

# *An Economic Analysis of Undergraduate Student Cheating Behaviour at University of Warwick*

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## **Abstract**

Academic dishonesty is a widespread problem in mostly all academic institutes across the globe. Dishonest behaviour of this sort cuts to the very heart of the purpose of education, and can reduce the efficiency of a country's educational system.

In this project I have analysed cheating behaviour by undergraduate students at the University of Warwick. I have assessed whether 'cheaters' are rational individuals and whether they weigh the effects of what they are doing before cheating. This project also throws light upon whether the current university policies regarding punishments imposed on cheaters is sufficient to combat the problem, or if a change could be required.

29% of the students in my survey results admitted to cheating in University. I found that these students do show signs of rational behaviour. Also, certain groups of students cheat more than others. Moreover, I found that the current punishment imposed in accordance to University regulations may not be sufficient to deter students from cheating, and perhaps, a more severe punishment method should be adopted to better handle the problem.

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## **Section 1: Introduction**

*“The University at the undergraduate level sounds like a place where cheating comes almost as naturally as breathing, where it’s an academic skill almost as important as reading, writing and math.”*

*- Moffatt M, 1990*

Alfred Marshall had described economics as being the study of man in the ordinary business of life. Unfortunately, in most schools and universities across the globe, cheating has become an ordinary part of life for a major portion of students. There is a growing concern regarding academic dishonesty<sup>1</sup>, as it cuts to the heart of the purpose of higher education. Students may not actually possess the fundamental information and skills implied by their transcript. Moreover, this dishonesty is affront to academically honest students and also to professors, as their purpose is to impart knowledge by teaching.

In this project, I will explore various aspects of cheating behaviour by undergraduate students at the University of Warwick from across various disciplines of study<sup>2</sup>. I seek an explanation to why certain students cheat while others do not. Also, I will look into whether the current punishment offered at the University is sufficient to deter students from cheating or if a higher form of punishment should be implemented.

Several studies have been carried out to understand student cheating behaviour. The most common form of research is surveys carried out amongst students in academic institutes. What is interesting to note is that all the research has been carried out in US or Canadian institutes. I have been unable to find any research based in a UK university.<sup>3</sup> This is where the novelty in my project lies. I have based my research in a UK university in order to see whether there are any similarities or differences as compared to the studies conducted in US and Canada. Through this project, I am trying to find answers to the following questions, some of which have been previously studied, some, to which I am applying a different approach.

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<sup>1</sup> Academic dishonesty and cheating mean the same thing, and are used interchangeably in the project.

<sup>2</sup> I have only considered cheating by students while at university. This does not include any cheating that students may have indulged in before they came to University. This fact is not repeated again, and is assumed through the project.

<sup>3</sup> This fact is based on the limits of the research I have conducted. There is a possibility that work has been carried out in the UK, but none to my knowledge.

1. Do cheaters show signs of ‘rationality’ in their behaviour?
2. Do certain groups of students cheat more than others?
3. What level of punishment can deter students from cheating?

In the remaining project, I have explained the idea, process, design and results of my research. Section 2 explains some important concepts about cheating. Section 3 provides a review of the existing literature. Section 4 provides an extensive description of the data. Section 5 describes the model used for the regression and lays out the results. Section 6 concludes the project.

## **Section 2: Understanding Cheating Behaviour**

Under the regulations sets out by the University of Warwick, ‘cheating’ means “*an attempt to benefit oneself or another, by deceit or fraud. This shall include deliberately reproducing the work of another person or persons without acknowledgement.*” (Website source in bibliography)

Following from the definition provided by the university, I have included various types of cheating in my own study – namely, cheating on exams, assignments (e.g.: problem sets), unassessed class tests, assessed class tests, and plagiarism (essays etc.).

### **2.1: Cheating as a Crime**

Cheating, by many, is considered to be a crime. Crime can be described in terms of the agents and agencies involved. A legal authority or law establishes property rights. Some ‘police’ force is responsible for enforcing the law. A criminal violates the property rights of parties (without their consent) for personal gain. In turn, the police protect the private property rights and detain criminals.

In the context of cheating, an institution operates its own policies, rules and regulations to deal with cheating. The professors, academic heads and invigilators act as the police, as it is their duty to ensure that a cheater does not get away with cheating. They have to protect the rights of the person who is being cheated from. The person who is cheating is a criminal, as he or she is taking advantage of someone else’s work.

Although a strong similarity can be seen between cheating and crime, there are also differences. (Eg. in Appendix 1) However, cheating is commonly analysed under the light of ‘crime and punishment’, and I will follow this reasoning in this project.

## 2.2: Honour Code at University

It is important to know what the University’s stand is on cheating behaviour, as it will help me to see if the current punishment method adopted is suitable to deter cheating by students, or if a higher level of punishment is required. A detailed statement from the regulation is given in Appendix 2, and the main feature is as highlighted below:

*“...If the investigating committee resolves that cheating has taken place it shall determine the penalty... The maximum penalty shall not normally exceed a mark of zero in that examination paper, but in appropriate cases the Committee shall have the power to impose a more severe penalty...”*

Thereby, the only punishment currently imposed according to University policies is to penalize the candidate on the assessment he/she is caught cheating on by deducting marks. I will ignore the special cases of more severe penalty in my project.

## 2.3: The Concept of Rationality

The study of cheating being similar to crime is strongly supported by studies that indicate that criminals are rational individuals. Edwin Chadwick (1829) suggested that criminals consider the costs and benefits of their actions before they commit a crime. The greater the expected benefit from committing criminal acts, the greater is the expected frequency of such acts. The costs of committing a crime are complicated, as the offender is only punished if he/she is caught. So, the higher the probability of capture, the lower is the expected incidence of crime, other things remaining constant. (A numerical and graphical explanation is attached in Appendix 3.) We can algebraically explain this concept in reference to cheating:

If  $\alpha$  = probability of getting caught while cheating;  
 $\alpha \times \text{punishment if caught} = \text{cost of cheating,}$   
 $(1 - \alpha) \times \text{increase in mark} = \text{benefit of cheating}$   
Students will cheat if benefit > cost; Students will not cheat if benefit < cost.

However, in order to carry out a cost-benefit analysis, I would require quantitative data on the costs and benefits of cheating. The benefits from cheating cannot be quantified, because it is difficult, if not impossible, to measure the increase in marks that result from cheating on a particular assessment. Due to this, rationality cannot be tested by using mathematical derivations of the cost-benefit analysis. So, I will try to find traces of rational behaviour in cheaters with the help of certain variables.

#### **2.4: The Public Goods Dimension (Free-Riding)**

When a thief steals a victim's wallet, the victim is deprived of his belongings. Unlike this, when a student cheats from a fellow classmate, the victim still has his answers. This brings in the interesting 'free-riding' problem into light. The victim makes an effort and prepares himself for an assessment but the free-riding student merely copies his answers and benefits without putting in the effort. This collides with the interest of a professor, whose goal is to produce knowledge, and in the presence of free-riding, knowledge is under produced. My survey has looked into this problem and seen if free-riding is a serious problem in the University.

#### **2.5: Collusive and Coordinated Behaviour**

Often, when a student is copying from another, it may not be a case of free-riding at all, because the person being copied from may be a conspirator who is helping a friend to do better by allowing him to see his work. Also, a group of friends may pre-decide to study different portions and help each other during an assessment by coordinating their actions. Houston (1986) in his paper found that answer copying was positively related to the degree of acquaintanceship. Helping others costs very little, as only answers are transferred, not marks. The only cost is the risk if getting caught, which is differently perceived by different students. This project will also reflect on how widespread this problem is at University.

### **Section 3: Related Works and Literature**

Several papers have been written on the similarities of cheating and crime. There is a large pool of work done to determine what factors affect cheating, and how,

eventually assessing if cheaters are rational individuals. Although different survey methods have been adopted by different people, a majority of them have adopted the use of logit or probit models to analyse effects of factors on cheating.

Gary Becker's paper on 'Crime and Punishment' (1968) provides an insight into various forms of crime such as murder and burglary, or even unconventional forms such as collusive business agreements, and 'cheating'. Becker concentrated on using economic analysis to develop 'optimal' public and private policies to combat illegal behaviour. He suggested that some people become 'criminals', not because their basic motivation differs from other people's, but because their costs and benefits differ (as explained in Appendix 3).

Becker's model implies there is a function relating the number of offences committed by a person to his probability of conviction, to his punishment if convicted, and to other relevant variables, such as available resources. This functional model is extremely useful to me for formulating a model that looks at what subset of students at university cheat, and what form of punishment can deter them from doing so. Moreover, his work concentrates on determining optimal policies rather than analysing actual policies. Keeping this in mind, I have designed my survey to ask students what form of 'hypothetical'<sup>4</sup> punishment could deter them from cheating, over and above the actual punishment exercised in the University presently.

Douglas Bunn, Steven Caudill and Daniel Gropper, (1992) further promote the similarity between crime and cheating. The questionnaire survey they conducted was aimed at understanding student perceptions of cheating and of penalties imposed on cheating. 476 students were included in the survey, of which 50% admitted to have cheated at least once. 65% of the students said that if they were caught, they expected to either fail the module or retake the test.<sup>5</sup> Over 70% of students did not consider cheating to be a problem. They estimated a logit model where the latent dependent variable measured a student's propensity to cheat. From the results, the student attitudes showed that they do not consider cheating to be a crime. Also, the students believed there was a very low probability of getting caught, both of which resulted in

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<sup>4</sup> Hypothetical, here, means that such punishments are not actually offered in the University (for e.g., getting expelled because of cheating). However, the students in the survey were asked if a variety of such punishments were offered at university, would they, then, be deterred from cheating?

