Lazy Students? A Study of Student Time Use

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Revised 10th May 2004

Abstract

We set out a two-period optimising model examining the economic forces determining allocation of time by students between study, paid work and leisure. We show that, provided the intertemporal elasticity of substitution is less than one, high prospective earnings will be a disincentive to study. Data collected from four English universities in 2000 and 2001 are consistent with this suggesting that lower study time is associated with higher prospective earnings. There is also evidence that consumption value of study increases with student ability.

*We are grateful to the Leverhulme Trust for financial support and to Geoff Mason and Jack Triplett for their comments.

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1 Introduction

Questions of labour supply are typically examined in a framework where people choose between work and leisure, with the choice depending on the balance between the wage on offer if they do work, and any benefits available to those who do not work (Pencavel 1986). Family choices may be coloured by the interdependence between benefits and the decision whether to work or not. But, apart from the issue of inter-temporal substitution for which there now appears to be some evidence (Lee 2001), the analysis of the labour supply decision is essentially seen as static; expectations of the future are not believed to enter current decisions.

By contrast the question of student labour supply appears much more interesting because, instead of a simple choice between work and leisure, the student has to choose between work, study and leisure. A student who takes paid employment will, if rational and not otherwise constrained, work to the point where the current marginal utility of the extra consumption that working makes possible, is just equal to the present value of the marginal utility which would be derived from extra study and the higher life-time earnings to which that study should give rise. With imperfect capital markets of course, the student will be driven out to work to meet current expenditure largely independently of the deleterious effect that distraction from study should be expected to have on future earnings. The purpose of this paper is to explore influences on student labour supply and study effort, with particular attention being paid to the impact of earnings prospects.

The work is based on a survey conducted by the National Institute of final-year students in four universities in England in the spring of 2000 and again in 2001. It has to be seen in the context of the changes which have taken place to the provision of public support for students in the United Kingdom over the last few years. Until the late 1980s students' living costs had been met by a system of grants whose size depended on the means of their parents. This was gradually replaced by a loan scheme with loans available at zero real interest rate. In 1998 the government (Department for Education and Skills 1998), following on from the Dearing Report (Dearing 1997) introduced top-up fees set initially with a maximum fee of £1000 p.a. but rising in line with the Retail Price Index. There were payable only by students starting at university in 1998 onwards but lower(or zero) fees were imposed on students from families of modest means; in Scotland fees stopped being charged in 2002 but they remain in place in England and Wales. Further changes are of course now planned, with universities likely to be allowed to charge fees of up to £3000 p.a. but with grant put in place once again for students from families of modest means[1]. The students surveyed in 2000 were not paying fees while those surveyed in 2001 faced fees depending on their family circumstances. DesJardins, Ahlburg & McCall (2002) show empirically that different methods of student finance affect college drop-out rates. Here we look theoretically at the interaction between methods of finance and student labour supply before exploring our data on student time use.

Related work on the issue has tended to focus on the effects of school-children and students working (Ruhm 1997), and the question whether or how far this affects academic performance. Thus Ruhm (1997) argues that work while at secondary school increases earnings and employment rates of school-leavers. Other earlier studies such as Mortimer & Finch (1986) have come to the opposite conclusion. A UK study of school-children studying for A-levels found that there was a small negative effect on A-level grades but no effect of study time (Tymms & Fitz-Gibbon 1992). Dolton, Marcenaro & Navarro (2003) also work on the question of the link between time use and exam results using a survey of students at Malaga university, looking at the way different time inputs affect degree result. Our study complements earlier work on the topic by Ehrenberg & Sherman (1987). They present a theoretical analysis of student time use based on optimisation but they work with a reduced form which does not explore the key importance of factors such as the intertemporal elasticity of substitution on incentives to work.

2 Human Capital and Student Working

We explore the influences on student time use with a two-period model. The two periods are, however, of very different length. The first is a period of education in which the student can choose to work, study or enjoy leisure and the second is the rest of the student's life. Income during the working life depends positively on the effort put into studying and thus, for any given amount of leisure time, negatively on the time that the student spends working. The effect of study on earnings is assumed to be multiplicative rather than additive. This is consistent with most analysis of the effects of education

[1] The new proposals show the split between grant and loan in student support depending on the incomes of their parents. Since the loans are to be repaid by income-depenent repayments, the system in effect imposes a form of income tax on workers as a function of the incomes of their parents.

(Mincer 1974, Willis 1986); we discuss later the implications of other possible structures. Our analysis assumes that students are liquidity constrained and we discuss the implications of this for their behaviour.

The student is assumed to have a Stone-Geary utility function of the form which reflects utility from consumption and leisure. In the first period there is also a term which represents the "consumption value" of learning, or the intellectual pleasure derived from study

$$
\begin{aligned}
U_1 &= \frac{\left([C_1 - \bar{C}_1]^{\alpha_1}[L_1 - \bar{L}_1]^{\alpha_2}[S - \bar{S}]^{\alpha_3} X^{\alpha_3}\right)^{1-\rho}}{\left(\alpha_1^{\alpha_1}\alpha_2^{\alpha_2}\alpha_3^{\alpha_3}\right)^{1-\rho}(1-\rho)} \\
U_2 &= \frac{\left([C_2 - \bar{C}_2]^{\beta_1}[L_2 - \bar{L}_2]^{\beta_2}\right)^{1-\rho}}{\left(\beta_1^{\beta_1}\beta^{\beta_2}\right)^{1-\rho}(1-\rho)} \quad \rho > 0, \alpha_1 + \alpha_2 + \alpha_3 = 1,\ \beta_1 + \beta_2 = 1
\end{aligned}
$$

where C_i represents consumption and L_i leisure in period i ($i = 1, 2$). In period 1 the student can devote an amount of time S to study, take employment at a wage rate W_1 or enjoy leisure. X represents the intellectual ability of the student; this enters with the same exponent as study time because it is assumed that the pleasure of learning increases with the student's ability. A fee, F is charged in the first period. In period 2 the wage rate is a function of the amount of study in period 1, $W_2 = wX^{\xi}(S + \hat{S})^{\zeta}$, $1 > \zeta > 0$, X^{ξ} represents the effect of intellectual ability on future earnings. We do not need to distinguish an influence of a high level of ability on earnings by making study very efficient from an effect on earnings relative to study effort and other factors. $wX^{\xi}\hat{S}^{\zeta}$ is the wage which would have been earned if the student had not studied[2]. The student devotes its non-study time to work or leisure. The total amount of time available in each period is denoted as N_i. This differs in the two periods because, in this simple model which focuses on time use by students, they are not of equal length.

