THE LABOR SUPPLY DECISIONS OF NURSES IN GREAT BRITAIN

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ABSTRACT

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The Labor Supply Decisions of Nurses in Great Britain

This thesis examines the nursing labor market in Great Britain. It describes the components of supply and demand, their interaction, and the dominant role of supply in the market. It also gives a detailed accounting of the conditions of employment for nurses, their training arrangements, and the system by which their pay is determined. Following this discussion, two types of supply models are estimated. The first is a static model which uses data from the Women and Employment Survey to explain two dimensions of supply at a particular point in time: participation and hours of work; discontinuities in the supply function are also discussed.

The second is a dynamic model which uses hazard functions to identify the determinants of nursing quits over time. Work history data collected from the personnel files of the John Radcliffe Hospital are the basis of this analysis and three specific quit models: to leave for another job, to leave the labor market altogether, and to leave to take up training, are estimated along with the aggregate quit function for qualified and unqualified nurses. Finally, the elasticities produced from the

supply models are used to evaluate the cost effectiveness of various policies to increase the supply of nurse labor.

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Introduction

This thesis examines the labor supply behavior of nurses.[1] This topic is of interest for several reasons. Given the rise in women's labor force participation over the last several decades and the increasing orientation of women towards careers and work, nursing provides ample material for a extensive case study of female labor supply. A substantial number of women -over half a million- are employed as nurses in the National Health Service, the NHS, and as there are several routes of entry into the profession, nursing attracts women from a wide range of educational and socio-economic backgrounds with differing attitudes towards work.

Examining the work experiences of nurses, however, is not simply an academic exercise. Via the National Health Service the Government spends a great deal of money recruiting, training and managing nurses to produce health care. Nursing salaries constitute 22% of NHS expenditure and the latest estimates for replacing the current contingent of NHS nurses is at least £4000 million (Delamothe, 1988a, 25). Thus, the supply of nurses is a national concern about which surprisingly little is known.

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1 The author of this thesis is American and the spelling of certain words, such as labor, and the use of language throughout this study generally reflect this fact.

In an effort to remedy this situation, this thesis provides a rigorous, quantitative examination of the labor supply of nurses. In particular the structure of two decisions is investigated in detail for those who have chosen nursing as a profession. They are: the decision to work in paid nursing employment at a particular point in time and the decision to leave a post, once employed. Presenting and testing models of these choices, respectively static and dynamic decisions, constitute the core of this thesis.

A number of related issues, however, must be addressed, before the discussion narrows to a study of individual choice. Both a rationale for viewing these decisions in isolation and the context in which these decisions are made must be established, particularly if the results of the analysis are to be used as a basis for policy recommendations. A comprehensive survey of the nursing labor market is thus in order.

This study begins by examining the basic structure of this market. It identifies the components of supply and demand and features of their interaction. It argues that demand for nurses, student labor (a dimension of supply), and pay can be viewed as exogenous to the market itself and

furthermore, that demand is not a dominant force in the market. Supply, rather, is the primary concern and as it is determined by nurses responding to market parameters, it is most reasonably examined as a product of individual choice. It is also a subject amenable to empirical investigation.

Before a methodology is developed for examining supply decisions, more information is needed about the context in which these decisions are made. Chapter two describes in detail the conditions under which nurses work, their training arrangements, and the method by which their pay is determined. Specifically, it provides a review of reforms in the NHS, the nation's leading nurse employer, and their effect on nurses. It also examines the structure of the profession itself -its regulatory bodies and requirements for entry- and the events which led to a Pay Review Body for Nurse's Midwives and Health Visitors being established.

Given the comprehensive market portrait provided in the first two chapters, chapter three develops a methodology for examining labor supply. It begins by reviewing the information available on nurses' labor force participation and finds that while basic participation statistics are obtainable, as well as surveys on nurses' attitudes towards work, the determinants of participation itself have not been rigorously assessed. Given the wealth of research on

women's participation in general, a methodology for such an examination is easily derived.

With this purpose in mind, the literature on female labor force participation is briefly reviewed, as well as that on labor supply behavior of nurses in the U.S.A.. The review indicates that application of a static, neoclassical model of labor force participation to this market would be useful and that a database is readily available for such work to be undertaken. It also provides a basis for comparing the behavior of nurses to that of other women.

The next chapter thus presents and estimates a probit model of labor force participation for nurses in Great Britain. The estimation procedure makes use of advanced econometric techniques, and selection bias corrected wage and hours equations are included in the model. The role of fixed costs in affecting work choices is also examined. The results indicate that, as for women in other occupations, the labor supply of nurses is primarily determined by family responsibilites and financial obligations. The fixed costs associated with employment are found to be sizeable and are identified as a significant deterrent to participation. Of note is that nurses' participation itself proves to be highly responsive to changes in the wage rate.

Chapter five returns to the literature to identify the information available on nursing turnover -essentially quits- and the issues involved in the decision to terminate employment. Although the topic has been discussed extensively in the nursing literature as a problem, little is actually known about its incidence and reliable data on the subject are scarce. It is thus established at the outset that a database needs to be assembled for examining voluntary job terminations. To provide some background information on quitting, however, the second part of the chapter reviews the economic literature on voluntary turnover to identify the factors which have been found to affect the phenomenon generally. They are assessed in relation to nursing and the foundation is laid to develop and test a model of quitting in chapter seven.

Before the model is presented, chapter six outlines the data collected to allow the quit decision to be analyzed. From the personnel records of the John Radcliffe II, the JRII, hospital in Oxford, the work histories of two groups of nurses were recorded: those taking up employment from June 1979 to June 1980 and those taking up employment from June 1984 to June 1985. Information on personal characteristics, contracts with the JRII, previous employment, nursing qualifications and general educational qualifications was coded and computerized as was the length of time they spent in post, their reason for leaving, and their anticipated

destination on departure. Qualified nurses in the sample were likely to be young, single and registered, while unqualified were more likely to be older and married. Nurses, on the whole, remained in their posts for relatively short periods, as the median duration of employment was less than two years, and they were likely to quit for one of three reasons: to take up another job, to take up training, or to move out of the labor market altogether.

Chapter seven extends the wage comparison model of chapter four to investigate the decision to quit over time. After employment is accepted, quits result in any period if the value of time spent in alternative states, working in another job or in nonmarket activities, exceeds that of the current post. Thus, conditional probability models, or more specifically hazard functions, which focus on the likelihood of quitting, can be used to determine the likely duration of employment for nurses. Models of quitting for those who leave their posts for other jobs, for training, and for non-participation are estimated. The results indicate that changes in labor market conditions, personal circumstances, and in the nursing wage all significantly affect the duration of employment for nurses.

Chapter eight draws together the findings of the first seven chapters and uses the results from the supply models of chapters four and seven to evaluate four policies to

increase the supply of nurse labor. They are: expanding the numbers trained, increasing the nursing wage, offering a childcare subsidy, and the use of overtime. Supply augmenting policies are focused on as the demographic changes taking place and the increasing competition for female labor has made securing an adequate nursing workforce a growing concern for most Regions. Based on extant cost estimates and the elasticities presented here, policies which offer childcare subsidies or general pay increases prove to be the most cost effective methods of increasing the supply of nurses.

Chapter One

The Nursing Labor Market

Introduction

This chapter outlines the demand and supply mechanisms operating in the nursing labor market. During the last two decades, this market has undergone substantial change as restructuring in both the National Health Service, which employs over 85% of English nurses, and in the regulatory bodies of the nursing profession itself, have occurred. Furthermore, the employment opportunities for nurses outside the NHS have grown as both the service sector which predominantly employs women has expanded and the private health care sector, a new nursing employer, began to flourish in the mid 1980s.

Before these changes and their effects on nurses can be analyzed, the unusual structure of the market itself must be understood. This chapter describes the composition of the nursing labor market by looking at in turn demand, supply, and their interaction. Supply is found to be the dominant market force and the chapter concludes by outlining the supply issues to be investigated in the remainder of this study.

I. Demand

Most nurses are employed in some capacity- in hospitals or in the community- by the National Health Service.[1] The NHS provides health care for England and nurse labor is an important input in the production of this commmodity. Essentially, the demand for nurses is a derived demand from that for healthcare. While these concepts and their relationships appear straightforward, they belie the difficulty of analyzing and actually deriving either amount.

The difficulty here is twofold. First of note is that calculating a demand function for health care is a challenging proposition under any circumstances; however, it is an undertaking complicated by the system of health care provision in England. The second stumbling block is identifying and quantifying the role of nurses in producing this good. Both these issues are discussed below.

The demand for a good is conventionally expressed as a function of its price. While the demand for health care can, in theory, be similarly represented, measuring this

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1 Throughout this thesis the term nurse refers to qualified and unqualified women working in nursing or, if they are not working, who consider themselves to be nurses. As they classify themselves as a separate occupational group, midwives are not included in the analysis. Student and pupil nurses are also excluded for reasons discussed in section II of this chapter, although training arrangements for nurses are discussed in chapter two, section II.

quantity is extremely difficult. Health care is a heterogenous commodity, encapsulating a wide variety of products and services and it is desired and consumed by individuals to produce health. What is noteworthy about this demand chain is that individuals seldom know what the appropriate health care inputs are, to achieve the health outcome, and they are dependent on doctors -the suppliers of care- to identify them.

The doctor/patient transaction is an example of the well known principal-agent relationship which arises in a market where serious information asymmetries exist.[2] While this relationship raises a number of questions concerning the appropriate guarantees for patient/consumer welfare, the by-product important to note for this discussion is the effect suppliers have on the demand for care; it is potentially supply induced. Given this possible distortion and the general lack of consumer knowledge, it is difficult to see how a pure demand for health care can ever be identified.

Despite these difficulties, attempts have been made to model this magnitude. For instance, Grossman (1972) presents a model which examines the factors affecting health care investments over the lifecycle. Later empirical work in this area investigates the responsiveness of demand for care

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2 See Vickers and Yarrow (1988) for a discussion of this relationship. For a more recent review of these issues in relation to health care, see McGuire et al. (1988 and 1989).

to changes in its price. While the findings concerning elasticity of expenditure on health care are mixed, it is important to note that these models actually investigate utilization rather than health care demand.[3] Even with its shortcomings, it is not possible to apply this methodology to study health care demand in England.

Unlike most goods, the price and consumption of health care are separated at the point of treatment in the English system of delivery. Established in 1948, the NHS was designed to provide care as needed and although the system is funded by general taxation and National Insurance contributions, care is delivered free of charge when required. This needs based provision has definite repercussions concerning the amount demanded by the population and that ultimately available for consumption.

People want to be healthy and the demand for health care as a free good is theoretically infinite. It is also difficult to control expenditure as health care is one case in which more can always be spent attempting to find ways to make people healthier, to make them live longer and so on. Supply, however, is clearly limited due to the finite nature of national resources and at present there is general agreement that a quantum of care should be readily and freely available, although technological advances in

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3 This point is made in McGuire et al. (1988); see Besley (1989) for a review of this work.

medicine and increasing awareness of health matters set off frequent reassessments about this amount. Access to the available care is regulated by general practitioners.

Thus, even if it could be measured, to a large degree it is not needs-based demand interacting with supply which determines the amount of health care consumed in England. Public opinion is influential in the matter, but the amount of health care actually available is the result of a political decision taken by the government. Through a complex process of negotiation between departments, the Treasury decides what percentage of limited national resources to allocate to the NHS and hence, how much health care to supply.

This decision process could be modelled in several ways. If objective, agreed on standards of provision existed, such as population to bed and staff to bed ratios, the amount of health care supplied could be represented as a function of population growth and the other factors on which provision is based. Several attempts have been made to establish such standards for provision in England, but they have never been statutorily binding and provision targets are abandoned when financial constraints bite.[4]

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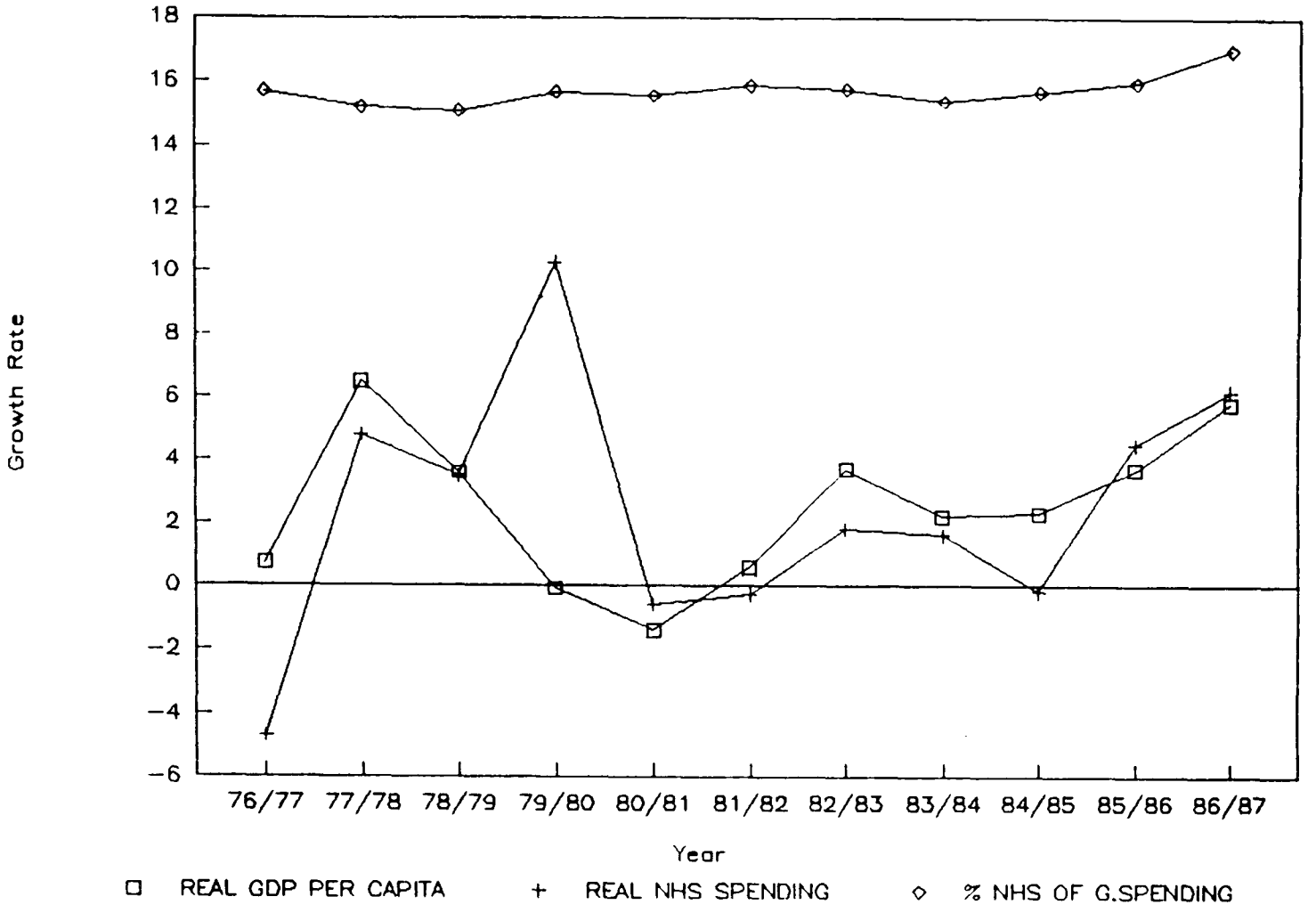
4 See discussion in *Establishing Priorities for Health Care Delivery in England* (DHSS, 1976b).

An alternative approach is to view health care as a component of an aggregate social welfare function and the amount supplied as part of a grand maximization scheme. Smith (1980) models the demand for military expenditure in this way. Adopting a similar approach, Dunne et al. (1984) present a model in which the allocation of resources between programs is the result of a dynamic optimization process constrained by resources, costs, indices of need, and bureacratic inertia. Finally, a bargaining model in which expenditure allocations reflect the strengths of Whitehall agents is another possibility.

While all these suggestions raise interesting questions, addressing the issues surrounding resource allocation takes the discussion far afield of the topic at hand: the nursing labor market. Furthermore, identifying the process by which the Government's decision is made does not change the fact that the allocation is a parameter to which the actors in the nursing labor market respond.