<sup>5</sup> If a student is already failing a course, this may not affect him much, following from the cost-benefit analysis.

higher incidence of cheating. Although this paper looked into attitudes of all students, it failed to segregate students into different groups to see whether their attitudes and perceptions differed with differing educational background, religious beliefs, alcohol consumption etc.

Clifford Nowell and Doug Laufer (1997) were pioneers in correlating cheating behaviour to demographic characteristics such as age, gender and religious preference<sup>6</sup>. They were also the first to provide an econometric analysis using data obtained from direct measurement consisting of two research methods. 311 students were given a multiple-choice quiz. These quizzes, after completion, were copied and returned to the students ungraded. In grading their own quizzes, if there was a discrepancy between the marks, it was an indication of cheating. 27% of the students were found to have cheated. A student's grade, major and work schedule were found to impact cheating. The second part of their research involved collecting questionnaires from students about cheating behaviour. The results from the two surveys were compared, and it was found that when the random response (RR) methodology (latter method) is applied, more testing is required to validate its econometric element. The work carried out by Nowell and Laufer is of superior quality as it explores deeply into different forms of research to pull out the more accurate results. Due to my limitations as a student, I was unable to adopt any method but the RR method for my data collection.

F.W Parr (1936), looked at frequency of cheating in a classroom and the 'why's and wherefores' associated with such conduct. Similar to Nowell and Laufer's method, the students were allowed to grade their own vocabulary tests. It was found that about 42% of students indulged in dishonest behaviour. Also, 45% of the men were dishonest compared to 38% of the women. Parr suggests that this difference is more apparent than real, and interestingly, I have found similar results in my research. He found the relationships between age, rank in class and degree of economic self-support and cheating, to be the most pronounced. Parr suggested that since this issue of cheating raises major concern over the honour code at any university, it is essential

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<sup>6</sup> It is essential to note that this paper, like all others mentioned in the section, looked at the relationships of many other factors with cheating. I have only mentioned a few variables, which are of any relevance in explanation of my work, as there are far too many to mention all.

to understand why such cheating conditions exist, before any university's honour code is accused of functioning ineffectively or corruptly. His ideas motivate my research question further, as I have tried seeing what factors make students cheat more, and if such attitudes make the current level of punishment at University insufficient.

Joe Kerkvliet (1994), in his attempt to analyse student cheating behaviour used both the RR survey method, as well as the DQ (direct question) survey method, to see if there were any differences in the answers given by students with changing levels of confidentiality. He found that under the RR method, 42% of the students admitted to have cheated on at least one examination, as compared to only 25% under the DQ method. Kerkvliet also attempted to see which factors affect cheating, and he found that a heavy drinker, who was a resident member of a fraternity or sorority was most likely to cheat. This result is similar to my findings, as I found that students who consume alcohol regularly and are involved in society work are more prone to cheating. These results were the same under either type of survey. Like others, this paper also adapted Becker's model to test the underlying hypothesis.

After carefully understanding and comparing the work of several people, I have developed a model that will help me answer the questions posed at the very onset of this project.

## **Section 4: Data Description**

### **4.1: Source of Data**

Data was collected from undergraduate students in the University of Warwick in all years of study (first, second, third and fourth), and across a large variety of academic disciplines<sup>7</sup>. The method adopted was the RR survey (a sample of the questionnaire is attached in Appendix 4).<sup>8</sup> The students were asked to fill out answers to a series of questions. (A list of number of responses for each question is attached in Appendix 5).

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<sup>7</sup> Departments covered were Economics, Business, Law, Politics, Chemistry, Engineering, Computer Science, Mathematics, English, History, German and Italian. For convenience, three broad departments have been classified (pure science, social science and humanities) to study the major differences.

<sup>8</sup> Full confidentiality was maintained and students were assured that their responses would remain anonymous.

Table 1 illustrates the breakdown of students within different departments and years of study. I did not face a problem of any missing observations in my dataset.

**Table 1: Segregation of Students That Participated in Survey**

<b>Department</b>	<b>1<sup>st</sup> year</b>	<b>2<sup>nd</sup> year</b>	<b>3<sup>rd</sup> year</b>	<b>4<sup>th</sup> year</b>	<b>Total</b>
<b>Pure Sciences</b>	<b>41</b>	<b>47</b>	<b>43</b>	<b>6</b>	<b>137</b>
<b>Humanities</b>	<b>40</b>	<b>48</b>	<b>38</b>	<b>13</b>	<b>139</b>
<b>Social Sciences</b>	<b>42</b>	<b>46</b>	<b>49</b>	<b>3</b>	<b>140</b>
<b>Total</b>	<b>123</b>	<b>141</b>	<b>130</b>	<b>22</b>	<b>416</b>

## **4.2: Description of Variables**

### **Dependent Variable: CHEAT**

Students were asked if they had ever cheated (atleast once) ‘while at university’. The term ‘cheating’ was clearly defined to extend the scope even to unassessed work. They were also requested to list which ways they had cheated in, namely, exams, assessed class work, unassessed class work, home assignments and essays. Students could mark any number of mediums (ways) relevant to them.

### **Explanatory (or Independent) Variables:**

#### **Department of study**

Classified into Pure Sciences, Social Sciences and Humanities, there is a marked difference in the assessment methods across these departments. Where assessment in the Science departments is numerical or practical in nature, the Humanities divisions assess in the form of essays and dissertations alone. The Social Science departments such as Economics and WBS reflect characteristics of both, with essay based and numerical assessments. Cheating on numerical multiple choice exams would be easier than copying an essay from someone. The probability of getting caught in such circumstances is also lower. I will see if there are differences in cheating behaviour amongst students from different departments.

### **Year of Study**

I have checked if students in different years of study (first, second, third or fourth) exhibit a difference in cheating behaviour. Since marks from first year do not count towards the final degree, the costs of cheating are lower for these students. On the other hand, for the same reason, there may not be enough incentive to cheat, as students would not benefit so much from taking the risk of cheating if the higher mark will not help them much.

### **Gender**

It is often argued that sex-role socialization typically provides an explanation for differences in cheating between men and women. (Ward and Beck, 1990) Some say that women are socialized differently and view cheating more negatively than men. There is also an opinion that there is more pressure on men to do better. I will test to see if there actually are differences between male and female cheating behaviour.

### **Grade**

I asked students for their grade in the past academic year. First year students were asked to mention their predicted grade for the coming year. Following the cost-benefit analysis, students with higher grades should indulge less in cheating behaviour than students with poor grades (Appendix 3). Moreover, it is generally believed that students who perform well are dedicated to their studies, and they would have little need to cheat. However, they could be helping a friend to do better, which accounts for cheating as well. The grades were classified as 1<sup>st</sup>, 2:1 and below 2:1.

### **Alcohol Consumption**

The students were asked if they consume alcohol atleast three times a week, which is used as an indication of regular alcohol consumption. A positive relation is expected between alcohol consumption and cheating. A student exhibiting 'party' behaviour could have very late nights and suffer from hangovers. This would give him less time to devote to academics, and lack of preparation could result in resorting to cheating.

### **Involvement in Extra-curricular Activities**

This is measured by two variables – regular and continuous involvement in *sports* at University, or in *societies* (including Students Union). Involvement in extra-curricular

activities is commonly linked with higher rates of cheating. One theory behind this is the ‘social pressure theory’ which means that there could be social pressure from groups such as sport teams or society members on a student that compels or encourages a student to cheat. The other is the ‘lack of time theory’<sup>9</sup>. Students who spend too much time playing sports or indulging in society work have less time to devote to their academics, thus giving another reason to indulge in cheating.

### **Part-Time Work (Employment)**

Following from the ‘lack of time’ theory, if a student is spending time working while at University, he is more likely to have a reason to cheat than students who do not work.

### **Opinions Regarding Cheating**

Students were asked questions regarding their opinions on cheating, to gauge whether they feel it is wrong to cheat in an exam, on assessed work (including essays, assignments, problem sets etc.) or on work that is unassessed (it does not count towards any final mark in that module). Generally, if students feel it is wrong to cheat, they would not indulge in cheating behaviour. So, this relationship is expected to be positive.

### **Punishment**

As the penalty imposed on crime gets higher, the less likely is a person to commit the crime. Students were asked to choose what forms of punishment would deter them from cheating. The question asked students to assume they were cheating, and under such circumstances, what would deter them from doing so. Four options were listed in increasing levels of severity. They were:

1. Getting penalized on that test/assignment/essay/exam on which they cheated (this is the punishment imposed in University currently)
2. Re-taking/re-doing that particular assignment/essay/test
3. Failing the module altogether
4. Getting expelled from university

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<sup>9</sup> The idea behind the social pressure and lack of time theory is taken from Lambert, Hogan and Barton’s paper (2003).

This variable is aimed to capture the effect of punishments on the decision to cheat. If the current punishment is insufficient, the university may want to alter the punishment to discourage cheating. Student perceptions could be influenced by their beliefs about the probability of getting caught. Also, we do not know if students are aware of the university's regulations regarding cheating.

Some of the variables did not form part of the regression model, but were collected plainly for informative use. These are:

**Collusion** - As mentioned in section 2.5, collusive cheating can be quite a problem, and students were asked if they had ever cheated in collaboration with their friends.

**Free-riding** - In section 2.4, I explained how free-riding troubles professors, as it destroys their purpose of imparting knowledge. I asked students if they had cheated from a person or persons without their knowledge.