We aim to explore the factors influencing the student's decision about how much time to allocate to study. To do this we need to express both utility functions in indirect form, as functions of the resources available to meet either consumption or leisure and the wage rates (prices of leisure) in the two periods. Students are assumed to be debt-constrained, so that they can borrow an amount, D in period 1 repaying the same amount inclusive of

[2]This specification is "almost" consistent with a view that there is a fixed amount to be learned and that clever students study for less long because they learn faster. Such an assumption implies that the marginal return to study is zero beyond a certain point. Our function does not have such a discontinuity, but a value of ζ only slighlty greater than 0 does imply that the marginal benefit of extra study may be very small. Our results require only that $0<\zeta < 1$.

interest, RD in period 2. The student is also assumed to anticipate a legacy, LG in period two. Standard optimisation gives us utility in each period as a function of the amount of study and amount of debt available

$$
\begin{aligned}
U_1 &= \frac{\left\{\left(W_1(N_1-\bar{L}_1-S)+D-F-\bar{C}_1\right)^{\alpha_1+\alpha_2}(S-\hat{S})^{\alpha_3}X^{\alpha_3}\right\}^{1-\rho}}{1-\rho}W_1^{-\alpha_2(1-\rho)} \\
U_2 &= \frac{\left(W_2[N_2-\bar{L}_2]+LG-RD-\bar{C}_2\right)^{1-\rho}}{1-\rho}W_2^{-\beta_2(1-\rho)} \\
&= \frac{\left(wX^{\xi}[S+\bar{S}]^{\zeta}[N_2-\bar{L}_2]+LG-RD-\bar{C}_2\right)^{1-\rho}}{1-\rho}(wX^{\xi}[S+\bar{S}]^{\zeta})^{-\beta_2(1-\rho)}
\end{aligned}
$$

The life-time utility of the student is given as

$$U_1+\delta U_2$$

where δ is a discount factor ($0<\delta<1$).

The concept of the debt constraint can be set out formally. It is the condition that

$$\frac{\partial}{\partial D}\{U_1+\delta U_2\}>0$$

we assume that this condition is met[3].

The student then chooses the amount of study to maximise a function of utility in the two periods

$$\underset{S}{Max}\ U_1+\delta U_2$$

We write

$$
\begin{aligned}
N_1^* &= N_1-\bar{L}_1 \\
N_2^* &= N_2-\bar{L}_2
\end{aligned}
$$

In Appendix A we show that this gives the following first-order condition determining the choice of study time.

[3]This condition amounts to

$$
\begin{aligned}
&(\alpha_1+\alpha_2)\frac{\left\{\left(W_1(N_1-\bar{L}_1-S)+D-F-\bar{C}_1\right)^{\alpha_1+\alpha_2}(S-\hat{S})^{\alpha_3}X^{\alpha_3}\right\}^{1-\rho}}{\left(W_1(N_1-\bar{L}_1-S)+D-F-\bar{C}_1\right)}W_1^{-\alpha_2(1-\rho)} \\
&-R\delta\left(wX_2^{\xi}[S+\bar{S}]^{\zeta}[N_2-\bar{L}_2]+LG-RD-\bar{C}_2\right)^{-\rho}(wX_2^{\xi}[S+\bar{S}]^{\zeta})^{-\beta_2(1-\rho)} \\
>&\ 0
\end{aligned}
$$

$$
\begin{aligned}
& \{1-\zeta\beta_1(1-\rho)\}\log([S+\hat{S}]) + \{(\alpha_1+\alpha_2)(1-\rho)-1\}\log(N_1^*-S) \\
& +\log\left\{S-\bar{S}-\alpha_3((N_1^*-\bar{S})+\frac{D-F-\bar{C}_1}{W_1})\right\} \\
& +\{\alpha_3(1-\rho)-1\}\log\left(S-\bar{S}\right) \qquad (1)\\
= \; & (1-\rho)\{\beta_1\log(w)-\alpha_1\log(W_1)\} \\
& +\log(\delta\beta_1\zeta)+(1-\rho)\log(N_2^*) \\
& +(1-\rho)(\beta_1\xi-\alpha_3)\log X \\
& -\rho\log\left(1-\frac{RD+\bar{C}_2-LG}{wX^{\xi}[S+\hat{S}]^{\zeta}N_2^*}\right) \\
& +\rho\log\left\{1+\frac{D-F-\bar{C}_1}{W_1(N_1^*-S)}\right\} \\
& +\log\left\{1+\frac{\beta_2}{\beta_1}\frac{RD+\bar{C}_2-LG}{[S+\hat{S}]^{\zeta}N_2^*X^{\xi}w}\right\}
\end{aligned}
$$

2.1 No Borrowing

We first explore equation (1) making the assumption that borrowing is impossible, so that $D=0$, and also set $LG=\bar{C}_1=\bar{C}_2=0$. If there is no consumption benefit from study ($\alpha_3=0$) then with $\rho>0$ and β_1 and ζ both positive but below 1, the left-hand side is increasing in S. The link between future earning power due to factors other than study, represented by w and hours of study emerges immediately. If ρ >1 the right-hand side of (1) is decreasing in w and increasing in W_1. The reason for this is as follows. Looking at the utility function for period 2, high earning power, for any given level of study, reduces the marginal utility derived from incremental study and therefore discourages study. The higher is the value of ρ, the more rapidly does the marginal utility of study decline. Putting the point another way, with this specification the proportionate effect of incremental study on future earnings depends only on the amount of time devoted to study. If the curvature of the utility function is steep enough, then 1% extra income is worth proportionately more in terms of utility to someone with limited resources than to someone with substantial resources even though the multiplicative nature of the earnings function means that in absolute terms earnings are raised more if earning power is high than if it is low. So, if the utility function is curved steeply enough, incremental study is more valuable to someone with a low earning potential than to someone with high earning potential. The boundary value of ρ is given by $\rho=1$, when the utility function is logarithmic. For values of ρ above this, an extra 1% income is worth more to people on low than on high incomes, so that study is more worthwhile to them than to people with high expected incomes and, in consequence, they are likely to study harder.

This result explains the phenomenon of the brilliant and lazy student, a species observed by everyone who has been involved in university teaching. It also accounts for the existence of the lazy student who anticipates a high salary, not because of innate brilliance but because of social connections and family origin create an expectation that earning power can be inherited. This student too, will study less and be less rewarding to teach than someone of similar ability from the working classes.

A more surprising consequence of the same reasoning is the fact that the model also implies a positive link between the wage rate available in period 1 and the time devoted to study. The reasoning is similar; with $\rho > 1$ a high wage rate reduces the marginal utility of time to allocate between work and leisure, and therefore makes study "cheaper"; the level of study is increased to bring the cost in terms of utility of study to its desired level.

With $\alpha_3 = 0$, of the two terms relating to intellect, only the second remains. With $\rho > 0$ and β_1 and $\xi > 0$ it clearly has a negative coefficient. Through this route high intellect discourages study; the mechanisms are some combination of it making a given amount of study term go further in terms of its impact on future earnings, and raised prospective earnings independently of study effort.

If there are consumption benefits from study so that $\alpha_3 > 0$ it is possible that these results on the effects of wages and earning power may be overturned. The first three elements on the left-hand side of the equation are all increasing in S while the fourth element is decreasing in S. For small α_3 it is unlikely that the effects of current and future wages on study time will change sign because the effects of α_3 are continuous rather than discontinuous[4]. We conduct the rest of the discussion on the assumption that, even though study may have consumption value, the parameters are not sufficiently large to make the left-hand side of (1) declining rather than increasing in S.