Figure 1.1 provides some basic information on health care spending by various Governments and on economic growth over time.

Figure 1.1: The Growth Rate of Real GDP Per Capita and of Real Expenditure on the NHS, and the Percent of of the Government's Budget Spent on the NHS in the U.K. from 1977 to 1987.



Source: *The Annual Abstract of Statistics* (1989), tables: 2.1, 3.3, 14.1, 16.4, 18.5.

The growth rate of real GDP per capita and of real spending on the NHS are shown in the figure above along with the percent of total Government expenditure accounted for by the Health Service. With the exception of two years, the growth rate of GDP per capita and NHS expenditure have followed the same course, while NHS expenditure as a percent of the total Government budget has remained remarkably constant, at just under 16% for most of the ten year period. These figures

suggest that the health care budget is most strongly tied to economic performance, which influences all of Government spending, rather than to the bargaining power of the Minister of Health within the Government.

Even if health care could be treated as a conventional good, the theories which outline relationships between production inputs and final products, which potentially apply to nurse labor and health care, shed little light on calculating the demand for nurses. In a competitive environment the demand for labor by a firm reflects the value of labors' marginal contribution to the production of the final good. The firm takes the wage as given and hires labor at the point where the wage equals the value of the marginal product. The number of nurses required by the NHS is clearly related to the amount of health care the government chooses to provide; however, this link itself is difficult to tease out.

First of note is that it is difficult to identify and to measure the nursing contribution to the production of healthcare. Neither the good itself nor the process by which it is produced is homogenous. As stated in the Briggs report (1972, 193), one of the largest studies of nursing ever undertaken:

> No satisfactory measures have yet been developed of the outputs of the NHS. Second, it is difficult to separate out the specific contribution of various inputs and grades of staff to patient care and even more difficult to weigh the contribution of patient care to a change in experience on the training of one type of staff.

While numerous studies have examined the work nurses do in detail, see Auld (1976) for example, they serve to emphasize the highly varied nature of nursing tasks rather than unexploited possibilities for standardization.

The other hitch in applying the economic prediction described above to the health care market in England is that it is not to date competitive. The NHS is a monopolist in the output market as the primary provider of care, but more importantly, it is a monopsonist in the labor market as the predominant employer of nurses. The latter point means that rather than taking wages as given and facing a horizontal labor supply curve as does a competitive firm, the monopsonist faces the industry labor supply curve which is upward sloping.

In competitive conditions a firm hires workers at the level determined by the intersection of the marginal product of labor and the wage rate. For a monopsonist, however, the marginal cost of labor is not constant and increasing the amount of labor hired means increasing the wage rate. As a

result a monopsonist hires labor such that the marginal revenue product of labor equals the wage.[5]

A labor market in which an employer exercises monopsony power has two notable features. Fewer units of labor are hired and the wage rate is lower than that which would exist under competitive conditions. Also of note is that under monopsony conditions, a report of a worker shortage may not be indicative of a market out of equilibrium or even of one functioning poorly. At the equilibrium wage rate monopsonists would like to hire more labor than workers will supply. They may therefore report vacancies suggesting a labor shortage, even though the market is in equilibrium.

Yett (1964) first applied the monopsony model to the nursing labor market in the U.S. and thus provided the seminal analysis of this sector. Following this, he and other American researchers (Yett, 1970; Sloan and Richupan, 1975; and Hurd, 1973), began to take hospitals to task on their vacancy reports, shortage claims, and subsequent calls for government intervention in the marketplace.[6]

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5 An exposition of monopsony is provided in most labor economic texts; for an example see Hammermesh and Rees (1984).

6 During the 1960s in the U.S. vacancies reported by hospitals were taken as evidence of a shortage in nursing staff which the market was failing to correct. After extensive lobbying in 1964, President Johnson signed the Nurse Training Act which allocated over $287 million for funding of nursing schools and subsidized student loans to nurses (Yett, 1970).

A number of studies in the 1970s documented the existence of monopsony and oligopsony power in the U.S. health care market (Cohen, 1972; Hurd, 1973) and the collusion in wage setting which occurs when more than one hospital is present (Link and Landon, 1975; Booten and Lane, 1985). After presenting statistics on the existence of market power, most studies use some form of a concentration variable in a regression explaining nurses' wages. Although results varied, they were generally found to reduce nursing wages, in one case up to 8% (Scheffler and Feldman, 1982).

While the monopsonistic characterization clearly applies in the U.K., its effect on nurses' employment conditions have not been rigorously analyzed. The situation, however, was discussed in the various inquiries into nurses' pay, namely the NBPI (1968) and Halsbury (1974), and recognition of it has led in part to a Pay Review Body, independent of the Government, being established for nurses.

Initially, nursing salaries were determined under the Whitley Council machinery which handled pay negotiations for all NHS workers. Beginning in the late 1960s, pay inquiries replaced Whiley negotiations and a process, theoretically immune from Government intervention, was established in the 1980s. The history of nursing pay negotiations is discussed extensively in chapter two and the evidence indicates that salaries are now set by a panel which objectively determines

what remuneration nurses should receive. The aspect of the procedure important to emphasize at this stage in the discussion is that pay is another market component determined by extra market forces.

In light of the nature of health care and the structure of the market, the questions about the demand for nurses which can feasibly be addressed are radically altered. The quantity of nurses demanded at a given price is not an informative way to look at the market as it suggests that certain conditions hold -such as the hospital knowing how many nurses are required to produce its output- which presently do not. Rather the issue is how many nurses can the service afford or attract, given the price set by the Nurses' Pay Review body and the budget set by the Government.

Having examined the features of demand, the discussion now turns to that of labor supply.

II. Supply

Nursing labor supply affords somewhat more conventional analysis. Essentially, it has two components: those nurses who are in training and those with and without qualifications who have chosen to accept paid nursing

employment. The first group are generally considered to be part of active supply as on average students spend up to 60% of their training time working on wards and they are paid hourly for their labor.[7] Considering those in training, however, raises the issue of occupational choice. This and other aspects of student supply are discussed below, while a discussion of the more conventional dimension of supply, those in employment, follows.

i. Nurse Trainees

The theory of compensating wage differentials offers an explanation of how people decide what type of work to do. On this account individuals choose an occupation based on their tastes, the training costs involved, and expected earnings over time.[8] It emphasizes that workers must be compensated for a job's characteristics, such as unsocial hours, and they must also be given the appropriate incentives for undertaking the training certain jobs require. Wages reflect these considerations and thus are the key mechanism which allocates labor in an economy. Individuals choose the occupation which brings them the most overall satisfaction in light of its costs and benefits.

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7 Although all are salaried employees of a District, the experience of student nurses varies widely. The 60% figure is that reported by the Delamothe (1988c), p. 272.
8 See Routh (1980) for an example.

A job in nursing has charcteristics which could generally be categorized as unpleasant. Tasks can be dirty, tedious, and repetitive and nurses face a substantial risk of illness due to their constant exposure to sickness; back injuries from moving patients are common in the profession (Redfern, 1978). Also of note is that nurses are often required to work varying shifts and freedom on-the-job is potentially limited as nurses are subject to supervision from three quarters: ward sisters, hospital managers, and doctors.[9]

On the other hand, there are a number of positive features associated with nursing work. Repeatedly, the satisfaction of helping others is cited as the job greatest attribute (Price Waterhouse, 1988). Of note as well is that nursing offers stable employment and jobs in the profession are most often readily available.

A substantial amount of research has been conducted on why people, mostly women, choose nursing as a profession. Although dated, the most thorough investigation in this area is by Macguire (1971). This work and research that has followed: Delamothe (1988a-c), Hutt et al. (1985), Hempstead (1988), Price Waterhouse (1988), generally indicate that

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9 As a result of the regrading exercise of 1988, ward sisters are now mostly grade G nurses. The restructuring of the profession itself is discussed in chapter two, but as the new terminology is not yet commonly used and as the data analyzed in this thesis predate regrading, the more familiar terms of ward sister, enrolled nurses etc. are employed throughout this text.

the vocational element cited above is the primary factor which attracts most women into nursing. They also indicate that those who have taken up training know little about the structure of the profession and what a career in nursing is likely to entail. A potential reflection of this is the fact that on average 21% of student nurse do not complete their training or fail to qualify (Delamothe, 1988, 26). A discussion of nurse training and its requirements takes place in chapter two.

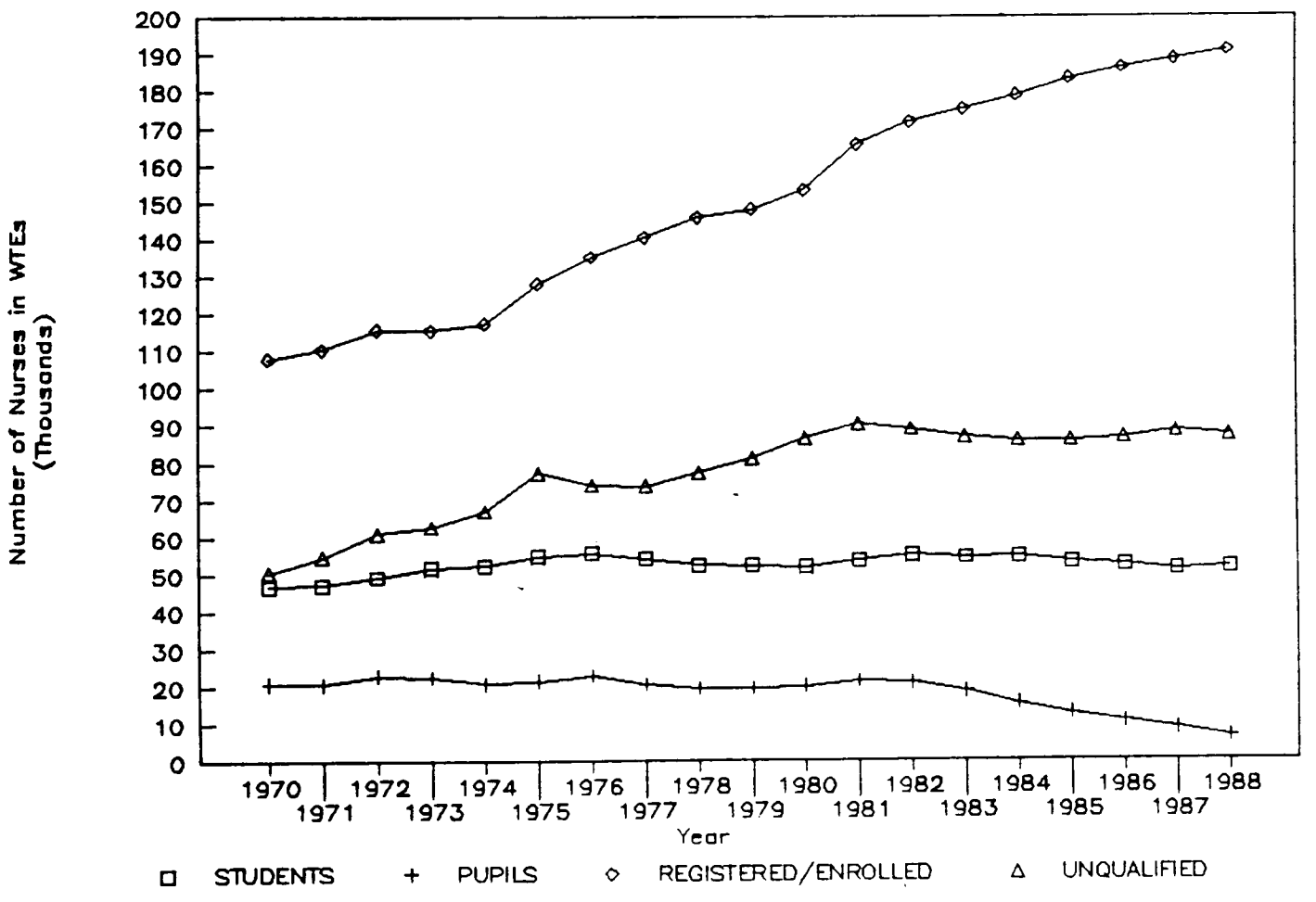
Although in theory individuals choose the type of work which maximizes utility, selecting an occupation is not necessarily a free choice. In England entry into further or higher education is highly regulated and the number of places in most training programs is limited by Government willingness to fund them. Purchasing training outright, moreover, is impossible due to borrowing constraining and the absence of mechanisms for such transactions.

As a result of these constraints, the number of nurse trainees available to contribute to the nursing labor force is potentially regulated by the government through its decisions on public expenditure. If the number of suitable applicants exceeds the number of funded places, then the budget allocation is dictating the supply of students. Alternatively, if the number of places exceeds recruits then

the optimizing behavior of individuals is determining student supply.

The whole-time equivalent, WTE, numbers of students and pupils in training, along with that of the total number of registered and enrolled nurses and of unqualified staff from 1970 to 1988 are shown in figure 1.2. Of note is that students train to registration, while pupils train to a lower standard called enrollment.

Figure 1.2: The WTE Number of Students, Pupils, Registered and Enrolled and Unqualified Nurses Employed by the NHS from 1970 to 1988



Source: *Health and Personal Social Service Statistics for England* (1974, 1979, 1982, 1990), section III.

The figure above contains two remarkable trends. The first is that after a slight increase in the early 1970s, the number of trainees employed over time has remained remarkably constant, while the second, discussed in section ii, is the dramatic rise of the number of women qualified and unqualified working in nursing. Roughly 50,000 students are at work in the Service every year, as are 20,000 pupils. The size of the latter group began to decline in the mid 1980s as a result of a decision, approved formally in 1989, to discontinue pupil training altogether. This reform is part of Project 2000, an extensive package to restructure the entire system of nurse education. It is an open question as to whether an additional number of students will be taken on to replace pupils, but what is clear is that the Service has been operating for the last twenty years with a fairly constant inflow of student labor.

The stability of the figures, furthermore, suggests that it is Government expenditure which is determining student numbers, as it is unlikely that individual selection alone would have produced such a steady stream of entrants over time, but it is impossible to make a definite assessment without additional information. The latest educational reforms do aim to improve data collection in the area of nurse training and information on the number of applications to nursing schools, the difference between posts funded and

posts filled, and changes in the number of funded posts over time is now being recorded (Waite and Hutt, 1987). When reliable time-series data are available, modelling the choice of nursing as a profession would clearly be a useful exercise.

The other striking aspect of figure 1.1, noted above, is the sustained growth in the number of registered and enrolled nurses employed as well as that of unqualified nurses over the period. Consideration of this trend leads into discussion of the second and most important source of labor to the market: that of qualified and unqualified nurses who choose to work in paid nursing employment.

ii. The Supply of Qualified and Unqualifed Nurses

The figure above indicates that the supply of working nurses has risen dramatically over the last twenty years, particularly that of the qualified nurses. Although this trend has received little attention to date, there are two mechanisms by which such an increase could come about.[10] The first is a rise in the flow of women into nursing as either those working in other occupations changed jobs or as

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10 The National Audit Office (1985) issued a report which criticized the sustained rise in staff numbers as excessive and called on managers to review their staffing levels. Adequate staffing levels are a very thorny issue in nursing and are discussed in section I of chapter two.

nurses who were out of the labor market took up employment. The second is a decline in outflow of nurses from employment.

Labor supply theory holds that supply in its simplest form can be expressed as a function of the wage. When deciding whether or not to work, nurses compare the value of their time in the market, their potential wage, with that of time spent out of the labor force. If the former exceeds the latter, they join the workforce; otherwise, they do not. When accepting employment, furthermore, nurses choose the best wage on offer. Thus, both inflows into and outflows from the profession which determine the supply of nurses available to produce health care critically depend on the wage rate.