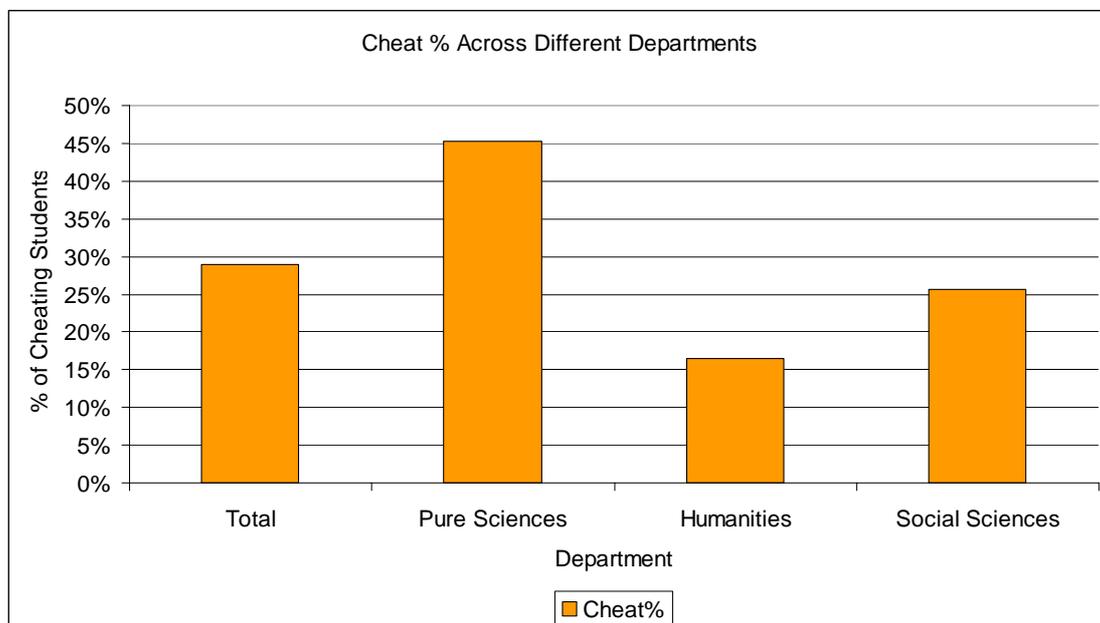
**Caught** - Students were asked if they had ever been caught while they cheated at university. Knowing this will help to know the likelihood of getting caught, which can be computed in the cost-benefit analysis to decide if a student should cheat or not.

### 4.3: Descriptive Statistics

The 416 samples collected from students exhibited some very interesting features. I have graphed or explained features that are of special interest and importance.<sup>10</sup>

Figure 1 shows the total percentage of students who cheat (admit to cheating)<sup>11</sup>, along with a breakdown of cheating behaviour amongst the different departments. The results support the discussion in section 4.2 - it is easier to cheat on practical or numerical assessments like in the science departments, than on essay type questions.

**Figure 1: Differences in Cheating Behaviour across Departments**



In the survey, 212 students were male, and 204 were female, which is a fairly equal distribution. Of the 416 students, 121 admitted to cheating. Amongst them, 78 were male and only 43 were female. So, of the total number of men, 36.8% said they have cheated at university, while the number for women was only 21%. A similar sex-

<sup>10</sup> I tried finding out university statistics on cheating, but failed. Thus, I cannot compare the proportion of cheating students in my survey to the actual number in University. so I do not know if the collected sample is a representative sample of the entire University.

<sup>11</sup> **Very important note:** When I write 'cheat', I mean 'admit to cheat', as the analysis is based on what students have said, and not on actual fact. Thus, everywhere in the project, cheat refers to the answers in the survey, which indicates students who have admitted to cheating. However, there could be students who do cheat, but have failed to report so in the survey.

oriented difference in cheating was found by McCabe & Trevino (1997), Ward (1986) and Whitley (1998).

Figure 2 shows the proportion of students that cheat across different grade classifications. As expected, students with good grades cheat less than students with grades below 2:1 as their costs of cheating are higher. The figure also shows the same classification without the 1<sup>st</sup> year students' survey results, since students in first year have given their predicted grade, rather than actual grade. The difference between the two is not drastically different.

**Figure 2: Cheating Behaviour across Different Grade Classifications**

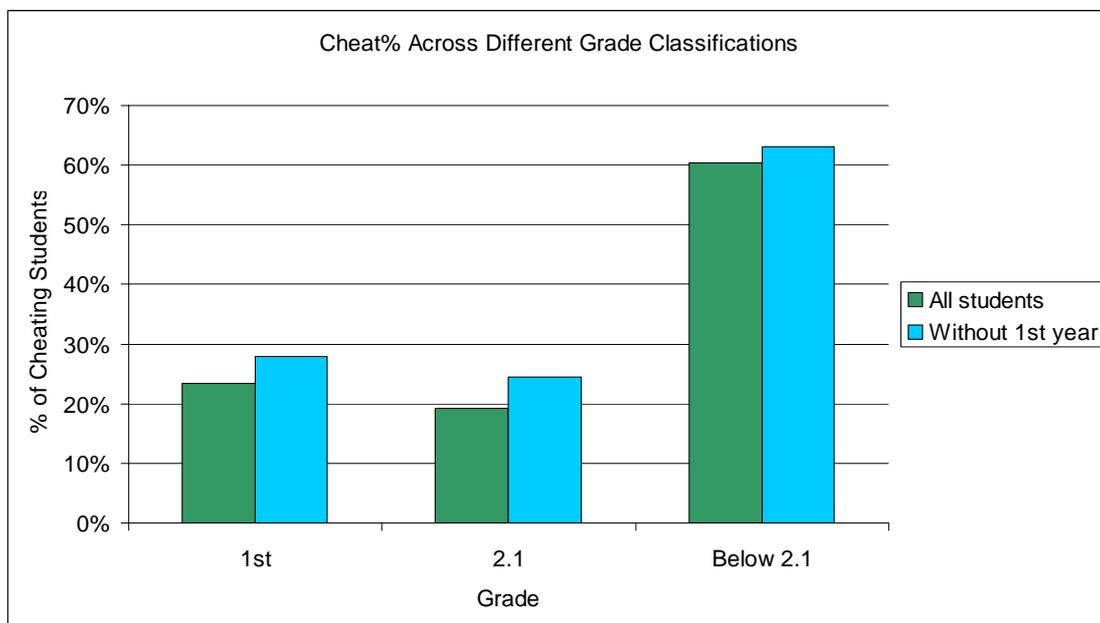


Figure 3 shows student life-style characteristics. It shows the % of students from amongst the whole sample of 416, who drink alcohol, play sports, work for societies or work part-time. Alongside, it also shows the % of ‘cheaters’ who do these things. There is an indication that there could indeed be a strong relationship between alcohol consumption, sports and society involvement and cheating. However, part time work does not appear to have much of a relationship with cheating behaviour.<sup>12</sup>

**Figure 3: Lifestyle Characteristics of Cheaters and Whole Sample**

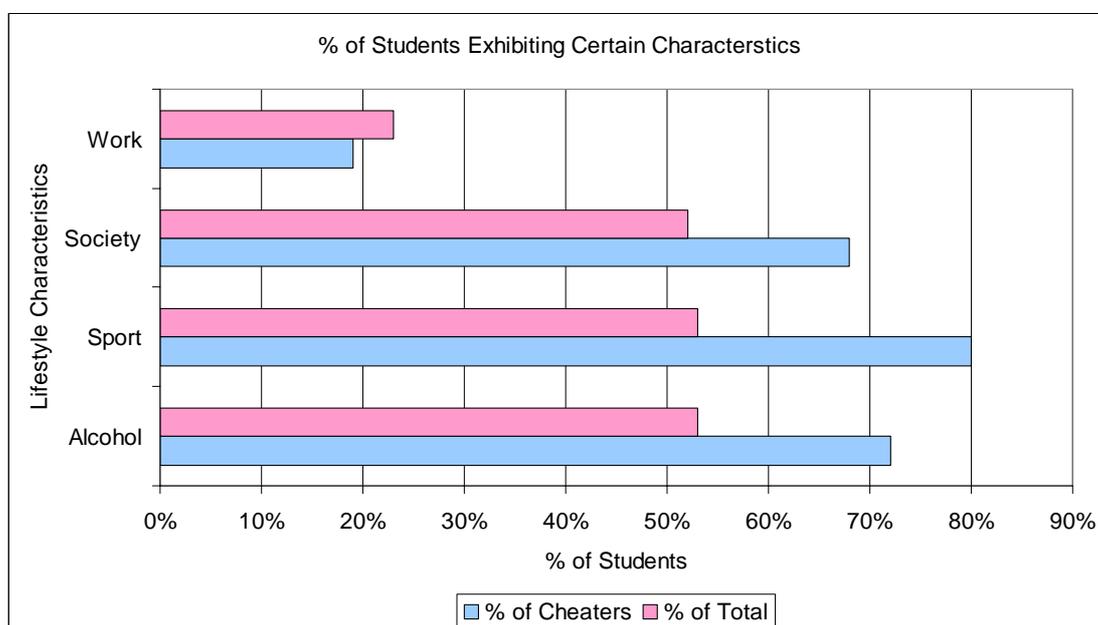


Figure 4 shows what students cheat in<sup>13</sup>. The percentage of students cheating in exams is the lowest since the cost of cheating in exams is the highest. The invigilators are very careful, and if a student gets caught, the penalty may cause him to fail the module altogether. Thus, students are less likely to cheat on an exam.

A large number of students opt to cheat on home assignments as it is easier to do. A lot of numerical or practical work is usually set as a home assignment, and the chances of getting caught when cheating on numerical work are low. Moreover,

<sup>12</sup> These interpretations are only based on initial impressions, and are tested again in section 5 using regression.

