The Effect of Casual Teaching on Student Satisfaction: Evidence from the UK

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Abstract

Using data on student satisfaction and teaching time in the UK, we examine how the proportion of teaching conducted by casual staff affected student satisfaction in the 2014-15 academic year. We find that an increased proportion of casual teaching leads to lower student satisfaction, even when controlling for the respondent's subject, university and faculty. This suggests that there is a trade-off between increasing casualisation and student satisfaction which could have implications for future student demand. These results can be generalised to the rest of the economy and highlight potential perverse effects arising from the use of casual contracts.

JEL classifications: I20, I23, C21, J41

Keywords: Casual Contracts, UK Higher Education, Student Satisfaction, Educational Economics

1 Introduction

A large and increasing proportion of teaching in UK universities is being fulfilled by staff employed on casual contracts, rather than those on permanent contracts. Figures from a survey of UK university staff, reported in greater detail below, suggest an average proportion of teaching conducted by casual staff of 13% in 2014/15. Increasing casualisation in higher education may be even greater outside the UK, with at least half of teaching staff on casual contracts in the US (Danaei 2019, AAUP 2018) and similar rates of casualisation occurring in Australia (Broadbent et al. 2018, May 2011). Consequently, universities are becoming dependent on a pool of workers hired on precarious and unfavourable contracts to carry out teaching activities. This is driven by increased funding constraints (McDonald 2017, Percy & Beaumont 2008) and to enable academics to concentrate on strategic activities and objectives, such as high-profile research, prioritised by managers (UCU 2020). Furthermore, casualisation is not a phenomenon restricted to the higher education sector, with temporary employment increasingly a concern across the whole economy (ILO 2016, Lucidi & Kleinknecht 2010).

Increasing casualisation could be a problem for a number of reasons, as it may lead to lower student satisfaction, worsening student results, lower levels of human capital accumulation and negative effects on staff well-being. Educational quality could be harmed by high levels of casualisation for two reasons. Firstly, casual staff may not be able to provide as many inputs as permanent staff as a result of limited time dedicated to teaching, not being paid/employed to provide out-of-class tuition, and if they are engaging in other paid work (Klopper & Power 2014, Richardson & Radloff 2014). Secondly, casual staff may be less experienced, skilled and trained than permanent staff (Percy &

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Beaumont 2008). However, there is little empirical evidence to support such beliefs. This paper acts to provide empirical evidence on the first problem, the relationship between staff casualisation and student satisfaction. Students might prefer to be taught by permanent staff for a number of reasons, so increasing use of casual teaching could lead to a reduction in student satisfaction. This is of interest not only because of the direct effect on student satisfaction in terms of retention, academic achievement, human capital acquisition and the value for money expected by "paying customers" (Kay et al. 2010) but also because reductions in student satisfaction can adversely impact university's rankings in league tables. Low rankings can result in reduced student demand for those institutions which place a larger proportion of teaching onto casual staff, at the detriment of long-term financial stability.

Student satisfaction may be affected by the proportion of teaching conducted by casual staff either as a direct effect of the type of contract, indirectly via the individual characteristics of those employed on such contracts, or by a combination of the two factors. For instance, a casual teaching contract may pay staff by the hour for delivering teaching and, therefore, may not include dedicated hours for offering out-of-class contact time, preparing teaching material or marking assignment work, thereby leading to lower student satisfaction. Poorer remuneration may also mean that casual teaching staff have to engage in other paid work, limiting their available time for student interaction. Casual staff may be unable to influence the study curriculum and method of examination, potentially resulting in them teaching material they are less familiar with and which may not be suitable for the students in the class. On the other hand, staff employed on a casual contract may make a greater effort to deliver high-quality teaching if there is a prospect of them gaining more permanent employment. In the latter case, it is possible for student satisfaction to increase when the proportion of casual staff increases. These examples are all cases where a feature of the contract affects student satisfaction. It might also be the case that less experienced, younger, or lower quality staff, unable to secure tenure, are more likely to accept casual contracts. Individuals with less experience and training in delivering teaching material are likely to have less satisfied students. On the other hand, younger individuals and those who were more recently taught themselves might have fresh insights into the teaching experience, which could lead to higher student satisfaction. These factors demonstrate the indirect link between the type of individual employed on casual contracts and student satisfaction.

These hypotheses indicate that staff casualisation is likely to affect student satisfaction but it is not clear whether the overall effect will be positive or negative (or zero). In this paper, we seek to resolve this question by studying the relationship between the proportion of teaching delivered by staff on casual contracts and students' reported satisfaction with their time at university in the UK. To the best of our knowledge, this paper is the first to explore the relationship between student satisfaction and the use of casual contracts in an empirical setting. The lack of existing evidence may be due to a previous absence of data with which to adequately explore this question. This paper uses survey data on student satisfaction, combined with survey data on the proportion of teaching conducted by staff on permanent, fixed or casual contracts, to explore the effect on student satisfaction of the amount of teaching conducted by casual staff in UK Higher Education Institutions (HEIs). The analysis is conducted at the university-subject level and focuses on the 2014-15 academic year. We contribute to both the student satisfaction and the staff casualisation literature by addressing an empirical question which was previously unanswered. Moreover, our analysis also contributes to the broader contract

literature, demonstrating potential indirect effects of casual contracts on performance outcomes.

An increase in the proportion of teaching by casual staff is found to result in a decline in student satisfaction, with a one percentage point increase in the casual teaching proportion resulting in a 0.25 percentage point reduction in the probability that a student will be 'very satisfied' with their time at university. Instead, a higher proportion of teaching by casual staff means students are more likely to respond that they were only 'fairly satisfied' (increase of 0.12pp), 'not very satisfied' (increase of 0.10pp) and 'not at all satisfied' (increase of 0.03pp). These results are robust to changes in the number of staff/student responses in a university-subject pair and to the use of a multi-level model. Additionally, we find preliminary evidence of a threshold effect, suggesting that student satisfaction is (negatively) affected by the level of casualised teaching at a proportion greater than 8.5%. In itself, these impacts may seem small. However, the impact quickly compounds, meaning these effects can have a substantial impact on university ranking tables, especially given the degree to which student satisfaction scores are clustered and their overall impact on third-party rankings (Gibbons et al. 2015). Consequently, the results suggest that decision-makers in HEIs have a direct incentive to consider their employment practices in order to boost student satisfaction. In turn, this could lead to positive effects on future student demand through the impact of student satisfaction on university ranking tables.

This paper proceeds with a review of the previous literature on staff casualisation and student satisfaction in Section 2. Section 3 outlines the nature of the data, whilst Section 4 presents descriptive statistics and other specific information about our dataset. In Section 5, we outline the methodology and estimation approach and Section 6 presents and discusses results and potential explanations. Finally, Section 7 concludes and provides some areas for further research.

2 Previous Literature

There is a wealth of literature identifying the issue of casualisation in universities across the UK (McDonald 2017, UCU 2019, Macfarlane 2011, Parfitt 2018), US (Danaei 2019, Baldwin & Wawrzynski 2011, Todd 2004) and Australia (Klopper & Power 2014, Kimber 2003, Junor 2004), in particular. Estimates of the extent of casualisation indicate that at least half of undergraduate teaching is being performed by casual staff in Australia, and similarly, that around half of all academic staff are paid on an hourly basis (Broadbent et al. 2018, May 2011, Lipton 2015), whilst in the US between 50% and 70% of academics are outside the tenure-track (AAUP 2018). Data on the extent of casualisation in the UK is scant (see footnote 1), although survey data reported in this paper indicate that, on average, around 13% of undergraduate teaching was conducted by casual staff in 2014-15. In the rest of this section, we discuss the phenomenon of casualisation, and the use of temporary employment in the economy more generally, before discussing the use of casual contracts in the higher education sector and associated concerns with the use of casualisation, followed by a discussion on the existing literature on student satisfaction.

Casualisation is a phenomenon that is not exclusive to the higher education sector but has become increasingly common across the economy, particularly the use of temporary employment contracts (ILO 2016, Lucidi & Kleinknecht 2010). Increased use of tempo-

rary employment has been found to have a negative and significant impact on innovation and productivity (Cappellari et al. 2012, Kleinknecht et al. 2014). More specifically, an increase of 10 percentage points in the share of temporary workers in skilled sectors would decrease labour productivity growth by about 1-1.5% (Lisi & Malo 2017). Mechanisms through which this effect are realised include temporary workers (i) not sharing innovative ideas and suggestions, perhaps because they are unlikely to see the benefit of such innovation or because they are less exposed to management (Kleinknecht 1998), (ii) may be more inclined to invest in general rather than firm-specific skills (MacLeod & Nakavachara 2007), and (iii) might receive fewer opportunities for training (Albert et al. 2010). These findings indicate more general channels through which casualisation and the increase in use of temporary workers can affect the economy, through lower innovation and productivity growth. However, such factors are not specific to the higher education sector and do not specifically consider the mechanisms through which casualisation can affect staff and students, which we discuss next.