Based on the WTE numbers alone, the force or forces which have brought about the rise, documented in figure 1.2, cannot be identified. However, given the substantial growth in general female labor force participation over this period and the fact that the Department of Health has consistently reported an outflow of 10% a year, it is likely that the increase is due to expanding inflows rather than reduced outflows.[11]

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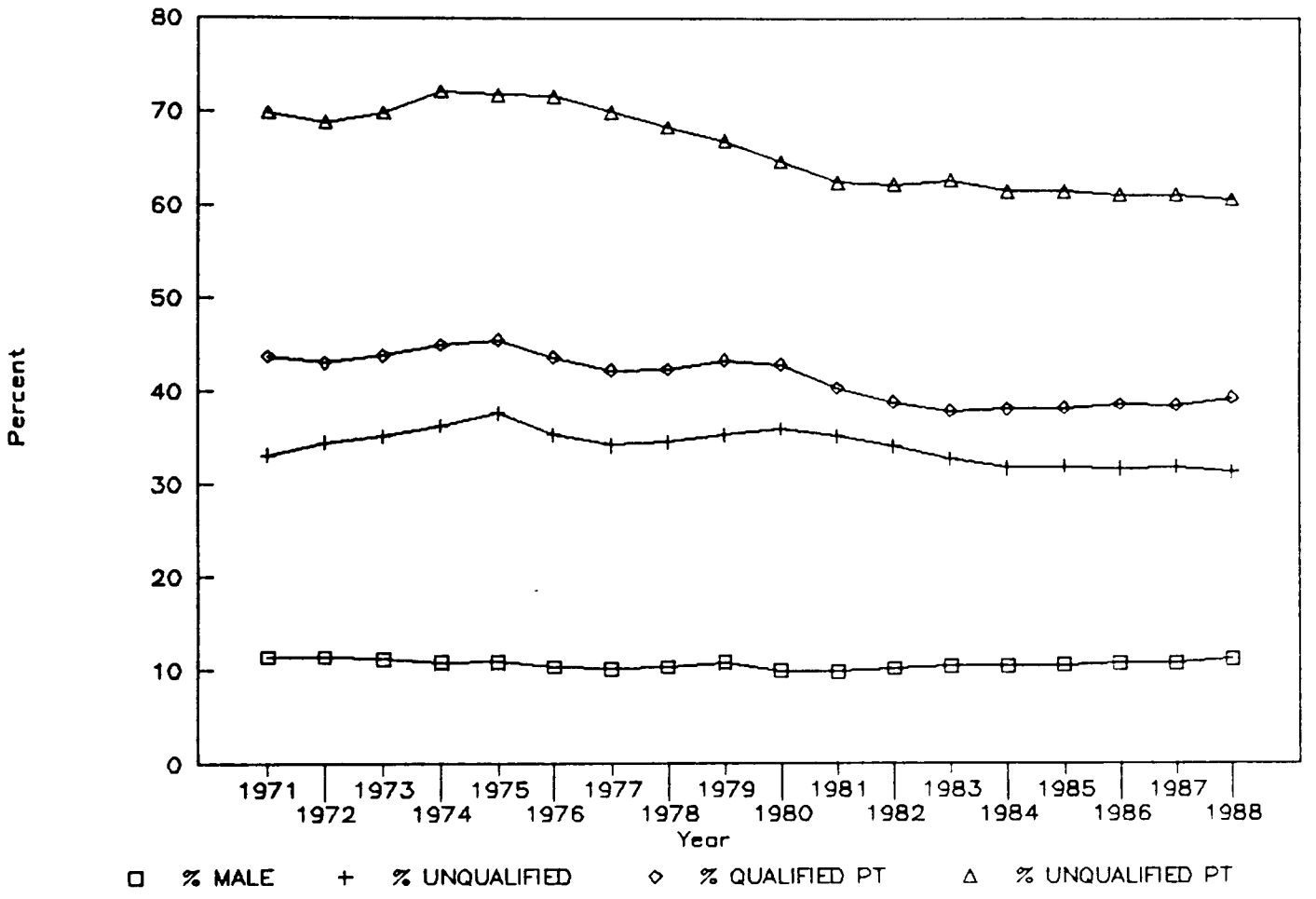
11 Joshi et al. (1985) report an 8% rise in female labor force participation during the 1970s, while the *General Household Survey* (1989) indicates a 4% rise during the 1980s. The Department of Health's historic nursing wastage rate is reported in the *Fourth Report on Nursing Staff, Midwives and Health Visitors*, (1984), p. 4.

Several other features of supply are worth noting as well. Figure 1.3 shows the percent of all nurses who are male, the percent of WTE nurses who are unqualified, the percent of all qualified nurses who work part-time, and the percent of unqualified nurses who work part-time.

Figure 1.3: The Percent Male, the Percent Unqualified, the Percent of Qualified Part-timers and the Percent of Unqualified Part-timers in the NHS in England from 1971 to 1988.



Source: *Health and Personal Social Service Statistics for England* (1974, 1979, 1982, 1990), section III.

As shown in figure 1.3, the percent of the nursing workforce which is male has remained notably constant over the last two decades. After rising for the first four years, the

percent of total WTEs who were unqualified steadily declined as did the number of part-timers, both qualified and unqualifed. Together these trends indicate that the Health Service has increased the human capital in its workforce as well as reduced the incidence of part-time employment.

With the components of supply now identified, the forces operating in the market can be summarized.

III. The Interaction of Supply and Demand

The three key elements in the demand for nurses identified in the discussion above are: the amount of healthcare to be provided, a function of funding, the budget allocation for nurses' salaries, and the average wage per nurse, set by the Review Body or by independent inquiries for the last ten years. Supply, on the other hand, is comprised of those currently in training and those who have chosen to work and is a function of the wage.

Given this description of the market's features, it is now useful to examine the possible interactions between supply and demand.[12] These ideas are presented graphically in figure 1.4.

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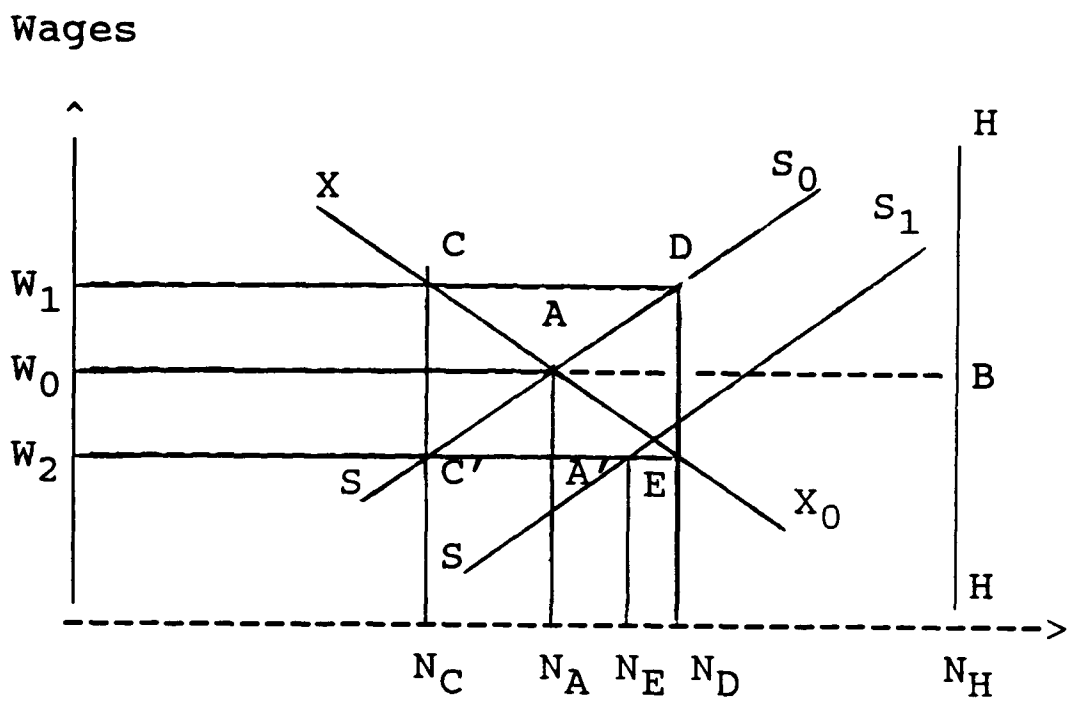
12 Zabalza (1976) presents a similar analysis of the market for teachers.

For this discussion a target amount of health care, Q, can be defined which represents the ideal amount of care to be provided if standards could be agreed on and costs were of no concern; HH is the number of nurses required to meet Q. XX_0 is the isoexpenditure curve along which the actual budget constraint set by the Government is met; it shows the tradeoff between hiring a smaller number of nurses at higher pay with presumably more skills versus a larger number of less skilled nurses earning lower pay.

Concerning supply, if the number of trainees is assumed to be constant, the number of nurses who accept paid nursing employment at various wage levels can be represented by SS. In the diagram the number of trainees is greater in SS_1 than in SS_0. Similarly, a rightward shift of XX_o would indicate that the budget for nursing salaries had increased. Adding bargained wage levels to figure 1.4 reveals possible states of this market and their dependence on wages.

Figure 1.4: Interactions of Supply and Demand in the Nursing Labor Market



Assume the wage level is set at w_0 by the Nurses' Pay Review Body. Given XX_0 and SS_0, the market is in equilibrium and clears at point A and the number of nurses in paid employment is N_a, although even in equilibrium there is a "target shortage" of AB. It seems that this is the type of shortage that many refer to when they claim that a shortage of nurses exists (RCN, 1984).

Alternatively, if the wage equals w_1, N_c nurses are demanded and hired, while N_d nurses are supplied and an oversupply of CD results. Another possibility is a wage value of w_2. This value produces an allocation shortage of C'E as N_e

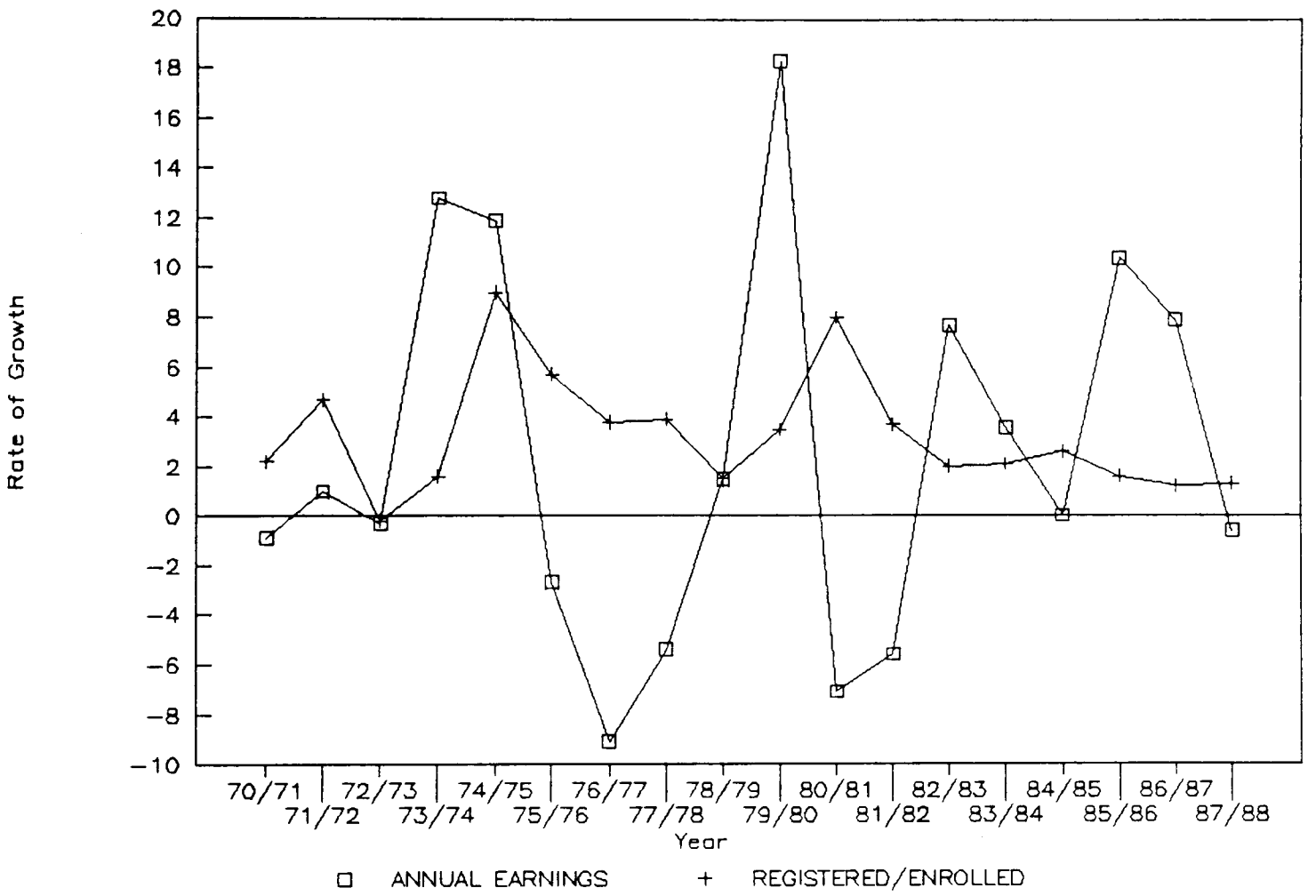
nurses are demanded but N_c are supplied. Of note is that part of this shortage, C'A', is generated through wage inflexibility.

Given that shortages are a frequent concern of policy makers, it is worth noting the options available to redress such an imbalance. Essentially, there are three. If the government believes that the labor supply of nurses is elastic, it can negotiate wage increases, thereby increasing expenditure and securing a greater supply of working nurses from those already trained. Alternatively, it can attempt to reduce outflow of those in post or it could try to increase the level of nurse trainees. Under the latter policy, SS_0 would shift to SS_1 and a new level of employment at N_e would be established with the shortage much reduced.

What the above discussion makes clear, however, is that for any given pair of XX and SS curves, the wage level is critical in determining the market regime. If w is set by the Nurses' Pay Review body at a level below the constrained equilibirum wage, w_a in the above diagram, the supply curve dictates what the resulting level of employment is. On the other hand, if w is set at a level above w_a, the demand curve is the constraining factor, and government expenditure levels determine how many nurses are employed.

At this stage it is useful to look at some statistics to see if they provide any indication of the actual state of the market. Several groups of figures will be discussed: the number of registered and enrolled nursing staff employed, the real annual earnings of staff nurses, the unemployment rate for nurses and involuntary job terminations. Pay and staff numbers are discussed first and time series information on both values is provided in figure 1.5.

Figure 1.5: The Growth of Registered and Enrolled Nursing WTEs and the Growth of Annual Earnings of Staff Nurses from 1970-1988[13]



13 Staff numbers are taken from *Health and Personal Social Service Statistics*, (1974, 1979, 1982, 1990). Pay data for Staff Nurses is in 1988 prices and the figures for 1970-78 were provided by A. Gray, while those for 1979-88 were generated from hourly base pay data provided by the Oxford District Health Authority plus a percentage for overtime and shift work as reported in the *New Earnings Survey* for the relevant years.

Figure 1.5 shows the growth rate of earnings of staff nurses and of the number of WTE enrolled and registered nurses employed over the last two decades. As previously suggested, growth in WTEs has been predominantly positive throughout the period, with the exception of 1972/73 when no growth occurred, and it appears to have settled at a lower rate since 1982. Growth in real pay, on the other hand, has fluctuated dramatically. It rose to record levels during years when pay was independently reviewed, such as 1973/74 and 1979/80, and it has stabilized somewhat since 1983 when the Pay Review Body for Nurses, Midwives and Health Visitors was established.[14]

While both sets of figures are of interest in themselves, they cannot identify the equilibrium market-clearing wage rate, w_a, and level of employment, N_a. Looking at how these values move in relation to each other, however, does provide an indication of the state of the market. For instance, wages and employment rising together suggest that the bargained wage is below w_a and that the supply curve is determining the observed level of employment, while a period of falling pay and rising employment suggests that the current wage level is above w_a and that the demand curve is the constraining limit on employment.

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14 The history of nursing pay negotiations is discussed in chapter two, section III.