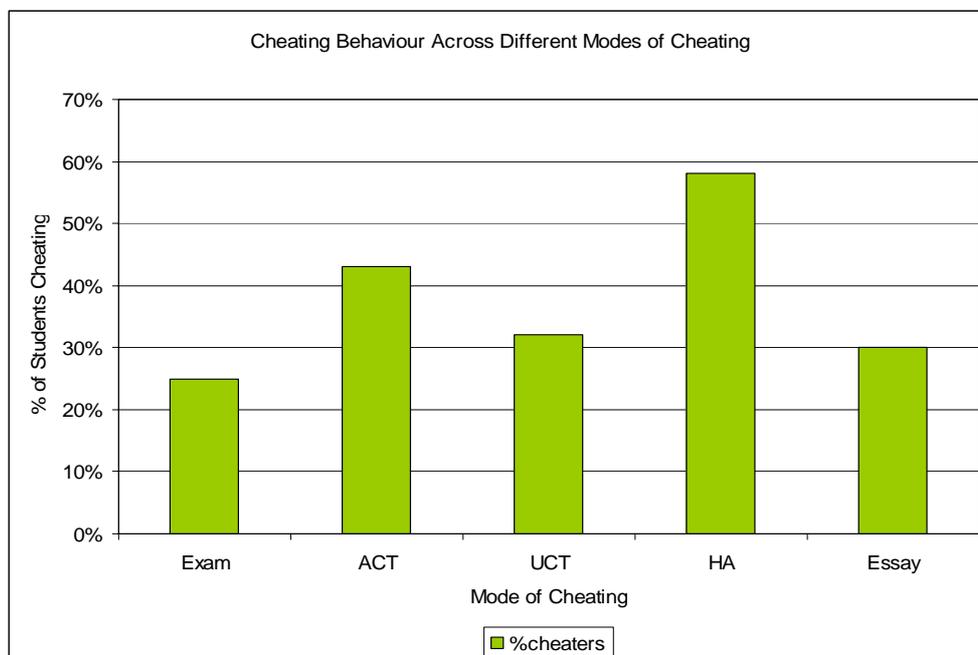
<sup>13</sup> It should be kept in mind that students in the Pure Science departments do not write essays, and students in Humanities rarely have class tests, and have no practical exams or numerical problem sets. Exams are common to students in all departments.

collusion becomes easier when friends can work together at home, as compared to cheating under invigilation.

Students cheat more on assessed class tests than on unassessed class work. Cheating on unassessed work has little benefit, as the higher grade does not count towards a degree mark. However, if caught, the authority still may make a note in the students' record, and a cheater may not feel it is worth the risk to cheat on unassessed work.

Cheating on essays (or plagiarism) is a common problem anywhere. Although the rate of plagiarism cases is low at University, students could just be copying ideas from friends or existing journals, which they can get away with.

**Figure 4: Illustration of What Form Students Cheat In<sup>14</sup>**



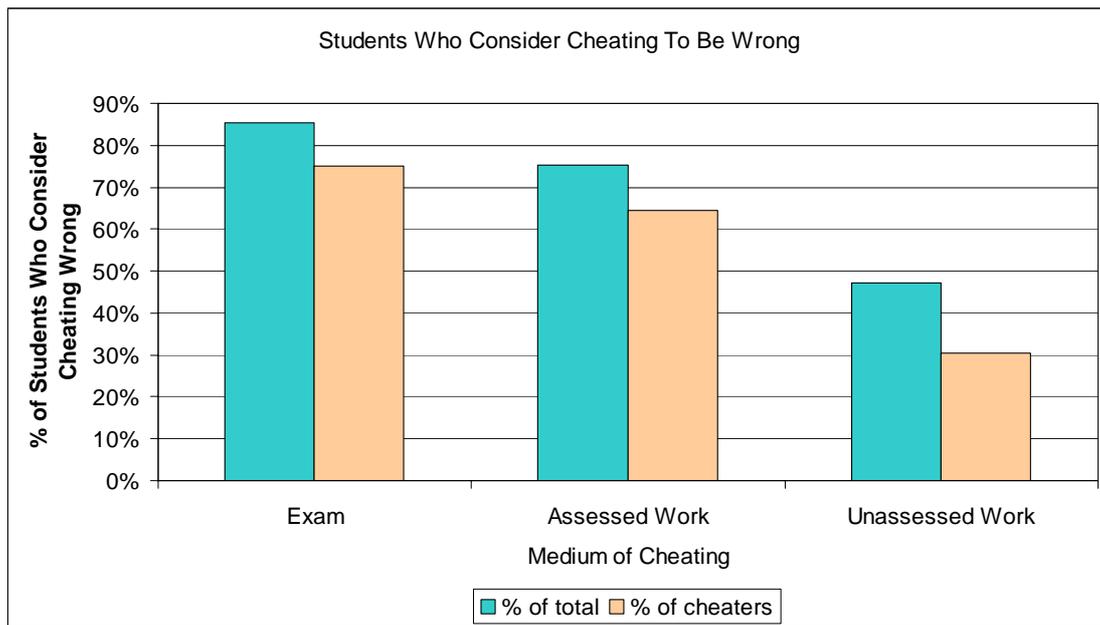
As mentioned earlier, free riding and collusive cheating are matters of great concern to professors. Of the 121 students who admitted to cheating on the survey, 56 (46.3%) admitted to free-riding on other people's work. Also, 69 (57%) said they had collaborated with their friends to cheat. Both these problems seem to be quite significant in the University. There are ways to combat these problems. Professors could design different question papers (of the same standard) to ensure students sitting next to each other cannot copy from each other. Moreover, severe penalties could be

<sup>14</sup> In the figure, ACT stands for assessed class tests, UCT for unassessed class tests and HA for assignments to be done at home.

imposed even on the student who is being cheated from. Such a measure would drive students to be more careful and not allow anyone to cheat from them.

Figure 5 graphs student opinions about cheating. In general, if a person feels it is wrong to cheat on unassessed work, he would hold the same opinion for assessed work and exams.<sup>15</sup> But it is interesting that even students who feel it is wrong to cheat do sometimes cheat. Figure 5 also shows the percentage of such students.

**Figure 5: Students Who Consider Cheating to be Wrong**



Of the cheating population, only 12.4% said they had been caught.<sup>16</sup> This small percentage indicates that students probably won't be threatened by the possibility of getting caught, as it seems to be low.

I measured whether increasing severity of punishments can deter students from cheating.<sup>17</sup> Students were asked to mark each type of punishment that would deter

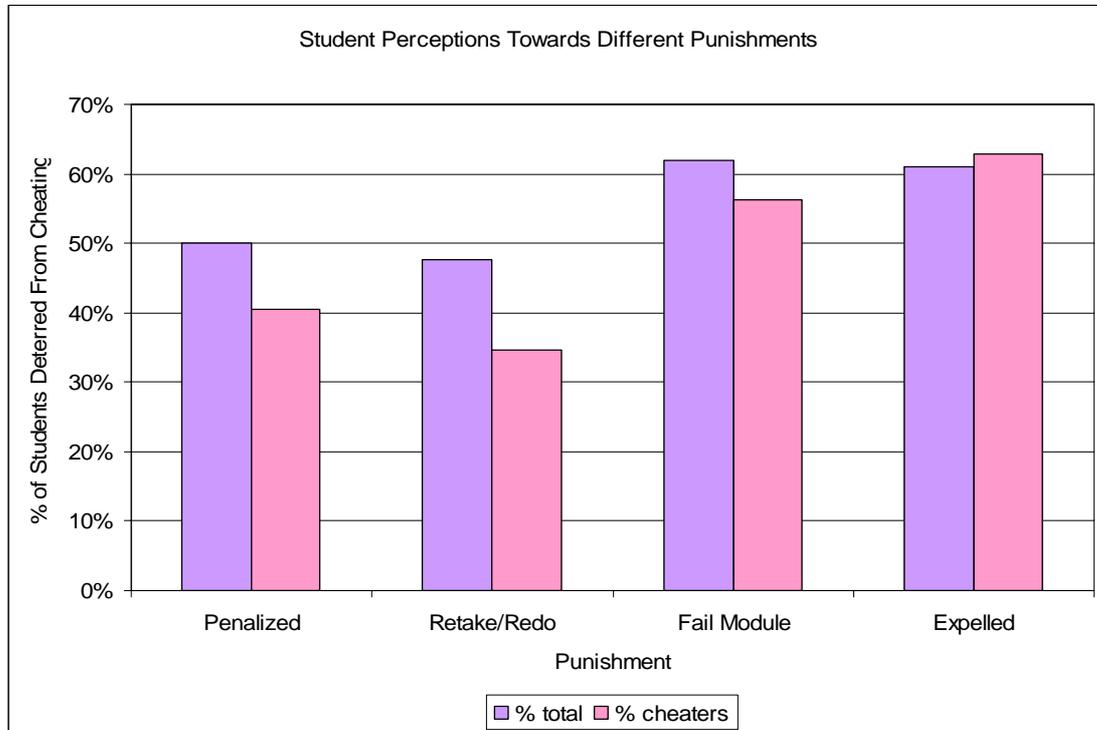
<sup>15</sup> Students could feel that it is unfair for a person to get marks awarded when they do not deserve it. In unassessed work, these marks will not really count towards the degree, where in exams or other assessed work, these marks do make a big difference. So students who strongly feel against cheating would feel it is wrong to cheat, even on unassessed work.

<sup>16</sup> I could have increased the scope of my research if I had asked students whether they have cheated after being caught. I could have also asked if students had seen their friends being caught. Such data would have helped me to see whether getting caught had a negative impact on cheating. However, due to the inadequacy of the question posed, I am unable to draw any conclusions from this finding

<sup>17</sup> If students have said that the easiest form of punishment can deter them from cheating, it is not assumed that a more severe form may have the same effect. For example, some students could be

them from cheating.<sup>18</sup> Figure 6 shows the percentage of students who claimed that punishment would deter them from cheating. The answers by cheating students are also shown in the graph.

