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Contract Cheating & the Market in Essays

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Abstract

We conduct the first empirical economic investigation of the decision to cheat by University students. We investigate student demand for essays, using hypothetical discrete choice experiments in conjunction with consequential Holt-Laury gambles to derive subjects' risk preferences. Students' stated willingness to participate in the essay market, and their valuation of purchased essays, vary with the characteristics of student and institutional environment. Risk preferring students, those working in a non-native language, and those believing they will attain a lower grade are willing to pay more. Purchase likelihoods and essay valuations decline as the probability of detection and associated penalty increase.

JEL: I21; K42; D81; D82

keywords: cheating; choice experiment; mixed logit; risk preference; gamble; asymmetric information.

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Contract Cheating & The Market In Essays

We conduct the first empirical economic investigation of the decision to cheat by University students. We investigate student demand for essays, using hypothetical discrete choice experiments in conjunction with consequential Holt-Laury gambles to derive subjects' risk preferences. Students' stated willingness to participate in the essay market, and their valuation of purchased essays, vary with the characteristics of student and institutional environment. Risk preferring students, those working in a non-native language, and those believing they will attain a lower grade are willing to pay more. Purchase likelihoods and essay valuations decline as the probability of detection and associated penalty increase.

1 Introduction

This paper investigates student cheating and the market in essays. The essay market is illicit and growing. It creates information asymmetries and hence an economic problem since the signalling of graduate quality via degree grade is weakened. Information asymmetries also characterize the market for essays with student buyers frequently struggling to locate 'reputable' suppliers who will provide essays that are both original and of the required quality. It is also characterized by strategic behavior, with those essay companies selling 'lemons' (Akerlof, 1970) having an incentive to disrupt buyers' attempts to gain reliable reputational information regarding suppliers.

The demand for essays involves the interplay of risk, penalties and the payoffs and the ethics, norms and risk preferences of the individual facing the option to buy. Since the internet has reduced the search costs for potential buyers of illicit essays so markedly, the cheating market is constrained only by supply side capacity and consumers' willingness to pay.

We investigate students' willingness to pay for written to order essays supplied by commercial providers. This is done by conducting hypothetical discrete choice experiments with university students in which they choose over essays systematically differing in terms of price and quality, the risk of detection and the penalty if caught. The purchase and submission of such essays is risky, and such behavior will be conditioned by the individual's risk preferences. We investigate this by deriving individual-specific estimates of risk aversion, via a 2^{nd} choice experiment over consequential gambles, which are included in the essay choice model.

We find that half of our subjects indicate a willingness to buy one or more essays in the hypothetical essay choice experiment. Students' stated willingness to participate in the essay market, and their implicit valuation of purchased essays, vary with the characteristics of student and institutional environment. Risk preferring students, those for whom English as an additional language, and those expecting a lower grade are willing to pay more. Purchase likelihoods and essay valuations decline as the probability of cheats being detected, and the penalties if caught, increase.

The structure of the paper is as follows: first we summarize the position regarding plagiarism in universities with specific emphasis on the rise of the market in essays. We then describe the study design, present results from the two choice experiments conducted and discuss their implications.

2 Contract Cheating

The problem of plagiarism is growing in universities. A 2011 survey of over 1000 college presidents in the US revealed that 55 percent thought that plagiarism was on the rise. Business Schools such as those at UCLA and Penn State have recently begun scanning the admission essays of their MBA applicants because of the scale of the problem (Parker et al., 2011). In the UK over 17 000 cases of cheating were recorded at universities in 2009-10, an increase of 50 percent from four years previously.

There is an incentive to cheat both to enter (a better) university and also to secure a (higher grade) degree. The prize is not only prestige but also economic; the average salary returns to higher education are approximately 27 percent (Blundell et al., 2005). The grade of degree awarded matters also; in the UK workers with higher grade degrees have wages 6 percent higher than other graduates 6 years after graduation (Dolton and Vignoles, 2000).

Widespread cheating within universities weakens the information content of graduates' degrees as an indicator of their quality, and an information asymmetry results. There is for able, honest students and for employers, universities and government, an incentive to reduce students' cheating and the corroded quality signals that result from it.

We address a specific form of cheating whereby students order an assignment of a given standard to be delivered in a given period at a fixed price, known as 'Contract Cheating' (CC, Clarke and Lancaster 2006). The Contract Cheating market has been boosted by technological change. First, technical change has pushed cheaters into the CC market because the probability of detection of traditional cut-and-paste plagiarism, and recycled papers, has increased with the greater use by universities of scanning systems such as *TurnItIn.* Second, the internet has reduced to almost zero the potential buyers' search costs, facilitating rapid ordering, payment and delivery.

The purchasing process for work takes two main forms: the buyer commissions work at a fixed price (most sites) or, alternatively, posts the work and potential suppliers bid for the work with the buyer in some cases able to see previous buyers' ratings of work done by bidding writers (eg *vworker* and, historically, *essaybay*). The information available about this illicit industry is patchy and nearly all concerns the supply side of the market; the UK CC market in CC was estimated to be worth £200m in 2006 with one company (UKEssays) reported to have 3,500 writers. Little is known about the demand side of the market.

While the internet has reduced the costs of locating suppliers hugely, the difficulties of assessing online suppliers' quality are substantial. Information asymmetry characterizes the Contract Cheating market as well as the graduate labour market: lemon essays exist as well as lemon graduates. For the cheat there are 2 forms of lemon essay, which differ regarding the point of revelation of the essay's poor quality. The purchased essay may be original and impervious to detection, but not match the prescribed quality (too low, too high) something only revealed after purchase, via the student's or grader's assessment. Alternatively, if the work is unoriginal it is likely to be detected via scanning and the customer identified as a cheat.[1]

Observation of the essay market suggests it is awash with lemons. Forums on sites such as essay-chat.com and www.essayscam.org are dominated by appeals for information on reliable companies or the airing of grievances toward sites from both buyers (for non delivery or delivery of low quality work) and writers (for non-payment). Information asymmetries and the lack of recourse for buyers (*PayPal*

[1] Many essay companies respond to buyer fraud (for example the buyer using a stolen credit card) by posting the sold essay online so it will become incorporated within *TurnItIn*'s database and the fraudulent plagiarizer caught.

will not refund buyers since they define essays as 'intangible goods' which are excluded from their dispute resolution framework.) create large numbers of disgruntled, defrauded customers.

The aspiring cheat is suffering because the good essays are being driven out by the bad. The incentive to reduce the information asymmetry exists for both good companies and buyers. The beneficiaries of the market failing are bad companies, and also honest students, universities and employers. Buyers try to reduce the information asymmetry by seeking reputational information in these online forums. Monitoring of these forums and the claims and counter-claims that fill them suggests that bad companies are systematically sabotaging these attempts by churning these information flows.

There are very few economic analyses of the student's decision to cheat and none of the contract cheating market. Research in education has found that those with high intrinsic motivation, who regard study as being conducted for its own sake, are less likely to cheat than those who exhibit extrinsic motivation and regard study as a means to an end (Davy et al., 2007; Murdock and Anderman, 2006). In addition, perceptions of social norms regarding cheating, especially those of the person's cohort or peer group, are found to affect the likelihood of cheating (McCabe et al., 1997; O'Rourke et al., 2010). An alternative, but related, perspective comes from the economics of crime and punishment, and rational choice (Becker, 1968). Collins et al. (2007) and Quandt (2010) develop theoretical models of student cheating within an expected utility framework. Their models have intuitive outcomes: the presence and extent of cheating depends on both institutional parameters (detection probabilities and penalties) and individuals' characteristics (preferences for grades and risks). If the utility costs associated with detection are large enough, then even opportunities for cheating which have zero direct costs and low detection rates will not be exploited. Further, the utility costs of detection depend upon the interaction of the penalties imposed and the individual's characteristics.

There is evidence that for some even a zero detection probability would not induce them to cheat. A recurrent finding in experimental studies is that while a significant proportions of subjects will act dishonestly whenever there is an economic payoff, others will avoid dishonesty in all cases. The finding that a substantial proportion refuse to lie even in situations where all parties benefit from the lie (a 'pareto white lie') supports the idea of pure lie aversion (Erat and Gneezy, 2012) implying

some students will never enter the essay market regardless of market and institutional conditions. A third group, the 'partially dishonest', may be induced to act dishonestly as *inter alia* the payoff, the degree of anonymity and the impact of their dishonesty on others are moderated (Fischbacher and Föllmi-Heusi, López-Pérez and Spiegelman, Gneezy et al). A commonly cited explanation of partial dishonesty (for example lying to increase a payoff but not to the fullest extent possible) is the maintenance of a "favourable self-concept". People act in a way that their behavior and associated gains are not sufficient to prompt an irresolvable conflict between the act and their self-perception:

> "People often resolve this conflict through creative reassessments and self-serving rationalizations ... such that they can act dishonestly enough to profit from their unethicality but honestly enough to maintain a positive self-concept" (Gino et al., 2013: 285-286).

These creative reassessments and rationalizations are observed in studies of plagiarism in which excessive workload pressures, poor teaching, poor guidance on academic practice and the need to cheat in order to keep up with many other cheaters in the class are all justifications cited by plagiarists (see Devlin and Gray, 2007). However the purchase of essays may place a greater strain on the behaviour-self image relationship than traditional copy and paste plagiarism, being viewed by some as qualitatively different from traditional plagiarism, as "bad" or "blatant" cheating (Sisti, 2007). How such behavior is perceived in terms of its effect on others, and the how personal the dishonesty is perceived as being, are likely to affect the willingness to undertake the act, in addition to the degree of private gain (Cappelen et al. 2013). One might expect some students to never buy essays while others will if there are gains to be had; others will only cheat if those gains are sufficient to outweigh the risks and costs, subject to the maintenance of self-image.