While figure 1.5 shows the growth rates of both values, it clearly suggests that it is the supply curve in nursing which dominates the market. For most of the last two decades, the rate of expansion in supply is dictated by rate of growth in earnings in the current or previous period. In each instance a substantial increase in supply is preceeded by a substantial increase in pay. This suggests that larger amounts of labor are purchased through higher wage levels and thus that supply constraints dominate the market, a factor which places heightened emphasis on the need to understand the labor supply behavior of nurses. Thus, even in a monopsonistic market, the predominant employer, the NHS, has little influence in the entry and exit decisions of a critically important production input as it does not directly control the wage.

Other evidence also supports the argument that the market is not one driven by fluctuations in demand. Nursing generally is characterized as a profession offering secure, stable employment, while data on unemployment rates for nurses and dismissals and redundancies in the profession also indicate it is a market dominated by supply.[15]

From the annual *Labor Force Survey*, the unemployment rates of those holding nursing qualifications versus those that do not can be calculated for various years.

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15 See the *First Report on Nursing Staff, Midwives, and Health Visitors*, (1984).

Table 1.1: The Unemployment Rates of Women With and Without Nursing Qualifications from 1983-1988

Year	With Qualification	Without Qualification
1983	4.7%	8.8%
1984	5.2%	9.6%
1985	5.0%	8.3%
1986	4.8%	8.7%
1987	3.0%	7.8%

Source: Institute for Economic Research (1990), section III, tables 1(a) and 1(b).

The figures in table 1.1 clearly indicate that qualified nurses experience substantially less unemployment than other women and imply that finding a nursing job is not a difficult task.

Data collected recently by the Department of Health attest to the security offered by nursing employment. Since 1987, the Department has requested that each District and Region record why nurses in their employment leave their posts. While coding problems make parts of the survey unreliable, the information on redundancies and dismissals is held to be accurate.[16] From this survey, known as KM46, 640 nurses out of over half a million in employment were made redundant in the year ending March of 1989, while 880 were fired. The numbers for the year ending 1988 are even smaller in both

16 This claim is based on conversations between the author and various regional human resource managers throughout the country who oversee the completion of the survey forms.

categories. These figures underline the degree to which time spent in post is the result of individual choice.

Another potential indicator of market conditions are vacancy data. However, data on nursing vacancies are known to be misleading, as compounding the usual enumeration difficulties, Districts often report posts as vacant, which they have no intention of filling due to a lack of funding. Futhermore, vacancy surveys often give no indication concerning the length of time the post has remained unfilled.[17]

Once established, the Pay Review Body set out to rectify this situation and instituted its own yearly vacancy survey of posts unfilled for a minimum of three months for lack of a suitable applicant. Reliable vacancy data are thus only available since 1985 and based on the findings of the Review Body, the overall vacancy rate for the Service has fluctuated between 3% and 5% over the last four years. Vacancy rates, however, vary dramatically by Region and by specialty, with London and the southeast generally finding it more difficult to attract than other regions.

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17 See the *First Report on Nursing Staff, Midwives, and Health Visitors*, (1984).

V. Conclusions

Given that nursing jobs are routinely available, that redundancies are rare, and that the remuneration level set by the Pay Review Body appears to be slightly below the constrained equilibrium wage, the amount of labor supplied by nurses in Great Britain, in terms of when to work and how long to remain in a post, is clearly the result of individual choice. Investigating work decisions at the micro level is thus the most sensible way to gain knowledge about the nursing labor market.

In the 1970s, nursing employment expanded via substantial pay increases and while the market in the 1980s appears to be adjusting to a more predictable pay regime and lower employment growth, human resource managers in the Health Service are extremely worried about the potential effects of demographic changes on the demand for and supply of nurse labor. Developments in the general labor market are a source of concern as well.

Based on demographic projections, a dramatic change in the age structure of the population is expected to occur over the next decade. While the total population of Britain is is projected to grow by only 4% from its mid 1985 level to the year 2000, the number of people age 75 and over is

expected to increase by 21%. This group, furthermore, has the highest out-patient and accident and emergency attendance rates of any age cohort and thus the change in age structure is highly likely to produce a tremendous rise in the demand for health care.[18]

The second demographic trend of interest is the decline in the number of eighteen year olds potentially available for employment in the first half of the 1990s. The Health Service is the nation's largest recruiter of those leaving school with at least five O levels and two A levels. To maintain its intake in terms of numbers hired, the NHS will have to attract 33% of this pool in 1992 (Delamothe, 1988a, 27). Given growing competition from other employers and the financial constraints under which the Service operates, this is believed to be an unattainable target.

Along with the anticipated changes in demography, increasing competition from the private health care sector for nurse labor and from the service sector for female labor generally have highlighted the need for a new supply policy. Between 1982 and 1986 the number of private hospitals, nursing homes, and clinics registered with District Health Authorities increased by 78.6%. Growth in the private hospital sector is expected to continue, while close to half

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18 See Conroy and Stidston (1988) for a discussion of these issues.

a million new jobs in the service sector are expected to be created between 1988 and 1993.[19]

Understanding this market by investigating nurses' behavior is clearly not only a matter of interest for labor or health economists as it also provides insight into the volatile events of the 1970s as well as identifying the most effective means by which to address the supply problems expected to arise in the 1990s. Two aspects of supply, participation in the nursing labor market and the decision to quit, are examined in the following chapters. Of note is that these investigations provide a great deal of information about a number of issues related to supply, such as the type of job moves nurses make, differences in the behavior of qualified and unqualified nurses, and the mechanisms by which NHS employers can affect nurses' work decisions. However, before examining specific aspects of supply, an expanded discussion of some features of the nursing labor market are in order. These are: the role of nurses within the Health Service, arrangements for training, and pay determination.

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19 See *Regional Trends* (1989), p. 86 and again, Conroy and Stidston (1988).

Chapter Two

Pay and Conditions of Employment for Nurses

Introduction

Having outlined the market's basic structure, this chapter looks in greater detail at nurses' pay and their conditions of employment over time. Both are important as they influence individual's labor supply decisions and in order to identify the nature of these effects, three major areas: the structure of the National Health Service, the educational and training requirements for nurses, and the methods of pay determination are discussed as well as the statutory changes in them over time. The Health Service and its reforms are reviewed first.

I. The National Health Service

While a comprehensive examination of NHS and its reforms is beyond the scope of this paper, an outline of the structure of the Service and the alterations to it are necessary for understanding the environment in which nurses work and their role within the NHS. A timetable of the events in the Service's history which have most affected nurses are set out in table 2.1.

Table 2.1: NHS Acts and Reforms Relevant to Nursing

Year	Description of Event
1948	National Health Service Established
1952	Report of the Bradbeer Committee on Hospital Administration
1956	Report of the Guillebaud Committee on NHS Expenditure
1966	Salmon Report on Senior Nursing Staff Structure
1969	Mayston Report on the Senior Nursing Staff Structure for Nurses in the Community
1972	NHS Reorganization I: Unified the Provision of Care and Created Area Health Authorities, AHAs Briggs Report on the Nursing Profession
1976	First Report of the Regional Allocation Working Party
1976	The Royal Commission on the NHS
1979	NHS Reorganization II: Decentralized Provision and Created District Health Authorities, DHAs
1981	The Korner Report on Establishing a Health Service Information System
1983	The Griffiths' Enquiry into NHS Management
1988	The Thatcher Government's Reforms

i. The Formation of the NHS

When the NHS was established in 1948, the government undertook the enormous task of providing health care for the nation. Three features of its founding are particularly noteworthy. The first is that the cost and the scale of this exercise were grossly underestimated. The NHS overspent its intial budget by one third and continued to make increasing demands on national resources. Real spending on the NHS rose by 13% from 1950 to 1958 and by 26% over the next ten years (Klein, 1983, 67). Controlling expenditure was proving difficult as was providing reliable cost estimates. Heightened public expectations about care, the shift to costlier

high-tech treatments, the variable wage bill, and the inability of the government to control referrals all exacerbated the difficulty of the task.[1]

The second is that Government was not founding a well-planned health service from scratch, but rather was taking charge of existing hospitals and staff with their own standards, practices, and problems. The Government took control of nearly 3200 hospitals and while the intent was to organize a new system which standardized care and distributed it equitably across the country, the resources required to transform the inheritance never materialized.[2] The regional inequalities of the old system were thus mirrored in the new, and serious efforts at changing the distribution of care did not get underway until the establishment of the Resource Allocation Working Party, RAWP, in 1975.

Of final note is that in the inital stages, health care provision was fragmented as Local Authorities controlled community services, such as ambulances, while independent Family Practitioner Committees governed general practice and the NHS ran hospitals. As a result national care schemes, authored by the Service, were somewhat incomplete as important aspects of provision were outside its domain. Also, this division of responsibility meant

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1 These issues are regularly discussed in the numerous histories of the National Health Service; see Klein (1983) or Levitt (1979) for examples.
2 See Gray (unpublished) Table 9.

that the NHS and its approach to care were hospital based.[3]

The Health Service was thus born with several weaknesses which have plagued it throughout its life. It was underfunded in relation to its declared goals of providing care on demand across the country and it lacked both the statutory authority and the resources to develop a rational system of delivery for England. The NHS essentially spent its first twenty years organizing its inheritance and learning to deliver health care in the existing market. Having examined the context in which the NHS was created, the discussion now turns to the specific structure of the Service and, in particular, the role of nurses within the NHS.

ii. The Initial Structure of the Service

England was divided into nine regions and within these areas hospitals were grouped and run by Local Management Committees. During the 1950s and 1960s extensive guidelines concerning hospital organization, service provision, patient welfare, and capital expenditure were issued. Although they addressed general problems in the Service, two reports had important repercussions for the nursing profession: the Bradbeer Report (1952) and the

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3 The interest in community based care has arisen in the last five to ten years; for example see the Cumberlege Report (1984).

Guillebaud Report (1956).[4] The first defined the role nurses would play in hospital governance, while the second revised expectations about what the Service they worked in would actually provide.

The Bradbeer report focused on the internal administration of hospitals. In this document the Committee outlined a tripartite administrative structure in which doctors, nurses, and administrators ran their respective departments and shared equally in authority within the hospital. Nurses were thus given a great deal of power in a plan of consensual hospital management.

The Guillebaud Report of 1956 is the second report of interest. It examined costs within the NHS in view of the increasing demands it was making on public resources. Its findings introduced a new realism concerning how much care the Service could be expected to provide. Foremost the Committee stressed that meeting public demand was not a realistic goal. The report stated that at current funding levels the NHS could not meet every demand which was justifiable on medical grounds and that considerable expenditure would be required to make this possible.[5] It concluded that the aim must be to provide the best possible service within the limits of available resources and while the Committee felt that it was too early to

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4 Throughout this chapter committees are referred to by the chairperson's name as is the convention in this literature. The formal titles of the reports can be found in the bibliography.
5 The Committee's findings are discussed in *Hospital and Health Services Yearbook* (1989), Summaries of Reports.

recommend structural changes to the system, it recognized the absence of a long-term national health care plan as the fundamental weakness in the system.

iii. Nursing Reforms

While the first two reports affected nurses indirectly, the Salmon Report of 1966 on senior nursing staff structure was aimed at the nursing profession alone. Nursing was in general disarray as no clear professional structure existed, and given the mixed origins of NHS hospitals, a great deal of confusion existed over job titles and responsibilites. For instance, no distinction was made between a matron who was responsible for a dozen wards and a thousand beds and one overseeing one ward with ten beds.

Appointed in 1963 by the Minister of Health, the Salmon Committee's remit was to provide a coherent staff structure and to increase the management skills of nurse administrators to enable them to take an active role in hospital decision-making as described in the Bradbeer report. Based on extensive surveys, the Committee provided job descriptions for over 200 staff grades and divided them into ten groups based on their responsibilities.

The recommended organization was as follows.

Table 2.2: The Salmon Structure for the Nursing Profession

Grade	Title	Former Title
10	Chief Nursing Officer	Chief Nursing Officer
9	Principal Nursing Officer	Principal Matron or Tutor
8	Senior Nursing Officer	Senior Matron or Tutor Senior Midwifery Teacher
7	Nursing Officer	Matron, Tutor, Midwifery Tutor
6	Charge Nurse	Ward Sister, Section Sister, Midwifery Sister, Charge Nurse
5	Staff Nurse	Staff Nurse or Midwife
4	Enrolled Nurse	Enrolled Nurse
3	Student Nurse	Student Nurse
2	Pupil Nurse	Pupil Nurse
1	Nursing Auxiliary	Auxiliary, Assistant

Grades nine and ten were responsible for formulating policy and were referred to as the "top management". Middle managers were nurses in grades seven and eight who were responsible for directing policy, while grades six and below were "first-line" managers who carried policy out. Note that nurse tutors and midwives were also included in the structure.

The report further recommended that a National Nurse Staffing Committee be set up to organize management courses for nurse administrators. While the Committee recognized that introducing the new structure would be a complicated process, estimated to take up to ten years, they stressed that Chief Nursing Officers should be

appointed as soon as possible to begin work organizing nursing staff and taking part in hospital governance.

Also of note is that, at this point in time, community nursing was under the direction of Local Authorities and thus not covered by the Salmon report. It was examined in a later study and subsequently restructured to conform to the Salmon scheme.[6]

While Salmon examined management, the next major inquiry into the nursing reviewed the nuts and bolts of the profession. In June of 1970 Asa Briggs was appointed by the Secretary of State for Social Services to head a committee to investigate the general state of affairs in nursing and more importantly, to prepare the profession for the imminent reorganization of the National Health Service. The Committee's specific remit was "to review the role of nurse and midwife in the hospital and community and the education and training required for that role so that the best use of available manpower is made to meet the present needs of an integrated Health Service" (Briggs, 1972, 4).

At the start of the inquiry, the Committee noted the lack of information available on important aspects of nursing such as recruitment, staff turnover, long-term vacancies and the training courses available for nurses. It thus

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6 See the *Report of the Working Party on Management Structure in the Local Authority Nursing Service*, also known as the Mayston Report, (1969).

sponsored five in-depth surveys for their review: 1) of qualified nurses currently employed by the NHS and local authorities, 2) of qualified nurses not currently practicing, 3) of expenditure on nurse recruitment, 4) of the experiences of qualified nurses overseas, and 5) of the regulation and availability of nonstatutory post-basic clinical courses. They also examined written and oral evidence from over 400 individuals and organizations. Based on their findings, the Committee recommended extensive alterations for several areas of nursing. Those concerning manpower and the career structure of nursing are discussed below.

Briggs wholeheartedly supported the pending integration of community nursing, currently under Local Authority control, and hospital nursing under the National Health Service. The Committee believed that this unification should be mirrored in the internal organization of the profession and recommended the creation of a single body which would be responsible for setting professional standards and training requirements and for the discipline of all nurses in the U.K.; it was envisaged that a National Board would carry out the governing body's policies within England.

They also recommended the establishment of manpower and personnel departments at the regional and area levels to ensure efficient deployment of current staff and to plan for future staffing needs. They noted that many

hospitals had never studied staffing needs nor had they made any determination of the number of nurses they ideally required and how this compared to the current number of staff in post. They recognized that a major constraint on conducting such an evaluation was the lack of manpower data and they acknowledged that the creation of a comprehensive health information system, on which manpower planning could be based, was indispensable if the proposed personnel departments were to be effective. They also noted that this information system should be designed to serve both the needs of finance officers and those involved with hospital staffing.[7]

Recognizing that changes in staff planning could not take place overnight, they made several recommendations concerning current practices. They stressed the need for better job descriptions to ease the matching of nursing skills with tasks and to enable adequate rewards to be given for responsibilities assumed. They also recommended that adequate pay incentives be offered for the acquisition of skills and that salary scales provide room for advancement for clinicians, teachers, and administrators. Finally, to ease current staff shortages, they recommended increasing the number of male recruits, encouraging mature women to enter the profession through special introductory courses and recruitment drives, and to maintain a register of

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7 It is most unfortunate that this Committee's advice was not heeded when computer systems were introduced into NHS manpower planning departments.

qualified nurses who leave their jobs for possible reference in the future.

Also of note is that the Briggs Committee applauded the recent change that had taken place in the nature of nursing itself. Nursing had shifted from a task oriented approach to one of wholistic patient care. The Committee also encouraged the development of community nursing as it anticipated such a shift in the orientation of the Health Service itself in the coming years. The Committee's final area of investigation was education; the suggested changes for nurse training are discussed in section II of this chapter.