With this assumption, it remains the case that a consumption benefit from study may

[4]For a high α_3 the possibility of a sign reverse becomes stronger. However, we note that there are three terms which are increasing in S; experimentation with plausible parameter values ($\alpha_1 = 0.04, \alpha_2 = 0.76, \alpha_3 = 0.2, \bar{S} = 0, \hat{S} = 10, \beta_1 = 0.3, \rho = 4, \bar{L}_1 = 32, \zeta = 0.3, D = 40, F = 20, \bar{C}_1 = 30, W_1 = 5$). points to the left-hand side remaining increasing in S even with a value of $\alpha_3 > 0$The figure for α_1 is chosen to reflect the later results. The temporal variables, $\bar{L}_1$, $\bar{S}$ and $\hat{S}$ are in hours per week. The figures for $\bar{C}_1$, D and F are in £ per week and the wage is hourly.

change the sign of the effect of intellect. If $\alpha_3 > \beta_1\xi$, high intellect will be associated with high rates of study even when high wages are a disincentive to study. In such a situation the extra consumption value associated with extra study dominates the disincentive effects arising through intertemporal substitution.

The impact of the second term on hours of study is easily understood. A high rate of discount (low δ) depresses study, for the obvious reason that it reduces the extent to which the benefits are valued. A high share of consumption of goods and services makes cash income more important and encourages study. So too does a high value of ζ for the obvious reason that it raises the marginal benefit of study.

2.2 Fees

The effect of fees is very straightforward. A positive charge for fees reduces the right-hand side of (1); with the left-hand side of (1) increasing in S, it follows that fees always have the effect of reducing study time. This result may not be a surprise but it contradicts the principle that if students have to pay for their education they will value it more highly, at least if valuing more highly is supposed to result in increased application. Subsistence consumption in the first period has the same effect.

2.3 Student Grants and Credit Constraints

Before considering the general case in which credit is made available to student and then repaid during their working lives, we can consider the situation created by student grants. This is generated in (1) by setting $D > 0$. Resources are made available to students in the first period. However, we also set $R = 0$, implying that the debt never needs to be repaid, and the debt is therefore in the form of a grant.

One can see immediately from (1) that a grant is the opposite of a fee. Just as a fee reduced study time so a grant has the effect of increasing it. This is no great surprise; arguably the implications of a positive interest rate are of greater interest. We can see that this introduces two additional terms in (1). Since $\beta_1 < 1$ these are both increasing in R for positive D, and increasing in D for positive R. Remembering that the left-hand side of (1) is increasing in S, it follows that a change from a grant to a loan scheme has the effect of increasing study time. Once again this result becomes clear on further thought. Loan repayments are like a lump-sum second-period charge and have the effect of raising the marginal utility of second period income, because they reduce available resources. This means that, with loan repayments, the effect on welfare of an incremental hour's study is greater than in their absence. It does not, of course mean that the higher the rate of interest the better in terms of inducing study. If fees are charged which can be avoided by the simple device of not going to university, then utility may be higher with $S = 0$, $F = 0$ than at the internal maximum with $S, F > 0$. But for someone who is prepared to study even when the credit constraint bites tightly ($D = 0$) it is plain that the introduction of loans has the effect of increasing hours of study both because the presence of debt eases the liquidity constraint in the first period and because the repayment in the second period raises the marginal benefit derived in the second period from study in the first period. Subsistence consumption in the second period increases study through the second of these mechanisms. Thus "treat 'em mean, keep 'em keen" works in terms of student finance.

2.4 Inheritance

The same argument which shows that debt repayment is an incentive to study demonstrates that the prospect of an inheritance is a disincentive to study. If students can finance their period 2 consumption from sources other than wage income, then it is less worth their while sacrificing leisure and consumption in period 1 to enhance their consumption in period 2. There is likely to be a positive correlation between the expectation of a good job from family connections and the expectation of a legacy. Thus, while it is unlikely that expectations of legacies can be observed in practice both this and the effects of inherited earning power point to an influence of social class on study effort with the lower social classes likely to study harder than the middle and upper social classes.

2.5 Implications of Alternative Models of the Benefit of Schooling

The most striking result from the above model is that high prospective earnings are a disincentive to study. Our model of the effects of study time on future earnings assumed that the proportionate effect of a given amount of study on future earnings was the same for everyone. It is perhaps more likely that the proportionate effect of a given amount of study is greater for able students than it is for those with low prospective w. While the implications of this must depend on the way in which the production function for human capital is specified, it almost certainly strengthens the findings. Suppose that future earnings depend on prospective earnings in the absence of education (which are taken to be higher for more able students) and on hours of effective rather than actual study. If able students study more effectively than less able students then their effective hours of study are greater for any given study effort. It follows that they will reach the point at which the marginal benefit of further study falls below its opportunity cost earlier than if study is equally effective for everyone. Thus the disincentive effect of high earnings is enhanced.

There is, however, one effect which could lead to high earners studying harder than low earners. If university education also a consumption value in addition to its investment value, then it is perfectly possible that high prospective earners will derive greater consumption benefit from the pleasure of study than will low prospective earners. In such a circumstance one may find that high prospective earners or more able students study harder than those with low prospective earnings. Thus an empirical analysis of the roles of ability and prospective earnings as determinants of study time become tests of whether these effects are sufficiently powerful to overturn the nature of the link derived from the basic model between prospective earnings and study effort.

It should, however, be noted that both of these effects are more likely to be related to ability than to prospective earnings. As we discuss later our measure of expected earnings does not fully reflect ability as measured by A-level scores, because these are not available in the data from which we calculate prospective earnings. But, in the problem in hand, there is no need to distinguish an influence of ability on study efficiency from an influence on earnings prospects. Either route implies that more able students study less. With ability measured by performance in A-level exams at age 17-18 it becomes possible to estimate the balance of the influence of abililty in raising the consumption value of study against its influence in reducing the time needed to learn and raising the income benefits of a given level of study.

3 Estimation

In confronting this model with data, one would typically include variables reflecting ability, social background and subject of study. We have already noted an influence of ability over and above its effect on prospective earnings represents a test for mis-specification of the model, or at least a test of whether the effect of ability in making study time more productive is largely offset by the greater pleasure able students might derive from study.

The influence of the other factors must also be described as ambiguous. A wealthy family background, represented by a high parental social class, is likely to be associated with high expected future earnings, discouraging study if $\rho > 1$, but at the same time it may be associated with a parental donation easing the liquidity constraint and so facilitating study. While one can study the effects of parental social class on earnings it has to be noted that there is considerable ambiguity, with some studies suggesting a strong link (Dearden, Machin & Reed 1997) and others suggesting that this is found only among non-graduates (Bennett, Glennerster & Nevison 1992). To the extent that expectations of graduate earnings conform to the pattern that parental background does affect earnings of graduates, then a modest parental background, indicated by social class and regarded as a proxy for earnings, should be expected to be associated with increased study.