**Figure 6: Student Perceptions towards Different Punishments**



According to current university regulations, if a student gets caught while cheating, he gets penalized. But a large number of students who do admit to having cheated at university have said they would stop cheating if they were penalized. This could mean that students feel the probability of getting caught is very low, or they may not be aware of the regulations.

Surprisingly, not a tremendously large number of students are deterred at the threat of getting expelled from university, as it is a very serious penalty that would not be taken lightly by any. A possible explanation for this number to be below our expectation could be that students do not consider this to be a credible threat.

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deterred by the threat of being penalized, but they may not get deterred if they had to retake the assessment.

<sup>18</sup> As stated before, even students who did not admit to cheating answered this question. They were to assume that if they did cheat, what form of punishment would deter them from cheating.

## Section 5: Methodology and Results

### 5.1: Methodology

All the questions in my survey asked students to select answers from the given options (e.g. yes or no). Thus, I first created dummy variables to capture the effect of each variable in order to use them in a regression model. The list of dummy variables with explanations can be found in Appendix 6. I did not encounter a problem of missing observations, as everyone in my survey responded to all questions.

The OLS measure of regression allows working with quantitative responses. However, when analysing why students decide to cheat or not to cheat, I am measuring a qualitative response. To study such responses, models such as Linear Probability Models (LPM) can be used, which takes the help of OLS. However, various problems are associated with the use of the LPM, such as non-normality and heteroscedasticity of the error term. Moreover, it assumes that the marginal effect of X (independent variable) remains constant throughout. Thus, the CDF (cumulative distribution function) can be used to model regressions where the response variable is dichotomous, taking values between 0-1, as is the case with variables in this project. One such CDF chosen to represent the response model is the normal CDF, which gives rise to the *Probit Model*. I have used this model to run regressions. A mathematical illustration of the Probit Model is in Appendix 7.

### 5.2: Results

I am trying to understand three questions in order to understand student cheating behaviour at University of Warwick.

1. Do cheaters show signs of rationality in their behaviour?
2. Do certain groups of students cheat more than others?
3. What level of punishment can deter students from cheating?

To answer the first two questions, several variables are included in a model to check the effect on the dependent variable, *dcheat*. Equation 1<sup>19</sup> below captures the effect of a variety of variables on cheating. (Output attached in Appendix 8).

$$dcheat = \beta_1 + \beta_2dss + \beta_3dhu + \beta_4dsecond + \beta_5dthird + \beta_6dfourth + \beta_7dmale + \beta_8done + \beta_9dtwo + \beta_{10}dalcohol + \beta_{11}dsport + \beta_{12}dsociety + \beta_{13}dwork + \beta_{14}dwe + \beta_{15}dwaw + \beta_{16}dwuw + \varepsilon_i$$

I carried out a probit regression based on the equation above, and the coefficients, standard errors and z-statistic for each variable are shown in Table 3<sup>20</sup>. The table also shows the marginal effect for each variable.

**Table 2: Table Showing Main Regression Results for Equation 1**

VARIABLE	COEFFICIENT	ST. ERROR	Z-VALUE	ME
dss	-0.6080308	0.2087197	-2.91	-0.1606275
dhu	-0.6318771	0.2259753	-2.8	-0.1660957
dsecond	0.4920561	0.225813	2.18	0.1500902
dthird	0.6016589	0.2411886	2.49	0.187366
dfourth	0.7547387	0.368853	2.05	0.2649483
dmale	0.0995933	0.1856459	0.54	0.0287004
done	-1.145283	0.2534646	-4.52	-0.2381282
dtwo	-1.007946	0.2054211	-4.91	-0.3043709
dalcohol	0.4661566	0.1673998	2.78	0.132719
dsport	1.349879	0.1981913	6.81	0.3666591
dsociety	1.045351	0.1847892	5.66	0.2927653
dwork	0.2118802	0.2078853	1.02	0.0637831
dwe	-0.5030634	0.258593	-1.95	-0.1637655
dwaw	-0.0253965	0.2490079	-0.1	-0.0073634
dwuw	-0.3786743	0.1861774	-2.03	-0.1081248

All the variables included proved to be significant at the 5% level, except for *dmale*, *dwork* and *dwaw*. For the remaining variables, we can look at the marginal effect to see the effect on cheating behaviour. (Regression output is attached in Appendix 6.)

<sup>19</sup> In the equation, *dhs*, *dfirst*, *dfemale* and *dthree* are used as base dummies to provide for comparative explanations of marginal effects.

<sup>20</sup> I have not interpreted the constant term, as it would be difficult to explain its purpose in my explanations.

As discussed in section 4.2, students in pure science departments could have more opportunity to cheat, as copying on a numerical or practical assessment is easier than copying on an essay-based one. So, the highest number of cheating students is from the pure science departments. Being in the humanities department (as compared to pure sciences) decreases the probability of cheating by 16.6%<sup>21</sup>. Students from social science departments are also 16% less likely to cheat, as compared to those from pure science departments.<sup>22</sup>

Students in their second, third and fourth year of study are more likely (by 15%, 18.7% and 26.4% respectively) to have cheated than those in their first year of study. This is dissimilar to the results found by Parr (1936) who found that sophomores were far more honest than freshmen. The result in my survey could be due to insufficient time spent by first year students at the University. I conducted the survey in January 2006, and first year students had only spent 10-12 weeks at University by that time. Several students may not have had any assignments or exams by the time the survey was conducted, thus having no opportunity to cheat. Also, costs are higher for students in their second, third or fourth year of study. But with the same reasoning, benefits too are higher for them. If students are rational, this result could mean that the benefits are more than the costs of cheating in second third and fourth years.

The coefficient on *dmale* is insignificant, suggesting that males have no greater or lesser tendency than women to cheat. This result supports Parr's (1936) view (as mentioned before), who says that sex difference in academic dishonesty is apparent, and not real. Nowell and Laufer (1997) and Kerkvliet (1994) also found the gender variable to be insignificant. A possible explanation for this insignificance in my data could be that in the Pure Sciences department, a majority of students (106 out of 137) are male. This department accounts for the highest number of cheating students (62 out of 121). Thus, the high percentage of men cheating (37% as compared to 21% of women) could be just in this department, and not an indication of a general trend.

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<sup>21</sup> Probability and likelihood are used interchangeably in the interpretations, although all interpretation indicates probability (mathematically). Likelihood is used as it offers an easier explanation.

<sup>22</sup> The effect for the two departments may be similar due to a bias in the selection of students, as several students from the social science departments belong to Politics and Law, which too, offer essay-based study.

Students with a 1<sup>st</sup> grade classification are 24% less likely to cheat than students with grades below 2:1. Similarly, students with a 2:1 are also 30% less likely to cheat than those with less than 2:1. Explanations for this have been discussed with the use of costs and benefits in section 4.3. Though the likelihood should have been lesser for students with 1<sup>st</sup> than for those with 2:1, this is not a serious problem.<sup>23</sup>

A student who regularly consumes alcohol is 13% more likely to cheat than a person who does not drink so much. This result is supported by Kerkvliet (1994) and Whitley (1998). Excessive consumption of alcohol leaves students with less time to study, as they spend more time ‘partying’, hence being distracted and not concentrating on work.

The social pressure theory and lack of time theory, as explained before, justify why students who are involved in sports or society work at university have a tendency to cheat more. The results indicate that students who play a sport regularly at university are 37% more likely to cheat than others who do not. Even involvement in society work increases the probability of cheating by 29%. Such social pressure encourages cheating by facilitating collusion with friends or team members within the sport or society organization (Moffatt 1990, Baird 1980).

However, the coefficient on *dwork* is very insignificant indicating that working part-time has no effect on a student’s decision to cheat. This shows that the lack of time theory is not necessarily applicable, and the result found for *dsport* and *dsociety* could be due to social pressure, or some other reason.

The coefficients on *dwe* and *dwuw* are significant. Students who feel it is wrong to cheat on an exam are 16% less likely to cheat. Students who feel cheating is wrong altogether (that is, even on unassessed work), are 11% less likely to cheat. This negative relation found between opinions on cheating and cheating behaviour is discussed previously in section 4.2.<sup>24</sup>

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<sup>23</sup> In the data, there are a large number of students from the pure science departments who obtained a 1<sup>st</sup> grade, yet cheated. The result could be a reflection of that.

<sup>24</sup> Appendix 9 shows multiple regressions carried out with the model in equation 1 to show robustness of the data.

To check the effect of different punishments on cheating, I ran a regression with the four dummies dpen, dretake, dfail and dexp, that capture the effect of students who say they would get deterred from cheating given this punishment was imposed. Equation 2 below shows the model, and Table 4 shows the main results. (Output is attached in Appendix 10).

$$dcheat = \beta_1 + \beta_2 dpen + \beta_3 dretake + \beta_4 dfail + \beta_5 dexp + \varepsilon_i$$

**Table 3: Table Showing Main Regression Results for Equation 2**

VARIABLE	COEFFICIENT	ST. ERROR	Z-VALUE	ME
dpen* <sup>25</sup>	-0.23509	0.135354	-1.74	-0.07956
dretake	-0.37443	0.138325	-2.71	-0.12577
dfail	-0.20728	0.149343	-1.39	-0.07115
dexp	0.178008	0.148621	1.2	0.059598

We can see that only the variables dpen and dretake are significant, and dpen is only significant at the 10% level. According to the results, a penalty on the assessment on which a student has been caught cheating, can decrease the probability of a student cheating by 7%.<sup>26</sup>

The punishment in which students are asked to re-take or re-do the assessment, can decrease the probability of cheating by 12.5%. Re-taking an assessment requires students to put in an equal amount of effort again in preparing for an exam, or re-writing an essay. As can be seen in Appendix 4, several students are involved in sport, society work or part-time employment. Such students have a lot of time dedicated to other activities, and if they had to re-do an assignment, it would be difficult for them to take time out. Thus, such a punishment could surely deter these groups of students from cheating. But, 12.5% is not a very large measure, and again, this could be attributed to the fact that students do not feel a strong threat of getting caught.