As the preceeding discussion indicates, the Briggs Report is a milestone in the profession's history. It is the most comprehensive study of modern nursing ever undertaken in England and it identified extant shortcomings which have been reiterated in nearly every report on nursing which has followed it.[8] The Committee's recommendations set the agenda for change which has dominated the profession for the last two decades and even though its suggestions were theoretically accepted in full, versions of some of them have been implemented only recently, while others await implementation. Changes in nursing, as in other NHS divisions, were slowed considerably by the reforms of the Service itself, of which there were two in the 1970s.

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8 For instance, see the *Royal Commission on the NHS* (1979).

iv. The Health Service Reorganizations

The first general reform occurred in 1972 when the Health Service was reorganized along with local government. This reform had two aims: to unify the administration of health care to facilitate national planning and to coordinate its provision between the NHS and Local Authorities; finally, the dichotomous provision of health care was to end. The administration of hospitals and of family practitioner services was brought under the umbrella of the Department of Health, while Area Health Authorities, AHAs, were created to liaise with Local Authorities who would continue to provide ambulance and various health services to the community.

The 72 AHAs were aggregations of districts, basically population clusters of 200,000 to 300,000 served by a general hospital and community health services. Their boundaries, furthermore, were designed to be coterminous with those of Local Authorities. These new entities were responsible for allocating resources and for providing guidance concerning future provision to district units. It is important to note that nursing officers were included as part of each area management team.

While the 1972 reorganization attempted to balance the need for national planning with decentralized provision,

it was soon found to be cumbersome and costly. With the general economic slowdown which occurred in the mid 1970s, the Government cut back public expenditure, including that on health care, and this led to a reexamination of NHS organization.

Two reports prepared the Service for the changes resulting from the new fiscal climate: a consultative document from the DHSS and the report of the Resource Allocation Working Party, RAWP. The DHSS report, issued in March of 1976, is the first document to establish spending priorities in the Service with each division being given different targets for spending growth. The second report, released in September of the same year from the RAWP, announced that resources were henceforth to be distributed in a systematic, objective way based on various data, related to need. In so doing they hoped to rationalize provision and to overcome some of the existing disparities in the availability of care. Both reports stressed that the Service would expand at a much slower rate over the coming years than it had in the past.

In May of the same year, a Royal Commission was appointed to inquire into the current organization of the Service and its use of resources. It emphasized the need to establish clear priorities in provision for the future and to simplify administration of the Service. While it reviewed all professions and services, albeit quickly,

its main comment concerning nursing was the need to implement the recommendations of the Briggs Committee.

Based on the findings of the Royal Commission, the second NHS reorganization was launched in 1979. Under the new system planning was to be streamlined and responsibilities delegated to a new, local management teams. AHAs were eliminated and responsibility for health care passed to smaller District Health Authorities, DHAs. Again, based on population clusters, the 192 Districts were created to have boundaries which matched those of Local Authorities wherever possible. Detailed decisions, subject to Departmental approval, on the restructuring, particularly concerning its pace, were left to the nine Regional Boards; December of 1983 was the national deadline set for reorganization.

v. The 1980s

During this transition period, one of the recommendations of Briggs was finally acted on and investigations into a comprehensive database for the NHS were undertaken. Data on which to determine care priorities, to allocate resources, and to evaluate performance were desperately needed and the Steering Group on Health Service Information was appointed in 1980 to evaluate the collection and use of information in the NHS. It issued five reports over the next four years which addressed the data requirements of five areas: patient transport

services, Health Service manpower, hospital activities, community services, and finance.

As a result of the group's recommendations, two new national surveys of nurse recruitment and turnover, KM45 and KM46 respectively, have been initiated by the Department of Health. The first trial run of the surveys was conducted in 1988, with a second following in 1989. The findings have yet to be released publically, and although a number of problems exists concerning collection, these surveys, when refined, are expected to be useful tools for manpower planners.[9]

In February of 1983 a final amendment to the structure of the NHS was made which was based on the recommendations of Sir Roy Griffiths. His report called for a Health Services Supervisory Board and a full-time management board to be established which would take over all existing responsibilties for running the NHS from the Department of Health. Furthermore, it advised that general managers be appointed throughout the Service, at the regional, district, and hospital level, to streamline decision-making and to increase accountability in terms of expenditure and performance.

Of note is that Griffiths attempted to exclude nurses from the NHS management board. However, a Chief Nursing Officer, was added to the management committee during the

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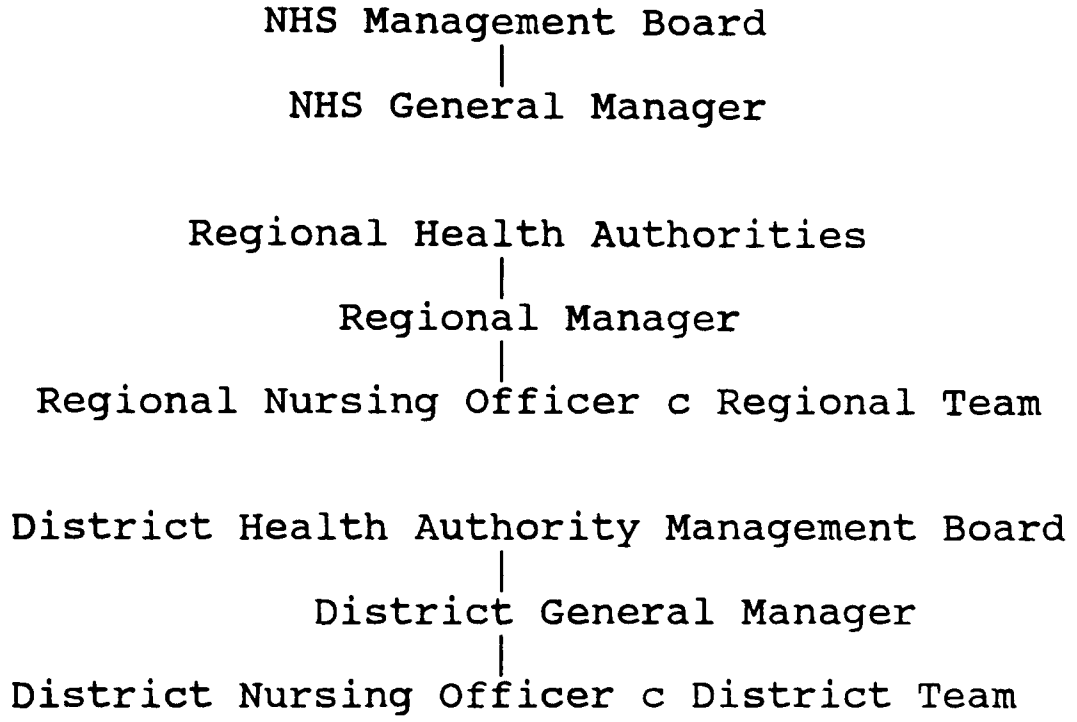
9 Some preliminary results from these surveys are discussed in chapters one and five.

December inquiry into the report, prior to its implementation in April of 84. The current structure is shown in figure 2.1.

Figure 2.1: The Current NHS Management Structure



With the second reorganization and Griffiths reforms, consensual tripartite management was replaced by managerialism. As shown in the figure, a management board heads each tier in the NHS with a general manager handling day to day operations and reporting to the governing board. Further down the hierarchy, not shown in the diagram, is the Director of Nursing Services who supervises hospital and community nurses at the unit level.[10] Under the direction of the unit manager, he or she supervises hospital nursing and nursing within the community.

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10 A unit can be defined as a geographical area, a client group, or an aggregation of several hospitals.

As a result of this change nurse managers, once at the heart of decision-making, are now one step removed from it. Under the current structure, nursing officers advise managers as part of a team, but the role they play is highly varied and depends on the approach of the manager in question.[11] It is important to note as well that nurses have moved into top-level management and currently, one Region, five Districts, and 80 units are run by former nurses (Delamothe, 1988c, 274).

Thus, in the 1980s, the period relevant to the empirical work presented in chapters four and seven, the Health Service was grappling with the aftershock of two serious structural reorganizations and was adapting to the climate of permanent fiscal stringency. While the disruption caused by these adjustments was a prime feature of this decade, it must be coupled with the more permanent features of NHS employment to understand the environment in which nurses work.

Even though the evolution of the NHS has been sketched in minimal detail, two important features of the system are evident. The first is that the Service lacks information and the second, exacerbating the first, is that it lacks resources, given the goals originally declared on its behalf. The Guillebaud Report makes this latter point clear and rather than entering the debate on the

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11 These issues are discussed at length by Robinson and Strong (1990).

appropriate level of funding for the NHS, this chapter discusses the relationship between resources and information and its crucial effect on nurses.

When the Government took over the provision of national health care, it knew little about the complicated process of producing this good and little about the market itself. Rationalizing health care provision, in any given situation, requires evaluating the existing system, formulating a practical, long-term plan for provision, and carrying it out. Such an exercise itself requires political concensus and a large expenditure of resources. Given these requirements, no comprehensive health care plan for England has ever existed, even though the NHS has been in existence for over 40 years, and large gaps in general knowledge about this market have never been filled.

The latest initiatives concerning the Health Service are outlined in white paper, *Caring for Patients*, authored by the Thatcher Government in 1989. It attempts to move away from developing a national care plan and instead aims to reduce costs, to devolve responsibilities, and to introduce a degree of competition into the market to help regulate provision. While the proposals have had a mixed reception nationwide and their practical implications are still a matter of debate, they at least bring to light the need to produce reliable data about this market and

the transfer to explicit contracting, which they propose, may help bring its production about.

At present the lack of information critically affects those working within the system, nurses in particular. Given that production goals are undefined, no objective determination of the number of nurses needed -by Region, by District, by hospital, by ward- has been possible. This complicates changing staff numbers as it is difficult to know on what to base the argument as well as the related issues of determining the appropriate skill mix on a ward and evaluting nursing productivity. These shortcomings of manpower planning are well known and much research, often initiated by nurses themselves, has been undertaken to resolve these issues. The next section reviews some of the findings in this area.

vi. Staffing levels within the Profession

Even though nurses represent 50% of the NHS workforce, the Department of Health has demarcated staffing levels for general nursing as a local issue. Standards concerning the number of Health Visitors and District Nurses per base population were set in 1956 and 1972, yet because of the variation in the mix of services to be provided by hospitals, in demographic factors, and in local labor market conditions, centrally determined formula are viewed as neither practical nor desirable for general nursing. Various "soft" guidelines have been

issued over time and the resulting target, currently agreed on by Chief Nursing Officers, is achieving a 60% qualified and 40% unqualified staff, although the origin of these percentages is not clear.[12]

In practice three methods are used for determining the number of nurses employed by hospitals and hence on wards; they are: top down, bottom up, or historical. As the label suggests, top-down planning determines the number of nurses to be hired or the establishment in relation to the number of beds or the population to be served. One of the most popular of these methods is the Trent Nursing Formula which has been used to determine regional manpower needs since 1977 (Trent RHA, 1978). It specifies the total nursing staff requirement based on 17 different categories such as maternity beds, acute beds, day unit places, and accident and emergency attendances.

Bottom-up models are built on patient dependency rates rather than bed numbers. In existing models -the Aberdeen formula, the Barr model, and Rhys-Hearn model- patients are grouped according to the amount of care they generally require and these groupings are then matched with average patient flows in the hospital to determine required staffing levels, although the specification of

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12 See the *Report by the Comptroller and Auditor General. NHS: Control of Nursing Manpower,* (1985) for a discussion of these issues.

patient categories and basis for determining care differ slightly in each formula.[13]

The third and most common method of determining staffing levels is historical. This label indicates that initial establishments were set according to Regional standards in force at the time, which were likely to be some mixture of top-down or bottom-up, and reigning financial constraints. It also implicitly acknowledges that current staffing levels reflect this starting point, the bargaining strength of various parties within the District or Region, staff recruitment and retention patterns, and the District's financial fortune over time.

The shortcomings of all three systems are clear. Top-down assessments are crude and inflexible, while those based on patient-dependencies require a great deal of information to be implemented properly. One of the greatest difficulties with the latter is categorizing dependencies and establishing a standard relationship between them and required care. Finally, the historical system incorporates the weaknesses of whichever system it was based on and suffers from being generally ad hoc. All, furthermore, fail to address the issues of quality and timing of nursing care.

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13 For long-stay patients such as the elderly or mentally and physically handicapped, point-based systems are often used in which patients are rated according to psychological, social, and nursing requirements are derived from these scores; see Moores and Grant (1976).

While flexibility and local discretion are important in determining staffing levels for general nursing, too little direction seems to have been given by the Department of Health which has resulted in indefensible, widely varying staffing levels across the country. In 1976 the Regional Allocation Working Party strongly recommended that the variance in these figures be reduced, yet there was no accompanying statement of what the appropriate target(s) should be. Subsequent publications by the Department (see DHSS, 1982 for instance), discussed different systems of manpower planning rather than goals for staffing levels.

Between 1976 and 1983, taking the reduction in the workweek into account, the number of nurses employed in the NHS rose by 9%. In light of this increase and the cash limits being imposed on the Service by the government, the National Audit Office, NAO, conducted an in-depth investigation into national nursing manpower policy in 1985. It found evidence of inefficiency in the scheduling and deployment of staff and again, extreme variations in staffing levels. For instance, from a survey of 49 acute hospitals, the ratio of qualified to unqualified staff varied from 0.47:1 to 4.76:1 (NAO, 1985, 16). While the report stressed that the Department should not take over manpower planning from the District Health Authorities, it called for standardized staffing levels to be agreed on and for personnel managers to be supplied with the information they required to eliminate

inefficiency and to reduce staffing levels wherever possible.

The response to NAO calls for a concerted policy were two documents: one published by the DHSS on skill mix in 1986 and another published by the Management Advisory Service, MAS, in 1989 which aimed to identify the appropriate staffing level and skill mix for a hospital nursing staff. The skill mix study will be discussed first.

After conducting a two week investigation of 49 long-stay and 20 high-dependency hospitals wards and reviewing existing research on skill mix, the authors concluded that the literature verified the difficulty in evaluating skill mix and that due to time and resource constraints, they could make no judgement about skill mix and cost effectiveness in the wards they studied.[14] Taking a more practical approach, the MAS provided an eight step plan for determining a hospital's staffing requirements. Of note is that it was designed to be highly complementary to the regrading exercise -discussed in section III- and adopted a bottom-up approach.

The Advisory Service recommended that profiles of wards and shifts, based on the tasks to be performed, the ancillary services available, and the model of nursing

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14 Evaluating the productivity of nurses with varying degrees of training is notoriously difficult. Most of the evidence is inconclusive, although work by Binnie (1987) suggests that skilled nurses are more efficient workers than those who are less skilled.

followed within the hospital be developed by the ward sister and that the nursing grades required to perform these tasks be identified. On this basis both an ideal staffing level and a minimum safety staffing level are specified and then, the current budget is translated into a financially achievable staffing level under the new grading system. From the original plan, however, the finance department calculates the cost of the ideal staff and negotiations with the Director of Nursing Services and/or the Unit General Manager are conducted to discuss moving towards the ideal staffing level through recruitment.

Thus, those who accepted employment as nurses in the NHS in the 1980s experienced very different working conditions from those who joined the Service in the three previous decades. The heady era of unquestioned, moderate expansion and government by consensus were quickly replaced by one in which limited budgets and managers ruled the day. They have also had to learn how to compete effectively with other divisions in the NHS for resources, an effort often hampered by a lack of information. Nurses continued to oversee their own affairs, but their influence within hospitals and the Service itself was much reduced. Concommitant with the loss of authority within the NHS, however, was a renewed effort to increase the standing of the entire profession through reforms to the system of nurse education and

training. Changes of this nature are discussed in the next section.

II. Education and Training

A second area in which significant changes have taken place that affect nurses is that of education and training. Nursing became a formally recognized profession in 1919 with the Nurses' Act of that year. Regulation itself was a contentious issue and the standards of training and requirements for entry into the profession have been a matter of continual disagreement.[15] This debate, alive today, actually centers around what nurses are and the related issues of how much training they should receive and how to recruit sufficient numbers for the nation's nursing tasks.