The issue of subject of study and its relation with future earnings is more complicated. Students with aptitude for different subjects can be regarded as distinguished by having different values of w. Highly-rewarded subjects are those whose students have high values of w and are therefore subjects where one would expect study time to be relatively low. If we find that, in fact they are associated with high amounts of study there is an obvious implication that the model is in some sense incomplete. If some students enjoy study as a consumption good in period 1, at least in subject areas of particular interest to them, then one is likely to find high prospective rates of pay associated with high rather than low hours of study. If access to debt is subject-specific, with larger loans being available to prospective lawyers than to history graduates, then it is also possible that high rates of pay will be associated with substantial amounts of study. Finally, if graduates studying highly-paid subjects, tend to differ from those studying poorly-paid subjects, having lower, discount rates, then too, one may observe high incomes after graduation associated with longer hours of study by undergraduates. We cannot expect to distinguish between these different causes, but they are all plausible deviations from the model as we have set it out.

Our expression is highly non-linear in the variables of interest and it is unlikely that it could satisfactorily be estimated as it stands. We proceed to an approximate relationship which is linear in S and log-linear in W_1 and W_2 and A-level score. The rationale for this is that we have little idea about the size of $\bar{S}$, but we do know that S is likely to be around 30 hours per week while $N = 112$ if non-sleeping time only is counted. It follows that a linear approximation for S is likely to be satisfactory. On the other hand if debts are relatively small relative to first-period resources, then the most important term on the right-hand side is likely to be $\beta_1(1-\rho)\log(w^*/W_1)$ and it is therefore best to avoid linearising this. We set out in section 4.2 the linearised equation which we estimate. We include there dummy variables representing students' circumstances to proxy for the unobserved variables in equation (1).

There is, nevertheless a particular problem of simultaneity which we need to address. We can observe the post-study earnings of previous cohorts of students as a function of the social and educational background of the person concern in the Labour Force Survey. We estimate wage equations which are presented in Appendix B and calculate the earning capacity as the ratio of the discounted value of life-time earnings relative to those of someone without university education. We cannot, however, observe the study effort which was made in order to deliver the earnings observed in the Labour Force Survey; nor, while we know broad details of the educational background of each respondent, can we observe their A-level scores. Accordingly, in our linearised equation we use wage rates fitted for subject categories from the Labour Force survey and address the remaining influences by means of dummies representing subject differences and personal characteristics.

4 Application

4.1 The Survey

The survey looked at a random sample of third-year students in four English universities. Until 1992 higher education in England was divided between universities and polytechnics. The "old" universities existed as universities before 1992 and have traditionally seen themselves as research and teaching institutions. The "new" universities were polytechnics until 1992 and have traditionally focussed mainly on teaching. The universities were selected as i) an old university of good standing, ii) an old university of more modest standing, iii) a new university of good standing and iv) a new university of rather poor standing. Thus the primary units were chosen to provide a mix of the student population. A full description of the survey and its findings is provided by Metcalf (2003).

The survey was conducted in spring 2000 of two thousand randomly selected home students (of all ages) in four universities. One of the universities was "over-sampled" by twenty per cent because of the large number of students on "thin" sandwich courses, which involve short periods of placement[5]. The university involved expressed concern that the students might not be resident at the address that the university had on file. Overall, the survey achieved a response rate of fifty percent which is high for this type of survey. The students were asked to complete a postal survey in which they recorded answers to a range of topics concerning their background, finances, subject of study, attitude to university and use of time. In particular they were asked to record time spent studying and working during term-time, and to report in which band their average weekly term-time earnings lay. The earnings bands were: £ 1-19, £ 20-39, £ 40-59, £ 60-79, £ 80-99, £ 100-199, and £ 200+.

After removing the respondents with incomplete or irregular data, we are left with a total sample size of 1998 in the two years. Of these 923 reported that they did some paid employment during term-time and reported their weekly earnings. Descriptive statistics for each of the wagebands and for those who did not work are presented in table 1.

Wageband	Observations	Hours worked	Study time	Leisure
£1-19	53	4.60	30.96	76.43
		(0.66)	(1.69)	(1.92)
£20-39	251	9.33	30.42	72.25
		(0.30)	(0.84)	(0.89)
£40-59	250	12.17	28.20	71.62
		(0.32)	(0.76)	(0.85)
£60-79	160	15.83	28.06	68.11
		(0.43)	(0.91)	(0.99)
£80-99	104	18.39	25.55	68.06
		(0.45)	(1.14)	(1.09)
£100-199	86	20.59	26.05	65.36
		(0.92)	(1.30)	(1.62)
£200+	19	17.58	27.37	67.05
		(2.94)	(2.88)	(4.19)
Total working	923	6.44	30.08	75.48
		(0.19)	(0.29)	(0.32)
Does not work	1075	0.65	31.50	79.85
		(0.10)	(0.40)	(0.41)

Table 1: Mean weekly term-time hours of work, study and leisure (standard errors in parenthesis): 2000 and 2001

[5]In contrast to the more common "thick" sandwich courses, which cover an entire academic year between the second and final (i.e. fourth) year of a course

4.2 The Study Equation

Our starting point is equation (1) which we have, as noted above considered in linearised form. Of the variables entering into this equation we can observe only study time. We can derive an estimate of expected future wage, w^*_{ik} using the methods discussed below, and this forms the core of our investigation of the theoretical model. We also observe students classified by their normal weekly earnings as students. We observe the age at which the student started university and the A-level (school-leaving exam) score. We introduce a dummy $NOLEV$ for students who have gone to university without A-levels, to distinguish them from those who have only one A-level point ($\log ALEV = 0$) We can identify a considerable number of characteristics (social class, subject of study, access to family finance etc.) which might be expected to be correlated with the unobserved variables such as access to finance. These are indicated as DUM_{ij}. We also have observations of students in their final years both before and after the introduction of fees of £ 1000 p.a. and we address the effect of this by means of a dummy $DFEES_{ik}$.Finally we introduce a term $HECK_{ik}$ to correct for the bias which would otherwise arise from the fact that we study only people who have decided to earn amounts lying in particular ranges. We therefore estimate regression equations of the form

$$\begin{aligned} S_{ik} &= \phi_{1k}\log w^*_{ik} + \phi_{2k}DFEES_{ik} + \phi_{3k}AGE_i + \phi_{4k}\log ALEV + \phi_{5,k}NOLEV \\ &\quad + \sum_{j=6}^{n}\phi_{jk}DUM_{ij} + \phi_{n+1,k}HECK_{ik} + Const_k + \varepsilon_{ik} \end{aligned} \tag{2}$$

for each of the k wage bands for which there are satisfactory data. The error term represents the cumulation of individual-specific effects attributable to the unobserved variables. The equations are estimated independently of each other for each wage band; there is no reason to expect them to be related to each other since they represent the decisions of different people. We can, as we discuss later, nevertheless, explore the obvious restrictions that the coefficients are equal to each other for different wage bands, $\phi_{ik} = \phi_{il}$.