The existing casual contract literature highlights the role of labour market dualisation, with an expanding set of outsiders - those on precarious contracts - and a shrinking core of insiders, on permanent contracts (Afonso 2014, Kimber 2003). In other words, "the tenured core and the tenuous periphery" (Kimber 2003). The reason such a situation arises, in this framework, is due to the large expansion in the number of PhD graduates without a similar increase in the number of permanent positions. With a large set of outsiders seeking to become insiders, there is an available supply of individuals willing to work on precarious terms due to the allure of relatively stable contracts later on in their career. Additionally, individuals may accept casual contracts if they are looking to supplement their income during study, other work or retirement (Klopper & Power 2014). Therefore, casual teaching can be seen as a convenient contractual arrangement for some staff members, however, it has primarily been used as an effective cost-reduction tool for financially-constrained universities (Junor 2004). Consequently, a growing number of casual workers find themselves unable to obtain permanent contracts, despite their preferences, and to the potential detriment of their mental health and financial stability. Evidence suggests that casual teaching staff are burdened with heavy teaching workloads, other employment and lack of time (Klopper & Power 2014). Further evidence points to casual staff facing increased stress and anxiety as a result of the precarious and uncertain nature of their employment (Gill 2014, Lopes & Dewan 2014, Allmer 2018, Loveday 2018). Such detriment can have adverse consequences for learning outcomes and may directly affect student satisfaction. Furthermore, evidence suggests that casualisation can negatively impact graduation rates (Jacoby 2006, Harrington & Schibik 2004, Ehrenberg & Zhang 2005), alongside discussion of casualisation potentially hurting academic quality and the educational attainment of students (Barrington 1999, Percy & Beaumont 2008).

In the US, there is a broader literature focusing on the use of non-permanent (adjunct professors) versus permanent academic staff and the effects this form of casualisation has on student outcomes (for a literature review, see Danaei 2019). There is evidence that students are more likely to take a further course in the same subject and also learn more from casual than permanent staff in their first term courses (Figlio et al. 2015). This suggests a positive effect of casualisation which these authors attribute to the worst performing non-permanent staff being better than the worst performing permanent staff. Furthermore, the authors note that non-permanent staff are hired for their teaching abilities meaning that poor teachers are unlikely to have their contracts renewed, whilst, permanent staff may be hired and retained for skills unrelated to their teaching. However,

it should be borne in mind that the university studied in this case was highly ranked in research, which may have attracted a non-representative pool of casual teaching staff, potentially limiting the external validity of these results. In fact, other studies suggest there may be a negative effect on overall graduation rates at institutions with higher proportions of non-permanent staff (Ehrenberg & Zhang 2005, Jaeger & Eagan 2011). Such results demonstrate that casualisation may reduce the quality of education and have pernicious effects on students' human capital acquisition.

Student satisfaction is important to universities for two reasons: firstly, it increases student retention and academic achievement, which is positive for the student, society and the university; and, secondly, good satisfaction ratings lead to high public rankings, enabling universities to recruit the best students and fulfil their quotas (Letcher & Neves 2010). To some extent, achieving a high rank in the league tables is a legitimate objective rather than only being a positive side-effect of good performance (Bell & Brooks 2018). There is evidence to suggest that student satisfaction is affected by factors such as the number of staff at an institution and that this effect may propagate through university league tables. For instance, Lenton (2015) investigates the determinants of the National Student Survey (NSS), an alternative data source of student satisfaction, finding that the student-staff ratio and student employability are strong influencers of student satisfaction. Likewise, frequent staff-student interactions also lead to higher levels of student satisfaction (Richardson & Radloff 2014). Gibbons et al. (2015) show that NSS scores have a significant, albeit relatively small, effect on applications of home students at the university-subject level. This effect is propagated through the influence of the NSS on third-party university league tables. Similarly, Chevalier & Jia (2016) find that a one standard deviation improvement in an institution's subject ranking score increases applications by around 4.3%, although it should be noted that this paper focuses on subjects at an aggregated level. Further research corroborates that student satisfaction affects future demand (Soo & Elliott 2010, Broecke 2015) and that this may be particularly important for international students (Chevalier & Jia 2016, Horstschräer 2012). Overall, students have a sense of empowerment as paying customers, expecting high quality teaching, access to state-of-the-art facilities and good standards of professionalism throughout their experience (Kay et al. 2010). Consequently, universities compete in an increasingly international marketplace to attract the most promising students (Chatterton & Goddard 2000).

Whilst temporary employment, casualisation in higher education and student satisfaction have all been studied separately in the literature, there has been little attempt to connect these topics. This paper intends to fill this evidence deficit by empirically testing the relationship between casualisation and student satisfaction in the UK higher education sector.

3 Data

Two proprietary datasets are used to explore the relationship between student satisfaction and staff casualisation: (1) survey results of UK university teaching staff, capturing the proportion of teaching by staff employed on different forms of contract (permanent, fixed and casual); and (2) survey results of undergraduate students across the UK, reporting their satisfaction with the university experience. Both datasets are available at the university-subject level for the academic year 2014-15.

The Union and College Union (UCU) survey was conducted over a six-week period starting mid-March 2016, directly targeted at 65,000 HEI staff listed in the UCU contact database and included an explicit request to forward the survey to other HEI staff involved in teaching. The survey's primary purpose was to investigate the prevalence of casual teaching and is the only data source which captures the proportion of teaching by staff employed on a casual contract and motivates its use, despite inevitable data imperfections arising from the nature of surveys.[1] Importantly, the survey allows the studying of the effect of the *proportion* of teaching conducted by casual staff, rather than the *number* of casual staff. It is expected that student satisfaction is more likely to be directly affected by the quantity of teaching performed by casual staff rather than the absolute number of casual teaching staff, who may only give a few hours of total teaching each. A casual contract is defined in the survey as a situation where an individual is employed on an 'as and when' basis, which may or may not be renewed. This includes zero hours, variable hours, sessional and termly contracts. A contract which lasts for one or two years is defined as being fixed. The proportion of teaching time delivered by casual staff, given as a value between 0 and 100%, was used as the key measure of staff casualisation in this analysis. The proportion of teaching by permanent, fixed-term and casual staff jointly sum to 100%.

A total of 8,918 staff members (fully) completed the UCU survey. Any survey response from respondents who were not involved in teaching, provided more than one response, or were at a further or alternative education provider were excluded, leaving 7,662 responses. The average response for each university-subject pair was taken, resulting in 1,521 observations at the university-subject level in the full dataset, with information on respondents' estimates of the average proportion of timetabled teaching time relating to undergraduate courses per week delivered by staff on open-ended/permanent contracts, fixed-term contracts or casual contracts.

On average, there were 5.0 responses per university-subject pair, with a median of 3.0 responses. When considering the number of responses which contributed to each university-subject observation, there is a clear trade-off between reliability and total number of observations. To elaborate, if the proportion of casual teaching in a given subject (at a given university) is determined by only a few respondents, then it is possible that the average of these responses is unreliable, as different staff members may have different knowledge of their department's employment practices and/or may be basing their response on their own personal experiences or those of close colleagues. Therefore, it is preferable for each university-subject observation to be based on as many responses as possible, to ensure that the average response accurately reflects the employment situation in that department. However, restricting university-subject observations to be based on a greater number of underlying responses reduces the number of observations which can be used for analysis. To alleviate such concerns and to balance the trade-off, any university-subject observation based on fewer than five responses in the UCU survey is removed. Obviously, this reduces the number of university-subject observations which can be used for estimation so, as a robustness check, the analysis is replicated for observations based on three or more responses.

[1]The Higher Education Statistics Agency (HESA) publish information on atypical academic staff but this is only available at the university and cost centre level. Atypical staff employed by an agency, self-employed, employed on an honorary contract or employed by a company consolidated in the higher education provider's accounts need not be included in HESA returns. Furthermore, HESA guidance states that atypical contracts are for less than four consecutive weeks or for one-off/short-term tasks, which thus excludes casual staff employed on a precarious contract for a longer period of time. Finally, it is likely that HEIs have differing definitions of atypical academic staff and, as a result, the data would not be comparable across institutions.

The second dataset comes from the 2014-15 Student Academic Experience Survey (SAES), a survey of full-time undergraduate students studying across the UK.[2] This survey was run by YouthSight and was jointly commissioned by the Higher Education Policy Institute and AdvanceHE. All UCAS starters are invited to join the panel which comprises 72,000 current UK undergraduates. 69,000 members of this panel were invited to complete this survey, with 15,129 responses collected (SAES 2015). The 2014-15 survey was conducted between 16 February and 24 March 2015 and investigated students' perceptions of satisfaction with their course.[3] The key variable of interest for this study is the extent to which the student is satisfied with the overall quality of their course, denoted on a four-point Likert scale ranging from 'not at all satisfied' to 'very satisfied'. Of the 15,129 collected responses, 8,635 responses were matched to the (restricted) UCU survey.[4] Furthermore, the sample was restricted to observations with six or more responses per university-subject to ensure reliability of the results (as above). This resulted in a dataset of 8,291 individuals across 472 university-subject pairs, with information on the university and subject studied, the satisfaction score and the proportion of teaching conducted by casual staff.

Data on Russell Group membership, academic staff numbers and student numbers is obtained from HESA.[5] A dummy variable is created if the university is based in London, as it is found that London is the only region of university location which has a statistically significant (negative) impact on student satisfaction rating. All variables are presented in Table 1. Staff numbers are provided at the university-subject level using 'HESA cost centres' rather than at the one-digit code level of the joint academic coding system (JACS) for subject, so we align each cost centre to the appropriate subject area. It is not possible to do this matching for 'combined' subjects, which we do not drop but retain with missing values for this variable. Further details on the variables in the final dataset are provided in the next section.