Understanding current training arrangements and the rationale behind the latest reform package requires understanding both the nature of the education argument as well as the actual sequence of events in the history of nurse education. This section first outlines the debate and the parties involved and then examines the legislative changes in this area.

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15 Abel-Smith has authored the seminal text on the history of the nursing profession.

i. The debate

The educational and training requirements for nurses are critically important to both those who work in the profession, their employers, and to the Treasury who funds the NHS. For nurses themselves entry and training requirements define their professional credentials and who can and will attempt to join their ranks; a matter which they have discussed at length within the profession (White, 1985). For the other groups, such requirements affect their supply of labor.

Training arrangements affect the labor supply of nurses in several ways. Firstly, nurse training is, in part, an apprenticeship. Student and pupil nurses spend up to 60% of their time working on wards and from the moment training begins, they become part of a hospital's staff used to meet service requirements (Delamothe, 1988c, 273). Educational programs also affect staffing levels in a more fundamental way. The training generally received determines the type and volume of responsibilites nurses can be given and hence how many are required to service a ward. Finally, as a correlation exists between training and pay, requirements to some extent affect the level of remuneration nurses can expect to command. Hospital managers are thus very concerned with the details of nurse training.

The Government is also concerned with the system of nurse education, as the Treasury pays for nurses to be trained; this support is twofold. Firstly, the English National Board, the ENB, receives money from central Government for teaching salaries, for support staff, and for other training costs. It appoints an educational advisory group for each Region and in cooperation with the Regional Director of Nurse Education, this group arranges for the teacher training in nursing, midwifery, and health visiting and for basic nurse training. Secondly, the Government also pays a salary to students via DHAs while they are training. Although this outlay is recouped to a certain extent through the cheaper pair of hands students provide on wards, cost effective training is a national concern.

The amount of training nurses receive should, in theory, be dictated by the requirements of the job itself, but as suggested above, the core issue in this discussion is what is meant by the term nurse. Two general views emerge from the nursing literature on the appropriate definition; both of which have very different implications concerning education. The first considers that nurses are primarily carers, while the second holds that nurses are skilled clinicians.

The first view is effectively summarized in an editorial from the *Nursing Mirror*. It states:

> The plain truth is that the vital qualifications for nursing- basic nursing- are personal qualities such a compassion and common sense, however much the highly skilled and highly trained brain is needed for the more complicated flights of medicine and surgical technique and the administration of hospitals.[16]

The alternative view focuses on nurses as having "highly skilled and highly trained brains" (White, 1985; Delamothe, 1988b, 125). On this account a nurse's duty is to provide specialized care and surgical assistance and to supervise the administration of general care by assistants and auxiliaries. Not surpisingly, the training requirements associated with each characterization differ dramatically.

According to the latter school, nurses require extensive theoretical and practical training. Students need to be equipped intellectually to handle a lengthy, demanding course and it is necessary to screen applicants so that only the able and career-oriented are selected. On the other hand, where the role of carers is emphasized, prescribed training is less rigorous and serves rather to acquaint trainees with hospital practices.

An approprate structure for the profession in terms of pay and promotion depends on which view of nursing is dominant. Clinicians need to be rewarded for their qualifications and given incentives and opportunities to advance, while the career structure of carers requires

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16 Editorial in the *Nursing Mirror*, June 10, 1955.

less emphasis. Similarly, the policies needed to increase nurse supply depend crucially on which type of nurse is believed to be required. While relative pay plays a role in both cases, the reference groups for carers and clinicians are different. Also, given that their training is less rigorous, the number of carers can potentially be expanded by widening the band from which they are recruited as training is less costly and increases in wastage are, to a certain extent, tolerable.

While the depiction of the debate as carer versus clinician may appear extreme, it is an accurate portrayal and it provides a helpful frame of reference for deciphering events over the last seventy years. Those who supported nurses as clinicians dominated the field in 1919; however, they lost ground in the following decades over the issue of nurse supply. The national concensus was that the supply of nurses needed to be increased, yet opinions differed dramatically on how to achieve this goal. Despite this, the regulatory structure of the profession was altered several times and the changes clearly promoted the idea of nurse as carer. Interestingly, the profession has now come full circle as the latest reform package -Project 2000- is a return to the standards which governed the profession at its inception, with the importance of the nurse clinician being asserted once again.

Table 2.3 lists the important events in the history of nurse education; they are discussed below.

Table 2.3: The Timetable of Reform in Nurse Education

Year	Description of Act
1919	Nurses Act: State Registration
1937	Athlone Inquiry into Nursing
1943	Nurses Act: State Enrollment
1946	Wood Inquiry into Nursing
1962	Minimum Education Standards For Taking Up Training Instated
1970	Joint Board for Clinical Studies Established
1972	Briggs Report on the Nursing Profession
1979	UK Central Council for Nurses Midwives and Health Visitors founded
1988	Project 2000 Reforms for Nurse Education launched

ii. Nurse Training and Education: 1919-1989

In 1919 the Nurse Act was passed which formally recognized nursing as a profession and which established the General Nursing Council, the GNC, as its regulatory body. Nurses had been lobbying for registration for over 30 years and their performance during the war, women obtaining the vote, and the fact that the supply of nurses seemed adequate facilitated passage of the Nurses Act.[17] While a plan for regulation through registration was laid out fairly easily, disagreement immediately

17 The presence of Voluntary Aid Detachments, trained during WWI, played an important role in facilitating this legislation as their presence seemed to insure that registration would not create a nursing shortage.

arose over how to admit nurses currently practicing to a national register and to regulate nurse education.

The general framework for registration was straightforward. The Council was to examine those who had completed training and to enter the names of those who passed its test on a national register, hence the term, State Registered Nurse, SRN. The register itself was divided into six parts, each with its own training program. The categories were: general nursing, only open to females, children's nursing, fever nursing, nursing of the mentally ill, nursing of the mentally handicapped, and a register for general nurses who were male. Once registration was obtained in an area, transfer to another part was difficult. For instance, a Registered Nurse would have to take two years additional training to have her name entered on the register for nursing the mentally ill.

The procedure to obtain a nursing credential was thus established for those taking up training after 1919, but an acrimonious debate ensued over how to certify and to admit currently practicing nurses from widely varying backgrounds. The Government intended for the greatest possible number to be registered, while certain, well organized factions within the profession wanted registration to be exclusive and, in particular, to keep VADs, volunteer nurses from WWI, off the register.[18]

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18 See Abel-Smith (1960) chapter six for the particulars of the debate.

Initially, the decision was left to the GNC, but upon observing the small numbers being admitted, Parliament intervened six months before inital registration was to close and widened the net. Ultimately, persons without formal training who could prove they had worked as nurses for three years under conditions deemed satisfactory by the Council were registered as nurses and by 1923, 40451 nurses were registered in England (*NT*, 1923, 710).

The other area of contention was education. In 1919 nurse training was highly unregulated and practices differed substantially between institutions. Many schools set the minimum education requirements for taking up training as the school certificate, a consolidated exam covering at least five subjects, a requirement which only a small proportion of the population met. Others who needed labor had substantially lower requirements. Those taking up training worked through a three year course which involved both tutorial sessions and extensive service on wards.

Given that a national exam was now to be administered, some standardization seemed necessary; however, the Council's power to regulate education was decidedly limited. The Council was to oversee the education of nurses by approving training schools and by recommending a syllabus. However, the syllabus was not mandatory and no school inspectorate existed until after WWII.

Furthermore, any school which the Council refused to certify could appeal to the Ministry of Health. The Council supported the school leaving certificate as the minimum educational requirement; its role, however, was advisory.

This system of training and certification guided nursing for two decades. After the dust had settled, clinicians had won the battle to secure registration and a professional credential, but the Government did not completely surrender control of supply. It decidedly influenced who was initially registered and it crucially controlled the student supply of labor. The major complaint which arose against these arrangements was that it was not producing enough nurses. Too few nurses were taking up training and of those who did nearly one third dropped out before their course was complete and 40% failed the exam (*Lancet*, 1932). Poor law and small voluntary hospitals suffered serious staffing shortages throughout the 1920s and as the condition spread to larger hospitals the *Lancet* launched its own investigation into the lack of nurses in 1930.

In 1937 the GNC instituted an entrance test for those who lacked formal qualifications, but wanted to take up nurse training. It was aimed at reducing the rate of failure by insuring that entrants could withstand the course. In the same year concerns over staffing levels prompted a formal inquiry by the Government. The Athlone Committee

was thus appointed to inquire into the arrangements for training nurses and their working conditions. In an interim report in 1939 the Committee recommended that a new type of nurse -an assistant- be created, that a permanent salary committee be established to lay down the terms of employment for nurses and that the Government subsidize payments made by hospitals to working students so that they could be increased and improve recruitment. However, before any decisions could be made concerning the Committee's initial findings, war broke out and their work was suspended.

The outbreak of war meant that the supply of nurses had to be increased dramatically and immediately; estimates from the Ministry of Health ranged from 34,000 to 67,000.[19] A Civil Nursing Reserve was created which drew together the country's nursing resources and which provided basic training to volunteers and sent them into the field. In view of the national emergency, the GNC recommended the lifting of all requirements for taking up the training for State Registration. The Government, however, was growing increasingly impatient with the general progress being made to augment the supply of nurses and responded with various initiatives throughout the decade.

Its first response was to act on the interim recommendations of the Athlone Committee. In October of

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19See Abel-Smith (1960) p. 161.

1941 the Rushcliffe Committee was formed to draw up salary scales for nurses and to formalize conditions of employment, such as sick leave and holiday pay. Although the resulting scales and terms were not binding, the Government strongly supported their implementation and agreed to pay 50% of an institution's costs in introducing them.[20] It also agreed to create a second type of nurse, the enrolled nurse, through parliamentary act.

According to the Nurses Act of 1943, two years of training were required to become an enrolled nurse, primarily a carer. Of note is that no formal qualifications were required to take up training, only proof that a good general education had been acquired. Those who were currently working as nurses, but who were not registered, could be listed on the roll if they could prove to the Council that they had been nursing under satisfactory conditions for five years if they were over 30 and for two years if they were 30 or younger. Even with the ease of entry, the inital take up for enrollment or pupil training was small and the Act did not bring about a sizeable increase in the supply of nurses. Only 678 people took up pupil training in 1947.[21]

When the war ended, nursing supply problems were not over. With the establishment of the NHS, the Ministry of Health estimated that the nation would need an additional

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20 Ibid., p. 167.
21 Ibid., p. 180.

48,000 nurses to staff its hospitals, a reflection of the seriousness of affairs prior to the war.[22] The Wood Inquiry was thus launched in 1946 to determine how to increase supply. The Committee concluded that recruitment needed to be increased and that wastage needed to be reduced and it recommended four measures to bring this about: 1) that training be standardized and made independent of hospital needs; 2) that hospitals be adequately staffed so that neither nurses nor students performed domestic duties as it was estimated that 1/3 of their time on the ward was spent on non-nursing tasks 3) that there be one type of nurse whose training lasted two years; and 4) that students be awarded supernumerary status.

The responded with much more cautious legislation. It aimed to reform education through the GNC. It thus expanded the Council's membership to bring in new blood and established regional standing committees on nurse training to assist the GNC in overseeing education. It also amalgamated the male and female parts of the general register.

The GNC in the 1950s began a campaign to have minimum standards to take up training reinstated by the Ministry of Health. Studies on nurse recruitment and training were conducted by two of the established committees - Oxford and South East Metropolitan; both stressed the

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22 *Annual Report of the Ministry of Health* (1949), p. 160.

need to establish reasonable standards for beginning training as they found that it was the lack of minimum requirements which made it difficult to recruit suitable candidates who could survive the course. Also of note is that the fall in nursing standards in the U.K. had not gone unnoticed. In 1947 the Registered Nursing Association of British Columbia withdrew their reciprocity agreements with the U.K. and several others followed in subsequent years (White, 1985, 584).

In 1962 in response to the standards campaign the Ministry agreed to establish a minimum requirement for entry into registered nurse training. As only two O levels were required, it was set at a level below that of the prewar period. At this time the Ministry also agreed to set minimum requirements for certification for training schools. They were required to be able to teach the full syllabus and to have at least 300 beds. Over the next decade reforms in nursing administration and in the NHS itself eclipsed discussion of education. In 1972, however, the Briggs Inquiry into nursing was launched. Its methodology was discussed in section one, while its findings concerning education are discussed below.

After extensive investigations into many aspects of nurse training, the Committee cited six fundamental weaknesses in the existing system. They were as follows:

1) trainees being simultaneously students and employees
2) hospitals carrying out the dual role of caring for patients and training nurses
3) the lack of a balanced syllabus to provide both theoretical and practical training
4) the need to integrate specialized training with that of basic nursing
5) having to cater to students of widely varying ability
6) inadequate inspection of nursing schools in general (Briggs, 1972, 64).

It is interesting to note the similarity between their findings and that of the Wood Committee of 25 years earlier. In light of the extent and the seriousness of their criticisms, the Committee outlined a ten year plan for the reform of nurse education which aimed to correct these shortcomings. Their recommendations involved the body governing nurse education, education facilities, and the syllabus itself.

The primary concern was to provide a coherent system of educating nurses in the U.K.. In order to bring this about, the Committee recommended, as discussed in section I, establishing a Central Council for Nursing and Midwifery in the United Kingdom to oversee education with national and area boards to implement its policy.

The second concern was to standardize training programs across hospitals and to establish a learning environment for students and pupils which was separate from the hospital in which they were working. Thus they recommended setting up colleges of nursing and midwifery

throughout the country which would arrange basic and post-basic courses which would be listed in a national directory. Interestingly, they rejected the idea of making students supernumerary as they claimed that means tested parental contributions and the loss of cover on superannuation would make nurses worse off (Briggs, 1972, 106). Rather they recommended that training allowances be continued, but that they be administered by Area Education Committees so that the the distinction between students and other hospital workers was again stressed.

Their third set of amendments was directed at the training courses themselves. The syllabus was to be restructured so that all nurses would take one 18 month course of basic nursing which would lead to a Certificate of Nursing Practice. A further 18 month course with some degree of specialization would be required for registration and those completing this second unit would be entered on a single register. Registered specializations could be obtained through further modular study. Greater liaison with secondary schools was encouraged to improve recruitment for training and it was recommended that the age of entry into nursing be reduced, ultimately to 17, so that it was possible to begin training immediately after leaving school. Special efforts were also to be made to recruit graduates, mature entrants, and men.

While the Committee envisoned that its recommendations would be enacted within the next five to ten years, the process has been much slower. It was not until 1979 that the first stage of the reforms were set in motion and that a central governing body for nurses was established. With the Nurses, Midwives, and Health Visitors Act of 1979, the United Kindom Central Council for Nurses, Midwives and Health Visitors, the U.K.C.C., was created to provide for the education, training, regulation, and discipline of all three groups and to maintain a register of those qualified in each field.

The English National Board, the ENB, currently carries out the policies of the U.K.C.C. in this country. It ensures that nursing courses are available throughout the country and that nursing schools meet required standards. It also sponsors the examinations which students must pass to have their names entered on the national register and it investigates allegations of misconduct by nurses.

While the act was passed in 1979, a four year transition period was allowed in which the Council and ENB were formed. The Council began working in earnest in 1983 and its first order of business was to reorganize the register of nurses. The existing state register was split into 11 parts and state registered nurses were categorized more specifically, as were enrolled nurses in England and Wales. The new registered is detailed below.

Table 2.4: The Revised Register for Nurses

Part	Reference Group	New Abbreviated Title
Part 1:	Registered Nurses trained in general nursing	RGN
Part 2:	Enrolled nurses trained in general nursing	EN(G)
Part 3:	Registered Nurses trained in nursing the mentally ill	RNMI
Part 4:	Enrolled nurses trained in nursing the mentally ill	EN(MI)
Part 5:	Registered Nurses trained in nursing the mentally handicapped	RNMH
Part 6:	Enrolled nurses trained in nursing the mentally handicapped	EN(MH)
Part 7:	Enrolled nurses[a]	
Part 8:	Persons trained in nursing children	RSCN
Part 9:	Persons trained in nursing those with fever	RFN
Part 10:	Midwives	RM
Part 11:	Health Visitors	RHV

a Part 7 of the register refers to Scotland and NI only.