4.3 The Leisure Equation

The two-period model also allows us to derive a leisure equation for period 1. The original utility function for the first period implies that the total value of the student's financial resources in the first period, defined as potential labour income (i.e. the wage rate multiplied by all time not devoted to study) plus borrowing less fees is allocated between consumption and leisure in the proportions $\alpha_1 : \alpha_2$. The proportion allocated to leisure is, of course used to buy leisure at the first period wage rate. It follows from this that

$$L_1 = \frac{\alpha_2}{\alpha_1 + \alpha_2}\{N_1^* - S + \frac{D - F - \bar{C}_1}{W_1}\} + \bar{L}_1$$

It is helpful to linearise the equation as before. By analogy with the study equation we in fact estimate

$$\begin{aligned} L_{ik} &= \pi_{1k} \log w_{ik}^* + \pi_{2k} DFEES_{ik} + \pi_{3k} S_{ik} + \pi_{4k} \log ALEV + \pi_{5,k} NOLEV \quad (3) \\ &+ \sum_{j=6}^{n+n} \pi_{jk} DUM_{ij} + \pi_{n+1,k} HECK_{ik} + Const_k + \varepsilon_{ik} \quad (4) \end{aligned}$$

Here our model suggests that $\pi_{1k} = \pi_{4,k} = 0$ and that the coefficient on study time, $\pi_{3k} = -\frac{\alpha_2}{\alpha_1+\alpha_2}$. In so far as the term $NOLEV$ represents only an A-level type term for students who have not actually taken A-levels, we should also expect $\pi_{5,k} = 0$; if it is a dummy variable which conveys more than this then the restriction might not be accepted. Otherwise because of the underlying linearisation is it not obvious that we can look for any relations between the coefficients on the dummies in the two sets of equations. Plainly instruments have to be used to represent the endogenous variable S_{ik}.

4.4 Earnings Prospects

The estimation of equations for the amount of time put into study and the time spent at leisure suffers from a number of practical problems. First of all, it is necessary to work out the reference value for future income in equation (2). The problem of course is that the survey is conducted of students at university. Neither we nor they know their future earnings, and the relevant question is whether their study input can be related to a plausible estimate of the benefits of future study. Thus the first stage of our study is to estimate the life-time income that a student can expect on the basis of her/his A-level qualifications, subject choice and background. We also estimate what the life-time income of the student would have been if the student had not gone to university. These allow us to calculate the relative income of the student and thus the enhancement offered by a university degree given a normal amount of study. Thus we can derive an estimate of w^*. Instruments are, however, needed in the estimation because this term is a derived regressor which may not actually represent the benefit of study as perceived by individual students.

In order to obtain estimates of w^*, we estimate a standard Mincerian "human capital earnings function" with Heckman-correction. We also estimate a multinomial logit model of economic activity to account for differentials in the probability of being employed, unemployed or inactive for those who choose to attend university. The data come from the Quarterly Labour Force Survey (QLFS). Because the QLFS collects data on income variables only in the first and last (fifth) waves, four quarters were joined together to increase the sample size. The data are for individuals from the summer, autumn and winter 1997 surveys and the spring 1998 survey.

Many studies of this kind utilise years of schooling to account for the effect of education on schooling. This is because such studies are interested in the internal rate of return to schooling investments. In this study, we are not. Rather, we are interested in the effect of a particular level of qualification and, more specifically, of a specific degree subject on lifetime earnings (and hours). Therefore, education is accounted for by a set of dummy variables. Our equation for the log of hourly wages (w^*) for individual i are:

$$\log w_i^* = \alpha_0 + \sum_{a=1}^{A} \alpha_{1a} age_i^a + \sum_{d=1}^{D} \alpha_{2d} X_{id} + \sum_{g=1}^{G} \alpha_{3g} Q_{ig} + \sum_{k=1}^{K} \alpha_{4k} G_{ik} + \alpha_5 \Omega_i + \varepsilon_{1i} \quad (5)$$

where X is a vector of personal characteristics, Q a set of dummy variables representing the highest level of education attained, G represents degree subject area for those with degrees, Ω is a Heckman-correction term and ε an error term. Many studies use a quadratic age/potential experience term. However, given the results of Murphy & Welch (1990) [6], it would seem appropriate to include higher-order age terms in our specification to avoid the bias they report[7]. The highest level of education received groupings, Q, were:first or higher degree level, sub-degree qualification (e.g. HNC or HND), A-Level or equivalent, Trade apprenticeship, AS-Level or equivalent, O-Level or equivalent, CSE below Grade 2 or equivalent, "other qualifications" and no qualifications.

Economic activity was modelled using a multinomial-logit specification with the same set of explanatory variables as in the wage equation. Let y be the dependent variable with $m = (1, 2, 3)$ nominal (unordered) outcomes representing the labour market states employment, unemployment and inactivity.$Pr(y = M \mid O)$ is the probability of observing outcome M given x, which is modelled as:

[6] According to Murphy and Welch (1990) a quadratic human capital earnings function will underestimate the rise in earnings in the early years and overestimate it in the middle years of a graduate's working life, with a slight overestimation of the decline in earnings over the final years.

[7] After some experimentation we settled on the cubic as our preferred specification.

$$\Pr(y_i = M \mid O_i) = \frac{\exp(\Theta_m O_i)}{\sum_{m=1}^{3} \exp(\Theta_m O_i)}$$

where O_i is a $(A + D + G + K + 1)$ vector of the explanatory variables (a cubic in age, X_i, Q_i, G_i and a constant) and Θ_m is a vector of parameters to be estimated. For identification purposes we constrain $\Theta_1 = 0$, so that employment is the baseline category.

Our theoretical model assumes a single wage rate in period 2, whereas in fact an implication of the time path of wages implied by equation 5. We consolidate these to a single equivalent wage by discounting the total using a discount rate of 5% p.a. It should be noted that this assumes that base-line leisure $\bar{L}_2$ is uniformly spread over period 2. These calculated wage rates vary by individual not only by degree subject choice but also by gender, ethnicity and age on leaving university[8].

The other variables shown in the study equation are unknown. In particular, while the survey collects information on hours worked, it asks students only to indicate in which of a number of bands their earnings lie. It is possible to find an estimate of the wage earned by students in each band by taking the mid-point of the band and dividing by the number of hours worked, but not to introduce any wage term directly.

The absence of data on current wages mean that the most practical way of implementing our model is to group the data into the earnings bands and to estimate the study equation and the leisure equation separately for each earnings band. The pair of equations is estimated by three-stage least squares (3SLS).

There is, however, the prior point that the choice of earnings band by each student has to be regarded as endogenous to the estimation problem. We therefore model earnings by ranking the bands in terms of amount of total earnings and using an ordered probit, with the latent variable being the unobserved wage. In order to avoid a potential parallel regression problem (Long 1997, p. 140-145) we model the selection equation as a separate binomial probit and include a correction term in our ordered probit equation, rather than include it as the lowest band in our ordered categorical earnings variable.

[8]We calculate the expected lifetime earnings up until the age of 65 for both men and women. We have, however, assumed current activity rates for women despite the change to the retirement age which will affect the students in our survey.