Although the variable dexp is not significant, it is interesting to see a positive sign on the variable. It does not make sense that a threat of getting expelled from university

<sup>25</sup> It is significant at the 10% level, but not at the 5% level.

<sup>26</sup> As mentioned before in section 4.3, this result could mean that some students are not aware of the current regulation against cheating at University, because this is the punishment currently imposed, and if students could get deterred by this punishment, they would not currently be indulging in cheating behaviour. It could also mean that students believe the probability of getting caught is very low. They do not feel the threat of getting caught and being penalized.

can actually increase cheating behaviour by students. However, this could mean that students do not consider this to be a credible threat. In other words, students do not believe that the university can adopt such strict measures in the event of cheating.<sup>27</sup>

Quite different to what I have found, Houston (1983) found that only the strongest penalty had a deterrent effect on cheating, that too only for students who had done well on previous exams.

### 5.3: Interpretations

I will now answer the questions set out at the very onset of the project by summarizing my findings of regression results and descriptive statistics.

1. Do cheaters show signs of 'rationality' in their behaviour?

As explained in section 2.3:

If  $\alpha$  = probability of getting caught while cheating;

$\alpha \times \text{punishment if caught} = \text{cost of cheating}$ ,

$(1 - \alpha) \times \text{Increase in mark} = \text{benefit of cheating}$

I have mentioned that of the sample of cheating students, only 12.5% of students got caught. I can use this figure as an estimate for the probability of getting caught, which would be 0.12, a very low figure.

From the results of Equation 2 in section 5.2, we can see that the probability of students being deterred from cheating with the current punishment in University is as low as 7% or 0.07. This shows that students perceive the cost of cheating to be very low, as the punishment is not making a significant impact in deterring students from cheating. Thus, given the low probability of getting caught, it can be said that cost of cheating is considered to be quite low by students at university.

29% of students have admitted to cheating. There must be some benefits to cheating for such a large proportion of students to cheat. However, as mentioned before, I cannot calculate the benefits of cheating, as it differs from person to person and from assignment to assignment.

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<sup>27</sup> Here, I have concentrated on the fact that there is NOT a negative sign, rather than on the fact that there is a positive sign. Either way, this is just a possible explanation, which does not hold in our case since the variable is insignificant.

If the perceived costs of cheating are low, and the perceived benefits are high, this should lead to a decision to cheat. The fact that some students at University are doing so indicates that there are signs of rationality in their behaviour. Although I cannot conclude for certain if these cheaters indeed are rational, my results definitely suggest there is a rational element in their decision to cheat or not to cheat.

## 2. Do certain groups of students cheat more than others?

Based on my results, students from the pure science departments find it easier to cheat than those from social sciences or humanities, and so they tend to cheat more. First year students have little to gain from cheating, thus making them less prone to cheating than their seniors. Students who get better grades cheat less than students with low grades.

Students who consume alcohol, play sports or are involved in societies tend to cheat more than others. One possible explanation is that students choose to commit the 'offence' of cheating only if their expected utility (increase in grade) exceeds the utility they would get if they put their time and resources at other activities. Due to this, certain students choose to spend their time and resources in activities such as sports or society work, as for them, the utility they get out of this is higher than the utility they get out of studying; thus they resort to cheating.

Students who hold negative opinions about cheating are less likely to cheat, as they consider cheating to be wrong.

Although several researchers have found that men cheat more than women, I have not found a supporting result. Also, I have found no indication that working part-time makes students cheat more than others.

So I can conclude that students with certain characteristics do cheat more than others, while other characteristics do not have a similar effect.

## 3. What level of punishment can deter students from cheating?

Although I cannot unquestionably conclude that the current regulations in University of Warwick regarding cheating are inadequate, it seems from my results that students are not quite threatened by the idea of getting caught while cheating. If students who are short on time had to re-do an assessment, it would cost them a lot, and such a punishment could possibly deter more students from cheating. However, my results

do not indicate that increasing severity of penalties has a greater effect on reducing cheating, as *dfail* and *dexp* were found to be insignificant.

## **Section 6: Conclusion**

### **6.1: Criticisms**

Data collection posed a severe problem. It was difficult to acquire an almost equal number of responses from across the different departments and different years of study. Since survey collection was difficult, my sample size is not very large (416), and any conclusions drawn from such a sample size are not necessarily very accurate. A greater sample could have generated better results. Also, I do not know if all students who do cheat have indeed admitted to cheating on the survey.

I am not aware of the actual proportion of students that do cheat across university (according to university records), as a result of which I do not know if my sample is representative of cheating behaviour in the entire University.

A significant criticism of this project is the inadequacy of questions asked in the survey. I should have gathered information about whether students had seen their friends cheating, if these friends had ever been caught, and if they cheated after such an incident. This would have given me a clearer understanding of the perceived cost of cheating amongst students. I could have also asked what students think will happen to them if they are caught cheating. This would help me know how ignorant students are about the current regulations at university. Including variables such as hours of study put in every week, religious belief, nationality and age (over and above the ones I already did) could broaden the scope of my work.<sup>28</sup> Thus, a little more time and thought could have enhanced the quality of questions, which could have improved my results.

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<sup>28</sup> It should be noted, however, that students are generally not responsive to surveys of this kind, and I had to intentionally keep the questionnaire very short in order to get several students to participate in the survey. Hence, I had to leave some questions out of the survey even though I wanted to include them.

I could not find a measure for the calculation of ‘benefits’ from cheating. Due to this limitation, I have not been able to provide a sound cost-benefit analysis which actually computes the costs and benefits of cheating for an individual. However, as mentioned before, it is very difficult to obtain a measure for the benefit of cheating, as the benefit is the increase in marks, and students may not know how much of their total mark is attributed to cheating.

## **6.2: Concluding Remarks**

As discussed in detail in the previous sections, cheaters behave like criminals in deriving utility out of someone else’s property. They seem rational in the choices they make, as they weigh their costs and benefits before deciding whether to cheat or not. This concept follows from the very foundation of the *Utility Theory*, in which the fundamental assumption is that a decision maker always chooses the alternative for which the expected utility is the maximum. This theory has helped to see why certain students opt to cheat, while others do not. As said by Becker (1968), ‘some people become criminals not because their motivation differs from others, but because their costs and benefits differ.’ This fact helps illustrate the economic dimension in problem of cheating an economic dimension, apart from a psychological one.

Certain lifestyle characteristics affect a student’s decision to cheat. Having little time to spend on academics due to other commitments makes cheating an easy resort for many students who are involved in several extra-curricular activities or those who are employed part-time. Social pressure from surrounding friends, who may compel students to cheat, is also very likely to influence cheaters in their decision.

29% of the survey population admitted to cheating at university, of which only 12% (or 4% of the entire sample) admitted to having been caught. Perhaps an increase in severity of punishment could decrease the number of cheating students. If the punishment required students to compromise their time on other activities that they rate high in importance, they could value the costs and benefits of cheating differently. Such a punishment could work as a deterring factor. Another possible measure could be to offer a combination of punishments, such as getting penalized, as well as re-doing an assessment. The increased severity would discourage students from cheating. However, any increase in severity has to be supported by an increase

in the possibility of getting caught. If students do not feel that they will get caught while cheating, then no form of punishment can stop them from cheating.

Cheating is undoubtedly a matter of great concern in all academic institutions. It spoils the purpose of education, which is to impart knowledge and assess students based on their knowledge. An unfair form of replicating work by a handful of students' cuts to this very purpose, and it is up to society to ensure such activity stops. Students and professors have to act like a 'police' force in the classroom in order to deter the cheating 'criminal' from carrying out his/her crime.

### **6.3: Extensions**

This field already has a vast existing literature, and in my project, I have tried to analyse only a few topics of interest with the hope of adding an interesting new dimension to policies operating in the university currently. There is much more that can be achieved in this area of study.

There is a lack of studies conducted in UK universities to assess cheating behaviour. A study similar to mine, if conducted in other universities, could provide a base for comparison of cheating behaviour across different institutions. Comparisons could also be made between American and UK universities.

Comparative studies could be undertaken to illustrate differences in undergraduate and postgraduate cheating behaviour. Whether different nationalities have an effect on student cheating behaviour is another interesting topic of discussion.

Since there are so many papers drawing comparisons between cheating and crime, it would be interesting to check if cheating and other forms of crime in the real world have a correlation with each other.

The above mentioned are just a few ideas I would have liked to explore if I had the time and opportunity to do so. There is a much wider scope for research in this interesting field of 'Cheating'!

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## **Appendix 1: Difference between Cheating and Crime**

Although a strong similarity can be seen between cheating and crime (such as theft), there are also differences. It is easier for professors to regulate cheating, than it is for a police force to have an effect on crime rates. Let us consider the case where students are sitting together in a lecture theatre and participating in a multiple-choice questions test. An increase in the population density of a classroom can make it easier for any person to cheat as it is harder for the invigilator to detect such cheating. To discourage dishonest behaviour, a professor can disperse the class into smaller groups so that it is easier to keep an eye on all students. However, a police force cannot order citizens to disperse themselves or move their property.