In this study the interplay of institutional parameters (risk of detection and penalty) and personal characteristics (academic ability, risk preferences) in generating the demand for essays are analyzed empirically, within a formal framework, for the first time. We examine the demand for essays, and how their value varies with the characteristics of both essay and buyer. We analyze how the stated willingness to pay for an essay varies with it's quality, the risk of being caught and the penalty

associated with detection. The cost and quality will be determined in the market. The penalty will be set by the university, while the risk of detection is a function of both the university's actions and the functioning of the market (whether a cherry or lemon is bought). The relevant characteristics of the buyer include, *inter alia*, their risk preferences, their abilities in the subject matter and their opportunity costs of time.

3 Study Design

In common with other illicit markets (Pudney, 2003; Cook et al. 2007) direct observation of prices and demand levels in the essay market is problematic; prices can be observed but many are for lemon essays and demand is unobserved. The absence of good revealed preference data prompts us to use a stated preference approach to investigate the nature of demand for essays. We use a hypothetical discrete choice experiment (DCE) to investigate students' willingness to pay for essays. Such choice experiments are widely used in, *inter alia*, health (San Miguel et al., 2006), food (Aoki et al., 2010) and transport (Hensher and Greene, 2003) economics. Their theoretical underpinnings originate in Lancaster (1966) and the decomposition of a product's value into the sum of the values of its attributes. This theoretical framework was made operational with the development of Random Utility Theory (RUT) and associated statistical models of choice (McFadden, 1974).

Respondents in a discrete choice experiment are presented with repeated choice sets. Each option within the sets is comprised of a series of attributes which vary in level. Respondents identify which of the options they prefer. With sufficient responses across a sufficiently wide range of choice situations, one can estimate the implicit weight given to attributes' levels in the choices that have been made. Further, one can analyze the marginal rates of substitution (MRS) between attribute levels and, where a monetary attribute is included, the MRS between the monetary attribute and non monetary attributes represents the willingness to pay (WTP) for changes in attribute levels.

In this study we conduct two choice experiments. The first, hypothetical, concerns essays, the second, consequential, is over gambles. The objective of the second DCE is to identify individuals' risk

preferences since we believe *a priori* that these will be important in explaining willingness to pay for the illicit essays. The recruitment process and structure of the two experiments are now outlined.

4 Recruitment

To make the essay choice scenarios as realistic as possible they had to be presented in the context of a specific piece of work that was due to be submitted not long after the experiment was conducted. The process conducted at 3 UK universities[2] was to identify a $2^{nd}/3^{rd}$ year undergraduate course which had a largely textual assignment, due soon, which accounted for a significant proportion of the unit's final mark. Then, with the approval of the unit lecturer, students were invited to attend the experiment which was held 2-3 weeks before the submission date. At the session the precise purpose and format of the experiment was explained (see online Appendix) and students given the opportunity to leave (none did). It was made clear that the research was unequivocally based on confidentiality, and had been approved by a University Research Ethics Committee on that basis.

Students completed a hard copy survey containing sections concerning demographics and educational past, views and experiences of plagiarism, and the essay and gamble choice sets. This was collected at the session's end with students retaining a separate sheet on which they had recorded their gamble choices. An on-screen random number generator was used to determine (i) which of the gambles was to be played out for payment, and (ii) the outcome of the selected gamble. Students then handed in their gamble choice sheet and received payment in cash (attendance fee + gamble winnings) as they left the room.

[2]Identified here only as Universities A, B and C

5 Choice experiment over essays

Students were asked to consider purchasing essays for the forthcoming unit assignment. The essays differed in terms of 4 attributes: price, grade[3], risk and penalty, as shown in Table 1.

Table 1 here

Defining attribute levels close to those observed in the illicit essay market was problematic. Although many prices are observable the proliferation of scam sites means that many (possibly most) are not associated with an essay of the necessary quality. Clarke and Lancaster (2013) tabulate prices on vWorker and Freelancer sites identifying 21 jobs completed for one contractor which averaged £71 when dissertations are excluded, and jobs for 13 writers which had prices ranging between £43 and £300. The risk attribute levels were also problematic since the number of commercially sourced essays submitted is unknown, as are the numbers detected. Given the reported scale of the industry the number of disciplinary cases involving Contract Cheating appears tiny suggesting that either buyers aren't submitting or, more plausibly to us, a tiny fraction of those submitted are detected. We regarded the levels selected as credible but not definitive, and we were interested in whether respondents' essay choices would be significantly affected by variation in the 2 risk levels presented.

An experimental design maximizing D-Efficiency[4] (Ferrini and Scarpa, 2007) was generated to combine the attributes and levels into options and sets. The design comprised 2 blocks of 8 choice sets with each set comprising 4 alternatives. Respondents were randomly allocated to either block of 8 essay choice sets. The 4th alternative in each set was a 'buy none' option. An example essay choice set is shown in Figure 1 .

Figure 1 here

One element of purchasing an essay in the real market is absent from the set up used in the choice

[3]The UK undergraduate system classifies marks as: 70%+ [1st class], 60-69% [Upper Second: 2(i)], 50-59% [Lower Second: 2(ii)] and 40-49% [a 3rd]. Marks below 40% are classified as fails.

[4]D-efficiency is essentially a method that ensures the choice sets are arranged so as to obtain the lowest possible standard errors when the model is estimated for a given sample size. For a more complete description readers are referred to (Ferrini and Scarpa, 2007) as a starting reference.

experiment: uncertainty over the essay's quality. As discussed above the essay market features many lemons. This could be incorporated by including an additional attribute which captures uncertainty in essay quality. This was excluded because of the additional cognitive load associated with a second probability appearing in the choice sets and because sample size was thought likely to be a constraint on identifying the effects of more attributes.

The 'buy none' option warrants some further comment. It comprises an essay with zero penalty, risk and price and of the grade the student predicts they will obtain if they write the essay themselves. Consequently we asked the participating students for a predicted grade if they were to submit their own assignment.

This grade prediction varies over students, and defines the 'none' option in each of their choice sets. This emphasizes an important issue regarding the design of a study of this nature. A student may be prepared to buy an essay for one course unit in which they struggle, but not in another in which they excel. This means that research into the demand for papers should be conducted regarding specific course units, it can not be done meaningfully in a generic context.

6 Choice experiment over gambles

We expect individuals' risk preferences to affect their willingness to buy, and their marginal valuations of, essays of differing quality. As risk preferences are unobservable we conduct a second, consequential, DCE, over gambles, to estimate them. We employ a lottery design based on Holt and Laury (2002, see Charness et al., 2013, for an overview) in which students choose a preferred gamble to play from a series of pairs (e.g. A or B in Figure 2). To ensure all choices were consequential, it was explained that one of the gambles would be selected at random and played at the end of the session, with the associated rewards paid in cash.

Figure 2 here

7 Modelling Choice

The analysis of the choice experiment data for both essays and gambles is based on Random Utility Theory, and extensions of the conditional logit model (McFadden, 1974). We outline the approach in general here before specifying the detail of the econometric implementation for the essay and gamble choice data, which differed.

Assume individual i is faced with a choice situation t with M alternatives with the attributes in the mth choice set defined as the vector z_{itm}. We denote $Z_{it} = \{z_{itm}\}_{m=1}^{M}$ as the set of attributes defining choice situation t for individual i and β_i as the parameters defining the ith individual's utility function. The probability that person i in choice situation t selects alternative m is given by:

$$P(y_{it} = m \mid Z_{it}, \beta_i) \tag{1}$$

The conditional logit model of this probability is given by:

$$P(y_{it} = m \mid Z_{it}, \beta_i) = \frac{\exp\left(V_{m|z_{itm},\beta_i}\right)}{\sum_{m'=1}^{M} \exp\left(V_{m'|z_{itm'},\beta_i}\right)} \tag{2}$$

where $V_{m|z_{itm},\beta_i}$ is the systematic component of utility derived from the attributes' levels, which differ across alternatives, and the additive random component of utility is drawn from a Gumbel distribution (see Train, 2003). We now outline the specification of the RUT models employed for the analysis of choice over gambles and essays, beginning with the former.

7.1 Modelling Gamble Choices

The purpose of the analysis of the choice of gamble from the pairs offered is to derive a measure of risk aversion for each individual. These risk preferences are then to be used to explain choices over

essays. The decision to cheat may be viewed as an economic gamble and thus attitudes toward risk, revealed by choices over monetary gambles, may also explain the decision to cheat[5].

We consider two approaches. The first is rooted in Expected Utility Theory (EUT). The second approach expresses risk preferences in terms of the distributional moments of uncertain monetary outcomes. A bridge between the two approaches can be constructed by appealing to Taylor approximations (Levy and Markowitz, 1979) or by making distributional assumptions such as normally distributed payoffs or, more generally, location-scale restrictions (Meyer, 1987). The well documented anomalies of EUT (see Rabin and Thaler 2001) have spawned many alternative approaches to conceptualizing behavior under risk such as Prospect Theory (Kahneman and Tversky, 1979) and 'first order' risk aversion (Epstein and Zin, 1990). It is the second of these approaches that we explore here as an alternative to EUT.

