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**WORK IN PROGRESS**

# **The returns to becoming a nurse in the UK**

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## Introduction

The NHS currently employs some 410,000 registered and non-registered nurses, <sup>[1]</sup> making it the single largest workforce in Europe. Via the NHS the Government consequently spends considerable resources each year training, managing and employing nurses. For example, in 1995 the total nursing paybill for Great Britain was £7,783 million. <sup>[2]</sup> This was 1.1% of UK GDP, 2.9% of total public expenditure and 18.7% of NHS expenditure. Clearly then nursing accounts for a large proportion of expenditure in Britain, yet remarkably little is known about the nursing labour market, particularly with reference to the supply of nurses. This is especially surprising when one considers the presumed current shortage of nursing labour.

As part of the evidence on which it bases its recommendations concerning nurses' pay the Pay Review Body for Nurses, Midwives and Health Visitors considers the results of a survey of nursing vacancies conducted annually by the Office of Manpower Economics of all health care providers in Great Britain that are known to employ nursing staff. Results of these surveys are presented in Table 1.

	Registered nurses 3 month vacancy rate (%) <sup>1</sup>	Unregistered nurses 1 month vacancy rate (%) <sup>1</sup>
1990	3.3	2.9
1991	2.3	3.0
1992	2.0	2.7
1993	1.3	2.2
1994	1.2	2.0
1995	1.2	2.1
1996	2.0	1.8

<sup>1</sup> The Pay Review Body considers the three month vacancy rate to be most appropriate for measuring vacancies for registered nurses and the one month vacancy rate to be the most appropriate measure for unregistered nurses

Source: Review Body for Nursing Staff, Midwives, Health Visitors and Professions Allied to Medicine, selected years.

*Table 1. Vacancies among registered and unregistered nurses in Great Britain, 1990-1996.*

Whilst these percentages may seem small, when one considers the size of the nursing workforce, the numbers of unfilled nursing posts indicated by these vacancy rates does

become quite large. This would seem to imply that, for one reason or another, nursing as a career is considered an unattractive option relative to other professions. This might be explained by any number of reasons, and in this paper we analyse the extent to which this shortage may be caused by relative earnings. Nurses are commonly perceived as being underpaid. Researchers have argued that nurses are among the lowest paid of all professions and that many nurses experience very real financial hardship with barely enough income to meet basic living costs. <sup>[3]</sup> Additionally, in a recent submission to the Pay Review Body by the Staff Side of the Nursing and Midwifery Staffs Negotiating Council it was argued that “both non-registered and registered nursing staff are paid significantly less than competitor occupations outside the NHS and comparator groups within it.” <sup>[4]</sup>

In contrast, simple comparison of nurses’ and midwives’ earnings with those in other occupations suggests that they are paid relatively well. For example, in 1996 the average female registered nurse earned £342 per week and the average female registered midwife earned £410 per week. <sup>[5]</sup> In comparison, the average female worker across all occupations earned £283 per week, and the average female non-manual worker earned £302 per week. <sup>[5]</sup> Additionally, in a review of public sector earnings between 1970 and 1992 Elliott and Duffus concluded that nurses had enjoyed some of the largest increases in real earnings over this period and that they received the highest average size of wage settlement. <sup>[6]</sup>

In light of these apparent discrepancies, it would clearly be useful to obtain a more accurate and comprehensive picture of the financial consequences to individuals from choosing a career in nursing. Internal rates of return provide a summary measure of the returns to capital investments and may be used to determine the attractiveness of nursing as a career by assessing the returns to nurse training. In the context of labour markets, internal rate of return analyses are based on the assumption that education and training are investments in human capital. Education and training involve costs during the period of their acquisition and later yield benefits in the form of improved earnings capacity for the educated individual. The ability to undertake a career as a nurse relies on the successful completion of a substantial period of training, normally of duration three years. The decision to choose nursing as a career may therefore be thought of as a decision to undertake nurse training. Similarly, the *returns* to becoming a nurse (a factor in the decision to become a nurse) may also be thought of as the returns to undertaking nurse training. In this way, the decision to become a nurse and hence

undertake nurse training may be thought of as an investment in human capital and thus may be analysed using the internal rate of return model.