4 Descriptive Statistics

Table 1 presents key descriptive statistics related to the dependent variables of interest in the sample. As discussed above, the dataset has been restricted to university-subject pairs which have at least five respondents in the UCU survey and at least six respondents from the SAES. Therefore, it contains 8,291 observations, with 110 different universities (shown in the Annex) and 17 different subject areas at JACS1 subject for a total of 472 university-subject pairs. In terms of representativeness, Table 2 compares the subject distribution in the sample with the distribution in the population, where we see broad similarities, albeit differences of around 5 percentage points for the subjects of business & administrative studies, languages, and physical sciences. Such small differences are unlikely to substantially affect the robustness of these results. Similarly, the distribution of students across universities does not substantially differ between the population and the sample, the sole exception being for the Open University, for which our sample

[2]The SAES was used as it specifically focuses on student satisfaction in the 2014-15 academic year and, therefore, corresponds to the period in which the UCU survey asked about staff casualisation. This contrasts with the NSS, which asks final year undergraduates to consider their course *overall*. To the extent that staff casualisation changes over time, such a distinction may be important. Nonetheless, satisfaction rates between the NSS and the SAES are broadly similar.

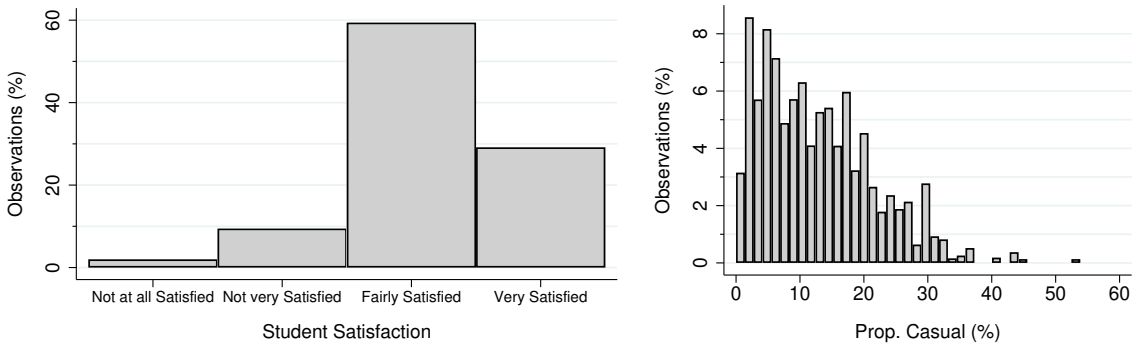
[3]The SAES dataset was not provided with respondents' demographic characteristics, in order to protect their anonymity. The survey asked "To what extent are you satisfied, or not, with the overall quality of your course?".

[4]Observations were unable to be matched when there existed a university-subject pair in one dataset but not the other.

[5]Total student numbers are used, including both undergraduate and postgraduate. The results are insensitive to replacing this variable with undergraduate student numbers.

under-represents the share of students at this institution by around 5 percentage points.[6] However, the analysis is likely to be more representative of larger institutions, with a number of smaller institutions excluded from the analysis given the stated restrictions on the number of respondents needed for inclusion.

Figure 1: Histograms of Student Satisfaction and Proportion of Casual Staff



The sample mean student satisfaction is 3.16, indicating that the average student was more than 'fairly satisfied' with their university experience. 2% of sampled students were 'not at all satisfied', 10% were 'not very satisfied', 59% were 'fairly satisfied' and 29% were 'very satisfied' (see Figure 1, left panel). Therefore, student satisfaction does not appear to be biased towards those who were dissatisfied, which might be expected if dissatisfied students were more likely to provide feedback. On the contrary, student satisfaction is particularly high, an observation also reflected in the NSS.[7] It should be noted that whilst respondents were incentivised to complete the SAES survey with a £1 Amazon gift card, it was clear that the survey was run by an independent organisation and the incentive was not provided by the student's institution or conditional on their reported satisfaction. It is, therefore, unlikely that the incentive would have affected the respondent's impression of their institution when providing feedback.

Around 2% of observations in the sample indicated that no undergraduate teaching was delivered by staff employed on a casual contract. It should be cautioned that the proportion used for this analysis comes from survey data and it may be the case that the information is inaccurate, particularly in larger departments where respondents may know less about the contractual arrangements of their colleagues. This reinforces the motivation for restricting the sample to observations which are based on the average of at least five responses. Furthermore, respondents were sourced from the UCU's mailing list, so this is not necessarily a representative sample of the university sector. In fact, casualised staff are under-represented in UCU membership, which may mean that permanent staff are over-represented in the survey. Nevertheless, these initial respondents were invited to forward the survey to their colleagues, although we have no indication of how many responses were provided by direct, compared to secondary, recipients.

It might also be expected that respondents would have been more likely to complete the UCU survey if they perceived the level of staff casualisation to be high. However, this does not seem to be witnessed in the data, with around 46% of observations in the

[6] Due to the data-sharing agreement, it is not possible to disclose the sample share of universities presented in the annex.

[7] Focusing on the institutions contained in this sample, the unweighted proportion of students reporting to be satisfied overall with their course stands at 86% (NSS, 2015), comparable to the 88% found in this sample.

Table 1: Descriptive Statistics of Variables in the Sample

Variables	Mean	Std. Dev.	Min	Max	Source
Student Satisfaction Rating	3.16	0.66	1	4	SAES
University	N/A	N/A	1	110	SAES and UCU
Subject	N/A	N/A	1	17	SAES and UCU
Proportion of Casual Staff	0.13	0.09	0.00	0.54	UCU
Proportion of Fixed Staff	0.15	0.09	0.00	0.68	UCU
Proportion of Permanent Staff	0.73	0.13	0.16	0.99	UCU
Number of Students[a,b]	22,236	8,694	1,840	132,360	HESA
Number of Students in Subject[a]	1,841	1,294	5	21,825	HESA
Number of Academic Staff[a,b]	2,357	1,491	105	7,070	HESA
Number of Academic Staff in Subject[a]	232	264	5	2,365	HESA
Russell Group	0.45	0.50	0	1	HESA
London University	0.14	0.34	0	1	HESA

Note: All variables listed above have 8,291 observations except Number of Academic Staff in Subject (8,264). UCU responses based on fewer than five responses in a university-subject observation have been excluded, as have SAES responses based on fewer than six responses. [a] refers to variables where the natural logarithm has been taken but for the purpose of readability the absolute value is presented here. [b] refers to number at university-level (and not university-subject level). Source: Author's calculations from UCU, SAES and HESA data.

Table 2: List of Subject Areas in the Sample

Subject Area	Sample Share (%)	Population Share (%)
Architecture, building & planning	0.27	1.93
Biological sciences	13.87	10.95
Business & administrative studies	8.58	13.36
Combined	0.33	1.62
Creative arts & design	9.13	9.06
Education	2.75	3.83
Engineering & technology	5.23	7.11
Historical & philosophical studies	6.19	4.30
Languages	10.08	5.54
Law	2.09	4.28
Mass communications & documentation	0.43	2.45
Mathematical sciences & computer science	6.57	7.04
Medicine & dentistry	3.37	2.96
Physical sciences	9.31	4.70
Social studies	11.63	9.64
Subjects allied to medicine	9.75	10.27
Veterinary science & agriculture & related subjects	0.43	0.94

Note: Subject areas are provided at the JACS1 level. Source: Author's calculations based on UCU, SAES and HESA data.

dataset reporting a proportion of teaching by casual staff lower than 10% and 81% of observations reporting a proportion lower than 20% (see Figure 1, right panel). The average reported proportion was 13%, indicating that, in a typical week, 13% of undergraduate teaching was conducted by staff on a casual contract. There are, however,

some university-subject observations which exhibit a much higher proportion of casual teaching: the highest observation in our dataset is 54%. Overall, there is no clear indication that the survey over-estimates the extent of casualisation. If anything, there are suggestions that permanent staff may be over-represented in the survey, which would be expected to under-estimate the extent of casualisation. Comparable figures from other sources are rarely available. Existing data from HESA focuses on staff numbers and not teaching proportion (also, see footnote 1). The same issue applies to most UCU publications, with the exception of a freedom of information request made to a small selection of universities which showed an average of 27% of undergraduate teaching in 2015/16 was being delivered by hourly-paid staff (UCU 2018). Whilst this estimate is substantially higher than the survey estimate, it is only based on 38 (self-selected) universities which were more likely to be post-1992 universities and hence represents a biased sample. Furthermore, the universities which responded to the request often caveated the results as being inaccurate, therefore making comparisons between the institutions difficult.

Interestingly, and perhaps surprisingly, the average proportion of casual teaching is 11% for Russell Group members, compared to 14% for non-Russell Group institutions, suggesting that more research-focused universities are shifting a lesser proportion of teaching onto casual staff than other institutions. This may indicate that casualisation occurs as a result of financial concerns rather than outsourcing to permit permanent staff greater research time. It can also be seen that the majority of teaching in the sample is conducted by permanent staff; on average, 73% of teaching is conducted by staff on permanent contracts. The proportion of teaching by staff on fixed contracts is, on average, 15%. At the university-level, there are, on average, around 9 students for every academic member of staff. At the university-subject level, this figure is around 8 students for every academic member of staff. Finally, of the 110 universities in the sample, 24 are Russell Group members, meaning that all Russell Group members are present in the sample. Additionally, there are 19 universities in the sample situated in the London region.