The expected utility approach is implemented using the expo-power utility function employed by Holt and Laury (2002). The moment approach uses the first and second moments of the gamble payoff distribution. Both approaches are implemented via estimation of mixed (random parameter) logit models (Revelt and Train, 1998).

The expected utility approach uses the utility function:

$$U_i\left(w_{itm}\right) = -\exp\left(-\lambda_i\left(\omega_i + w_{itm}\right)^{\theta_i}\right) \tag{3}$$

where ω_i is the (unobserved) wealth of individual i, w_{itm} is a monetary amount presented within alternative t in gamble m, and λ_i and θ_i are individual-specific parameters to be estimated. The absolute Risk aversion for the individual is $-\frac{U_i''}{U_i'} = \lambda_i\theta_i\left(\omega_i + w_{itm}\right)^{\theta-1} - \left(\theta_i - 1\right)\left(\omega_i + w_{itm}\right)^{-1}$. The expected utility of a gamble between two monetary amounts w_{itm} and w_{itm}^* with probabilities p_{itm} and $1 - p_{itm}$ is therefore:

$$V_{itm}^{G,EUT} = \left(p_{itm}U_i\left(w_{itm}\right) + \left(1 - p_{itm}\right)U_i\left(w_{itm}^*\right)\right) \tag{4}$$

[5]Estimates of risk aversion may be context specific. We are interested in whether estimates of risk aversion derived from the gamble choices provide information that can help rationalise choices in the essay choice experiment. For this to be the case we need only that risk preferences in the two contexts are correlated.

The 'moment function' approach is implemented using:

$$V_{itm}^{G,Moment} = e^{\alpha_i}\left(\mu_{itm} + \frac{\tau_i}{2}\left(\phi_0\mu_{itm}^2 + \left(\sigma_{itm}^2\right)^{\phi_1}\right)\right) \tag{5}$$

where μ_{itm} is the expected payoff faced by individual i in alternative t in gamble m, and $\sigma_{itm}^2$is the variance of that payoff, with ϕ_0 and ϕ_1 to be estimated along with individual-specific parameters α_i and τ_i. When $\phi_0 = \phi_1 = 1$, equation [5] takes the form that would be derived from a second order Taylor approximation of an expected utility function[6], where τ_i is proportional to the Pratt-Arrow measure of absolute risk aversion. We implement and compare 4 formulations of the Moment model. Moment model 1 is unrestricted. However, in portfolio theory the utility function is more commonly specified without the quadratic term on payoff ($\phi_0 = 0$) and Moment models 2-4 are variants of this. In Moment model 2 ϕ_0 is constrained to be zero while $\phi_1$is unrestricted. In Moment model 3 $\phi_0 = 0$ and $\phi_1 = 1$. Within the literature on risk aversion it has been suggested (Epstein and Zin, 1990) that the standard deviation may be a better predictor of behavior than the variance which gives Moment model 4 ($\phi_0 = 0$, $\phi_1 = \frac{1}{2}$).

In estimating the parameters using non-linear mixed logit models a gumbel error is added to equations [4] and [5] in which case the probability of a given choice takes a logistic form. The parameters of interest are $g(\beta_i) = (\omega_i, \lambda_i, \theta_i, \varphi)$ for [4] where φ is an additional parameter representing the scale variance of the Gumbel error, and $g(\beta_i) = (\alpha_i, \tau_i, \phi_0, \phi_1)$ for [5]. The β_i are assumed to be normally distributed with a mean and covariance (potentially conditioned on individuals' characteristics), with constant parameters (ϕ_0, ϕ_1) having zero variance.

In the expected utility model we assumed that all parameters $\omega_i, \lambda_i, \theta_i$ were log normal, therefore the utility function imposed increasing relative risk aversion, with absolute risk aversion free to be decreasing, increasing or constant. Within the Moment model α_i and τ_i was specified as normal (or conditionally normal). The parameter ϕ_0 was constrained to lie on the unit interval by specifying $\phi_0 = \frac{e^{\rho_0}}{1+e^{\rho_0}}$ where the parameter ρ_0 could take any real value. The parameter ϕ_1 was constrained to

[6] Define w=wealth, x= payoff with a distribution $f(x)$ then $U(w+x) \simeq U(w) + U'(w)x + \frac{U''(w)}{2}x^2$
$\Rightarrow E(U(w+x)) \propto E(x) + \frac{1}{2}\frac{U''(w)}{U'(w)}E\left(x^2\right)$ where $E\left(x^2\right) = E(x - E(x))^2 + E(x)^2$

be strictly positive by specifying $\phi_1 = e^{\rho_1}$ where ρ_1 could take any real value.

7.2 Modelling Essay Choices

To model essay choices we employ a mixed logit model with discrete mixing distributions (McFadden and Train, 2000)[7]. This specification of the mixed logit considers there to be a finite number of discrete classes of preferences. We believe *a priori* that preferences toward cheating are polarized with some students strongly averse to entering the market whereas others will, to varying degrees, be open to purchase depending on institutional parameters and the interplay between their own abilities and the characteristics of the essays available. Hence we seek in estimation to identify the number of discrete classes that best approximate the choice behavior observed, noting that as the number of classes increases in the limit the model approximates the continuous mixed logit model.

We model the utility associated with an essay as a linear-in-parameters function of P attributes, the levels of which vary across the m alternatives. Additionally, we assume that there are a number of discrete latent classes ($x = 1, ...K$) within the sample, which differ with respect to the parameters of the utility function. We define the class specific vector of parameters as $\beta_x^{att} = \left(\beta_{x1}^{att}, ...\beta_{xP}^{att}\right)'$ and the set of all parameters as $\beta^{att} = \left\{\beta_x^{att}\right\}_{x=1}^{K}$. The vector of essay attributes faced by the ith individual in set t is $z_{itm} = (z_{itm1}, ...z_{itmP})'$ and, as above, we denote $Z_{it} = \left\{z_{itm}\right\}_{m=1}^{M}$. The systematic component of utility for a member of class x, is modelled as:

$$V_{m|x,z_{itm},\beta^{att}}^{Essay} = \sum\nolimits_{p=1}^{P} \beta_{xp}^{att} z_{itmp} \tag{6}$$

The attributes in (6) are defined as the price and grade of the essay being purchased (defined as dummy variables) and the risk-penalty regime in which it is available. We specify the risk and penalty attributes as a combined term (Table 2) since the risk attribute has little intuitive meaning if there is no penalty, and vice versa.

[7] Other models estimated permitted investigation of misreported preferences, which seemed credible in the context of students being asked about plagiarism. The issue of misreporting can be addressed in the elicitation process, for example by using randomised response techniques (see Caudill and Mixon 2005), or the estimation process. We investigated the issue via estimation of models (see Balcombe et al, 2007, 2009) which allow for misreporting but found no evidence of systematic misreporting (results available upon request).

Table 2 here

Defining $\beta^{att} = \{\beta_{x0}, \beta_{x1}, .., \beta_{x3}, \delta_{x1}, .., \delta_{x4}, \}_{x=1}^{K}$, we specify the systematic component of utility that person i derives from essay m in choice set t, conditional on being a member of class x, as:

$$V^{Essay}_{m|x,\beta^{att},z_{it}} = \beta_{x0} price_{tm} + \sum_{g=1}^{3} \beta_{xg} grade_{tmg} + \sum_{r=1}^{4} \delta_{xr} RP_{tmr} \tag{7}$$

where:

$grade_{tmg}$	is the grade of the essay in alternative m in choice set t. For essays offered for purchase this is the level of the *grade* attribute (specified as g dummies for a 1^{st} through to 3^{rd} class essay, the latter used as the baseline: see Table 1). For the 'none' option this will be the respondent's self-predicted grade (1^{st} through to 3^{rd} class, since no student predicted they would fail)
$price_{tm}$	is the price of the essay in alternative m in choice set t;
RP_{tmr}	is the risk/penalty regime (specified as dummies, see Table 2) operational in alternative m within choice set t.
δ_{xr}	is the utility associated with risk-penalty level r, for members of class x.

Introducing latent classes, we re-state (2) as:

$$P(y_{it} = m \mid x, Z_{it}, \beta^{att}) = \frac{\exp\left(V^{Essay}_{m|x,z_{itm},\beta^{att}}\right)}{\sum_{m'=1}^{M} \exp\left(V^{Essay}_{m'|x,z_{itm'},\beta^{att}}\right)} \tag{8}$$

We explicitly model class membership using a multinomial logit functional form, based on a $J \times 1$ vector of characteristics C_i and a set of parameters $\Upsilon = \{\Upsilon_x\}_{x=1}^{K}$ where $\Upsilon_x = (\Upsilon_{x0}, \Upsilon_{x1}.....\Upsilon_{xJ})$ such that:

$$P(x \mid C_i, \Upsilon) = \frac{\exp\left(S_{x|C_i,\Upsilon_x}\right)}{\sum_{x'=1}^{K} \exp\left(S_{x'|C_i,\Upsilon_{x'}}\right)} \tag{9}$$

where:

$$S_{x|C_i,\Upsilon_x} = \Upsilon_{x0} + \sum\nolimits_{j=1}^{J} \Upsilon_{xj} C_{ij} \tag{10}$$

and the restriction $\sum_{x=1}^{K} \Upsilon_{xj} = 0$ is imposed for purposes of identification.