Two internal rates of return may be used in the internal rate of return approach. The private internal rate of return measures how attractive an investment in human capital is to the individual. The social internal rate of return assesses the attractiveness of such an investment to society. Assuming that individuals view their education and training as investments in their human capital, the private internal rate of return may be used to explain existing demand for places on training and education programmes, and as an indicator as to whether the future demand for places is likely to rise or fall. In this way the private internal rate of return may be used to explain vacancies in labour markets. Social internal rates of return may be used as an indicator of the efficiency of existing funding of education and training and may help in decisions to fund education and training programmes in the future by suggesting areas of expansion or contraction.

Internal rate of return analyses have most frequently been conducted to assess the returns to non-compulsory schooling or higher education and have usually examined the returns to education in broad bands such as all first university degrees or all postgraduate degrees.<sup>[7-12]</sup> Some analyses have considered particular disciplines,<sup>[13-21]</sup> though no study has yet estimated the returns to nurse training in the UK. That is the primary aim of this paper: to estimate the private and social internal rates of return to nurse training in the UK. The reason for doing so is to shed some light on why vacancies exist in the nursing labour market. Because the majority of nurses are female, and because of the available data, we estimate the rates of return using data for females only. For comparison, we also calculate the private and social internal rates of return to females to becoming teachers and to obtaining a university degree. Internal rates of return are calculated for the years 1991 to 1996. We also estimate the returns to becoming a nurse by an alternative method; by constructing an earnings function for nurses. Returns are again estimated for females only and for one specific year, 1996.

## **Calculating private and social internal rates of return**

The internal rate of return to an investment in training is calculated by solving for  $r$  in the following expression:

$$\sum_{t=18}^{60} \frac{B_t - C_t}{(1+r)^{t-17}} = 0 \quad [1]$$

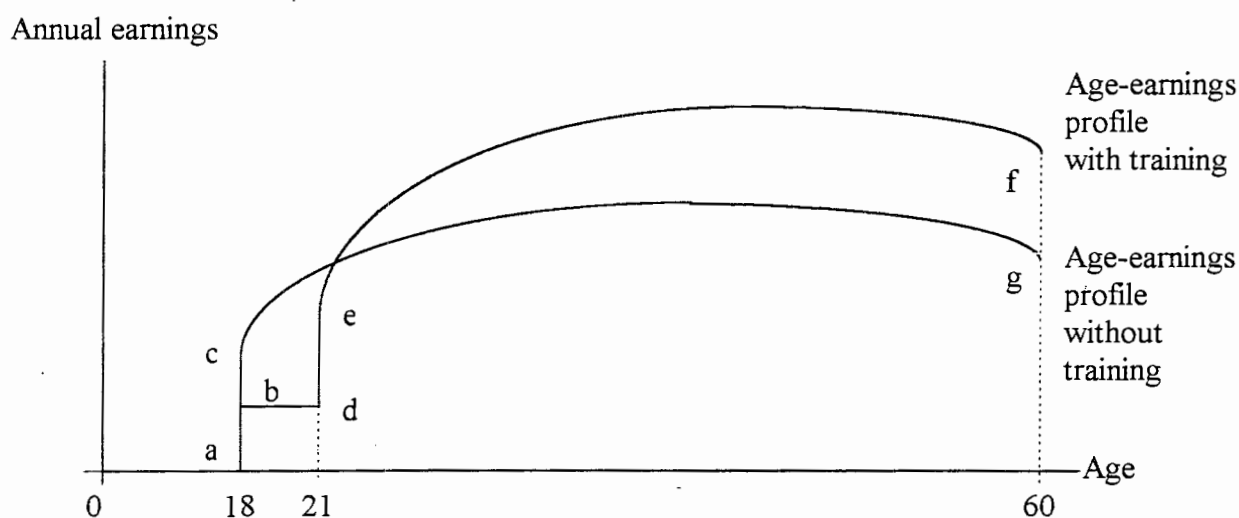
where  $B_t$  are the benefits of undertaking the investment at age  $t$ , and  $C_t$  is the cost at age  $t$ . The investment is assumed to begin at age 18 and retirement is assumed to occur at age 60.