5 Methodology

As a result of the discrete and ordered nature of the dependent variable (student satisfaction), a multinomial discrete choice model is adopted, namely the ordered logit model. This model is built around a latent regression where y^* is the unobserved dependent variable (true level of student satisfaction), x is a vector of explanatory variables, β an unknown parameter vector and ϵ an error term with a logistic distribution:

$$y_i^* = \beta' X_i + \epsilon_i$$

The true level of student satisfaction (y^*) is not observed but y, the student satisfaction rating given by the individual, is observed:

$y = 1$ (student 'not at all satisfied') if $y^* \leq 1$

$y = 2$ (student 'not very satisfied') if $1 < y^* \leq \mu_1$

$y = 3$ (student 'fairly satisfied') if $\mu_1 < y^* \leq \mu_2$

$y = 4$ (student 'very satisfied') if $\mu_2 < y^* \leq \mu_3$

With μ_1, μ_2 and μ_3 being unknown threshold variables to be determined. Note that $Pr(y_i = j) = Pr(y_i$ is in the jth range), where $J = 1, 2, 3, 4$. Therefore, the probability that y will take on a particular value is expressed as:

$$Pr(y_i = j|X) = F(\mu_j - \beta' X_i) - F(\mu_{j-1} - \beta' X_i)$$

With $F(.)$ representing the cumulative distribution function of the logistic distribution, such that $F(a) = 1/[1 + exp(a)]$. This implies that:

$$Pr(y_i = j|X) = \frac{1}{1 + e^{-u_j + \beta' X_i}} - \frac{1}{1 + e^{-u_{j-1} + \beta' X_i}}$$

For this study, we begin by examining a latent regression of form (1), controlling for a number of observable characteristics such as Russell Group membership, whether university is situated in London, student numbers and staff numbers (both at the university and the university-subject level). However, it could be argued that these observable characteristics are insufficient to alleviate omitted variable concerns as unobserved characteristics, such as financial wealth and management style, remain unobserved. Thus, to overcome such a potential criticism, we also estimate a specification which controls for the university and subject of the individual (latent regression 2). By controlling for both university and subject, we are eliminating any unobserved characteristics associated with a given university or subject (separately) which might affect the student satisfaction rating or propensity to utilise casual teaching staff.

It could be further argued that this solution is still insufficient, as there may be characteristics at the university-subject level which are still confounding our findings, resulting in endogeneity concerns. Obviously, we cannot control for both subject and university simultaneously as an interaction term, as this removes all sources of variation. The usual method to deal with this problem is to utilise panel series data, so that university-subject fixed effects can be estimated. However, the UCU survey was only conducted for 2014-15 and no time-varying source of suitable information exists to adequately capture the proportion of casual teaching time. Consequently, we adopt the novel approach of grouping subjects together into 'faculties' within a given university, and control for characteristics at this level. We thereby eliminate any unobserved characteristics at the university-faculty level, which is likely to remove unobserved variables such as management quality and the financial wealth of a faculty. Thus, in latent regression (2), we control for university-faculty, along with staff and student numbers at the university-subject level. We explain in more detail below how the faculty variable is constructed.

$$StudentSatisfaction_{i,j,k} = \alpha + \beta CasualStaff_{j,k} + \gamma X_j + \phi U_{j,k} + \epsilon_{i,j,k} \tag{1}$$

$$\begin{aligned} StudentSatisfaction_{i,j,k} = \alpha + \beta CasualStaff_{j,k} + \phi ln(StudentNumbers)_{j,k} \\ + \omega ln(StaffNumbers)_{j,k} + \lambda_{j,k,l} + \epsilon_{i,j,k} \end{aligned} \tag{2}$$

In both specifications, i refers to the student, j to the university, k to the subject and l to the faculty (group of subjects). β is the coefficient of interest: a positive and significant value implies that the proportion of teaching by casual staff is associated with higher student satisfaction and vice versa for a negative coefficient.

In the first instance, X_j is a vector of control variables at the university-level, including the (log) number of students at the institution, (log) number of academic staff at the institution, a dummy variable if the university is based in London and a dummy variable for Russell Group membership. A vector of control variables at the university-subject level, $U_{j,k}$, are also included, including proportion of teaching by staff on a fixed contract, number of students and number of academic staff. However, as noted above, it is arguably insufficient to control only for observable characteristics whilst omitting unobserved characteristics which may conceivably be correlated with both student satisfaction and the proportion of casual staff. For instance, the financial health of a department might be correlated with both student satisfaction and levels of staff casualisation, leading to endogeneity concerns. To some extent, the university-subject level controls for staff and students should proxy financial health; nonetheless, controlling for university characteristics may be insufficient to completely ameliorate endogeneity concerns. Therefore, specification (2) is estimated, which, in addition to controlling for staff and student numbers at the university-subject level, also includes controls for university and subject (separately), to remove university-level unobserved characteristics. Given the cross-sectional nature of our data, it is not possible to add a control for the university and subject jointly. This motivates the grouping of subjects together into 'faculties'. Hence, in addition to controlling for university and subject, we separately control for university-faculty, to remove unobserved characteristics at the faculty level within university. In determining these 'faculties', we wish to group together subjects that are likely to have similar management structures and sources of finance but, due to sample size issues, there is a trade-off between disaggregating faculties to a fine degree and ensuring that there remains a large enough sample size in each faculty grouping. We therefore proceed by splitting the sample into humanities (including business and other subjects) and sciences faculties (H, B&O/S) and, separately, into humanities, business and other faculties, and sciences (H/B&O/S).[8] Finally, we estimate a multi-level ordered logistic specification based on the second specification including university and subject controls. The multi-level approach nests students into subject groups and subject groups into universities. Such an approach allows a random intercept for subject and universities, relaxing the constraint that the intercept is the same across groupings. The results confirm the main findings and are presented in the Annex.

All specifications are estimated with robust standard errors to account for any potential heteroskedasticity or serial correlation. Additionally, the data is weighted using the weights provided in the SAES, to account for the fact that the survey sample design did not fully reflect the demographic split of the university population.

To summarise how we proceed, we estimate two sets of specifications, the first based on controlling for observable characteristics, which provides interesting relationships between staff casualisation, student satisfaction and university characteristics but may suffer from endogeneity bias. This motivates the second specification, which includes controls for the number of students and staff at the university-subject level, university and subject controls and, moreover, university-faculty controls, holding constant a set of subjects within a university to control for unobserved characteristics such as faculty wealth and faculty management styles. In the Annex, results are presented from a multi-level ordered

[8]Faculty groups are denoted by letters H, S and B&O. H contains the humanities subjects of social studies, law, languages, mass communications & documentation and historical & philosophical studies. S contains the science subjects of biological sciences, medicine & dentistry, physical sciences, subjects allied to medicine, veterinary sciences, mathematical sciences & computer science and engineering & technology. B&O contains the subjects business & administrative studies, architecture building & planning, combined subjects, creative arts & design and education.

logistic model based on the second specification including university and subject controls.

6 Results and Discussion

6.1 Observable characteristic controls

The estimated results from a variety of specifications controlling for observable characteristics are presented below. First, the most parsimonious model is estimated (shown in column 1 of Table 3) before various controls are added to examine the effect of each additional variable. Column 2 includes controls for the proportion of teaching conducted by staff on fixed contracts, as well as dummy variables for being located in London and being a member of the Russell Group. Column 3 additionally includes the number of students and staff at each institution and (4) includes student and staff numbers at the university-subject level. Table 4 presents the associated marginal effects for the estimates of the proportion of teaching by casual staff from the ordered logistic models. Across all specifications, there is a negative coefficient attached to the variable of interest, indicating that, as the proportion of teaching by casual staff increases, student satisfaction decreases. This is true even in the most parsimonious model, which has a negative and statistically significant coefficient. Generally, as more controls are added, the coefficient of interest decreases in absolute magnitude but remains negative, and statistically significant, in all specifications despite additional controls intended to reduce omitted variable bias.

The proportion of teaching time by those on fixed contracts is generally statistically insignificant in well-controlled specifications suggesting that, unlike casual proportion, the proportion of staff on fixed contracts does not affect student satisfaction. We further observe that institutions with a greater number of students are associated with lower student satisfaction, whilst employing a greater number of staff is associated with higher student satisfaction. This echoes other empirical results found in the literature, which emphasise the importance of student-staff ratios on student satisfaction (Lenton 2015). These findings also hold at the university-subject level, albeit with a smaller effect: more students in a given subject is associated with lower student satisfaction, whilst more subject staff members is correlated with higher student satisfaction. Being a London-based university reduces student satisfaction in all specifications. This matches evidence discussed in the literature, with possible reasons being the high cost of living in London and the lack of campus-life both driving down student satisfaction (Bell & Brooks 2018). Russell Group membership is only found to affect student satisfaction in specification (2), which does not include variables for the number of staff and students. In this case, Russell Group members have a higher student satisfaction than non-members. This result is in line with Lenton (2015) and Bell & Brooks (2018). The fact that this variable is no longer significant with the inclusion of staff and student number variables suggests that the effect on student satisfaction of being a Russell Group university is well proxied by university size. Whilst the coefficient on Russell Group membership is not significant in specifications (3) and (4), the results are insensitive to its inclusion.