Nurses were thus given more specific titles and SRNs became RGNs. Also of note is that the minimum entry requirements for taking up nurse training were increased from two to five O levels, hence returning the profession to the accepted standard of entry in 1919.

The second act of the Council was to review nurse education. Their investigation began with the Briggs report and to its findings were added the results of more recent research. The concerns identified in later work were remarkably similar to those of the report published 15 years earlier. They were: the abuse of student labor by hospitals and improper use of enrolled nurses (NAO,

1985), student wastage averaging 20-35% (Hutt et al., 1985; Price Waterhouse, 1987), difficulties retaining qualified staff (RCN, 1984 and 1987), and the lack of a comprehensive system of basic and advanced education for nurses (Delamothe, 1988b; NAO, 1985).

While the concerns were generally the same, the Briggs recommendations needed to be examined in light of the changes in nursing and in the Health Service during the intervening period. The two most important of these were the shift to community nursing and the advent of primary nursing as the dominant professional philosophy (Pearson and Vaughan, 1986; Christenen and Kenny, 1990). The result of their investigation is Project 2000 which introduces a five part reform program for nurse education.[23]

Generally, Project 2000 attempts to rationalize the profession by providing a single definition for the term nurse, a well trained clinical specialist. It also seeks to establish a unified training and career structure for these new nurses. It has five parts.

The first creates a single course structure for nursing, very similar to that recommended by the Briggs Committee, in which all nurses train for registration only.

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23 The literature on Project 2000 is voluminous. Nine discussion papers were published by the U.K.C.C. on the matter and there have been a myriad of editorials in the nursing journals. Both Hartley and Goodwin (1985) and Price Waterhouse (1987) conducted cost-benefit analyses of the project.

Trainees undertake a two year common foundation program which gives them a sound theoretical base in nursing and extensive practical experience. In the final year an area of specialization is chosen in nursing one of the following patient categories: the mentally ill, the mentally handicapped, adults or children, or there is a midwifery option which requires a further 18 months of study. Upon passing her examinations, an individual registers with the Council in her preparation and all subsequent qualifications earned are added to her name, rather than their registering again in a different area of nursing.

After training for registration, courses in further specialties will be offered. While most have not yet been spelled out in detail, the object is to provide further training for those hoping to pursue managerial, clinical, or tutorial careers. In nursing after basic training, gaining experience is the key to promotion in any area. Experience can be acquired by moving to another ward or by enrolling in a post-basic course.[24] Another aim of Project 2000 is to clean up the system of post-basic education in nursing.

Prior to 1970 post-basic courses were unregulated and were offered at the discretion of hospitals or training schools. A multitude of courses existed as any school,

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24 The survey of Chief Nursing Advisers, conducted by Robinson et al. (1989), shows the extensive qualifications held and experience acquired by nurses in senior posts.

District, or Region could offer further training. In the late 1960s concern mounted over the variation in the substance of these courses and the belief that courses were being used to recruit needed labor rather than to provide nurses with additional training. As a result of a joint deputation from the Royal College of Nurses and the Royal College of Midwives, supported by the Royal College of Medicine, the Ministry of Health agreed to establish a body to monitor the provision of courses and their standards. (Collins, 1985, 84); it was entitled the Joint Board of Clinical Nursing Studies, JBCNS.

Although a step in the right direction, its powers were too limited to bring about much change. Notably, the board's only authority was to refuse to approve courses; it had no remit concerning community nurses nor any statutory connection with those administering nurse training. Two years later the Briggs report criticized the state of further education and noted that in 1972 there were over 350 post-registration courses on offer of varying length and strigency (Briggs, 1972, 72). One of Project 2000's objectives is to integrate basic and post-basic training and to link both with institutions of higher education.

Implicit in the discussion above is the third feature of project 2000, namely that the category of enrolled nurse is to be eliminated. This change was not introduced without controversy and was a departure from the

recommendations from Briggs. The rationale behind it was twofold. The primary aim was to eliminate the abuse of enrolled nurses who were often given responsibilities for which they had not been trained and who were given no opportunities to advance. The second was to purify the term nurse and essentially restore it to its former 1919 status. It is envisioned that many enrolled nurses will undertake conversion courses to upgrade their qualification.

Related to the elimination of enrolled nurses, a new "helper grade" of nurse is to be created under Project 2000. Although their precise role of the helper has not yet been defined, he or she is clearly envisioned as a nurse's aide and under the supervision of a registered nurse.

The last important component of the reform program is that all nurses are to become supernumerary. This is projected to occur at the rate of roughly 10% per year and the first cohort of nurses under this arrangement took up training in 1989. While the costs of training nurses will increase by an estimated £6000 per trainee student as well as additional outlays being required for more teachers and nurses to replace students, the benefits of the reforms are expected to be substantial.[25]

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25 The estimates are from Price Waterhouse (1987) table 3, appendix 6; the assumptions on which they are based are contained in the text.

While the reforms will be costly, the profession feels that they are justified on a number of grounds. Namely, it is maintained that nurses' productivity will increase and standards of care will rise as nurses receive better training under the new proposals. Student wastage is also expected to decline as they are appropriately supervised during the learning period. Finally, some training costs will be reduced as courses for health visitors, community nurses, and midwives can be shortened as a result of the improvements in the core curriculum.

Also, if clearer paths for promotion in nursing are developed in conjunction with the education reforms, it is anticipated that wastage could fall generally in the profession as qualified nurses remain in post longer and as those who do leave are more interested in returning. Promotional paths, however, are presently beyond the remit of Project 2000.

This reform package is quite an ambitious and, in some ways, risky undertaking. At the profession's request, the Government is increasing its human capital investment in its nursing labor force at a time when expenditure on the NHS is restricted, when the demand for nurses is expected to rise via the aging of the population, and when the employment opportunities for nurses outside the Service are growing. Managers have recognized the need to prevent, if possible, private sector poaching of staff trained at the Service's expense, but it is difficult to

see how this will be accomplished.[26] The Government is also allowing the entry requirements for training to be raised when the traditional pool from which nurses are recruited is shrinking. Keeping Project 2000 up and running will not be an easy task.

While the potential benefits from the proposals are great, it is imperative that aspects of management change along with those of education if the reforms are to be successful. Provision will have to be made to integrate staff trained under the new system and those under the old. Also, as it is likely that Project 2000 nurses will have higher expectations about their nursing careers than did nurses who preceeded them, having an appropriate promotional structure and remuneration package in place will be essential if the Government is to receive a reasonable return on its investment. Of note is that reforms have recently been initiated in both areas and they are the topics to which the discussion now turns.

III. Pay

While there is undoubtedly a vocational aspect to nursing, pay is as important in this profession as in any other. Nurses through intense lobbying and industrial action have progressed from Whitley Council negotiations to yearly assessments by their own Pay Review Body to

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26 These matters are discussed in the Department of Health's, Working Paper #10.

achieve what they believe is equitable remuneration for the labor. Even though the latter system was adopted to insure fairness, efficiency, and independence in the negotiating process, it, as discussed shortly, has not proved completely satisfactory for either staff or management.

Nursing wage negotiations clearly illustrate the difficulty of determining pay in a market with a monopsonistic employer, particularly one facing externally imposed resource constraints. The problem is that competitive forces cannot determine the wage rate nor is there any other obvious gauge to use for guidance. For reasons discusssed in chapter one, nursing pay cannot be linked to the production of health care nor is there any group, either within the NHS or outside it, whose salary levels could be used as a benchmark for that for nurses. This situation is further complicated by the fact that nurses work in the public sector and their pay is decided in the much larger context of general public expenditure.

In setting pay scales Councils and Review Bodies have based their decisions on two types of evidence: the information generally available on earnings -levels and increases within the NHS, pay rises in the economy, and predictions on the cost of living- and evidence from staff and management. In negotiations staff representatives have continually emphasized the need for

fair pay which recognizes nurses' training and their responsibilities, an approach which underlines the importance of how nurses are viewed and defined, while managers have lobbied for pay levels which allow them to secure an adequate nursing staff within their budgets and for agreements which give them the flexibility to address localized shortages through pay. Only in the last two years has any progess been made on this latter issue.

While both sides present evidence to support their respective claims, those making the decision have little to go on. Their decisions, however, appear to be most influenced by evidence of shortages, primarily gathered from their own surveys. Hence, management's criteria for determining pay is inherently favored by the nature of information obtainable in this market.

Given that pay plays an important role in attracting people to the profession and in retaining staff, it is important to understand its composition and the method by which it is determined. A nurse's total earnings are comprised of basic pay plus a number of supplements, such as for overtime, living in London, remaining on call, working in a psychiatric hospital and so on. A breakdown of the national nursing paybill for four grade of nurse is shown in Table 2.5.

Table 2.5: The Breakdown of the Annual Nursing Paybill By Grade for 1985

Category of Payment	Sister	Registered Staff Nurse	Enrolled Nurse	Auxiliary
Basic Pay	87.8	84.9	83.8	81.7
Special Duty Payments and Overtime	11.2	13.6	14.4	15.7
Maternity/Redundancy	0.3	0.5	0.4	0.3
Geriatric and Psychiatric Allowance	0.7	0.8	1.2	2.1
On-Call, Stand-by and Non-pay items	0.3	0.1	0.2	0.2

Source: ERBOD Survey, Department of Health, Table 5(b).

For all nurses, basic pay is the primary determinant of earnings, although its importance declines slightly with grade. Of note is that over 350 rates of basic pay exist for nurses. Special Duty Payments for working split shifts, night duty, or overtime make the second greatest addition to the packet with the size of the contribution again being inversely related to grade. As well as its composition, it is crucial to understand how the various payments are determined. Table 2.6 outlines the course of events in the history of nursing pay negotiations.

Table 2.6: Events in Nursing Pay Negotiations

1948	Whitley Council for Nurses and Midwives Established
1968	Pay Review for Nurses by National Board for Prices and Incomes
1974	Halsbury Report on Nurses' Pay
1980	Clegg Report on Nurses' Pay
1983	Pay Review Body for Nurses, Midwives and Health Visitors established
1985	Clinical Regrading Exercise Begun
1988	New Clinical Grades Defined

i. The Whitley Council for Nurses and Midwives

From 1948-1983, the salaries and conditions of service for nurses were primarily determined by the Whitley Council for Nurses and Midwives, although three independent bodies were called in to review nurse pay in 1967, 1973, and 1979. This Council was one of eight created as part of the general machinery established for determining pay for NHS workers and was essentially the Rushcliffe Committee of 1941, discussed in section I, expanded slightly.

As shown in table 2.7, the Council was comprised of 49 staff and management representatives.[27] Based on directives from the Secretary of State for Health concerning Government pay targets and on evidence from all groups listed below, employment contracts were negotiated for all staff grades. The major complaints against this machinery were that it was cumbersome and contentious as 50% of the NHS pay settlements between 1948-55 were referred to independent arbitration (Leopold et al., 1986, 35).

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27 See the Report of the Halsbury Committee, p. 8.

Table 2.7: The Composition of the Whitley Council

Side	Number of Seats	Organization
Management	11	Regional and Area Health Authorities in England
	4	Scottish and Welsh Health Authorities
	5	Department of Health
Staff	8	Royal College of Nurses (RCN)
	4	Confederation of Health Service Employees (COHSE)
	4	National Union of Public Employees (NUPE)
	3	Royal College of Midwives (RCM)
	2	Health Visitors' Association
	2	National and Local Government Officers' Association
	1	Association of Nurse Administrators
	1	Association of Hospital and Residential Care Officers
	1	Association of Supervisors of Midwives
	1	Managerial, Administrative, Technical, and Supervisory Association
	1	Scottish Association of Nurse Administrators
	1	Scottish Health Visitors' Association

Membership has varied slightly over the years as trade unions and professional associations representing nurses battled for control of the Council, but under this system, nurses' pay remained relatively constant in real terms throughout the 1950s and moved broadly in line with other groups working in the public sector.[28] Problems, however, arose with incomes policies instituted by the Government in the 1960s.

28 See Smail and Gray (1982) for a discussion of trends in nurse pay.

Incomes policies were one tool chosen by Government during this period to combat inflation. They were initially advisory, but became statutory in April of 1965 and exceptions to the pay growth target laid down by Government were admitted only under very limited circumstances.[29] In 1967, however, the Secretary of State for Health acceded to staff demands for a review of nursing pay and the first comprehensive, independent enquiry into this area since the creation of the NHS was thus instituted. The primary concerns were establishing adequate remuneration levels and a reasonable salary structure for nurses which would thereby ensure that an adequate supply of nurses could be obtained in light of the predicted decline in the number of 18 year olds expected to enter the labor market from 1968 to 1975.

ii. The National Board for Prices and Incomes

The specific remit of the National Board for Incomes and Prices, the NBPI, was to adjudicate the staff side requests for a substantial pay increase, a reduction in hours, and the extension of special duty payments to all nurses. They were also to determine levels of remuneration for the new nurse grades created under Salmon, particularly that of Chief Nursing Officer. Their investigations, however, extended well beyond salary levels and the Committee ultimately made far-

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29 See Robinson (1985) for details.

reaching recommendations concerning education and management.

Citing a general lack of information on which to make decisions, the NBPI conducted their own survey of conditions in 587 hospitals, with intensive case studies in eleven institutions. They found evidence of a general shortage of staff nurses and of geriatric and pychiatric nurses of all grades. They subsequently recommended a pay increase of 14% for second and third year student nurses and for staff nurses and enrolled nurses at the lowest grade; this increase tapered to 9% at the highest grade for the latter two groups. They also shortened the pay scales for staff and enrolled nurses. For those above the staff nurse grade, i.e. Salmon grades one to ten, pay increased 9%. For all nurses a 4% increase was to be granted immediately and backdated to October of 1967 with the balance of the award to take effect in January of 1969. They further suggested that the Whitley Council attempt to simplify the pay structure.

The Committee also made several recommendations concerning training and management which foreshadow those of the Briggs Committee published five years later. They encouraged the GNC to increase the number of nurse tutors and to institute a general reorganization of schools and resources. They also criticized the concentration of students in London teaching hospitals.[30] Finally, they

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30 The Briggs Committee offered a similar criticism; see *Report of the Committee on Nursing*, p. 141.

suggested increasing the intake of married women into enrolled nurse training and to recruit more men into nursing in general.[31]

In the area of management the Committee stressed the importance of implementing the recommendations of the Salmon report and the need to improve the information available on nursing staff requirements. They stated that too many decisions were made on historical staffing levels and that all managers needed to review staffing requirements and the organization of their wards. To assist in these studies and to provide advice on implementing the Salmon structure, the Committee sought to establish a National Nursing Management Committee with its own staff and budget.[32] For the immediate future they recommended increased cooperation among hospital management committees to relieve staffing shortages and that managers seek to identify supply nurses, similar to supply teachers, as reserve labor.

The Whitley Council machinery resumed its former role, but by 1973 a second independent body was called in to resolve an impasse between staff and management over pay. Both sides agreed that the Council negotiations had become ineffective and the staff representatives felt

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31 The fact that these recommendations are being repeated today suggests that the profession has yet to act on them; see *A Strategy for Nursing: A Report of the Steering Committee*, published by the Department of Health (1990) for example.

32 A report of this organization's activities is given in *NSC: Report to the Secretary of State*, April 1979.

that financial limits imposed by the Government's incomes policy were unfairly dominating the negotiations.

As provided for in a report by the National Pay Advisory Board in 1973, inquiries were the appropriate method for dealing with pay claims by special groups within the statutory incomes policy and given the comments of Briggs and the pending reorganization, a review seemed timely. Thus, the Committee of Inquiry into Pay and the Related Conditions and Service of Nurses and Midwives was appointed in May of 1974; it was chaired by Lord Halsbury.

iii. The Halsbury Committee

The Halsbury committee had three goals: 1) to evaluate nurses pay within the national pay hierarchy 2) to simplify the current pay structure and 3) to rationalize the structure to establish appropriate rewards for promotion and to increase recruitment and retention. Staff representatives were again predominantly concerned with securing adequate remuneration for nurses in view of their increasing responsibilities and of wage rates in other jobs, while for managers the primary concern was pay rationalization.