In calculating the private internal rate of return the benefits of the investment are the grant or bursary received by the individual whilst undergoing training and the earnings of the individual subsequent to training net of taxation. The costs of the investment are the earnings foregone by the individual whilst undergoing training and subsequent to it (that is, the earnings the individual would have received had they not made the investment). From the societal perspective it is the net marginal contribution to the national product that is important. Thus the main differences between private and social internal rates of return is that the social analysis needs to concentrate on net contributions to output rather than disposable income. Earnings gross of taxation are used to calculate the benefits of the investment, as an indicator of marginal revenue product. The direct costs of training are included as a cost of the investment as well as earnings foregone gross of taxation. Grants and bursaries received whilst undergoing education and training are ignored since they represent a transfer payment.

### **The data**

Central to the calculation of private and social internal rates of return are age-earnings profiles, which depict earnings at each year of age for individuals with particular levels of education and training (see Figure 1).

For example, the age-earnings profile of an individual undergoing a three-year period of training at age 18 is depicted by  $Oabdef$ . The age-earnings profile of the same individual not undergoing training but instead joining the workforce at age 18 is depicted by  $Oacg$ .



*Figure 1. Hypothetical age-earnings profiles with and without training*

Due to data limitations, the method usually adopted in internal rate of return studies, and the one adopted here, is to use cross-sectional data of mean earnings of individuals in each age and occupation/qualification group. Age-earnings profiles for nurses and teachers were obtained from the New Earnings Survey (NES), an annual survey covering 1% of all employees in employment. Earnings for individuals whose highest academic qualification was a degree were obtained from the British Household Panel Survey (BHPS), an annual longitudinal survey of over 17,000 individual household members living in Great Britain. All earnings data are for full-time workers and are calculated in five-year bands.

As already indicated an important component of the cost of undertaking an investment in human capital is the opportunity cost earnings of the individual who undergoes training. In Figure 1, the opportunity cost earnings are shown by  $Oacg$ . The ideal opportunity cost age-earnings profile would depict the earnings the individual would have received had they not made the investment. In this analysis the earnings of all female workers is used to represent the opportunity cost of undertaking nurse or teacher training or obtaining a degree. Since the group of all female workers as a whole may differ from those females who undertake the education and training considered here, both in terms of natural ability and motivation, we also calculate internal rates of return using female non-manual workers and females whose highest academic qualifications are A-levels as opportunity cost earnings. Opportunity cost earnings

for female non-manual workers and all female workers were obtained from the NES. Those for females whose highest academic qualification was A-level were obtained from the BHPS.

The length of nurse training and the length of time to obtain a degree is assumed to be three years. The length of training for teachers is assumed to be four years (either by a four-year teaching degree or via a three-year non-teaching degree followed by a one-year postgraduate diploma). The direct costs of nurse training were taken from Goodwin and Bosanquet <sup>[22]</sup> and updated to relevant prices using the NHS pay and prices index. The direct costs of initial teacher training and obtaining a degree were taken from the Higher Education Statistics for England. <sup>[23]</sup>

The bursary received by individuals training to be nurses was taken from Goodwin and Bosanquet <sup>[22]</sup> and updated to relevant prices using the NHS pay and prices index. The grant received by individuals undergoing initial teacher training and university education was taken from the Higher Education Statistics for England. <sup>[23]</sup>

Earnings net of taxation are used to calculate private internal rates of return. Income tax allowances and rates of income tax used to calculate earnings net of taxation were taken from Annual Abstract of Statistics. <sup>[24]</sup> It was assumed that the entire married couple's allowance was allocated to the husband.