Table 4 presents the marginal effects of all estimated specifications, allowing the effect to be quantified in terms of probabilities. Examination of the marginal effects (focusing on the preferred specification of column 4), reveals that a one percentage point increase

Table 3: Logistic Regression for Student Satisfaction - Characteristics Model - Estimation Results

Variables	(1)	(2)	(3)	(4)
Prop. Casual	-1.134***	-0.940***	-1.050***	-0.858***
	(0.284)	(0.287)	(0.287)	(0.299)
Prop. Fixed		0.687**	0.459	0.325
		(0.282)	(0.285)	(0.289)
Russell Group		0.162***	0.0308	0.0130
		(0.0495)	(0.0765)	(0.0775)
London		-0.273***	-0.372***	-0.371***
		(0.0737)	(0.0775)	(0.0780)
Students (uni)			-0.456***	-0.363***
			(0.0950)	(0.110)
Staff (uni)			0.321***	0.249***
			(0.0810)	(0.0891)
Students				-0.150**
				(0.0653)
Staff				0.0807**
				(0.0409)
Observations	8,291	8,291	8,291	8,264
University Controls	No	No	No	No
Subject Controls	No	No	No	No

Note: All models are weighted using survey weights. Standard errors are robust. *** p<0.01, ** p<0.05, * p<0.1. Source: Author's calculations based on UCU, SAES and HESA data.

Table 4: Logistic Regression for Student Satisfaction - Characteristics Model - Estimated Marginal Effects - Proportion of Casual Staff

Student Satisfaction:	(1)	(2)	(3)	(4)
Not at all satisfied	0.0253***	0.0208***	0.0231***	0.0189***
	(0.00679)	(0.00666)	(0.00670)	(0.00685)
Not very satisfied	0.0964***	0.0797***	0.0887***	0.0724***
	(0.0245)	(0.0245)	(0.0245)	(0.0254)
Fairly satisfied	0.108***	0.0893***	0.100***	0.0818***
	(0.0268)	(0.0271)	(0.0273)	(0.0284)
Very satisfied	-0.229***	-0.190***	-0.212***	-0.173***
	(0.0571)	(0.0577)	(0.0577)	(0.0602)
Observations	8,291	8,291	8,291	8,264
University Controls	No	No	No	No
Subject Controls	No	No	No	No

Note: Standard errors are robust. *** p<0.01, ** p<0.05, * p<0.1. Source: Author's calculations based on UCU, SAES and HESA data.

in the proportion of teaching delivered by casualised staff is associated with a 0.17 percentage point decrease in the probability that a student will be 'very satisfied'. Instead, the probability that a student is 'fairly satisfied' increases by around 0.08pp, 'not very satisfied' by 0.07pp and 'not at all satisfied' by around 0.02pp. The positive marginal

effect associated with 'fairly satisfied' does not indicate that increasing the proportion of teaching by casual staff will increase student satisfaction but instead that responses switch from 'very satisfied' to just 'fairly satisfied'.

6.2 University, subject and faculty controls

As discussed earlier, there may be concerns that, whilst these specifications control for a number of observable characteristics, unobservable variables are omitted. If such unobserved factors are correlated with both student satisfaction and the proportion of casual teaching, then the results would be biased. There are several unobservable variables which we might suppose are correlated with both the dependent and the independent variable, including financial characteristics, management and the level of casual teaching conducted by PhD students or early career academics. Let us consider first the case of university-faculty management being the omitted variable - where it might be expected that good management increases student satisfaction and lowers staff turnover, reducing the need for a high proportion of casual staff. Then we would expect that endogeneity bias would serve to inflate the results, meaning that our findings would be an overestimate of the true effect. Similarly, considering income and wealth at the department (university-subject) level, we might expect that wealthier departments would see higher student satisfaction, perhaps because they are able to use their wealth to spend lavishly on expensive equipment and impressive buildings, and lower proportions of casual teaching as there is less of a financial imperative to do so (although alternative possibilities are discussed below). On the other hand, the unobserved confounder might be correlated with both student satisfaction and casual teaching proportion in the *same* direction, in which case the endogeneity bias would serve to attenuate our results, meaning the results presented in Table 3 are a lower bound of the true effect. One candidate variable which would exhibit these properties (i.e. is correlated with student satisfaction and staff casualisation in the same direction) is the propensity of PhD students to teach (Kimber 2003). It might be plausible to assume that students prefer being taught by PhD students and that PhD students are more likely to be employed on casual, rather than permanent, contracts. In a similar vein, it may be the case that richer departments (which have higher student satisfaction due to better facilities) can afford to fund more PhD students, who are then employed on casual contracts; or that wealthier departments attract prestigious guest lecturers employed on casual contracts. In all three cases, endogeneity bias would mean that the estimated results would be an underestimate of the true effect.

Without knowing what unobservable variables are driving our results (if any), it is not immediately clear, a priori, whether endogeneity bias will result in over- or under-estimated coefficients. This is therefore an empirical question, which can be alleviated, to some extent, by controlling for subject and university, as well as faculty (groups of subjects). The estimated results from this approach are presented in Table 5. The marginal effects associated with the estimates of the proportion of teaching by casual staff from the ordered logistic specifications are given in Table 6.

Firstly, a university and subject control are included in the parsimonious specification (column 1). Here, identification comes from variation within universities and within subjects (separately) in the use of casual staff. The coefficient is statistically significant and negative, with a larger coefficient (in absolute terms) relative to specifications controlling simply for university characteristics (column 2 to 4 in Table 3). This suggests that

omitted variable bias is attenuating the results in Table 3, indicating that the omitted variable is correlated with student satisfaction and staff casualisation in the same direction.[9] Secondly, the proportion of staff on fixed contracts has no effect on student satisfaction (column 2) suggesting that there is a distinct difference between casual and fixed contracts, or those who are offered / accept such contracts. Thirdly, there is no effect of student numbers on student satisfaction (column 3), suggesting this effect is being picked up by the separate university and subject controls or by the staff numbers variable. Moreover, controlling for student and staff numbers slightly reduces the magnitude of the variable of interest. Fourthly, university-faculty level controls are included to alleviate concerns that there might be unobservable differences between faculties within a university, such as in management styles, management quality, likelihood of PhD students teaching, the availability of guest lecturers and key financial variables. This is seen in column 4 where subjects are split into either 'science' or 'humanity, business and other subjects'. Here, identification comes from variation within faculty in each university. The effect of the proportion of casual teaching time is stronger than the models controlling only for university and subject (column 1 to 3), suggesting attenuation bias in the earlier specifications. Specification (5) further controls for the proportion of staff on fixed contracts and the number of staff and students at subject level. These controls reduce the absolute magnitude of the coefficient of interest and the student numbers variable is now significant, with a greater effect (in absolute terms) than the number of staff. Finally, in (6), the university-faculty analysis, with controls, is repeated but faculty is defined in a more disaggregated manner, grouping subjects into three categories: 'sciences', 'humanities' and 'business and other subjects'. This is the preferred specification, as it disaggregates the subjects into a relatively fine categorisation. The effect of the proportion of casual teaching time on student satisfaction is statistically significant and is of higher magnitude, in absolute terms, than either models which control only for university characteristics or those which control for university and subject.[10] We do not attempt to define faculty to a finer degree (i.e. categorising only two or three subjects into a faculty) as this would result in too few degrees of freedom for a robust analysis.

Table 6 presents the marginal effects for the proportion of casual staff across all estimated specifications from Table 5. Examination of the marginal effects in the preferred specification of (6) reveals that a one percentage point increase in the proportion of teaching delivered by casual staff is associated with a 0.25 percentage point decrease in the probability that a student will be 'very satisfied'. Instead, the probability that a student is 'fairly satisfied' increases by around 0.12pp, 'not very satisfied' by 0.10pp and 'not at all satisfied' by around 0.03pp. These results are mirrored by those from the multi-level ordered logistic regressions, presented in the Annex, which are very similar.

[9]This does not necessarily mean that the aforementioned omitted variable is indeed propensity of PhD students to teach, as hypothesised for illustrative purposes above. We have no evidence as to what these omitted variables are, so cannot make a definitive conclusion, other than that the evidence suggests the omitted variable is correlated with the dependent and independent variable in the same direction.

[10]Note that the results are insensitive to whether engineering is defined as a 'science' faculty or if it is included in 'business and other subjects'.

Table 5: Logistic Regression for Student Satisfaction - University, Subject and Faculty Controls - Estimation Results

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Prop. Casual	-1.102***	-1.112***	-0.999**	-1.585***	-1.227**	-1.274**
	(0.424)	(0.426)	(0.435)	(0.454)	(0.477)	(0.529)
Prop. Fixed		-0.167	-0.202		0.127	-0.0335
		(0.417)	(0.418)		(0.422)	(0.449)
Students			-0.138		-0.234**	-0.282***
			(0.0934)		(0.0943)	(0.109)
Staff			0.171**		0.104*	0.0926
			(0.0699)		(0.0602)	(0.0628)
Observations	8,291	8,291	8,264	8,291	8,264	8,264
University Controls	Yes	Yes	Yes	Yes	Yes	Yes
Subject Controls	Yes	Yes	Yes	No	No	No
Faculty Controls	No	No	No	H,B&O/S	H,B&O/S	H/S/B&O

Note: All models are weighted using survey weights. Faculty groups are denoted by letters H, S and B&O. H contains the humanities subjects of social studies, law, languages, mass communications & documentation and historical & philosophical studies. S contains the science subjects of biological sciences, medicine & dentistry, physical sciences, subjects allied to medicine, veterinary sciences, mathematical sciences & computer science and engineering & technology. B&O contains the subjects business & administrative studies, architecture building & planning, combined subjects, creative arts & design and education. Standard errors are robust. *** p<0.01, ** p<0.05, * p<0.1. Source: Author's calculations based on UCU, SAES and HESA data.