5 Results

We estimate our model from the survey data, considering first a system of probit and ordered probit equations showing the probability of students either not working at all, or being in each of our five wage bands if they do chose to work. Secondly, for each of those wage bands we estimate equations of the form shown by equations (2) and (3). We omit the bands £100-199 per week and £200+ per week from our study because they are large bands with few respondents and are likely to be populated by outlying students.

We estimate initially separate parameters for each wage band. We are, however, able to accept the restrictions that the coefficients are equal across wage bands, except for the constant terms; imposing these restrictions means that we simply estimate a single equation with dummy variables for the different wage bands. When the restriction is imposed across bands 1 to 5 which are the focus of our attention, the test statistic is $\chi^2_{110} = 70.33$. Since the sixth wage band covers a very large spread of weekly income (£100-£199) we focus our attention on bands 1 to 5.

Table 2 shows the estimated parameters after coefficients on variables which were insignificant in both study and leisure equations were restricted to zero. In particular we found that we could accept the restriction that the sample selection terms were zero ($\chi^2_2 = 3.4$) and that the introduction of fees in the second year of the survey had no significant effect ($\chi^2_2 = 0.46$). We are also able to accept the restrictions that the wage term and the A-level term are absent from the leisure equation ($\chi^2_2 = 1.1$).The first equation shows the coefficient on study time in the leisure equation unrestricted. The estimated parameter is just above one which causes obvious problems. We are, however, able to impose the restriction that it equals 0.95, implying $\frac{\alpha_1}{\alpha_2+\alpha_2} = 0.05$ in the original utility function ($\chi^2_1 = 1.8$); this is more satisfactory. Had we used a CES utility function in place of the Stone-Geary model this proportion would interact with the (unobserved) wage rate earned by the relevant student. The second equation shows the remaining parameters with this restriction in place.

The main finding is that the coefficient on prospective wage in the study equation is negative, consistent with the prediction of our model (assuming that the intertemporal elasticity of substitution ($1/\rho$) is below one and therefore that $\rho > 1$). An increase in the prospective wage rate of 1% reduces study time by about 3% although there is a substantial standard error round this parameter. In the model with the study time coefficient in the leisure equation unrestricted, the P-value for the prospective wage rate is 8%. When we impose the restriction on study time in the leisure time equation we find that the P-value rises to 10%. There are subject dependencies over and above the effects of subject choice on prospective earnings. Scientists work harder than the reference group of social scientists while those studying languages and humanities work less hard than social scientists. Universities 1 and 2 are the old universities while the reference university and university 4 are new universities. It is clear that students in new universities study for longer than those in old ones. We are able to accept the restriction that the dummies for universities 1 and 2 are equal and also that the two new universities are not distinguished.

There are two dummy variables whose coefficients support the idea that good earning prospects are a disincentive to study. We find students from socio-economic classes D and E work harder than others, while those with family support work less hard than others. The first is an indicator of a relatively impoverished family background while the second points to family wealth. Our analysis of the prospective wage rate cannot take into account the effects of family background on wages because the Labour Force Survey from which we assess the prospective wage does not provide data on this. There is, however a body of evidence pointing to a correlation between parents' and children's earnings(Dearden et al. 1997). To the extent that this effect is being picked up in these coefficients it is consistent that a poor family background (from socio-economic groups D/E) would depress earnings prospects and thus encourage study, with a wealthy family able to provide financial support having the opposite effect. The negative coefficient on family support may also represent the point identified in our theoretical analysis that anticipation of a debt burden in working life is an incentive to devote more time to study.

The sensitivity of study time to A-level scores allows us to explore the trade-off between two forces pulling in opposite directions. On the one hand clever students, represented by high A-level scores might be expected to learn faster and therefore devote less time to study. They may also earn more in a way which our wage variable does not represent because it includes only rudimentary information on A-level results. On the other hand they may have an intellectual curiosity in their subject and therefore enjoy consumption value from study. The positive coefficient on the term suggests that the consumption effect dominates. Clever students work harder because they tend to enjoy their subjects. We also see a substantial positive dummy for students who have not taken A-levels. These are likely to be non-standard students for whom going to university has been a positive decision rather than simply the expected thing to do. The positive coefficient suggests that, even in their final year, an enthusiasm and interest in the subject has persisted which is not present in students with low A-level scores.

Equation	RMSE	R^2	RMSE	R^2
Study Time	11.78	0.09	11.78	0.09
Leisure Time	4.90	0.87	4.92	0.37
	Coef.	Std. Err.	Coef.	Std. Err.
Study Time				
Wage Band 1	0.74	1.81	0.73	1.81
Wage Band 3	-2.59	1.08	-2.59	1.08
Wage Band 4	-3.04	1.23	-3.05	1.23
Wage Band 5	-5.06	1.45	-5.07	1.45
Age at Start	0.31	0.12	0.30	0.12
University 1	-3.76	1.18	-3.72	1.18
University 2	-5.55	1.50	-5.47	1.50
University 4	-1.82	1.17	-1.82	1.17
Science/Medicine	3.42	1.11	3.44	1.11
Languages/Humanities	-3.15	1.23	-3.09	1.23
Socio-Economic Group D/E	0.93	1.32	0.95	1.32
Family Support	-1.20	0.88	-1.19	0.88
No Debt	0.33	1.07	0.33	1.07
Log A-level Score	3.15	1.16	2.97	1.15
No A-levels	9.95	3.32	9.48	3.30
Log Prospective Wage Rate	-3.46	1.93	-3.12	1.92
Constant	23.28	4.90	23.42	4.88
Leisure Time				
Wage Band 1	4.86	0.75	4.81	0.76
Wage Band 3	-2.80	0.47	-2.59	0.45
Wage Band 4	-6.44	0.54	-6.18	0.51
Wage Band 5	-8.74	0.68	-8.32	0.60
Age at Start	0.06	0.05	0.04	0.05
University 1	-0.49	0.52	-0.24	0.48
University 2	0.27	0.61	0.60	0.56
University 4	-0.48	0.50	-0.33	0.49
Science/Medicine	0.70	0.51	0.40	0.46
Languages/Humanities	-0.27	0.52	-0.07	0.50
Socio-Economic Group D/E	-1.11	0.55	-1.22	0.55
Family Support	0.81	0.37	0.90	0.37
No Debt	1.47	0.44	1.44	0.45
No A-levels	0.08	0.45	-0.05	0.44
Study Time	-1.03	0.06	0.95	**
Constant	101.84	2.02	99.52	1.04

Table 2: Parameters of the Time Use Model

6 Conclusion

We have explored the trichotomous time allocation decision faced by students in the presence of financial constraints. We have shown how study effort might be related to future earnings if students are optimisers, and also identified the implications of this for the balance between paid work and leisure with the conclusion that incremental study is worth less to potentially high earners than to people with relatively poor prospects. Analysis of a survey of how students spend their time has allowed us to investigate the link between study effort and expected future earnings empirically and provides evidence to support the view that study effort is indeed decreasing in earnings. Thus the allocation of time by students between study, paid work and leisure appears to be an economic decision made in the light of a comparison of the investment benefits of study with the consumption benefits of paid work and leisure. We also find that students with good A-level scores work harder than those without them and interpret this as a consumption interest in their subjects of study.