The likelihood of individual i making their sequence of choices over the T choice sets faced is:

$$P(y_i \mid \{Z_{it}\}_{t=1}^{T}, C_i, \beta^{att}, \Upsilon) = \sum\nolimits_{x=1}^{K} P(x \mid C_i, \Upsilon) \prod\nolimits_{t=1}^{T} P\left(y_{it} \mid x, Z_{it}, \beta^{att}\right) \tag{11}$$

where y_i is the vector of all responses by the ith individual. The likelihood function is therefore the product of (11) over all individuals in the sample. Estimation proceeds by maximizing this likelihood with respect to β^{att} and Υ.

8 Results

We recruited 90 students. Descriptive statistics for the sample, split by their English as an Additional language (EAL) status, is provided in Table A1 of the online appendix. The gender split of the sample was 57% female, 43% male, with all but one of the 90 participants in the 18-24 age range. The sample comprised both humanities and science students, 72 spoke English as their first language and 83% had taken their pre-University examinations in a UK educational institution. Ten of the 90 students knew one or more people who had bought an essay (22% of the EAL students, 8% of non EAL) and ten had been warned over their use of sources previously (17% of the EAL students, 10% of non EAL). The students' predictions for their coursework are also shown in the table, while the proportions predicting Upper and Lower Second Grades is stable between EAL and non-EAL students there are marked differences at the top and bottom of the grade ladder: EAL students more likely to predict a low pass,

non-EAL more likely to predict a top grade.

8.1 Gamble Choice Results

The proportion choosing each of the paired gambles are shown in Table A2 in the online Appendix. Mixed logit models of the alternative gamble choice specifications [4] and [5] are estimated using Bayesian methods (Train 2003; Balcombe et al., 2009) with α_i, τ_i conditioned on the individual's characteristics (students' gender[8] and university). Mixed logit estimation involves estimation of the parameters (mean and variance) which define the distribution from which the preferences of those in the sample are drawn. Estimation yields individual-level point estimates of risk aversion, conditional on that distribution and an individual's choices.

The performance of the EU and four formulations of the Moment model are reported in the online Appendix. We restrict ourselves here to noting that the EU model is outperformed by all the Moment models. The model which performed best on predicting gamble choices was Moment Model 4 (87% gamble choices predicted) in which linearity in the standard deviation was imposed ($\phi_1 = \frac{1}{2}$). We note that the correlation in the estimates of risk aversion is very high (0.97 - 0.99) for Moment models 1, 2 and 4.

We report (Table 3) the full results of the Standard Deviation Moment model in which the means of the distributions of α_i and τ_i are conditioned on students' university (A, B, C) and gender ($female$=1 for females):[9]

$$\begin{aligned} V^G_{m|\mu_{itm},\sigma_{itm},\beta_i} &= \exp(\alpha_{0i} + \alpha_B B_i + \alpha_C C_i + \alpha_{female} female_i) \times \\ &\left(\mu_{itm} + \frac{\tau_{0i} + \tau_B B_i + \tau_C C_i + \tau_{_{female} female_i}}{2} \sigma_{itm}\right) \end{aligned} \tag{12}$$

[8] See Booth and Nolen (2012) for more on the evidence regarding, and possible causes of, gender differences in risk aversion.

[9] Using $\overline{\beta}|\Omega, D$ to denote a draw of $\overline{\beta}$ from its conditional distribution given Ω and D, with D denoting the data (choices made by all individuals), estimation proceeds by taking some arbitrary starting values of α and Ω and proceeding to draw $\{\beta_i\}|\overline{\beta}, \Omega, D$ then $\overline{\beta}\ |\Omega, D, \{\beta_i\}$ and then $\Omega|\overline{\beta}, D, \{\beta_i\}$,and repeating this sequence for g= 1,...,G. The first g*draws are disregarded so that the draws are approximately independent of their starting values. Accordingly, the draws for $\{\beta_i\}^g$ from each iteration g of the chain can be recorded. The priors for all $\overline{\beta}$ estimated were normal with mean zero with covariance I.

The upper panel of Table 3 reports the mean and standard deviations of the estimates of the mean of the distributions of α and τ for the base group ($\bar{\alpha}_0, \bar{\tau}_0$; University A, males) and the terms which shift the means of these parameters' distribution by University (α_C, α_B; τ_B,τ_C) and gender (α_{female},τ_{female}). The lower panel of Table 3 shows the mean and standard deviations of the estimates of the variance of the distributions of α and τ. The estimates of τ indicate the degree to which different groups tend to avoid standard deviation in the gamble.

Clearly the more negative τ, the more risk averse. The fact that in Table 3 the standard deviations for the group estimates for τ have mean estimates of around 1.8 greater than their standard deviations suggests that they are moderately significant, in the sense that if we treated these as classical estimates they would be significant at at around a 10% level of significance. In behavioral terms there is a substantive difference in that we can see that for some of the universities there is tendency for students to actually be risk liking as opposed to risk averse. This is also reflected in the kernal density plots in Figure 3.

Table 3 here

The estimate of $var(\tau)$ indicates significant heterogeneity around the means of the distributions for each university-gender combination. Students at University A are more risk averse ($\bar{\tau}_0$= -0.265) than the rest of the sample, since increases in τ represent increasing preference for risk. Males are less risk averse than females (τ_{female}= -0.286), *ceteris paribus,* consistent with past findings (see Charness and Gneezy, 2012). The degree of the heterogeneity in risk aversion is evident in Figure 3, a kernel density plot of the distribution of students' risk preference coefficients (τ_i). While we can say that there appears to be a range of individuals that are risk averse through to risk seeking, it is more difficult to make a comment about whether this range of τ constitutes a meaningful difference in risk attitudes.

Figure 3 here

The primary motivation of deriving individual-specific measures of risk aversion (τ_i) is to assess whether these risk preferences play a significant role in the model of essay choice. We consider the value of these risk aversion estimates further when discussing the models estimated on essay choice

data in the following section.

8.2 Essay Choice Results

Each respondent was presented with 8 essay choice sets, leading to 720 choice occasions in total. Half of the sample indicated they would buy at least one of the essays offered, whereas half never opted for a purchased essay. The proportion of 'buyers' was stable across the 3 universities. The frequency of 'purchase' was variable across the sample, with 7 people indicating they would buy on all eight occasions while ten people opted to 'buy' on only one of the 8 choice occasions.

Latent class models, using the utility function specification in (7), are estimated. While it is possible to segment the sample into classes on the basis only of choices, individual characteristics may be used additionally to explain class membership (see equation 9). Two characteristics were found to be consistently significant: English not being the student's first language and the individual's degree of risk aversion, τ_i, derived from the gamble experiment[10][11]. A number of variables were tested as class membership predictors but proved insignificant. These included gender and university identifier (although these were included in the estimation of τ_i), whether the student had a part time job (a possible indicator of greater time pressure) or had previously been warned about their use of sources.

Estimation requires the number of classes to be specified *ex ante*. We follow current practice (Hensher and Greene, 2003; Train, 2008) of using information criteria (IC) to compare model specifications. The Bayesian Information Criterion and Consistent Akaike Information Criterion (CAIC) support a 2 class specification and it is results from this specification which we report in Table 4.

Table 4 here

The model correctly predicts 83 percent of the essay choices. For both classes the price term is

[10] We note that τ is an estimated term with an associated standard error. The complexity of incorporating that error within the multinomial logit class membership model within a latent class model means that the uncertainty in τ is not captured within the essay choice model.

[11] We tested whether EAL status and estimates of τ_i were significantly correlated with stated willingness to cheat in a reduced form model. Both terms were significant in a probit model in which the dependent variable was whether a person 'bought' one or more essays in the essay choice experiment. Predictions from a probit model featuring only τ_i correctly predict the (non) buying status of 60 of the sample of 90.

negative and there is the expected progression of increased utility from essays of higher grade. A striking difference between the two classes occurs in the impact of changes in the risk-penalty regime. For Class 2, the risk-penalty coefficients show an intuitive progression from positive and significant (for the most lax) through to a large negative and significant value for the most stringent regime, RP_4. For Class 2 many grade upgrades, under several risk-penalty regimes, generate a net utility gain, implying that this segment represents those who are willing to enter into the market if they consider the conditions right. For Class 1 the marginal utilities for risk-penalty are all negative from RP_1 through to RP_4 and the utility gain from moving from the lowest grade of paper (a 3^{rd}) to the highest grade (a 1^{st}) would cause a net utility loss under all risk-penalty regimes except RP_2. Even in that case, the net utility gain from buying one's way from the bottom to the top pass grade is very small. This suggests that for this class of person, if they predict they will pass (however low their grade), there is almost no incentive to participate in the market.

Not having English as a first language is found to be determinant of class membership: those without English as a first language (EAL=1) are significantly more likely to be a member of Class 2. In addition, those who are less risk averse (larger τ) are more likely to be members of Class 2 and hence more likely to enter the essay market.

A fuller assessment of the interpretation of the behaviors represented by the 2-class model of essay choice requires a formal consideration of willingness to pay (WTP) for essays, and predicted probabilities of purchase. This analysis requires consideration of an additional piece of information: the individuals' expectation of the grade they would receive for their own work. This is considered next.