Table 6: Logistic Regression for Student Satisfaction - University, Subject and Faculty Controls - Estimated Marginal Effects - Proportion of Casual Staff

Student Satisfaction:	(1)	(2)	(3)	(4)	(5)	(6)
Not at all satisfied	0.0225**	0.0227**	0.0204**	0.0322***	0.0249**	0.0253**
	(0.00884)	(0.00890)	(0.00904)	(0.00956)	(0.00986)	(0.0106)
Not very satisfied	0.0902***	0.0911***	0.0818**	0.129***	0.1000**	0.103**
	(0.0347)	(0.0349)	(0.0357)	(0.0371)	(0.0390)	(0.0427)
Fairly satisfied	0.106***	0.107***	0.0964**	0.154***	0.119**	0.124**
	(0.0413)	(0.0416)	(0.0423)	(0.0447)	(0.0466)	(0.0520)
Very satisfied	-0.219***	-0.221***	-0.199**	-0.315***	-0.244**	-0.252**
	(0.0843)	(0.0848)	(0.0866)	(0.0903)	(0.0948)	(0.105)
Observations	8,291	8,291	8,264	8,291	8,264	8,264
University Controls	Yes	Yes	Yes	Yes	Yes	Yes
Subject Controls	Yes	Yes	Yes	No	No	No
Faculty Controls	No	No	No	H,B&O/S	H,B&O/S	H/S/B&O

Note: Faculty groups are denoted by letters H, S and B&O. H contains the humanities subjects of social studies, law, languages, mass communications & documentation and historical & philosophical studies. S contains the science subjects of biological sciences, medicine & dentistry, physical sciences, subjects allied to medicine, veterinary sciences, mathematical sciences & computer science and engineering & technology. B&O contains the subjects business & administrative studies, architecture building & planning, combined subjects, creative arts & design and education. Standard errors are robust. *** p<0.01, ** p<0.05, * p<0.1. Source: Author's calculations based on UCU, SAES and HESA data.

6.3 General remarks

Overall, the evidence suggests that increasing the proportion of teaching by casual staff is linked with a reduction in student satisfaction of their university experience. Whilst these

results might seem small at the outset, the findings suggests that a five percentage point increase in the proportion of teaching delivered by staff employed on a casual contract leads to a 1.25 percentage point reduction in the probability that a student will be 'very satisfied' with the university experience. It should be remembered how clustered student satisfaction scores are in national rankings and the importance of such scores in third-party rankings (Gibbons et al. 2015). As a result, decision-makers in universities have an incentive to consider employment practices, exercising caution in shifting teaching to academic staff on casual contracts, in order to preserve student satisfaction and thus their position in university ranking tables (Chevalier & Jia 2016). Additionally, the existing literature highlights that staff casualisation is undesirable for other reasons, including student results, graduation rates, quality of education, staff health and staff retention (Gill 2014, Lopes & Dewan 2014, Ehrenberg & Zhang 2005, Jacoby 2006, Barrington 1999, Percy & Beaumont 2008).

6.4 Robustness checks

To check the robustness of our results, the above specifications are re-estimated on a dataset where each university-subject observation is restricted to only three staff responses in the UCU dataset (and not five), yielding 10,635 observations. The results are very similar: the coefficient of interest, in our preferred specification (6), remains statistically significant, with a point value of -1.214. Similarly, we re-estimated on a dataset where each university-subject observations is restricted to only three student responses in the SAES dataset (and not six), yielding 8,603 observations. Again, the results are very similar, although statistical significance is somewhat reduced (but still significant at the 5% significance level): with a point value of -1.006. Additionally, the dataset is simultaneously restricted to three staff and student responses, which results in 11,246 observations and reduces both the significance and point estimates of the results. Nonetheless, the results are still negative and the coefficient of interest has a point value of -0.696 but is only statistically significant at the 10% level (with a p-value of 0.081). The reduction in magnitude of coefficient and significance likely reflects the unreliability of reported staff casualisation and student satisfaction based on only three responses (which motivates the restrictions in the first instance). Finally, results from the multi-level ordered logistic regression - allowing random intercepts across university and subject - are presented in the Annex, which confirm the conclusions presented here.

It would be expected that, if faculties have similar approaches to management styles, then they would also have similar approaches to casualisation, to some degree. Therefore, evidence that casualisation is broadly similar within university-faculties provides some reassurance that we might expect omitted variables to also be broadly similar within faculty. To this end, we produce the standard deviations for each university-faculty pair, take the average and compare this with the average of the standard deviations for each university (as a whole). The average standard deviation for the H,B&O/S faculty grouping stands at 0.066, whilst the average standard deviation for the H/S/B&O faculty grouping stands at 0.061. This compares with a value of 0.081 across universities, suggesting that decisions on casualisation are more similar within faculty than within university. Furthermore, this suggests that the more refined faculty grouping is slightly better than the less refined grouping, in the sense that there is less dispersion in casualisation decisions within faculty. Whilst imperfect, this evidence provides some further reassurance that the usage of faculty is able to control for omitted variables.

6.5 Non-linear effects

It might be expected that the effect of staff casualisation on student satisfaction is non-linear. That is, student satisfaction may not be affected in a homogeneous manner by staff casualisation irrespective of the level of proportion of casual staff. For instance, we might expect limited effects on student satisfaction at low levels of casualisation where student perceptions are not significantly affected. Whilst data limitations prevent a thorough investigation of non-linear effects, a model, which minimises the residual sum of squares obtained for all possible thresholds (allowing up to five potential thresholds), is estimated to explore the potential for non-linearity. This finds the existence of a (single) threshold effect at a proportion of casual teaching of 8.5%. Including an interaction term for this threshold reveals, that for university-subject pairs with a proportion of casual teaching below 8.5%, there is a positive association between student satisfaction and proportion of casual teaching, whilst at levels above 8.5% there is a negative association (see the Annex for more details). One reason that student satisfaction may increase at low levels of casualisation is that such casual staff may be industry experts or distinguished professors employed to present a few lectures rather than the bulk of teaching material. This makes the probable assumption that student satisfaction is increasing in the presence of industry experts and distinguished lecturers. As a whole, these findings suggest that a small proportion of casual teaching does not harm student satisfaction but that, when the proportion enters the double digits, it begins to lower student satisfaction. This reinforces the policy implications that staff casualisation should be kept low if student satisfaction is to be maintained.

6.6 Potential mechanisms

There are a number of potential mechanisms which could explain why a higher proportion of casual teaching leads to lower student satisfaction. These mechanisms can be divided into reasons stemming from the nature of casual contracts (contract effects) and reasons stemming from the nature of individuals likely to accept / be offered casual contracts (selection effects). Whilst a few mechanisms are discussed below, it should be remembered that the evidence is unable to pinpoint exactly which mechanism (or combination of mechanisms) is driving the finding.

Firstly, it might be anticipated that students expect to be taught by qualified faculty members, employed on 'fair' contracts, given that most students will be paying at least £9,000 per year in tuition fees. Whilst such an argument would suggest that students might report being less satisfied if this were not the case, students are unlikely to be aware of the contractual arrangements of teaching staff, making such an argument difficult to assert. Secondly, casual teaching staff, often remunerated only for the duration of the lesson, may have less time to dedicate to preparing class materials or marking students' work (Klopper & Power 2014). They may also have less out-of-class contact time available for students. All of these factors are likely to reduce student satisfaction (Richardson & Radloff 2014). Furthermore, such factors may also have spillover effects, potentially reducing the educational attainment and human capital levels of students (Percy & Beaumont 2008, Barrington 1999). Thirdly, casual staff may have less influence and be less able to determine the subject material and curriculum and may be restricted in the method of teaching demanded by their employer. This lack of influence on the form and method of teaching could lead to poor teaching outcomes, thereby affecting stu-

dent satisfaction. Fourthly, casual staff may receive fewer opportunities for professional development, including training courses and collegiate feedback, which may limit their knowledge of the latest techniques and lessons. These (non-exhaustive) aforementioned mechanisms are related to the nature of the casual contract (contract effects).

The final mechanism discussed relates to the type of individuals who may be more likely to be employed on casual rather than permanent contracts (selection effects). Such individuals may have less teaching experience and receive less training, thereby resulting in lower teaching quality and hence lower student satisfaction (Percy & Beaumont 2008). This mechanism is supported by existing research which finds that part-time staff are less likely than full-time staff to experiment with their teaching or to teach potentially challenging material (AAUP 2016). As a related point, casual staff may be PhD students, who are just beginning their academic career and thus have less teaching experience. Alternatively, students might prefer to be taught by experienced or prestigious academics in order to feel that they are getting value for money.