## **Appendix 2: Regulations for Cheating at University of Warwick**

“An honour code is a set of rules or principles governing a community based on a set of rules or ideals that define what constitutes honourable behaviour within that community. The use of an honour code depends on the idea that people (at least within the community) can be trusted to act honourably. Those who are in violation of the honour code can be subject to various sanctions, including expulsion from the institution.”<sup>29</sup>

The University of Warwick has set regulations ‘*in the event of suspected cheating in a university test conducted under examination conditions or in the case of essays, dissertations, reports, and other assessed work not undertaken under examination conditions*’. Each Faculty Board or Department, School, or Graduate School may issue instructions containing specific definitions to apply in that Faculty, or Department, School or Graduate School in the assessment of work not undertaken under invigilated examination conditions. The regulation states that:

*“...If the investigating committee resolves that cheating has taken place it shall determine the penalty... The maximum penalty shall not normally exceed a mark of zero in that examination paper, but in appropriate cases the Committee shall have the power to impose a more severe penalty...”*

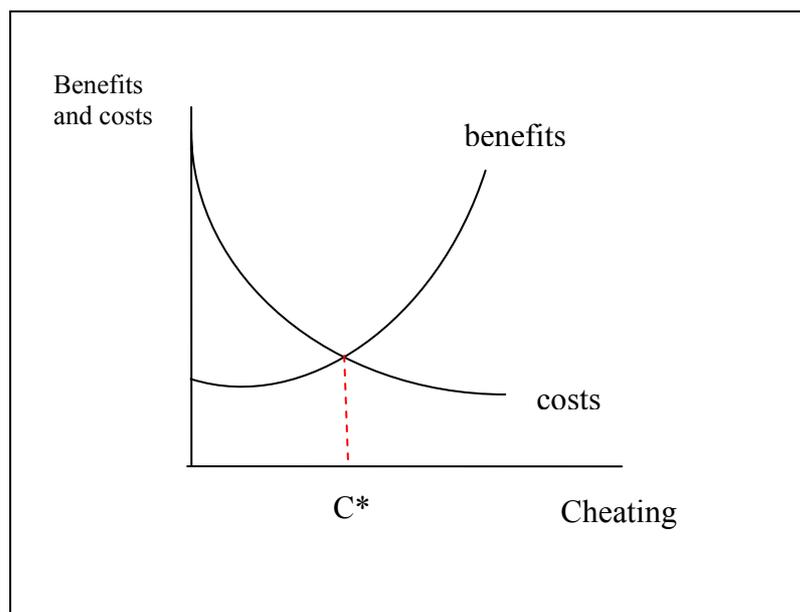
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<sup>29</sup> Definition taken from en.wikipedia.org

### Appendix 3: The Cost-Benefit Analysis of a Rational Cheating Individual

I will assume that each student weighs the costs and benefits of cheating before deciding to cheat or not to cheat. The cost and benefit to each individual can be depicted by non-linear curves.<sup>30</sup> The benefit of cheating is obtaining a higher grade than you would expect to gain otherwise. The cost of course, is getting caught, and subsequently being punished, which in accordance with university regulations, would mean getting penalized on that very test/assignment/essay or exam. This cost is only a cost if the cheating student gets caught. If not, then cheating only has a benefit, and no cost to it. However, while making a decision, an individual always will keep the risk of running these costs in mind, as he will then rationally weigh his benefit against it.

#### Cost-Benefit Analysis by a Rational Individual Deciding to Cheat



Referring to the figure above, if a good student decides to cheat, the benefit that he may get from achieving a slightly higher score is smaller than the cost if he gets caught cheating and is penalized. Let us consider an example. If a student is expecting a 70% without cheating, and he can get 75% if he cheats, his benefit is 5%. However,

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<sup>30</sup> In figure 1, the Y-axis measures the costs and benefits of cheating to any individual. The X-axis' measure is a little more complicated, as it indicates whether a student will cheat or not, and if he does cheat, under what circumstances he will do so. The axis does not actually help to answer such questions, but only simplifies the understanding of an individual's analysis of his costs against his benefits.

if he gets caught cheating, he will be awarded a pass mark of 40%, and the ‘loss’<sup>31</sup> here is 30%. Such a student will usually decide not to cheat, and his position will be on the left of the equilibrium C\*. However, there is no certainty that this student will get caught cheating. Depending on the expected probability of getting caught, the student’s position could be anywhere on the left of the equilibrium. If the risk of getting caught is high enough, the position for this student could coincide with the Y-axis, and in such a case, the student will not cheat at all. Again, X-axis has no definite measure. It sums up the decision of a student to cheat or not cheat, and if to cheat, then how to cheat, how much to cheat and when to cheat.<sup>32</sup>

Similarly, for a student who is only expecting 45% on his own merit, the costs of cheating may not be as high as the benefit, and such a student would be positioned on the right of the equilibrium point. Such a graphical illustration helps to explain how the cost-benefit analysis works in the mind of any individual, who does not literally weigh his costs against his benefits by maximizing utility, but thinks about them in a random fashion before making the decision.

It is important to mention however, that a student cannot estimate his benefit (increase in mark) before cheating, and so carrying out a cost-benefit analysis of this sort can be difficult to achieve.

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<sup>31</sup> The loss is not same as the cost, as the cost is determined by the probability of getting caught.

<sup>32</sup> The graph is not meant to explain any concept theoretically. It is simply used as a tool to describe what may go on in a student’s mind before he decides to cheat or not to cheat. The X-axis has no definite measure, it is only used to illustrate and simplify the cost-benefit analysis.

## **Appendix 4: Sample Questionnaire**

1. Department of study:       Hard Sciences               Social Science/WBS                       Humanities
2. Year of study:               First                       Second                       Third                       Fourth
3. Sex:                       Male                       Female
4. Your grade in the past academic year (if you are in first year, then your predicted grade for this year)?  
     First                       2:1                       Below 2:1

5. Do you consume alcohol on a regular basis (atleast thrice a week)?                       Yes                       No
6. Do you play any sport at university (professionally or for leisure)?                       Yes                       No
7. Are you actively involved in any societies/ Students Union?                       Yes                       No
8. Do you do any part time work while at University?                       Yes                       No

Cheating includes copying on an exam, on class tests (assessed or unassessed) or copying assignments (numerical or essay type), plagiarism, and other ways that I may have missed out in this list!

9. **While at University**, have you ever cheated?                       Yes                       No
10. If yes, in which ways (tick all that are relevant)?  
     Exam                       Assessed class test                       Unassessed class test  
     Home assignment (Eg: problem sets)                       Essays
11. Have you ever cheated in collaboration with other people (have you and your friends decided on cheating together, from each other?)                       Yes                       No
12. Have you ever cheated from someone without them knowing?                       Yes                       No
13. Do you feel it is wrong to cheat in an exam?                       Yes                       No
14. Do you feel it is wrong to cheat in any assessed work?                       Yes                       No
15. Do you feel it is wrong to cheat on unassessed work?                       Yes                       No
16. Have you ever been caught cheating?                       Yes                       No
17. Now assume you were cheating. What kind of punishment would stop you from doing so? (tick all that are relevant):  
     Penalized on that test/assignment/ exam on which you cheated  
     Retake the test/exam or redo the essay  
     Fail the module altogether  
     Expelled from university

## **Appendix 5: Responses to Questionnaire**

(Brackets indicate the number of responses)

Department of study:

Pure/Hard Sciences (137)      Social Sciences (140)      Humanities (139)

Year of Study:

First (123)      Second (141)      Third (130)      Fourth (22)

Gender:

Male (212)      Female (204)

Grade:

1<sup>st</sup> (81)      2:1 (244)      Below 2:1 (91)

Alcohol:      Yes (219)      No (197)

Sport:      Yes (222)      No (194)

Society:      Yes (215)      No (201)

Work:      Yes (98)      No (318)

Cheat:      Yes (121)      No (295)

Mode of Cheating:

Exam:      Yes (30)      No (386)

Assessed Class Test:      Yes (52)      No (364)

Unassessed Class Test:      Yes (39)      No (377)

Home Assignments:      Yes (70)      No (346)

Essays:      Yes (36)      No (380)

Collude:      Yes (69)      No (347)

Free-riding:      Yes (57)      No (359)

Opinions that it is wrong to cheat on:

Exams:      Yes (355)      No (61)

Assessed Work:      Yes (314)      No (102)

Unassessed Work:      Yes (197)      No (219)

Caught Cheating:      Yes (16)      No (400)

Whether following punishment can deter you from cheating:

Penalized:      Yes (208)      No (208)

Re-take Assessment:      Yes (198)      No (218)

Fail Module:      Yes (258)      No (158)

Expelled:      Yes (254)      No (162)

## **Appendix 6: Explanation of Variables**

dcheat = 1 if student admitted to cheating, 0 otherwise

dhs = 1 if department is pure (hard) sciences, 0 otherwise

dss = 1 if department is social sciences, 0 otherwise

dhu = 1 if department is humanities, 0 otherwise

dfirst = 1 if year of study is first, 0 otherwise

dsecond = 1 if year of study is second, 0 otherwise

dthird = 1 if year of study is third, 0 otherwise

dfourth = 1 if year of study is fourth, 0 otherwise

dmale = 1 if sex (gender) is male, 0 otherwise

dfemale = 1 if sex (gender) is female, 0 otherwise

done = 1 if grade is 1<sup>st</sup>, 0 otherwise

dtwo = 1 if grade is 2:1, 0 otherwise

dthree = 1 if grade is below 2:1, 0 otherwise

dalcohol = 1 if alcohol consumption is regular, 0 otherwise

dsport = 1 if student plays sport at university, 0 otherwise

dsociety = 1 if student is involved in societies/Student's Union, 0 otherwise

dwork = 1 if student does part-time work while at University, 0 otherwise

dexam = 1 if cheated on exam, 0 otherwise

dact = 1 if cheated on assessed class test, 0 otherwise

duct = 1 if cheated on unassessed class test, 0 otherwise

dha = 1 if cheated on home assignments, 0 otherwise

dessay = 1 if cheated on essays, 0 otherwise

dcollude = 1 if cheated in collaboration with other people, 0 otherwise

dfr = 1 if cheated without the other person knowing (free-riding), 0 otherwise

dwe = 1 if student feels cheating on exams is wrong, 0 otherwise

dwaw = 1 if student feels cheating on assessed work is wrong, 0 otherwise

dwuw = 1 if student feels cheating on unassessed work is wrong, 0 otherwise

dcaught = 1 if student has been caught cheating, 0 otherwise

dpen = 1 if being penalized can deter student from cheating, 0 otherwise

dretake = 1 if re-taking assessment can deter student from cheating, 0 otherwise

dfail = 1 if failing the module can deter student from cheating, 0 otherwise

dexp = 1 if getting expelled can deter student from cheating, 0 otherwise

## **Appendix 7: Mathematical Explanation of Probit Model**

The probit model uses the cumulative standardized normal distribution to model the sigmoid relationship  $F(Z)$ .