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Appendices

A The First-order Conditions

The first order conditions for the choice of study time are

$$\begin{aligned}\frac{\partial U_1}{\partial S} &= \left\{\left(W_1(N_1-\bar{L}_1-S)+D-F-\bar{C}_1\right)^{\alpha_1+\alpha_2}(S-\hat{S})^{\alpha_3}X^{\alpha_3}\right\}^{1-\rho}W_1^{-\alpha_2(1-\rho)}\\ &\left\{\frac{\alpha_3}{S-\hat{S}}-\frac{W_1(\alpha_1+\alpha_2)}{W_1(N_1-\bar{L}_1-S)+D-F-\bar{C}_1}\right\}\end{aligned}$$

$$\begin{aligned}\frac{\partial U_2}{\partial S} &= wX^{\xi}[N_2-\bar{L}_2]\zeta[S+\bar{S}]^{\zeta-1}\left(wX^{\xi}[S+\bar{S}]^{\zeta}[N_2-\bar{L}_2]-RD-\bar{C}_2\right)^{-\rho}(wX^{\xi}[S+\bar{S}]^{\zeta})^{-\beta_2(1-\rho)}\\ &-\beta_2\zeta\frac{\left(w[S+\bar{S}]^{\zeta}[N_2-\bar{L}_2]+LG-RD-\bar{C}_2\right)^{1-\rho}}{[S+\bar{S}]}(wX^{\xi}[S+\bar{S}]^{\zeta})^{-\beta_2(1-\rho)}\end{aligned}$$

Second-period utility is unambiguously increasing in hours of study. For there to be an interior solution, we therefore require that first period utility is decreasing in study time, even though they pure consumption value of study is increasing. This in turn means that we require

$$\left\{\alpha_3-\frac{\left(S-\hat{S}\right)W_1(\alpha_1+\alpha_2)}{W_1(N_1-\bar{L}_1-S)+D-F-\bar{C}_1}\right\}<0$$

Since $\alpha_1+\alpha_2+\alpha_3=1$ the expression may also be set out as

$$\left\{(S-\hat{S})-\alpha_3((N_1^*-\hat{S})+\frac{D-F-\bar{C}_1}{W_1})\right\}>0$$

and in this form it is perfectly clear that total study time in excess of 'subsistence study' must exceed the amount that would be done if there were consumption demand only for the derivative to be negative. This condition is obviously met if there is investment demand for study.

These first-order conditions imply that, at an optimum

$$\begin{aligned}&\left\{\left(W_1(N_1-\bar{L}_1-S)+D-F-\bar{C}_1\right)^{\alpha_1+\alpha_2}(S-\hat{S})^{\alpha_3}X^{\alpha_3}\right\}^{1-\rho}W_1^{-\alpha_2(1-\rho)}\\ &\left\{\frac{\alpha_3}{S-\hat{S}}-\frac{W_1(\alpha_1+\alpha_2)}{W_1(N_1-\bar{L}_1-S)+D-F-\bar{C}_1}\right\}\\ = \;&\delta wX^{\xi}[N_2-\bar{L}_2]\zeta[S+\bar{S}]^{\zeta-1}\left(wX^{\xi}[S+\bar{S}]^{\zeta}[N_2-\bar{L}_2]+LG-RD-\bar{C}_2\right)^{-\rho}(wX^{\xi}[S+\bar{S}]^{\zeta})^{-\beta_2(1-\rho)}\\ &-\delta\zeta\beta_2\frac{\left(wX^{\xi}[S+\bar{S}]^{\zeta}[N_2-\bar{L}_2]+LG-RD-\bar{C}_2\right)^{1-\rho}}{[S+\bar{S}]}(wX^{\xi}[S+\bar{S}]^{\zeta})^{-\beta_2(1-\rho)}\end{aligned}$$

With

$$
\begin{aligned}
N_1^* &= N_1 - \bar{L}_1 \\
N_2^* &= N_2 - \bar{L}_2
\end{aligned}
$$

we then have, re-organizing the expression

$$
\begin{aligned}
& W_1^{\alpha_1(1-\rho)}(N_1^* - S)^{(\alpha_1+\alpha_2)(1-\rho)-1} \left\{1 + \frac{D - F - \bar{C}_1}{W_1(N_1^* - S)}\right\}^{(\alpha_1+\alpha_2)(1-\rho)-1} \left(S - \hat{S}\right)^{\alpha_3(1-\rho)-1} X^{\alpha_3(1-\rho)} \\
& \left\{(S - \hat{S}) - \alpha_3((N_1^* - \hat{S}) + \frac{D - F - \bar{C}_1}{W_1})\right\} \\
= \ & \delta\beta_1\zeta w^{\beta_1(1-\rho)} N_2^{*(1-\rho)} X^{\xi\beta_1(1-\rho)} [S + \bar{S}]^{\zeta\beta_1(1-\rho)-1} \left(1 - \frac{RD + \bar{C}_2 - LG}{wX^\xi[S + \bar{S}]^\zeta N_2^*}\right)^{-\rho} \\
& \left\{1 + \frac{\beta_2}{\beta_1}\frac{RD + \bar{C}_2 - LG}{wX^\xi[S + \bar{S}]^\zeta N_2^*}\right\}
\end{aligned}
$$

Taking logarithms, this becomes

$$
\begin{aligned}
& \{1 - \zeta\beta_1(1-\rho)\}\log([S + \bar{S}]) + \{(\alpha_1 + \alpha_2)(1-\rho) - 1\}\log(N_1^* - S) \\
& + \{\alpha_3(1-\rho) - 1\}\log\left(S - \hat{S}\right) \\
& + \log\left\{S - \hat{S} - \alpha_3((N_1^* - \hat{S}) + \frac{D - F - \bar{C}_1}{W_1})\right\} \\
= \ & (1-\rho)\{\beta_1\log(w) - \alpha_1\log(W_1)\} \\
& + \log(\delta\beta_1\zeta) + (1-\rho)\log(N_2^*) \\
& -\alpha_3(1-\rho)\log X \\
& +(1-\rho)\beta_1\xi\log X \\
& -\rho\log\left(1 - \frac{RD + \bar{C}_2 - LG}{wX^\xi[S + \bar{S}]^\zeta N_2^*}\right) \\
& +\rho\log\left\{1 + \frac{D - F - \bar{C}_1}{W_1(N_1^* - S)}\right\} \\
& + \log\left\{1 + \frac{\beta_2}{\beta_1}\frac{RD + \bar{C}_2 - LG}{[S + \bar{S}]^\zeta N_2^* X^\xi w}\right\}
\end{aligned} \tag{6}
$$