As alluded to above, it is not clear whether student satisfaction is lower as a result of the selection or contract effect. Similarly, the finding that student satisfaction is unaffected by the proportion of staff on fixed contracts could be a result of either effect. The data presented here is unable to distinguish between these two competing hypotheses as individual characteristics of casual staff were not asked in the UCU survey. Therefore, it is not possible to compare factors such as age and years of experience between casual and permanent/fixed staff to explore the selection effect. Furthermore, HESA does not provide information on individual characteristics, so it is not possible to use this source to shed light on the issue (notwithstanding the data issues of HESA atypical staff data). However, there is some evidence to suggest that a large proportion of casual staff are indeed PhD students.[11] Whilst this distinction is unimportant for the principal conclusion, it does affect the prescription of policy. If casual staff do not differ from permanent staff in individual characteristics, then this suggests that casual contracts themselves are the issue and HEIs should replace casual contracts with permanent or fixed equivalents; particularly given the finding that the proportion of staff on fixed contracts does not affect student satisfaction. Conversely, if individual characteristics are different for casual and permanent staff, then the policy prescription would be to ensure that hiring is comparable and not loaded onto less expensive, but less experienced, individuals. For instance, it could be the case that PhD students, who are younger and less experienced than permanent professors, are providing a significant proportion of teaching whilst being employed on casual contracts. This would suggest that decision-makers within universities should not shift teaching load onto such individuals as a means of cutting costs, without expecting to see a reduction in student satisfaction.

7 Conclusion

Existing literature on the casualisation of teaching staff has focused on the effect of casual contracts on staff well-being and not the direct effect on students. Furthermore, the research methods in the existing literature tend to focus on case studies, perhaps stemming from a lack of suitable data with which to explore such relationships. On the other hand, there is a well established literature focusing on the determinants of student

[11] See UCU (2019), UCU (2018) and Lopes & Dewan (2014). This hypothesis would also be consistent with the suspected direction of omitted variable bias.

satisfaction but it predominantly investigates the NSS and has not studied the effect of casualisation on student satisfaction. In this paper, two proprietary datasets are utilised to examine the direct effect of teaching by casual staff on student satisfaction. An increase in the proportion of teaching by casual staff is found to reduce the probability of a student being 'very satisfied' with the university experience. More specifically, a one percentage point increase in the proportion of teaching by casual staff leads to a 0.25 percentage point reduction in the probability that the individual will be 'very satisfied' with their time at university. These results are robust to changes in the number of staff/student responses in a university-subject pair and to the use of a multi-level model. Additionally, we find preliminary evidence of a threshold effect, suggesting that student satisfaction is (negatively) affected by the level of casualised teaching at a proportion greater than 8.5%. Not only do these results show a negative effect of casualisation in the higher education sector but they indicate, more generally, that there are negative effects on consumer perceptions of service provision when providers use high levels of casual staff. As such, this paper contributes to the literature on temporary contracts and emphasises a different dimension (satisfaction) across which temporary contracts can harm consumers.

Given the increasing marketisation of higher education in the UK, and the need to attract students for the financial viability of universities, maintaining high student satisfaction is of great importance for university decision-makers. The findings of this paper would suggest that decision-makers within universities, who often sit within the human resources and management departments, should exercise caution when considering employing teaching staff on casual contracts, as this may lead to lower student satisfaction. Existing evidence suggests that university rankings, of which student satisfaction is one component, play an important role in helping students decide which university to attend, particularly for international students (Chevalier & Jia 2016). Therefore, low student satisfaction could have negative effects on future demand. Nonetheless, given that casualisation has often been pursued by universities' human resources departments for cost-saving and flexibility motivations, the question arises of how this reduction in the reliance of casual teaching contracts will be financed. If resources are constrained then finances may need to be diverted from other activities in order to reduce casualisation and maintain student satisfaction. Such resource-diversion may similarly reduce student satisfaction, potentially to a greater extent. Consequently, decision-makers must carefully consider how finances can be balanced to ensure that student satisfaction is maintained, particularly to preserve future student demand. Inevitably, this will not be an easy task.

Whilst this paper has focused on the effect of casualisation on student satisfaction, there are a number of other dimensions affected by casualisation. This includes staff well-being and retention, graduation rates and educational attainment. In fact, evidence suggests that student satisfaction is closely related to student effort, which can affect grades and educational attainment (Gopal et al. 2021, El-Hilali et al. 2015, Bean & Bradley 1986), therefore, through the impact on student satisfaction, staff casualisation can further affect educational attainment. Further empirical evidence is required to examine the effect of casualisation on these other dimensions.

Further work ought to develop measures of casual teaching proportions over time, to allow estimation of a panel dataset which would benefit the literature both by eliminating endogeneity concerns and permitting an investigation into how the relationship between student satisfaction and staff casualisation has evolved over time. Better data could also be used to investigate threshold and non-linear effects more carefully. Moreover, improved data relating to the proportion of casual teaching ought to be collected without

resorting to subjective survey methods. Such data-gathering could collect information relating to the characteristics of individuals on casual contracts, to examine whether our finding stems from the contract or selection effect. Exploring the key mechanisms behind the empirical finding would help refine policy conclusions.

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Annex

7.1 Multi-level ordered logistic regressions

In this sub-section, we present the results of a multi-level ordered logistic regression based on the second specification, presented in Tables 5 and 6 in the main body of the paper. The multi-level approach nests students into subject groups and subject groups into universities and thus allows a random intercept for subject and universities, thereby relaxing the constraint that the intercept is the same across groupings. Note that there are no controls for university/subject/faculty - these are instead modelled as nests (or levels).

Table 7 presents the results from the multi-level ordered logistic regression, which shows very similar results to those presented in the main body, with the direction and significance of the variable of interest being preserved. However, it can also be seen that the coefficient on casual proportion is larger in absolute terms in specifications (1) to (4) in the multi-level model but smaller in absolute terms in specifications (5) and (6), with a similar picture emerging with respect to the estimated marginal effects (Table 8). The effect of fixed proportion is positive, but statistically insignificant except in (2), whereas the sign in Table 5 fluctuates. Finally, the effect of the number of university-subject staff is positive and statistically significant in (6), demonstrating that, in the preferred model, student satisfaction is increasing in the number of staff. These differences between the baseline and the multi-level models are small and, overall, confirm the paper's conclusions.

Table 7: Multi-level Logistic Regression for Student Satisfaction - Estimation Results

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Prop. Casual	-1.310***	-1.336***	-1.027***	-1.325***	-1.044***	-1.079***
	(0.347)	(0.352)	(0.349)	(0.353)	(0.352)	(0.331)
Prop. Fixed		0.719**	0.459		0.324	0.367
		(0.310)	(0.323)		(0.334)	(0.334)
Students			-0.237***		-0.227***	-0.238***
			(0.0655)		(0.0667)	(0.0647)
Staff			0.121***		0.113***	0.113***
			(0.0420)		(0.0405)	(0.0410)
Observations	8,291	8,291	8,264	8,291	8,264	8,264
Level 3	University	University	University	University	University	University
Level 2	Subject	Subject	Subject	H,B&O/S	H,B&O/S	H/S/B&O

Note: All models are weighted using survey weights. Faculty groups are denoted by letters H, S and B&O. H contains the humanities subjects of social studies, law, languages, mass communications & documentation and historical & philosophical studies. S contains the science subjects of biological sciences, medicine & dentistry, physical sciences, subjects allied to medicine, veterinary sciences, mathematical sciences & computer science and engineering & technology. B&O contains the subjects business & administrative studies, architecture building & planning, combined subjects, creative arts & design and education. Standard errors are robust. *** p<0.01, ** p<0.05, * p<0.1. Source: Author's calculations based on UCU, SAES and HESA data.

Table 8: Multi-level Logistic Regression for Student Satisfaction - Estimated Marginal Effects - Proportion of Casual Staff

Student Satisfaction:	(1)	(2)	(3)	(4)	(5)	(6)
Not at all satisfied	0.0292***	0.0298***	0.0229***	0.0298***	0.0233***	0.0242***
	(0.00827)	(0.00833)	(0.00816)	(0.00853)	(0.00833)	(0.00792)
Not very satisfied	0.109***	0.111***	0.0859***	0.112***	0.0880***	0.0912***
	(0.0290)	(0.0292)	(0.0293)	(0.0300)	(0.0299)	(0.0283)
Fairly satisfied	0.118***	0.120***	0.0916***	0.121***	0.0958***	0.0973***
	(0.0315)	(0.0323)	(0.0310)	(0.0321)	(0.0318)	(0.0293)
Very satisfied	-0.256***	-0.261***	-0.200***	-0.262***	-0.207***	-0.213***
	(0.0671)	(0.0682)	(0.0675)	(0.0689)	(0.0690)	(0.0644)
Observations	8,291	8,291	8,264	8,291	8,264	8,264
Level 3	University	University	University	University	University	University
Level 2	Subject	Subject	Subject	H,B&O/S	H,B&O/S	H/S/B&O

Note: Faculty groups are denoted by letters H, S and B&O. H contains the humanities subjects of social studies, law, languages, mass communications & documentation and historical & philosophical studies. S contains the science subjects of biological sciences, medicine & dentistry, physical sciences, subjects allied to medicine, veterinary sciences, mathematical sciences & computer science and engineering & technology. B&O contains the subjects business & administrative studies, architecture building & planning, combined subjects, creative arts & design and education. Standard errors are robust. *** p<0.01, ** p<0.05, * p<0.1. Source: Author's calculations based on UCU, SAES and HESA data.