(A standardized normal distribution has a mean 0 and unit variance.)

We define a variable  $Z$  that is a linear function of the variables that determine the probability.

$$Z = \beta_1 + \beta_2 X_2 + \dots + \beta_k X_k$$

$F(Z)$ , the standardized cumulative normal distribution, gives the probability of the event occurring for any value of  $Z$ :

$$p_i = F(Z_i)$$

The maximum likelihood analysis is used to obtain estimates of the parameters. The marginal effect of  $X_i$  is  $\delta p / \delta X_i$ .

Since  $F(Z)$  is the cumulative standardized normal distribution,  $f(Z)$ , its derivative, is just the standardized normal distribution itself:

$$f(Z) = \frac{1}{\sqrt{2\pi}} e^{-1/2 (Z)^*}$$

Where, \* is an indication of a square:  $z^2$

The marginal effect of any variable is not constant. It depends on the value of  $f(Z)$ , which in turn depends on the values of each of the explanatory variables.

**Appendix 8: Probit Regression and Marginal Effects for Equation 1**

Iteration 0: log likelihood = -250.81668  
 Iteration 1: log likelihood = -161.81019  
 Iteration 2: log likelihood = -153.6474  
 Iteration 3: log likelihood = -153.29058  
 Iteration 4: log likelihood = -153.28945

Probit estimates

Number of obs = 416  
 LR chi2 (15) = 195.05  
 Prob > chi2 = 0.0000  
 Pseudo R2 = 0.3888

Log likelihood = -153.28945

dcheat	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
dss	-0.60803	0.20872	-2.91	0.004	-1.01711	-0.19895
dhu	-0.63188	0.225975	-2.8	0.005	-1.07478	-0.18897
dsecond	0.492056	0.225813	2.18	0.029	0.049471	0.934642
dthird	0.601659	0.241189	2.49	0.013	0.128938	1.07438
dfourth	0.754739	0.368853	2.05	0.041	0.0318	1.477677
dmale	0.099593	0.185646	0.54	0.592	-0.26427	0.463453
done	-1.14528	0.253465	-4.52	0	-1.64206	-0.6485
dtwo	-1.00795	0.205421	-4.91	0	-1.41056	-0.60533
dalcohol	0.466157	0.1674	2.78	0.005	0.138059	0.794254
dsport	1.349879	0.198191	6.81	0	0.961431	1.738327
dsociety	1.045351	0.184789	5.66	0	0.683171	1.407531
dwork	0.21188	0.207885	1.02	0.308	-0.19557	0.619328
dwe	-0.50306	0.258593	-1.95	0.052	-1.0099	0.00377
dwaw	-0.0254	0.249008	-0.1	0.919	-0.51344	0.46265
dwuw	-0.37867	0.186177	-2.03	0.042	-0.74358	-0.01377
_cons	-0.94906	0.353497	-2.68	0.007	-1.6419	-0.25622

Marginal effects after probit  
 $y = \text{Pr}(\text{dcheat})$  (predict)  
 $= .21029698$

variable	dy/dx	std. err.	z	P> z	[ 95% C.I. ]		X
dss*	-0.16063	0.0502	-3.2	0.001	-0.25902	-0.06224	0.336538
dhu*	-0.1661	0.05381	-3.09	0.002	-0.27156	-0.06063	0.334135
dsecond*	0.15009	0.0717	2.09	0.036	0.009566	0.290615	0.338942
dthird*	0.187366	0.07907	2.37	0.018	0.032394	0.342338	0.3125
dfourth*	0.264948	0.14291	1.85	0.064	-0.01516	0.545052	0.052885
dmale*	0.0287	0.05335	0.54	0.591	-0.07587	0.133265	0.509615
done*	-0.23813	0.03906	-6.1	0	-0.31469	-0.16157	0.194712
dtwo*	-0.30437	0.06354	-4.79	0	-0.42891	-0.17983	0.586538
dalcohol*	0.132719	0.04729	2.81	0.005	0.040026	0.225412	0.526442
dsport*	0.366659	0.04934	7.43	0	0.269958	0.46336	0.533654
dsociety*	0.292765	0.04952	5.91	0	0.19571	0.389821	0.516827
dwork*	0.063783	0.065	0.98	0.326	-0.06361	0.191177	0.235577
dwe*	-0.16377	0.09201	-1.78	0.075	-0.34411	0.016575	0.853365
dwaw*	-0.00736	0.07257	-0.1	0.919	-0.14959	0.134866	0.754808
dwuw*	-0.10812	0.05263	-2.05	0.04	-0.21128	-0.00497	0.473558

(\*) dy/dx is for discrete change of dummy variable from 0 to 1

## Appendix 9: Robustness of Data

I have run the regressions for equation 1 again, with different base dummies to see if the results are the same. The interpretations, significance of variables are indeed the same, thus showing the robustness of the data.

### **Regression 1: Base dummies are dh, dfourth, dmale, done**

Iteration 0: log likelihood = -250.81668  
 Iteration 1: log likelihood = -161.81019  
 Iteration 2: log likelihood = -153.6474  
 Iteration 3: log likelihood = -153.29058  
 Iteration 4: log likelihood = -153.28945  
 Iteration 5: log likelihood = -153.28945

Probit estimates

Number of obs = 416  
 LR chi2 (15) = 195.05  
 Prob > chi2 = 0.0000  
 Pseudo R2 = 0.3888

Log likelihood = -153.28945

	coeff.	std. err.	z	p>z	95% conf.	interval
dcheat						
dhs	0.631877	0.225976	2.8	0.005	0.188972	1.074782
dss	0.023846	0.218191	0.11	0.913	-0.4038	0.451493
dfirst	-0.75474	0.368854	-2.05	0.041	-1.47768	-0.0318
dsecond	-0.26268	0.350164	-0.75	0.453	-0.94899	0.423626
dthird	-0.15308	0.353482	-0.43	0.665	-0.84589	0.539732
dfemale	-0.09959	0.185647	-0.54	0.592	-0.46345	0.264268
dtwo	0.137337	0.224477	0.61	0.541	-0.30263	0.577303
dthree	1.145283	0.253466	4.52	0	0.648499	1.642067
dalcohol	0.466157	0.1674	2.78	0.005	0.138058	0.794255
dsport	1.349879	0.198192	6.81	0	0.961429	1.738329
dsociety	1.045351	0.18479	5.66	0	0.683169	1.407533
dwork	0.21188	0.207886	1.02	0.308	-0.19557	0.619329
dwe	-0.50306	0.258594	-1.95	0.052	-1.0099	0.003771
dwaw	-0.0254	0.249009	-0.1	0.919	-0.51344	0.462652
dwuw	-0.37867	0.186178	-2.03	0.042	-0.74358	-0.01377
_cons	-1.87189	0.482592	-3.88	0	-2.81775	-0.92603

**Regression 2: Base dummies are dss, dthird, dmale and dtwo**

Iteration 0: log likelihood = -250.81668  
 Iteration 1: log likelihood = -161.81019  
 Iteration 2: log likelihood = -153.6474  
 Iteration 3: log likelihood = -153.29058  
 Iteration 4: log likelihood = -153.28945  
 Iteration 5: log likelihood = -153.28945

Probit estimates Number of obs = 416  
LR chi2 (15) = 195.05  
Prob > chi2 = 0.0000  
 Log likelihood = -153.28945 Pseudo R2 = 0.3888

dcheat	coeff.	std. err.	z	p>z	95% conf.	interval
dhs	0.608031	0.208721	2.91	0.004	0.198946	1.017116
dhu	-0.02385	0.218191	-0.11	0.913	-0.45149	0.403801
dfirst	-0.60166	0.24119	-2.49	0.013	-1.07438	-0.12894
dsecond	-0.1096	0.201639	-0.54	0.587	-0.50481	0.285603
dfourth	0.15308	0.353482	0.43	0.665	-0.53973	0.845891
dfemale	-0.09959	0.185647	-0.54	0.592	-0.46345	0.264268
done	-0.13734	0.224477	-0.61	0.541	-0.5773	0.302629
dthree	1.007946	0.205422	4.91	0	0.605327	1.410565
dalcohol	0.466157	0.1674	2.78	0.005	0.138058	0.794255
dsport	1.349879	0.198192	6.81	0	0.961429	1.738329
dsociety	1.045351	0.18479	5.66	0	0.683169	1.407533
dwork	0.21188	0.207886	1.02	0.308	-0.19557	0.619329
dwe	-0.50306	0.258594	-1.95	0.052	-1.0099	0.003771
dwaw	-0.0254	0.249009	-0.1	0.919	-0.51344	0.462652
dwuw	-0.37867	0.186178	-2.03	0.042	-0.74358	-0.01377
_cons	-1.86379	0.383705	-4.86	0	-2.61583	-1.11174



## **Appendix 11: List of all Tables and Figures**

### Tables:

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Table 2: Table Showing Main Regression Results for Equation 1 (page 22)

Table 3: Table Showing Main Regression Results for Equation 2 (page 25)

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