0.006		
	(0.99)	(1.80)+		
Engineering rank			-0.013	-0.016
			(2.99)**	(3.92)**
Bus Home apps	0.637	0.704		
	(5.45)**	(6.84)**		
Eng Home apps			0.621	0.746
			(7.93)**	(9.45)**
Log overseas	0.194	0.207	0.559	0.376
	(1.92)+	(2.55)*	(3.92)**	(3.04)**
Distance to London	-2.836	-3.346	-2.745	-2.670
	(6.23)**	(7.80)**	(5.41)**	(5.27)**
Year=2003	-0.009	0.032	0.153	0.330
	(0.09)	(0.34)	(3.06)**	(4.58)**
Year=2004	-0.036	-0.174	0.234	0.243
	(0.19)	(0.95)	(3.46)**	(2.35)*
Year=2005	-0.085	-0.366	0.333	0.252
	(0.31)	(1.43)	(3.62)**	(2.30)*
Year=2006	-0.462	-0.532	0.224	0.058
	(1.26)	(1.54)	(2.06)*	(0.51)
Year=2007	-0.687	-0.733	0.207	0.141
	(1.41)	(1.63)	(1.47)	(0.98)
Observations	492	492	471	461
Hausman test chi2	-2.04	0.37	2.61	-0.05
p-value	1.00	1.00	0.99	1.00
Underidentification χ^2	41.23	41.23	51.73	56.00
Weak identification F	25.03	25.03	259.00	256.67
Hansen J-test p-value	0.52	0.50	0.36	0.03
Endog. of fees p-value	0.18	0.24	0.07	0.30

Notes: Absolute value of z statistics in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%. Estimation method is 2SLS using efficient 2-step GMM, with standard errors clustered by university. University fees for Engineering students is instrumented using fees for Business Studies students and a post-1992 university dummy, while university fees for Business Studies students is instrumented using fees for Engineering students and a post-1992 university dummy. The Hausman test is the test for equality of parameter estimates between OLS and 2SLS. Underidentification chi2 is the chi-squared of the LM test for whether or not the equation is identified. Weak identification F is the F-statistic of the Wald test for weak correlation between the instruments and the instrumented variable. The Hansen J-test is the test for over-identification. The test of whether or not fees are endogenous is the C-test (see Baum, Schaffer and Stillman (2003) for details).