Whilst the data described above may be used to construct basic age-earnings profiles necessary to compute  $r$  in equation [1], these data on their own may not provide a complete picture of the net benefits of training. Consequently we adjust the data to obtain a more accurate picture of the true costs and benefits. Four adjustments are made: for mortality; for unemployment; for other causes of economic inactivity; and, for discontinuation from training.

It is common in internal rate of return analyses to make some adjustment to the age-earnings profiles for mortality. The approach usually adopted in internal rate of return studies and the approach adopted here is to multiply the earnings at each age by the probability that the individual will survive to that age. It is assumed that mortality rates do not differ across occupation groups. Mortality rates were taken from English life tables. <sup>[25]</sup>

The returns to training are likely to be affected positively by the higher employment rates of more educated individuals. Indeed, improved employment rates may be one reason why individuals choose to undertake training in the first place. Therefore, some adjustment to age-earnings profiles is justified for employment. Earnings at each age are multiplied by the probability that individuals of that age are employed. Employment rates for each occupation/qualification group were taken from the BHPS.

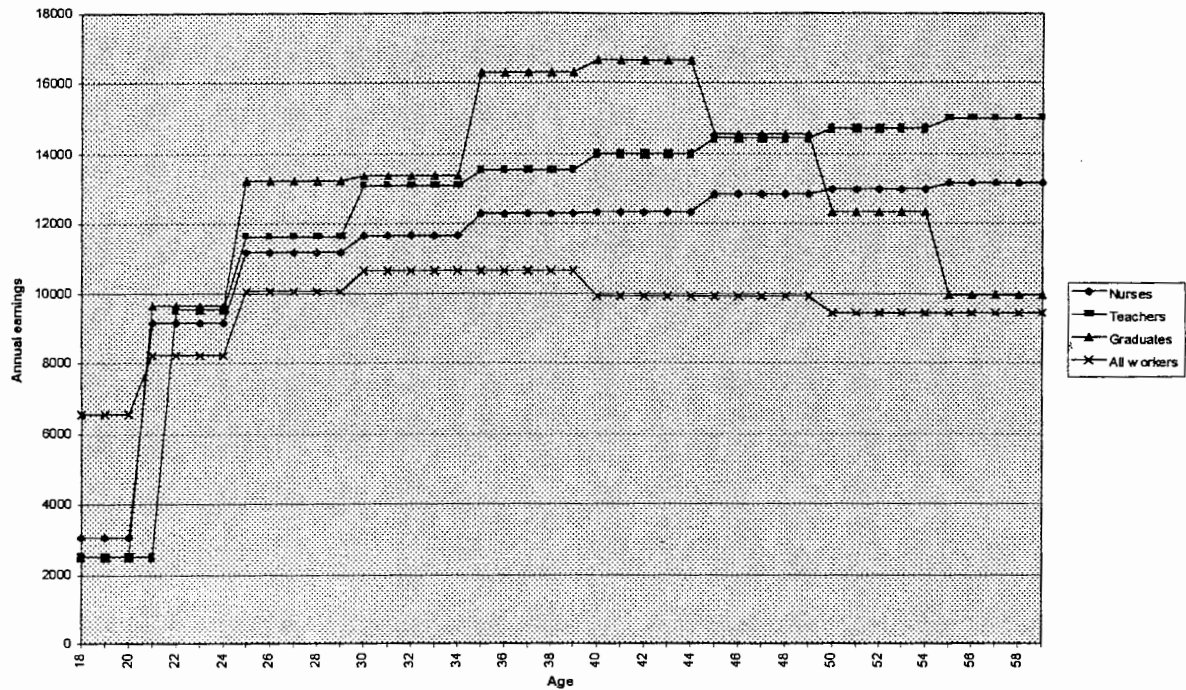
Non-participation in the workforce for reasons other than unemployment (retirement, family care, long term sickness or disability and maternity leave) may also affect internal rates of return. The approach adopted here is to multiply the earnings at each age by the probability that the individual will participate in the workforce at that age. It is assumed that participation rates for reasons other than unemployment do not differ across occupation groups. Participation rates were taken from the BHPS.