8.3 Essay Valuations and Probabilities of Purchase

Choice experiment data permit estimation of both the value associated with a marginal change in an attribute level and the value associated with switching from one alternative to another. The DCE design was such that the 'purchased essay' options always featured a non-zero level of risk and penalty, while the 'buy none' option always featured zero risk and penalty. Hence the risk-penalty variables collectively represent both the risk-penalty characteristics of a purchased essay and other, unstated,

elements associated with purchasing an essay. This value is subsumed into the estimate of the 4 risk-penalty parameters; there is effectively a fixed component associated with purchasing any essay that is independent of its qualities. This is the net effect of both positive (savings in time and effort) and negative (disutility from dishonesty) aspects of purchase. [12].

Derivation of the value of an essay to a student must take account of the paper's quality and cost, the risk-penalty regime under which it is bought, and the risk preferences and English Language status of the student as well as their own-grade expectation.

The WTP for a paper will be individual- and class-specific and can be identified as that price ($price^*_{igr}$) at which student i becomes indifferent between buying an essay of grade g under risk-penalty regime r and submitting their own work. We define self predicted grade as P and hence β_{xP} represents the utility from submitting one's own paper in the expectation of that grade. Student i is therefore indifferent between purchase and submission of their own work when:

$$\beta_{xP} = \beta_{x0} price^*_{igr} + \beta_{xg} + \delta_{xr} \tag{13}$$

Rearranging (13) yields the maximum price at which the student will purchase:

$$price^*_{igr} = \frac{\beta_{xP} - \beta_{xg} - \delta_{xr}}{\beta_{x0}} \tag{14}$$

The parameters in (14) will be class (x) specific and hence one can generate conditional WTP values for each class, or an unconditional value based on the expected probability of class membership. WTP for essays in specific conditions are obtained through simulation. Taking 1000 random draws of the parameters, based on a multivariate normal distribution and utilizing the estimated variance covariance matrix of the parameters, a distribution of simulated WTP values is generated (Krinsky and Robb, 1986). This distribution yields median WTP and associated confidence intervals[13] for each

[12] Decomposition of these effects would require essays that could be bought with zero risk of detection; including such options in the design was thought too unrealistic.

[13] The significance of a WTP value is based on a 1-tail test since our concern is identifying statistically significant

essay type. These WTP values are displayed in Figure 4 (and in Table A4 in the online appendix with 95 percent confidence intervals for those values which are significantly positive).

Each of the four panels in Figure 4 shows how WTP varies with the grade the student expects if they submit their own work. Within each panel the WTP is shown for each combination of the 4 essay grades one could buy and the 4 risk-penalty regimes. Only significant WTP values are shown. In the first panel, representing students who predict their own work would receive a 1^{st} grade mark, an essay will only be purchased if it is also of a 1^{st} standard and only within the least stringent risk-penalty regime, RP_1. The value of such a paper is £93 and represents the amount the individual is prepared to pay to avoid the work needed to submit their own work in that risk-penalty environment; there is no grade upgrade involved, only the avoidance of work.

While the results do not allow the decomposition of the some of the fixed gains from buying an essay (savings in time and effort, utility from having outwitted the system, etc.) we can infer something about the value of time. For example, it must exceed £92 pounds for Class 2 since this is the amount that respondents are prepared to pay for an essay of the same grade as they predict for their own work. While the results do not allow the decomposition of the some of the fixed gains from buying an essay (savings in time and effort, utility from having outwitted the system) we can infer something about the value of time. For example, it must exceed £92 pounds for Class 2 since this is the amount that respondents are prepared to pay for an essay of the same grade as they predict for their own work.

Inspection of the other panels reveals that as the students' predicted grade falls, WTP for all essays increases, up to a maximum of £277 for a 1^{st} grade essay bought by a student expecting a 3^{rd}, under the low detection, low penalty regime, RP_1. There is never a positive WTP for an essay under the most severe risk-penalty regime (RP_4).

Figure 4 here

We now consider the probability that a student will purchase coursework. This requires evaluation of the probability that a member of each class will purchase an essay, combined with the probability

positive WTP values.

of class membership for a specific individual. The former requires assumptions about the cost and grade of the purchased paper, the buyer's own predicted grade, and the risk-penalty regime in place. The latter, the probability of class membership, is determined by English language status and risk preference. Figure 5a shows the probability of purchasing a 1^{st} grade essay for £200, if the student has English as a first language and predicts they would attain a 3^{rd} level grade. The evolution of the probability as the individual's risk aversion changes is displayed for each of the risk-penalty regimes. Figure 5b displays these purchase probabilities for a student also expecting a 3^{rd} level grade but without English as a first language. These figures show the very low probability of purchase under the most severe risk-penalty regime, and the relatively high probability of purchase under the lowest risk-penalty regime. The role of English as a first language in our sample is also highlighted here, such that a student who has English as their first language and low risk aversion has a similar probability of purchase as a student for whom English is not their first language and strong risk aversion. For those with English as an additional language, the distribution of τ within the sample is such that approximately 75 percent of this sub-sample have a probability of purchase in excess of 50 percent when the risk-penalty regime is at its most lax (RP_1).

Figure 5 here

We are wary of making general inferences from the powerful EAL effect observed in this small sample of 90 students (of whom only 18 are EAL students). However it does resonate with some previous findings. Bretag (2013) reviews empirical evidence on the relationship between EAL status and academic malpractice including Marshall and Garry's (2006) finding that EAL students were more likely to have committed serious plagiarism than non-EAL counterparts, Vieyra et al.'s (2013) finding that 47% of EAL graduate students had committed plagiarism in research proposals and Bretag et al's (2013) finding that international students were more than twice as likely as domestic counterparts to be unconfident regarding the avoidance of breaches of academic integrity.

Some caution is also required when assessing the valuations and purchase probabilities since our essay choice models are based on stated preferences. When considering the potential for hypothetical bias one is wary of systematic misreporting of preferences. In particular, choice experiments in which

there is a 'warm glow' associated with certain options are at risk of over-valuing those products and attributes. In the case of essays it might be the case that students did not treat the choices sufficiently seriously and over-report their willingness to buy. However, there may be an opposite effect: the fear of self incrimination may have caused respondents to under-report their willingness to buy since the experiments were conducted on-campus, under the supervision of academics. The warm glow of giving might have been replaced by the cold fear of self-incrimination. The net effect of these pressures to over- and under-report is unknown.

The papers' valuations under risk-penalty regimes RP_2 and RP_3 are very similar. Thus the movement from low to high penalty can be offset for the buyer by a shift from high to low risk of detection. The information asymmetries and associated quality uncertainty in the market about whether a purchased paper is truly original will translate into higher risks of detection. Thus the market constraining impact of lemon essays in reducing incentives for plagiarism can be offset by low penalties if caught. However it is only when both the risk of being caught and the penalty are high that students in Class 2 are deterred from entering the market at all. Thus, although it may be encouraging that the essay market is characterized by information asymmetries, universities also have to provide sufficiently negative incentives, via sufficiently harsh penalties, to constrain the market.

It should also be noted that the 'low' level of the penalty attribute (zero mark for the course unit) is more severe than the penalty that is applied in many institutions for a first offence (Tennant et al., 2007) and so WTP is expected to be higher under these more lax regimes. Also, no student predicted they would fail and therefore we can not estimate WTP nor the probability of its purchase, for such students. We expect their valuations, and their likelihood of entering the market for papers, to be higher than those reported here.

9 Conclusions

This paper is the first formal economic investigation of the demand for essays. It reports university students' willingness to buy, and their valuations of, bespoke papers from commercial providers. To

investigate the demand for papers accurately it is necessary to pose the option to buy with respect to a realistic scenario. An individual's willingness to buy may differ across course units hence it is necessary to frame the choices with respect to a specific piece of work. This approach is employed using choice experiments with 90 students at 3 UK universities. Given the anticipated role of risk preferences in the decision to cheat, a consequential gambling experiment is conducted, from which individual specific risk preferences are derived. In the hypothetical essay choice experiment students revealed their willingness to purchase an essay for submission for credit.

We find women to be more risk averse than men. Students who are less risk averse and have English as an additional language are more likely to 'buy'. The small sample size of 90 cautions against making any general claims, but the findings that EAL status is a strong predictor in the latent class essay choice model and 15 of the 18 EAL students opted to 'buy' on one or more occasion is notable. This EAL effect resonates with findings from other studies in the plagiarism literature. Half of the sample refuse to 'buy' an essay in all of the 8 choice sets. This may represent pure aversion to dishonesty or reflect that the combined effects of risk, price and grade attributes are insufficient to persuade partially dishonest respondents to enter the hypothetical market. Of the 45 students who opted to 'buy' at least once, only 7 of them opted for purchase on all 8 choice occasions. This, and the significant estimated effects of the essays' attributes, suggest that respondents carefully evaluated essay characteristics when considering engaging in contract cheating. The WTP value for some in the sample reaches £277 ($445) for a 1^{st} grade piece of work. The valuations decline with the quality of the essay, increases in risk and penalty and the student's own-grade expectation.

Further analysis of the demand for essays would be enriched by a greater understanding of the attitudes and norms of the students and their peer groups. Given the experimental evidence on lying, a better understanding of student perspectives on the negative effects, if any, of cheating on others, and how this varies between traditional and contract cheating, would aid understanding of the market's development. Similarly, the degree to which contract cheating challenges the self-concept of (which) students in a more profound and troubling way than copy and paste plagiarism will also shed light on the growth of the essay market. As the market grows the justification that such behavior is necessary

to keep up with other cheaters will be reinforced, further fuelling essay market growth.