B The Wage Equations

	Baseline Group is Employed				
		Number of obs	45549		
		LR χ^2_{64}	19454		
		Pseudo R^2	0.3027		
		Log likelihood	-22407		
		Unemployed- ILO Definition		Inactive	
		Coef.	Std. Err.	Coef.	Std. Err.
	Constant	0.921	0.524	5.973	0.381
	Age	-0.214	0.039	-0.606	0.028
	Age^2	0.004	0.001	0.012	0.001
	Age^3	0.000	0.000	0.000	0.000
	Married	-1.034	0.054	-0.692	0.040
	Health Problems	0.644	0.053	2.091	0.035
	Black	1.050	0.124	0.663	0.126
	Indian	0.471	0.160	0.469	0.123
	Pak./Bangladeshi	1.124	0.142	0.976	0.124
	Other Asian	0.838	0.231	1.753	0.157
	Mixed Race	0.546	0.259	0.306	0.233
	Other	1.216	0.344	1.091	0.320
	1 A-level	0.019	0.162	0.017	0.126
	2 or more A-levels	-0.107	0.166	0.636	0.127
Highest	Not Known	1.064	0.334	3.768	0.210
Qualification	No Qualification	0.736	0.279	1.073	0.197
	Other	0.192	0.284	0.446	0.200
	CSE	0.289	0.288	0.271	0.211
	O-level	-0.267	0.282	0.299	0.200
	AS-level	0.196	0.291	0.003	0.218
	Apprenticeship	-0.130	0.282	0.237	0.198
	A-level	-0.430	0.279	0.324	0.196
	Subdegree	-0.514	0.286	-0.025	0.201
	Age$\times$Degree	-0.017	0.014	-0.031	0.009
	$Age^2\times$Degree	0.000	0.000	0.000	0.000
Degree	Medicine/Med. Related	-0.265	0.222	-0.307	0.154
Subject	Agric/Biology	-0.180	0.328	0.148	0.238
	Phsyics/Maths	-0.543	0.251	-0.030	0.182
	Arch./Engineering	-0.544	0.243	-0.249	0.182
	Business/Comm. Techn.	-0.821	0.282	-0.258	0.207
	Lang./Humanities/Edcn	-0.262	0.258	0.000	0.187
	Arts	0.835	0.258	-0.112	0.296
	Not Known	0.506	0.558	-0.222	0.653

Table 3: Multinomial Logistic Regression: Men's Employment

		Baseline Group is Employed			
		Number of obs	48761		
		LR χ^2_{64}	18690		
		Pseudo R^2	= 0.2438		
		Log likelihood	-28981.2		
		Unemployed- ILO Definition		Inactive	
		Coef.	Std. Err.	Coef.	Std. Err.
	Constant	0.668	0.745	-1.275	0.362
	Age	-0.318	0.054	-0.058	0.023
	Age^2	0.008	0.002	0.000	0.001
	Age^3	0.000	0.000	0.000	0.000
	Married	-0.757	0.062	0.032	0.027
	Health Problems	0.544	0.066	1.238	0.028
	Black	1.120	0.130	0.541	0.090
	Indian	0.822	0.164	0.509	0.089
	Pak./Bangladeshi	1.516	0.210	2.072	0.118
	Other Asian	0.769	0.262	0.864	0.131
	Mixed Race	0.660	0.267	0.436	0.162
	Other	0.843	0.441	1.078	0.222
	1 A-level	0.111	0.163	0.099	0.084
	2 or more A-levels	-0.397	0.164	0.248	0.082
Highest	Not Known	3.868	0.505	6.293	0.256
Qualification	No Qualification	1.379	0.447	2.476	0.241
	Other	1.077	0.453	1.682	0.243
	CSE	1.157	0.451	1.797	0.243
	O-levels	0.699	0.446	1.498	0.241
	AS-levels	0.706	0.456	1.014	0.248
	Apprenticeship	0.233	0.485	1.790	0.247
	A-levels	0.669	0.445	1.349	0.239
	Subdegree	0.235	0.449	0.804	0.241
	Age×Degree	0.000	0.025	-0.002	0.013
	Age^2×Degree	0.000	0.000	0.000	0.000
Degree	Medicine/Med.Related	-0.121	0.213	-0.295	0.108
Subject	Agriculture/Biology	0.264	0.367	0.486	0.180
	Physics/Maths	-0.411	0.422	0.146	0.182
	Arch./Engineering	-0.239	0.615	-0.186	0.336
	Business/Comm. Techn.	0.114	0.310	-0.127	0.186
	Langs./Humanities/Edcn	0.271	0.237	0.229	0.126
	Arts	1.020	0.276	0.182	0.195
	Not Known	0.840	0.764	0.923	0.433

Table 4: Multinomial Logistic Regression: Women's Employment

		Men		Women	
		Obs	Parms	Obs	Parms
	Ln Wage	22825	39	23229	39
		RMSE	R^2	RMSE	R^2
		0.4676	0.3231	0.4251	0.2784
		Coef.	Std. Err.	Coef.	Std. Err.
	Constant	0.919	0.14	-0.572	0.300
	Age	0.094	0.01	0.135	0.009
	Age^2	-0.002	0.00	-0.003	0.000
	Age^3	1E-05	0.00	0.000	0.000
	Health Problem	0.125	0.02	-0.182	0.079
	Black	0.092	0.03	-0.063	0.070
	Indian	0.143	0.03	-0.163	0.080
	Pakistani/Bangladeshi	0.061	0.04	-0.390	0.179
	Other Asian	0.216	0.05	-0.100	0.087
	Mixed Race	0.037	0.05	0.074	0.047
	Other	0.138	0.09	-0.113	0.134
	1-A-level	0.045	0.02	0.077	0.017
	2 or more A-levels	0.137	0.02	0.024	0.020
Highest Qualification	Not Known	-0.019	0.07	-0.916	0.289
	No Qualifications	-0.545	0.03	-0.771	0.119
	CSE	-0.589	0.04	-0.565	0.070
	O-level	-0.487	0.03	-0.413	0.052
	AS-level	-0.621	0.04	-0.426	0.037
	Apprenticeship	-0.503	0.03	-0.627	0.089
	A-level	-0.423	0.03	-0.356	0.049
	Subdegree	-0.369	0.03	-0.112	0.036
	Other	-0.584	0.03	-0.585	0.070
	Age$\times$ Degree Dummy	-0.014	0.00	0.003	0.003
	Age $^2\times$ Degree Dummy	0.0003	0.00	0.000	0.000
Degree Subject	Medicine	0.136	0.05	0.048	0.030
	Medical-related	-0.087	0.04	0.051	0.019
	Biology	-0.256	0.04	-0.056	0.034
	Agriculture	-0.187	0.09	-0.105	0.094
	Physics	-0.221	0.03	0.020	0.045
	Maths	-0.116	0.03	0.107	0.039
	Eng./Technology	-0.159	0.03	0.020	0.058
	Architecture	-0.240	0.04	0.119	0.088
	Business	-0.018	0.03	0.046	0.032
	Comm. Technology	-0.203	0.10	-0.254	0.068
	Languages	-0.192	0.04	-0.052	0.031
	Humanities	-0.308	0.04	-0.119	0.036
	Arts	-0.157	0.04	-0.191	0.064
	Education	-0.241	0.04	0.117	0.037
	Not Known	-0.094	0.10	-0.178	0.117
	Heckman Correction	-1.174	0.09	0.781	0.447

Table 5: Equations for Wage Rates