Whilst an individual may decide to undertake training there is no guarantee that they will successfully complete that training. Some allowance would therefore seem to be justified for the possibility of failure to complete the course. We assume here that an individual who drops out earns a zero return on the investment and achieves the earnings profile they would have achieved had they not begun training in the first place. Course discontinuation rates for nurse training were taken from the ENB Annual Report.<sup>[26]</sup> Dropout rates for initial teacher training were calculated from the Annual Abstract of Statistics.<sup>[24]</sup> Dropout rates for degree courses were taken from Committee of Vice Chancellors and Principals and Universities Funding Council.<sup>[27]</sup>

## **Results**

Figure 2 plots age-earnings profiles used to calculate private internal rates of return for female nurses and teachers, female graduates, and all female workers in 1991. Profiles for 1992 to 1996 were generally similar to those in Figure 2.





1 All figures relate to females

Figure 2. Age-earnings profiles for nurses, teachers, graduates, and all workers in 1991<sup>1</sup>

From age 30, annual earnings for nurses were generally lower than those for teachers. Relative to graduates, nurses' annual earnings were lower up until age 50, when nurses' earnings outstripped those of graduates. Apart from age 18 to 21 or 22 when training took place, all workers' earnings were lower than those for nurses, teachers and graduates.

Private and social internal rates of return to nurse training, teacher training and obtaining a degree are presented in Table 2. Taking as the baseline opportunity cost earnings represented by all female workers, the private internal rate of return to nurse training was 13-20% across the period. This remained fairly constant at around 14% until 1995 when it increased to around 19%. This jump is explained by an increase in average earnings of nurses at younger ages in this period relative to previous years and all female workers. Generally, the private internal rates of return to nurse training are greater than those for teachers, and, for the last three years, are greater than those for graduates.

Social internal rates of return are in all cases less than the private internal rates of return. This is a consequence of including the direct costs of education and training which greatly increases the social cost of the investment. Again taking as the baseline opportunity cost earnings represented by all female workers, social internal rates of return to nurse training vary from 4-6% across the time period. The social internal rate of return to teacher training and obtaining a degree is greater than the social internal rate of return to nurse training.

The relative ranking of private and social internal rates of return for nurse training, teacher training and obtaining a degree are the same when earnings of female non-manual workers and females whose highest academic qualifications are A-levels are used as the opportunity cost earnings. Internal rates of return are lower using earnings of female non-manual workers as opportunity cost earnings, and higher using earnings of females whose highest academic qualification was A-level. This is unsurprising since the average non-manual worker would be expected to earn more than the average worker who in turn would be expected to earn more than the average individual whose highest academic qualifications are A-level.

### **Estimating an earnings function for nurses**

An alternative method of considering the returns to nursing is to estimate the return to the occupation relative to the average female wage rate. This can be done by considering the following relation:

$$W = f(\text{hours, experience, degree, nurse}) \quad [2]$$

Where  $W$  is the natural log of the average female workers (or some comparator group's) wage rate, hours represents hours worked, experience represents years in current occupation, degree is whether or not the individual has a university degree, and nurse is whether the individual is currently employed as a nurse or not. If nursing as an occupation has a higher return than the average wage the coefficient on nurse would be positive and significant. To allow for potential correlation between the decision to work and the wage rate we employ a two stage procedure following Heckman <sup>[28]</sup> to correct for any sample selection bias introduced. This involves estimating a participation (P) equation to correct for potential bias. This was specified as:

	1991	1992	1993	1994	1995	1996
<i>Private rate of return</i>						
Opportunity cost earnings = All workers						
Nurses	14.20	14.65	13.17	15.23	19.51	19.23
Teachers	11.48	13.54	13.73	14.49	13.87	13.02
Graduates	16.23	17.18	16.92	15.11	16.80	14.77
Opportunity cost earnings = A level						
Nurses	16.66	14.51	12.98	15.66	15.71	23.45
Teachers	12.82	13.50	13.50	14.58	12.29	14.93
Graduates	17.76	16.86	16.30	15.26	14.97	16.88
Opportunity cost earnings = Non-manual workers						
Nurses	10.85	11.14	9.13	11.20	15.48	14.89
Teachers	9.64	11.82	11.91	12.70	12.11	11.10
Graduates	14.22	15.11	14.86	13.41	14.86	12.76
<i>Social rate of return</i>						
Opportunity cost earnings = All workers						
Nurses	5.23	5.18	4.08	4.69	5.49	5.64
Teachers	5.20	6.50	6.29	6.70	6.49	6.12
Graduates	8.06	8.40	8.25	8.14	8.39	7.74
Opportunity cost earnings = A level						
Nurses	6.41	5.84	5.25	3.75	4.23	7.22
Teachers	5.99	6.84	6.78	6.29	5.79	6.97
Graduates	8.95	8.72	8.64	7.78	7.55	8.78
Opportunity cost earnings = Non-manual workers						
Nurses	3.50	3.38	1.97	2.61	3.33	3.31
Teachers	4.09	5.49	5.23	5.66	5.42	4.98
Graduates	6.84	7.14	7.03	7.03	7.16	6.46

1 All figures relate to females

*Table 2. Private and social internal rates of return to nurse training, teacher training and obtaining a degree, 1991-1996 (%)<sup>1</sup>*

$$P = f(\text{degree, age, marital status, number of children}) \quad [3]$$

Where degree is defined as in [2] and the other variables are self-explanatory. These equations were estimated using STATA's full maximum-likelihood Heckman procedure where the lambda term used to correct for sample-selection bias is first estimated through Probit estimation of equation [3] and the corrected earnings equation is then run. The data were drawn from a one year (1996) cross section of the BHPS. 2,217 females aged 18 to 60 years were pulled, including 143 nurses. The results are reported in Table 3 where the OLS

coefficients for equation [2] are also reported for comparative purposes. All coefficients are right-signed and significant at conventional levels. Note that lambda is significant, implying the existence of selectivity bias, although comparison to the OLS results show that the quantitative impact is minimal. The negative sign on rho implies that workers in the sample had unobserved characteristics causing them to earn lower wages than would have been earned by non-participants. Relative to the implicit individual (i.e. the average earning female in our sample) the coefficient showing on nurse implies that approximately 40% can be expected to be added to wages through nursing employment. Average earnings across the sample were £650 per month, implying an extra £260 earned per month by nurses. This is almost as much as the addition to wages implied by obtaining a degree.

<u>Heckman 2-stage procedure correcting for participation</u>			<u>OLS</u>	
<i>Wage equation</i>				
Variable	Coefficient	s.e.	Coefficient	s.e
Degree	0.475	0.033	0.499	0.032
Hours worked per week	0.048	0.001	0.049	0.0009
Overtime worked per week	0.0265	0.002	0.027	0.002
Nurse	0.405	0.056	0.423	0.056
Experience	0.032	0.005	0.038	0.005
Experience squared	-0.001	0.0002	-0.001	0.0002
Constant	4.872	0.035	4.771	0.032
<i>Participation probit</i>				
Degree	0.303	0.165		
Age	0.053	0.006		
Marital status	-0.117	0.025		
Number of children	-0.128	0.058		
Constant	0.317	0.247		
rho	-0.594			
sigma	0.508			
lambda	-0.302	0.034		
N = 2217				
Log likelihood = -1871.76				
R <sup>2</sup> (OLS) = 0.628				