Knowledge of the variability in the time it would take students to write, rather than buy, papers and their opportunity costs of time would also enrich further work on contract cheating. A critical aspect of the market which should be incorporated in further work is uncertainty about the quality of the paper being purchased. In this study buyers were assured that the essay purchased would be of the stated grade. Asymmetric information and the fear of buying a lemon may well prevent some buyers in this hypothetical study from participating in the real market. In this case the activities of reputable (and disreputable) companies to reduce (increase) the information asymmetries facing buyers will significantly affect the growth of the market in essays. Another extension to make the choice experiment more closely resemble the market would be to incorporate time pressure. Many essay providers charge higher prices for quicker turnarounds: an essay needed within 48 hours is typically more expensive than one required a month later.

We consider it remarkable how many students, in a study administered by academics, indicate a willingness to buy. The assurances of confidentiality were genuine but the level of purchasing indicated was contrary to the expectations of both the authors and their colleagues. Why is there such an apparent lack of stigma in revealing a willingness to purchase essays? It may be that the ethical line that most Faculty perceive as being crossed when such purchases are made is not that significant to many students. At a time when the university student is increasingly treated as a consumer demanding value for money it would appear that subcontracting some of the work required to achieve their degree is seen as a rational choice for many consumers on campus.

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Table 1: Essay attributes and levels

Attribute	Levels
Essay grade	1st class, 2(i), 2(ii), 3rd class
Risk of being caught	None, 1/1000, 1/100
Penalty	None, 0% for course unit, Repeat the year
Price	£100, £50, £75, £25

Table 2: A combined risk-penalty measure

Probability of detection	Penalty	risk-penalty dummy
1/1000	0% for the course unit	RP_1
1/1000	repeat the year	RP_2
1/100	0% for the course unit	RP_3
1/100	repeat the year	RP_4

Table 3: Parameter estimates: mixed logit model on gamble choices

	Mean	Standard deviation
$\bar{\alpha}_0$	0.947	0.274
α_{uni_B}	-0.201	0.362
α_{uni_C}	0.243	0.445
α_{female}	0.238	0.312
$\bar{\tau}_0$	-0.265	0.162
τ_{uni_B}	0.347	0.186
τ_{uni_C}	0.392	0.214
τ_{female}	-0.286	0.166
var (α_{0i})	0.702	0.424
var (τ_{0i})	0.333	0.097
cov (τ_{0i}, α_{0i})	-0.264	0.174

N=720; LMargL = -284.62

Table 4: A 2 class model of essay choice.

Utility functions:	Class 1		Class 2	
Attributes	Coefficient	standard error	Coefficient	standard error
price	-0.029	0.013	-0.014	0.005
RP_1	-3.314	1.371	1.284	0.489
RP_2	-2.884	1.142	0.106	0.392
RP_3	-3.628	1.167	0.399	0.393
RP_4	-4.323	1.260	-2.053	0.524
$grade\_2(ii)$	0.737	0.979	0.999	0.366
$grade\_2(i)$	0.935	0.965	1.885	0.339
$grade\_1^{st}$	3.088	0.970	2.609	0.352
Class membership:				
Intercept	0.484	0.208	-0.484	0.208
EAL	-1.283	0.373	1.283	0.373
τ	-0.722	0.315	0.722	0.315
N=720; LL = -367.637				

	Buy Essay 1	Buy Essay 2	Buy Essay 3	Buy None of Them
Price of Essay	£100	£75	£100	
Risk of Being Caught	1 in 100	1 in 100	1 in 1000	
Penalty if Caught	Repeat the Year	0% for the Unit	Repeat the Year	
Quality of the Essay	1st Class	2(i)	3rd Class	
What would you do? Tick one option (√)	□	□	□	□

Figure 1: An example essay choice set

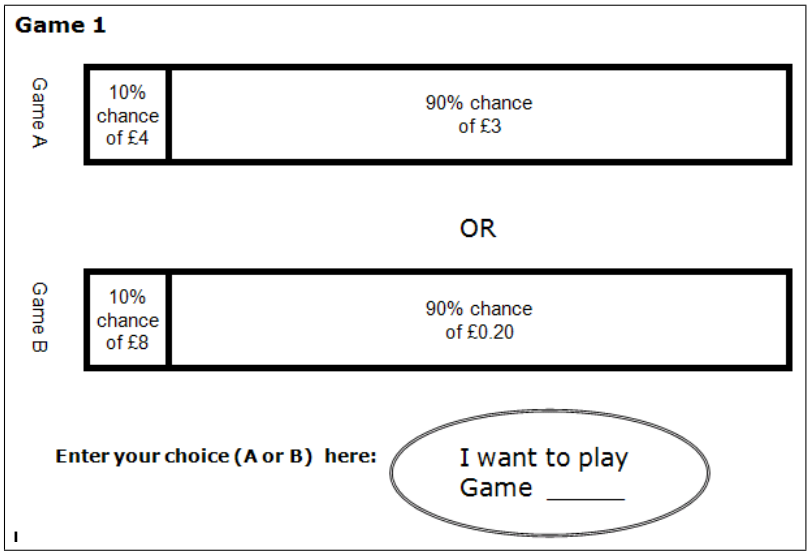


Figure 2: An example gamble choice set

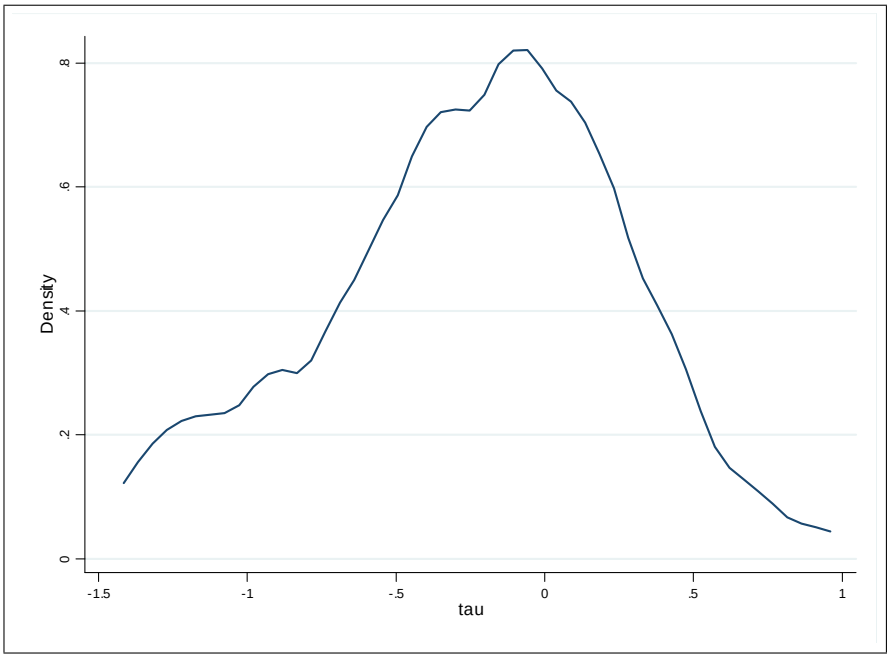


Figure 3: Kernel Density plot of τ_i

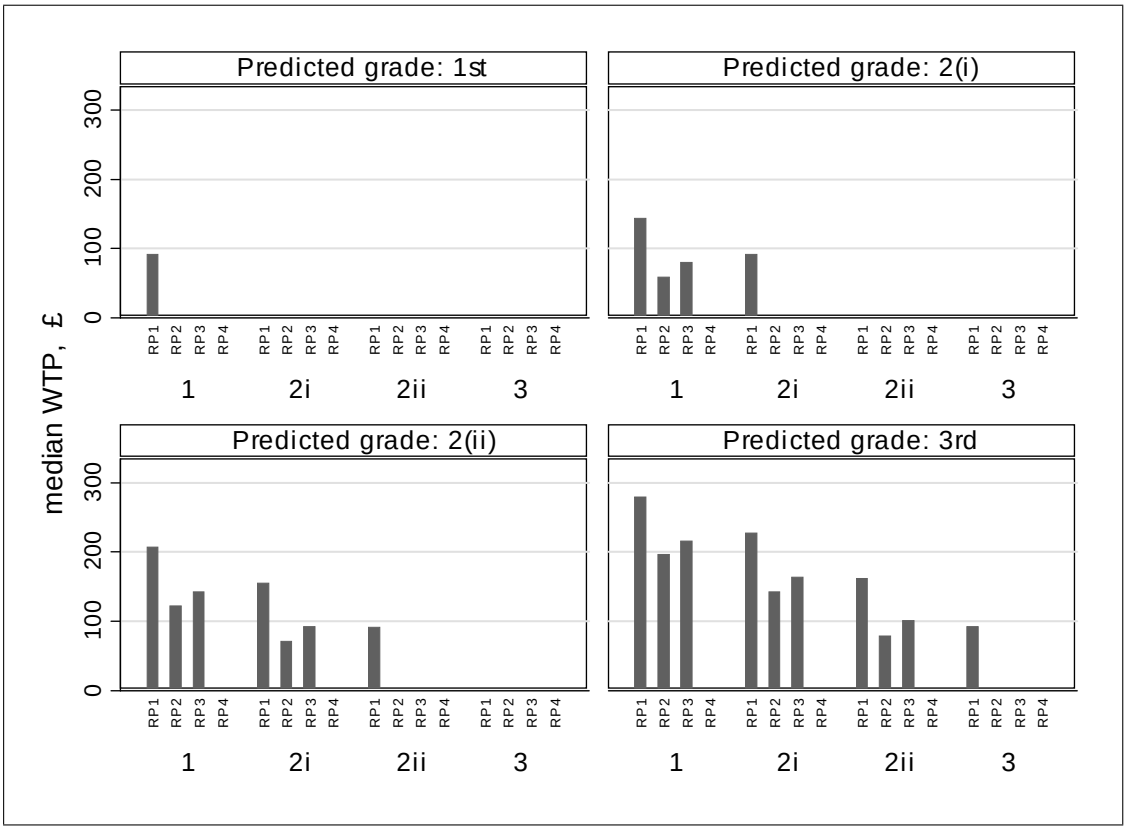


Figure 4: WTP for Essays of Differing Grade, by Own Grade Expectation and Risk-Penalty Regime