7.2 Threshold effects

In this sub-section, we present the results of the preliminary threshold analysis, used to explore non-linearities in the relationship between student satisfaction and the proportion of casual teaching. Using a model which minimises the residual sum of squares obtained for all possible thresholds, and allowing up to five potential thresholds, we find that there is a (single) threshold at a proportion of casual teaching of 8.5%. We therefore extend specification (2) of Section 5 to include a threshold dummy variable (i.e. equals zero if proportion casual is less than 8.5%, and one otherwise) and an interaction term (between the threshold and the proportion of casual teaching) as follows:

$$\begin{aligned} \textit{Student Satisfaction}_{i,j,k} = \alpha + \beta \textit{PropCasual}_{j,k} + \mu \textit{Threshold} + \delta \textit{Threshold*PropCasual}_{j,k} \\ + \phi ln(StudentNum)_{j,k} + \omega ln(StaffNum)_{j,k} + \lambda_{j,k,l} + \epsilon_{i,j,k} \end{aligned} \tag{3}$$

δ captures the effect of the interaction term, i.e. the impact of casual teaching on student satisfaction at levels of casual teaching above 8.5%.

Estimation of this model yields that student satisfaction is increasing in the proportion of casual teaching up until the threshold is reached, when it then falls (column 6 of Table 9). In support of the results presented in Table 5, it can be seen that the coefficients attached to proportion of fixed-term teaching and the number of university-subject staff remain insignificant, whilst the coefficient on student numbers at the university-subject level remains negative. In Tables 10 and 11, the results of the marginal effects of casual teaching on student satisfaction are presented, in terms of the proportion of casual staff and interaction variables.

Table 9: Logistic Regression for Student Satisfaction with Threshold Effects - Estimation Results

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Prop. Casual	5.354**	5.320**	5.940***	9.704***	9.946***	10.14***
	(2.128)	(2.135)	(2.150)	(2.352)	(2.371)	(2.420)
Threshold	0.203	0.200	0.250*	0.363**	0.379**	0.438***
	(0.146)	(0.147)	(0.148)	(0.159)	(0.160)	(0.168)
Interaction	-6.283***	-6.251***	-6.844***	-10.93***	-10.91***	-11.41***
	(2.186)	(2.191)	(2.203)	(2.390)	(2.404)	(2.479)
Prop. Fixed		-0.146	-0.177		0.249	0.192
		(0.419)	(0.420)		(0.422)	(0.449)
Students			-0.146		-0.205**	-0.268**
			(0.0945)		(0.0952)	(0.109)
Staff			0.185***		0.0703	0.0599
			(0.0705)		(0.0616)	(0.0638)
Observations	8,291	8,291	8,264	8,291	8,264	8,264
University Controls	Yes	Yes	Yes	Yes	Yes	Yes
Subject Controls	Yes	Yes	Yes	No	No	No
Faculty Controls	No	No	No	H,B&O/S	H,B&O/S	H/S/B&O

Note: All models are weighted using survey weights. Faculty groups are denoted by letters H, S and B&O. H contains the humanities subjects of social studies, law, languages, mass communications & documentation and historical & philosophical studies. S contains the science subjects of biological sciences, medicine & dentistry, physical sciences, subjects allied to medicine, veterinary sciences, mathematical sciences & computer science and engineering & technology. B&O contains the subjects business & administrative studies, architecture building & planning, combined subjects, creative arts & design and education. Standard errors are robust. *** p<0.01, ** p<0.05, * p<0.1. Source: Author's calculations based on UCU, SAES and HESA data.

Table 10: Logistic Regression for Student Satisfaction with Threshold Effects - Estimated Marginal Effects - Proportion of Casual Staff

Student Satisfaction:	(1)	(2)	(3)	(4)	(5)	(6)
Not at all satisfied	-0.109**	-0.109**	-0.121***	-0.196***	-0.201***	-0.200***
	(0.0444)	(0.0445)	(0.0450)	(0.0503)	(0.0508)	(0.0508)
Not very satisfied	-0.438**	-0.435**	-0.486***	-0.789***	-0.808***	-0.815***
	(0.175)	(0.175)	(0.176)	(0.192)	(0.193)	(0.196)
Fairly satisfied	-0.518**	-0.514**	-0.574***	-0.943***	-0.965***	-0.989***
	(0.207)	(0.208)	(0.209)	(0.233)	(0.234)	(0.240)
Very satisfied	1.065**	1.058**	1.181***	1.927***	1.974***	2.004***
	(0.423)	(0.425)	(0.427)	(0.467)	(0.471)	(0.479)
Observations	8,291	8,291	8,264	8,291	8,264	8,264
University Controls	Yes	Yes	Yes	Yes	Yes	Yes
Subject Controls	Yes	Yes	Yes	No	No	No
Faculty Controls	No	No	No	H,B&O/S	H,B&O/S	H/S/B&O

Note: Faculty groups are denoted by letters H, S and B&O. H contains the humanities subjects of social studies, law, languages, mass communications & documentation and historical & philosophical studies. S contains the science subjects of biological sciences, medicine & dentistry, physical sciences, subjects allied to medicine, veterinary sciences, mathematical sciences & computer science and engineering & technology. B&O contains the subjects business & administrative studies, architecture building & planning, combined subjects, creative arts & design and education. Standard errors are robust. *** p<0.01, ** p<0.05, * p<0.1. Source: Author's calculations based on UCU, SAES and HESA data.

Table 11: Logistic Regression for Student Satisfaction with Threshold Effects - Estimated Marginal Effects - Interaction

Student Satisfaction:	(1)	(2)	(3)	(4)	(5)	(6)
Not at all satisfied	0.128***	0.128***	0.140***	0.221***	0.220***	0.225***
	(0.0459)	(0.0460)	(0.0464)	(0.0518)	(0.0520)	(0.0526)
Not very satisfied	0.514***	0.512***	0.560***	0.888***	0.887***	0.918***
	(0.179)	(0.180)	(0.181)	(0.195)	(0.196)	(0.200)
Fairly satisfied	0.607***	0.604***	0.661***	1.062***	1.059***	1.114***
	(0.213)	(0.214)	(0.215)	(0.238)	(0.238)	(0.247)
Very satisfied	-1.250***	-1.243***	-1.360***	-2.171***	-2.166***	-2.257***
	(0.435)	(0.436)	(0.438)	(0.475)	(0.477)	(0.490)
Observations	8,291	8,291	8,264	8,291	8,264	8,264
University Controls	Yes	Yes	Yes	Yes	Yes	Yes
Subject Controls	Yes	Yes	Yes	No	No	No
Faculty Controls	No	No	No	H,B&O/S	H,B&O/S	H/S/B&O

Note: Faculty groups are denoted by letters H, S and B&O. H contains the humanities subjects of social studies, law, languages, mass communications & documentation and historical & philosophical studies. S contains the science subjects of biological sciences, medicine & dentistry, physical sciences, subjects allied to medicine, veterinary sciences, mathematical sciences & computer science and engineering & technology. B&O contains the subjects business & administrative studies, architecture building & planning, combined subjects, creative arts & design and education. Standard errors are robust. *** p<0.01, ** p<0.05, * p<0.1. Source: Author's calculations based on UCU, SAES and HESA data.

List of Universities

Aberystwyth University
Anglia Ruskin University
Arts University Bournemouth
Aston University
Bangor University
Bath Spa University
Birmingham City University
Bournemouth University
Brunel University London
Canterbury Christ Church University
Cardiff University
City University
Coventry University
De Montfort University
Edge Hill University
Falmouth University
Glasgow Caledonian University
Glasgow School of Art
Goldsmiths College
Harper Adams University
Heriot-Watt University
Imperial College
King's College London
Kingston University
Leeds Beckett University
Liverpool John Moores University
London Metropolitan University
London School of Economics
London South Bank University
Loughborough University
Manchester Metropolitan University
Middlesex University
Nottingham Trent University
Open University
Oxford Brookes University
Queen Margaret University, Edinburgh
Queen Mary University of London
Queen's University of Belfast
Royal Holloway and Bedford New College
School of Oriental and African Studies
Sheffield Hallam University
Southampton Solent University
Staffordshire University
Swansea University
Teesside University
University College London
University for the Creative Arts
University of Aberdeen
University of Abertay Dundee
University of Bath
University of Bedfordshire
University of Birmingham
University of Bradford
University of Brighton
University of Bristol
University of Cambridge
University of Central Lancashire
University of Chester
University of Cumbria
University of Derby
University of Durham
University of East Anglia
University of East London
University of Edinburgh
University of Essex
University of Exeter
University of Glasgow
University of Gloucestershire
University of Greenwich
University of Hertfordshire
University of Huddersfield
University of Hull
University of Keele
University of Kent
University of Lancaster
University of Leeds
University of Leicester
University of Lincoln
University of Liverpool
University of Manchester
University of Newcastle-upon-Tyne
University of Northampton
University of Northumbria at Newcastle
University of Nottingham
University of Oxford
University of Plymouth
University of Portsmouth
University of Reading
University of Salford
University of Sheffield
University of South Wales
University of Southampton
University of St Andrews
University of St Mark and St John

University of Stirling
University of Strathclyde
University of Sunderland
University of Surrey
University of Sussex
University of the Arts, London
University of the West of England, Bristol
University of Ulster
University of Wales Trinity Saint David
University of Warwick
University of Westminster
University of Winchester
University of Wolverhampton
University of Worcester
University of York
York St John University