*Box 1. Earnings function for nurses estimated from BHPS (using 1996 data)*

## Discussion

The private internal rate of return measures the attractiveness of an investment in human capital to the individual. While there are a number of general problems associated with the human capital approach, including the assumptions that human capital is homogeneous, that individuals have good knowledge over their future participation and earnings profiles and that all individuals are treated similarly, it remains a useful method to consider the impact of earnings and training costs on labour market participation. A low private internal rate of return to nurse training relative to other occupations would indicate that the net benefit to individuals from choosing a career in nursing is low relative to the net benefits that could be achieved by investing in other forms of human capital. In this case, low relative earnings in nursing might explain current vacancies. A high private internal rate of return relative to other occupations would indicate that there are substantial net benefits to becoming a nurse. This implies that current vacancies are not explained by low relative earnings, but that factors other than relative earnings are causing the shortage. Relative to graduates, for example, the results of this study would seem to indicate that from 1991 to 1993 the first situation exists and that the private internal rates of return to nursing are relatively low. From 1994 to 1996 the situation gradually changed and the private internal rate of returns to nurse training became at least on a par with earnings in other occupations. This would seem to imply that in these three years at least current nursing vacancies are not explained by nurses earnings.

There are a number of issues which may affect the usefulness of the results and the ability to use them to infer a relationship between nurses' earnings and vacancy rates. First, arguably what is important to individuals when deciding whether to undergo training is not the actual earnings capacity achieved by the trained individual but the *perceived* capacity. Therefore, whilst there may be actual large net financial benefits to becoming a nurse, if it is generally *perceived* that there are will be no or only small net financial benefits then this may convince individuals to choose a career other than nursing.

Second, social internal rates of return are based on the assumption that the wage rate equals the marginal revenue product of labour. This is probably an unrealistic assumption in the nursing labour market where wages rates, rather than being determined in a perfectly competitive environment, are more likely to be determined administratively by the Pay Review

Body via the size of the budget allocated to the NHS. This, complicated by the existence of a bilateral monopoly where wage rates rely on relative bargaining strength is likely to reduce even further the likelihood that the wage rate equals the marginal revenue product. Where there is also evidence of a labour shortage, earnings are likely to be less than the marginal revenue product and the social internal rate of return is therefore likely to be underestimated. In defence of the social internal rates of return calculated here, the issue is not whether there is imperfect competition in the labour market but whether these imperfections are significant enough to invalidate the social internal rate of return calculations. With no data on the marginal revenue product of nursing labour, the social internal rates of return presented here would appear to be the best possible, given available information.

Thirdly, using the data from the BHPS cross-sectional analysis the inference is that the return to nursing is some 40% higher than to female workers generally. High rates of return (though not as high) are also obtained using the internal rate of return method. These results imply that there are financial incentives to becoming a nurse. However, clearly there may be other, non-pecuniary, reasons why an individual may choose to invest or not to invest in human capital in this way. In the context of the nursing labour market, an individual may choose to become a nurse for reasons other than potential earnings capacity. However, rather than being a criticism of the methods used here, in the context of nursing this may be used to shed some light on reasons why vacancies in the labour market for nurses persist. If returns to nursing are comparable with those in other occupations and yet vacancies exist this would imply that nurses' earnings have little impact on the decision to choose not to become a nurse. Instead, other factors are affecting the decision to participate in nurse training which should be addressed. For example, in a survey of 2,483 out-of service nurses, midwives and health visitors who had returned to the profession who were asked what item would make the greatest difference in encouraging or enabling them to return to the profession, 'better pay' was chosen by 6% of respondents. <sup>[29]</sup> This was the fifth most important item across all respondents after 'greater availability of part-time work, more flexible working hours or job sharing' (14%), 'refresher courses including updating in recent developments' (13%), 'less bureaucracy and more contact with patients' (9%) and 'opportunities to acquaint or reacquaint yourself with nursing or health visiting before making a long term commitment' (7%). The results of this study would seem to indicate that factors such as these other than earnings should be addressed to reduce current vacancies in the labour market for nurses.

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