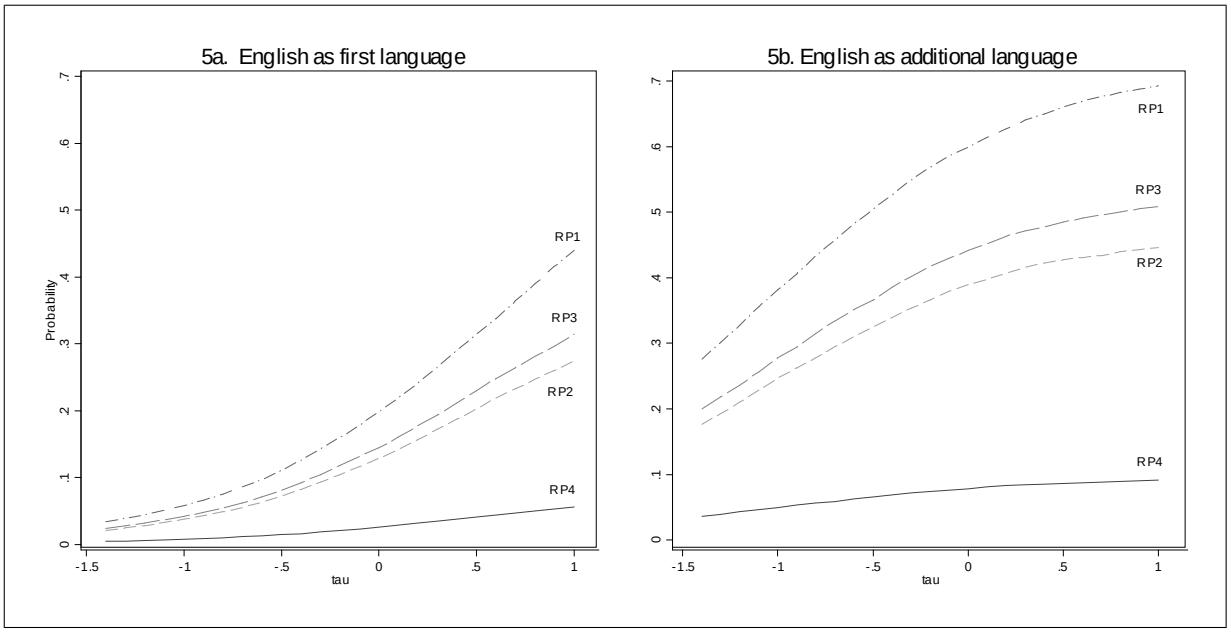


Figure 5: Probability of a student who is expecting a 3^{rd} grade buying a 1^{st} Class essay for £200, under each risk-penalty regime, as τ varies

Online Appendix for the paper 'Contract Cheating & the Market in Essays'

Table A1. Sample Descriptives, by EAL status

	All					EAL =0					EAL =1				
	n	mean	sd	min	max	n	mean	sd	min	max	n	mean	sd	min	max
female	90	0.567	0.498	0	1	72	0.653	0.479	0	1	18	0.222	0.428	0	1
knowbuyers	90	0.111	0.316	0	1	72	0.083	0.278	0	1	18	0.222	0.428	0	1
ptjob	90	0.433	0.498	0	1	72	0.431	0.499	0	1	18	0.444	0.511	0	1
warn	90	0.111	0.316	0	1	72	0.097	0.298	0	1	18	0.167	0.383	0	1
dcebuyer	90	0.500	0.503	0	1	72	0.417	0.496	0	1	18	0.833	0.383	0	1
tau	90	-0.254	0.491	-1.236	0.781	72	-0.279	0.469	-1.236	0.770	18	-0.151	0.576	-1.235	0.781

Own Grade prediction

All			EAL =0			EAL =1		
40-49%	4	0.04	40-49%	1	0.01	40-49%	3	0.17
50-59%	26	0.29	50-59%	21	0.29	50-59%	5	0.28
60-69%	47	0.52	60-69%	38	0.53	60-69%	9	0.50
70%+	13	0.14	70%+	12	0.17	70%+	1	0.06

Variable definitions

EAL	1 = English is an Additional Language	, 0 otherwise
female	1 = female	, 0 otherwise
knowbuyers	1= know someone who has bought essay	, 0 otherwise
ptjob	1= had a part time job	, 0 otherwise
warn	1= been warned over source use	, 0 otherwise
dcebuyer	1= hypothetically bought 1+ essay in DCE	, 0 otherwise
tau	estimate of relative risk aversion	

Table A2. Gamble Choice Descriptives

Game	Gamble S (safe)	Gamble R (risky)	% Choosing S
1	1/10 of s1, 9/10 of s2	1/10 of r1, 9/10 of r2	91.11
2	2/10 of s1, 8/10 of s2	2/10 of r1, 8/10 of r2	81.61
3	3/10 of s1, 7/10 of s2	3/10 of r1, 7/10 of r2	84.09
4	4/10 of s1, 6/10 of s2	4/10 of r1, 6/10 of r2	68.97
5	5/10 of s1, 5/10 of s2	5/10 of r1, 5/10 of r2	50.57
6	6/10 of s1, 4/10 of s2	6/10 of r1, 4/10 of r2	35.63
7	7/10 of s1, 3/10 of s2	7/10 of r1, 3/10 of r2	11.36
8	8/10 of s1, 2/10 of s2	8/10 of r1, 2/10 of r2	14.94
Notes:			
	Payoffs:		
Uni A	s1= £2; s2=£1	r1= £3; r2=£0.2	
Uni B, C	s1= £4; s2=£3	r1= £8; r2=£0.2	

Expected Utility and Moment approaches to deriving individual level Risk Preferences

The comparison between EUT and Moment approaches is based on the expected utility of a gamble between two monetary amounts w_{itm} and w^*_{itm} with probabilities p_{itm} and $1 - p_{itm}$. These are defined in the paper for EUT as:

$$V^{G,EUT}_{itm} = \left(p_{itm}U_i(w_{itm}) + (1 - p_{itm})U_i(w^*_{itm})\right) \quad (4)$$

and for the 'moment function' approach as:

$$V^{G,Moment}_{itm} = e^{\alpha_i}\left(\mu_{itm} + \frac{\tau_i}{2}\left(\phi_0\mu^2_{itm} + (\sigma^2_{itm})^{\phi_1}\right)\right) \quad (5)$$

in which μ_{itm} is the expected payoff faced by individual i in alternative t in gamble m, and $\sigma^2_{itm}$is the variance of that payoff, with ϕ_0 and ϕ_1 to be estimated along with individual-specific parameters α_i and τ_i.

When $\phi_0 = \phi_1 = 1$, equation [5] takes the form that would be derived from a second order Taylor approximation of an expected utility function[1], where τ_i is proportional to the Pratt-Arrow measure of absolute risk aversion.

We implement and compare 4 formulations of the Moment model. Moment model 1 is unrestricted. However, in portfolio theory the utility function is more commonly specified without the quadratic term on payoff ($\phi_0 = 0$) and Moment models 2-4 are variants of this. In Moment model 2 ϕ_0 is constrained to be zero while $\phi_1$is unrestricted. In Moment model 3 $\phi_0 = 0$ and $\phi_1 = 1$. Within the literature on risk aversion it has been suggested (Epstein and Zin, 1990) that the standard deviation may be a better predictor of behavior than the variance which gives Moment model 4 ($\phi_0 = 0$, $\phi_1 = \frac{1}{2}$).

The performance of the EU model and the four formulations of the Moment model were evaluated using 2 criteria. In the first (predictive power) the individuals' gamble choices are compared against those predicted from the individual level utility function estimates. In the second we calculate the Marginal Likelihood (LMargL) for each model (following Balcombe et al. 2011). The LMargL is a general Bayesian method for model comparison, able to compare models which are non-nested and differ in the number of parameters. If there is no difference in the prior odds of two models then the ratio of their Marginal Likelihoods gives the posterior odds of one over the other. The results on both criteria are presented in Table A3.

[1] Define w=wealth, x= payoff with a distribution $f(x)$ then $U(w + x) \simeq U(w) + U'(w)x + \frac{U''(w)}{2}x^2$
$\Rightarrow E\big(U(w + x)\big) \propto E(x) + \frac{1}{2}\frac{U''(w)}{U'(w)}E(x^2)$ where $E(x^2) = E\big(x - E(x)\big)^2 + E(x)^2$

Table A3. Gamble choice model performance

	prediction (% correct)	LMargL
Expected Utility Model	81.7	-301.12
Moment Model 1: $0 < \phi_0 < 1; \phi_1 > 0$	82.7	-292.52
Moment Model 2: $\phi_0 = 0; \phi_1 > 0$	83.5	-282.38
Moment Model 3: $\phi_0 = 0; \phi_1 = 1$ (Var Model)	86.5	-299.25
Moment Model 4: $\phi_0 = 0; \phi_1 = \frac{1}{2}$ (St.Dev Model)	87.2	-284.62

It is apparent from Table A3 that the EU model is outperformed by all the Moment models on both criteria (LMargL and Prediction). The highest LMargL is for Moment model 2 with $\phi_0 = 0$ but ϕ_1 estimated, suggesting that μ_{itm}^2 played no useful role in model performance. In Moment models 1 and 2 the estimates of ϕ_1 were 0.32 and 0.23 respectively, suggesting the model was not linear in variance (since that would imply $\phi_1 = 1$). These estimates suggest that even 'first order' risk ($\phi_1 = \frac{1}{2}$) overstates the power to which the gamble standard deviation should be raised.

Imposing linearity in variance ($\phi_1 = 1$) (Moment model 3) caused the LMargL to deteriorate markedly. However the predictive power of this linear in variance model still outperformed the more general Moment model 2. Likewise, when linearity in the standard deviation was imposed (Moment model 4, $\phi_1 = \frac{1}{2}$), there was a decline in the LMargL relative to Moment model 2, however this fall was small and the estimates of individuals' risk preferences from this model performed best in predicting gamble choices. It is this Standard Deviation Moment model which is used in the paper, when describing the distribution of risk preferences in the sample and within the essay choice model.

Table A4. Value of essays for Class 2, by predicted grade and risk-penalty regime.

		Grade of essay purchased			
Predicted grade	**Risk-Penalty**	**1st**	**2(i)**	**2(ii)**	**3rd**
	RP_1	277 *(184-613)*	228 *(149-491)*	164 *(89-364)*	92 *(48-166)*
3rd	RP_2	194 *(130-419)*	142 *(90-291)*	79 *(21-172)*	
	RP_3	214 *(137-469)*	163 *(95-372)*	100 *(37-232)*	
	RP_1	206 *(148-412)*	156 *(108-284)*	92 *(49-165)*	
2(ii)	RP_2	123 *(86-222)*	71 *(19-120)*		
	RP_3	143 *(96-288)*	92 *(37-174)*		
	RP_1	142 *(96-297)*	92 *(48-167)*		
2(i)	RP_2	60 *(21-108)*			
	RP_3	80 *(45-163)*			
1st	RP_1	93 *(51-166)*			

note:
95% confidence intervals are displayed for those WTP values which are significantly positive.

Briefing Notes to Students on Gamble and Essay Choice Experiments

Today's Survey

- The training you have received about the correct use of sources/references.
- The extent to which you think there is misuse of sources at the University
- Your assessment of detection rates and associated penalties for the misuse of sources.

Today's Survey I

We are also going to present you with some scenarios and ask you to indicate what you would do in each of them.

These scenarios involve this year's

|Course Code | Course Title| Essay

Present you with a series of choices, in each case they involve obtaining your **|Course Code | Course Title| Essay** by other means.

An example of one of the choices you might face is shown below.

	Buy Essay 1	Buy Essay 2	Buy Essay 3
Price of Essay	£75	£50	£100
Risk of Being Caught	1 in a 100 chance of being caught	1 in a 1000 chance of being caught	1 in a 100 chance of being caught
Penalty if Caught	0% Mark for the Module	Repeat the Year	0% Mark for the Module
Essay Grade	3rd Class Mark	1st Class Mark	2(ii) Mark

An example of one of the choices you might face is shown below.

	Buy Essay 1	Buy Essay 2	Buy Essay 3	Buy None of Them
Price of Essay	£75	£50	£100	
Risk of Being Caught	1 in a 100 chance of being caught	1 in a 1000 chance of being caught	1 in a 100 chance of being caught	
Penalty if Caught	0% Mark for the Module	Repeat the Year	0% Mark for the Module	
Essay Grade	3rd Class Mark	1st Class Mark	2(ii) Mark	

An example of one of the choices you might face is shown below.

	Buy Essay 1	Buy Essay 2	Buy Essay 3	Buy None of Them
Price of Essay	£75	£50	£100	
Risk of Being Caught	1 in a 100 chance of being caught	1 in a 1000 chance of being caught	1 in a 100 chance of being caught	
Penalty if Caught	0% Mark for the Module	Repeat the Year	0% Mark for the Module	
Essay Grade	3rd Class Mark	1st Class Mark	2(ii) Mark	
What option would you choose?	☐	☐	√	☐
Tick one option (√)				

First we would like you to predict what grade you think you will get for this essay.
Please be honest, there is no need for false modesty and no one will ever know what mark you predicted:

Fail [less than 30%]	Fail [30-40%]	III [40-49%]	2(ii) [50-59%]	2(i) [60-69%]	I [70% +]

Today's Survey II

Finally, you are going to be asked to choose some lotteries to play.

In each case, you'll just have to choose whether to play Lottery A or Lottery B.

We will then play out one of these games at the end of the session and calculate your winnings.

These winnings will be in addition to the £8 payment for taking part, which is guaranteed.

Game 1

Game A	10% chance of £4	90% chance of £3

OR

Game B	10% chance of £8	90% chance of £0.20

Enter your choice (A or B) here: I want to play Game _____

17

Anonymity

25

Record below (ie duplicate) the choices you made in the questionnaire as to which game (A or B) you wanted to play, for each of the 8 games you were presented with:

Game	Your choice (A or B)
1	_____
2	_____
3	_____
4	_____
5	_____

Timing

35 minutes on the survey

We collect the questionnaires (you keep the single sheet)

5 minutes to play the gamble

You exchange your single sheet for payment

How the gamble is played

A volunteer will come to the front and use the Random Number generator in Excel, displayed on the big screen.

This will determine:

- Which gamble is played (1-8)
- The outcome of the gamble

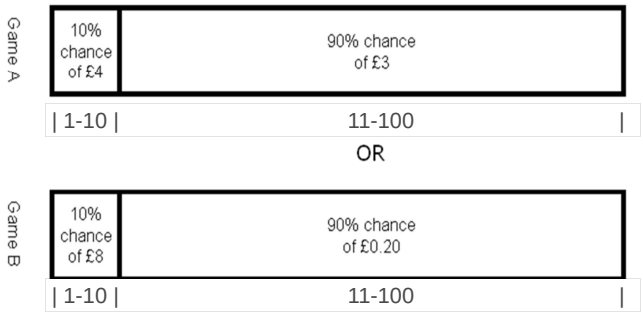
Game 1

Game A	10% chance of £4	90% chance of £3

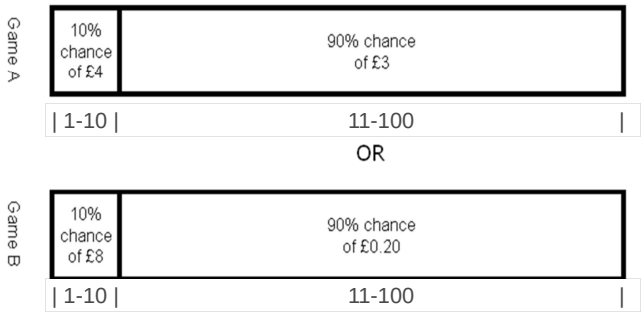
OR

Game B	10% chance of £8	90% chance of £0.20

Game 1

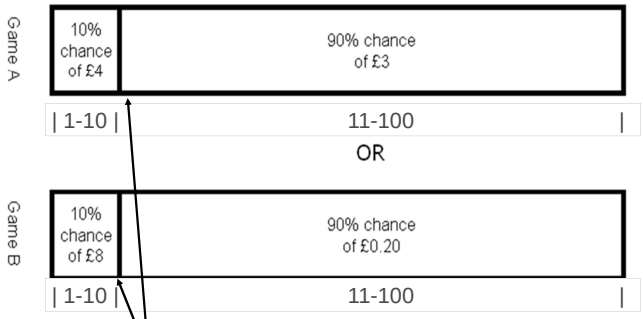


Game 1



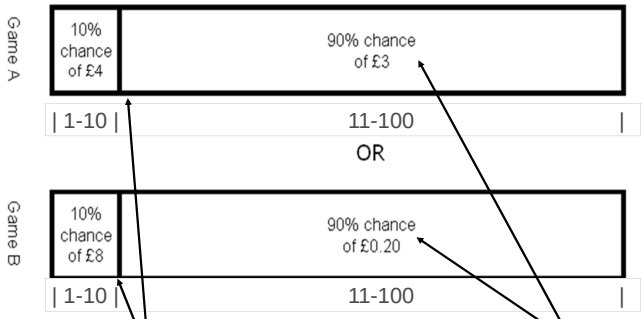
Generate a random number between 1 & 100

Game 1



Number between 1 & 10: winnings are shown here for Games A&B

Game 1



Number between 1 & 10: winnings are shown here for Games A&B

Number between 11 & 100: winnings are shown here for Games A&B

Payment

Payment in cash occurs at the end of the session

The payment comprises your:

- participation fee (guaranteed)
- gamble payout