The main source of information for the Committee was an extensive survey of 250 hospitals, initiated on their appointment. Their study examined staffing levels in

hospitals, ward organization itself, including shift patterns and manning levels, and the responsibilities of nurses at various grades. They supplemented these findings with data on changes in the number of doctors, patients, and unqualified nurses over the preceeding five years and with information on pay from the New Earnings Survey. They identified increases in the workload of nurses and staff shortages averaging 20% in the clinical grades. They also noted that while the average earnings of nurses had increased 46% since 1970, the retail price index had also increased by 46% and the average earnings of salaried men and women had increased by 56%.

They generally concluded that nurses were not adequately compensated for their work and as a result recommended real pay increases, averaging 12.8% for staff nurses.[33] Concerning future pay awards, they identifed the upper quartile of male nonmanual employees as the appropriate group with which to make pay comparisons. The Commmittee also made a number of adjustments to simplify the pay structure: numbered grades were transformed into descriptive titles, pay scales for hospital and community nurses were integrated, and the number of increments on the scales, with the exception of enrolled and auxiliary nurses, were reduced to a maximum of five. Special duty payments were increased, holiday leave was standardized by grade and increased, and lead payments to geriatric and pychiatric nurses were also increased.

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33 See figure 1.4, chapter one.

The Treasury allocated an additional £170 million to fund the award and all parties seemed satisfied with the outcome.[34] Nurses felt that their work had been adequately rewarded and, of greater importance, they believed they had secured a permanent, appropriate place in the national pay hierarchy; managers felt that the beginnings of a sound salary structure for an important part of their workforce had been established. This honeymoon, however, was shortlived.

Cutbacks in Government spending in the mid 1970s led to the erosion of nurse pay, particularly in relation to the benchmark recommended by the Halsbury Committee. General expenditure in the NHS, along with the Whitley Council machinery itself, was critically examined during this period. The McCarthy Committee (1976) conducted the inquiry into pay negotiation procedures and in their report described the Councils as unwieldly, costly, and being increasingly abandoned for periodic, ad hoc inquiries. They aptly identified the key weakness of the machinery -those who decide pay do not employ- yet the system itself was not amended.

In July of 1978 the staff representatives on the Nurses and Midwives Whitley Council again submitted a claim for special treatment under the current pay policy and asked for a restoration of their position in the "national

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34 See the Press Releases of Barbara Castle, May 1974.

earnings league" as laid down by the Halsbury Committe a few years earlier. In light of these requests, the Clegg Commission was appointed by the Government in April of 1979 and asked to establish appropriate comparators for nurse pay which were acceptable to all Council members and which could be monitored and incorporated in their negotiations.[35]

iv. The Clegg Commission

While the work of the Halsbury Committee was not criticized outright by the Clegg Commission, it was rejected on the grounds that it was out of date as conditions in the economy had changed substantially and that the upper quartile of male nonmanual workers was too broad -read inappropriate- a comparator for wages for the nursing profession. Alongside the staff request for pay restoration, management were asking for futher simplifications in the pay structure as well as the creation of financial incentives necessary to keep qualified staff in post. They reported an average national vacancy figure of 10%, which appeared to be on the rise, with substantially higher percentages for certain posts -theatres and psychiatric nursing- and locations such as London.

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35 It is important to note that there was a change in Government during the life of this committee.

The Clegg Commission thus undertook an extensive factor analysis of nursing work. They hired a private consulting firm with a data bank characterizing over 250,000 jobs in the U.K. to compare the responsibilities, training requirements, and pay package of nurses with that of workers in jobs whose content was most similar to that of nursing. The consultants interviewed 134 nurses in 13 pay grades across the country and they assigned their job a score based on their responses. Then, having made adjustments in both sets of pay figures for London weightings, variations in holiday entitlements, bonus schemes and pensions, they compared the remuneration levels for nursing and comparably scored jobs.[36]

The Commission subsequently recommended significant pay rises, concentrated at the lower end of the scale, which increased the real earnings of staff nurses by 18.3%. While the size of the increase was substantial, it fell on average 10% below what would have been recommended under Halsbury guidelines according to the Commission's own calculations (Clegg, 1980, 21). Other recommendations included increases in special duty payments for weekend and night work and a salary rise for third year students. They also agreed to reduce the normal working week for nurses from 40 hours to 37.5 hours by April of 1981. The Commission referred back two items back to the Council for assessment. They were: the

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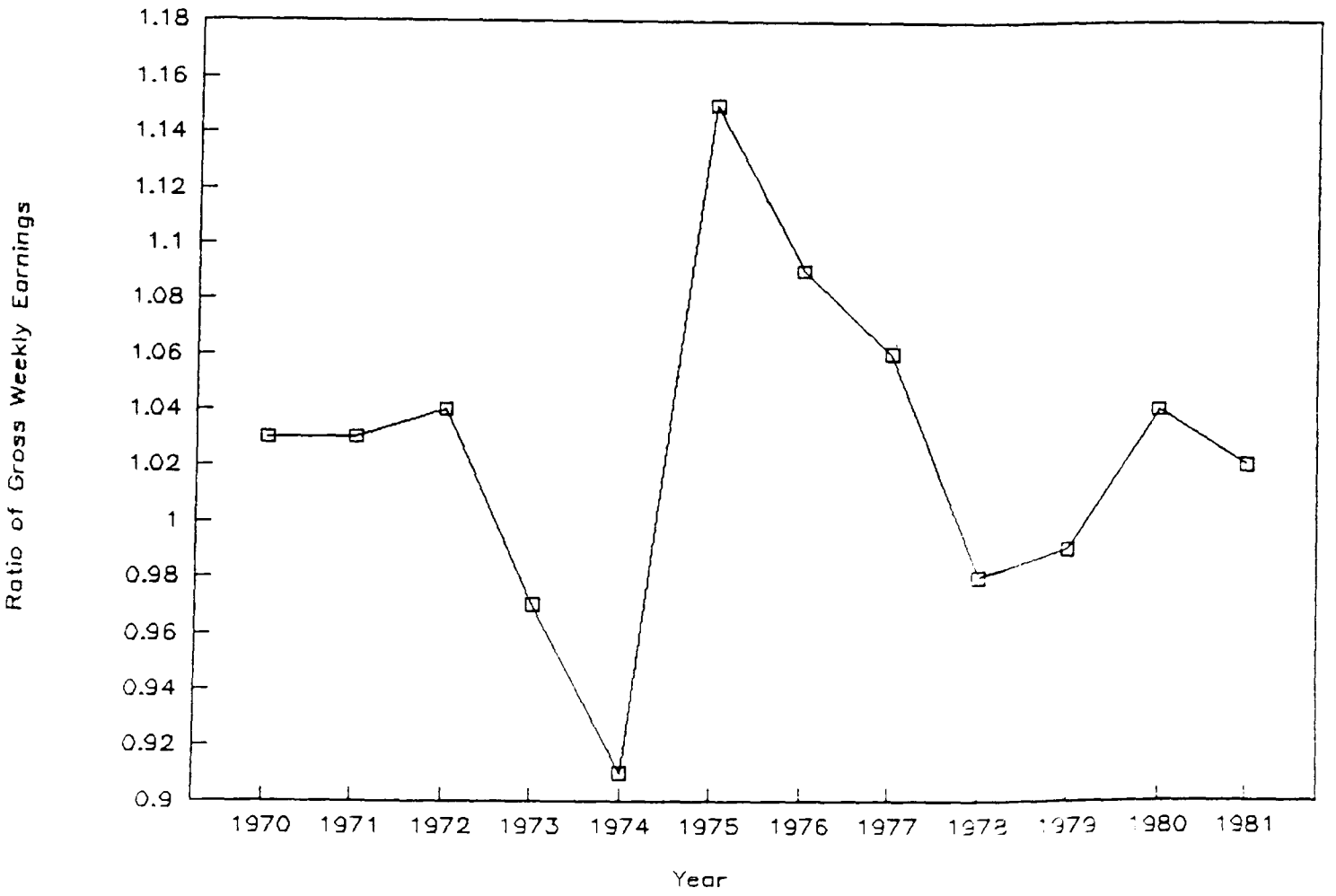
36 The Commission was heavily criticized by the nursing unions for the secrecy with which the factor analysis was undertaken and the small number of nurses interviewed.

pay of tutors, as difficulties concerning their recruitment had been reported, but the consultants had not recommended substantial increases for them, and a recommendation to do away with the posts of Regional and Area nursing officers.

In spite of the substantial increase, neither side was particularly pleased with the post-Clegg state of affairs. Nurses believed that they had been arbitrarily demoted in the national earnings league and they were generally tired of the vacillations in their earnings. Figure 2.2 shows nurse pay relative to that for other female nonmanual workers during the 1970s.

Figure 2.2: The Ratio of Gross Weekly Earnings for Nurses to that of Female Non-manual Workers



Source: *New Earnings Survey*, Various Years.

Managers felt that the pay structure had become too complex and that it was undermining financial incentives for acquiring skills and staying in posts. Special duty payments, overtime, and various allowances made estimating nurse pay difficult for managers as well as for the nurses themselves. Furthermore, as pay scales had expanded and the number of pay spines per grade had grown, differentials between grades had narrowed considerably. For instance, in 1973 the average pay of staff nurses was 40.6% of that of grades above ward sister, while in 1981 it was 63.0% of the pay of higher grades.[37] Also of note is that the overlap of some pay spines was such that a nurse could be promoted, but simultaneously receive a reduction in pay.

Given these objections and the general downturn in economic conditions, pay was becoming an increasingly contentious issue. After another impasse in negotiations had been reached, which resulted in nurses taking industrial action, the Government agreed to establish a Pay Review Body for nurses and midwives in February of 1983.

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37 Smail and Gray (1982) Table 3, p. 9.

v. The Pay Review Body for Nurses, Midwives, and Health Visitors

Appointed in November of 1983, the remit of the Review Body was to make annual recommendations conerning pay based on evidence from staff and management and on relevant economic data. Conditions of work were to be determined by the Nurses and Midwives Negotiating Council, a streamlined version of Whitley. This system was chosen for its apparent fairness, the continuity it provided, and most importantly, its independence from financial considerations as, in theory, the Government was obliged to accept the Review Body's recommendations.

The methodology of the Review Body in determining pay scales is similar to that of previous pay committees. It reviews evidence from staff and management and information available on the general economy and on labor market conditions, both within the NHS and outside it. The Review Body recognized early on that assessing productivity was practically impossible and that Clegg had given comparability studies a bad name; thus these aspects of pay formulation were avoided.

Like its predecessors, the Review Body has repeatedly expressed dismay on the lack of data available on which to make such important decisions; the total nursing paybill in 1989 was £5035 million.[38] Since 1985, the

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38 See the *Sixth Report of the Review Body for Nurses, Midwives, and Health Visitors*, p. 23. This figure

Review Body has conducted its own vacancy survey through the Office of Manpower Economics, which appears to be the factor which most influences its pay decisions. It realized that extant vacancy data were unreliable as it was not clear how long the posts recorded as vacant had been unfilled and, in some cases, vacancies were being maintained as evidence of savings rather than through an inability to fill the post. In their survey only those posts which have been vacant three months are more are included.

Along with the vacancy data, several other principles guided pay decisions. The Review Body wanted to establish the appropriate differential between the pay for third year students and first year staff nurses to provide an incentive for qualification, and it also aimed to insure that staff nurses received satisfactory salaries as this grade was the formal entry point into the profession at which most nurses spent several years. Finally, the Review Body felt that wage rates for unqualified staff should be dictated by conditions in general labor market and by the pay of ancillary staff.

While these were the Review Body's stated goals, little work could be done on revising the profession's salary structure as a major clinical regrading was launched by the Nursing and Midwifery Staff Negotiating Council in

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excludes the cost of employers' National Insurance and superannuation contributions, agency staff costs and London Weighting.

1985 and the Review Body felt that significant changes in pay should not be instituted when such a fundamental revision of the structure of the profession was underway.

Although the regrading took several years, nurses have benefitted from the Review Body being established. Earnings have stabilized to a degree -see figure 1.4- and they have recieved substantial salary increases each year from the Review Body. However, the system has proven less satisfactory than expected as the Government, on several occassions, has delayed implementing the pay award or has chosen to implement it in stages, rather than in full. As shown in table 2.8, this occurred in 1984 and 1985 and it undermined the Review Body's authority at the outset.

Table 2.8: Statistics on the Review Body for Nurses, Midwives, and Health Visitors from 1984-90[a]

Date of Report	Average Nominal Increase	Date Changes Take Effect	Estimated Nominal Addition to Pay Bill
April 84	7.0%	April 84	228m
April 85	12.2%	(5%) April (7.2%) February 85	282m
April 86	7.9%	July 86	280m
April 87		April 87	374m
April 88	4.0% 15.3%	April 88 when regraded	669m
February 89	6.7%	April 89	343m
February 90	9.0%	April 90	552m

Source: First through Seventh Reports by the Review Body for Nursing Staff, Midwives, and Health Visitors.

a. Cost estimates for 1988 exclude the pilot payment scheme, while those for 1990 include the costs of students becoming supernumerary under project 2000.

Although delays became less of a problem in the late 1980s, presumably that in 1988 was unavoidable, nurses were initially angered by the Government's failure to live up to the terms under which the Review Body was established.

After the regrading had taken place, the Review Body decided to monitor nurses' responses to the changes before making any dramatic alterations in the pay structure. They did, however, launch one intiative, a pilot scheme to introduce a degree of local discretion in determining pay. Requests for increased flexibility in setting wage rates were first presented to the Review Body by the Department of Health in 1988. The proposals were rejected at that time, but a second set were accepted for implementation the following year.

For positions which Districts have extreme difficulty filling, they can apply for a pay supplement to be attached to the post to help attract a suitable applicant. Interested Districts must submit evidence on their recruitment efforts to fill the post, the length of time it has been vacant, reasons why it in particular needs to be filled, and the non-pay initiatives currently being pursued by the Distict to attract staff. On this basis the Department will make awards among Authorities requesting assistance. The pilot scheme was intially given a £15 million operating budget in 1989.

In their evidence the following year, the Department reported it was happy with the program and the Review Body agreed to continue to fund the system in 1990. As of yet, no assessments of its effectiveness are available, although a number of subsequent reports have supported moves toward greater local discretion in NHS pay determination generally. (*BMJ*, 1990, 1535).

While pay has been the sole responsiblity of the Review Body, the streamlined Council oversees the conditions of employment, such as holiday entitlements, and it was in charge of the regrading exercise, discussed below.

vi. The Nursing and Midwifery Staff Negotiating Council

The most important undertaking by the Nursing and Midwifery Staff Negotiating Council was the clinical regrading of the nursing profession. The aim of the exercise was to provide clear job descriptions for all posts, so that titles and tasks could be standardized throughout the Service. Pay was then to be linked to the tasked performed.

For example, the job description for Grade D reads as follows:

> Nurses who are responsible for assessing, planning, implementing, and evaluating all relevant forms of care without direct supervision, and who may have teaching responsibilites; (it) applies to those who have first level registration; or a second level registration plus a recognized post-basic certificate or statement of competence; or a second level registration and who supervise the work of other staff.[39]

Each grade was awarded its own six point pay scale with a three to four percent differential between each point and minimal overlap between scales for each grade. Most auxiliaries were placed on grade A, while enrolled nurses were fairly evenly distributed between grades C and D and registered staff nurses between grades D and E; ward sisters were placed on grades G and H.[40]

While simpler than its predecessor, the new system also introduced a number of important changes. Registered and enrolled nurses with similar responsibilities were placed on the same grade and pay scale. Also, the necessity of further education or experience for nurses who want to gain promotion was made explicit. Finally, along with rewarding actual responsibility, the new structure clarified the paths of promotion available to nurse who wanted to remain in clinical practice rather than transfer to management or teaching.

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39 *Understanding Clinical Regrading: A Nurse's Guide to the New Pay Structure*, p. 10.
40 Actual percentage distributions of the number of nurses awarded each grade are provided in *New for Old? Prospects for Nursing in the 1990s*, table 4.1.

The regrading was a massive, time-consuming undertaking and it took nearly three years to decide on the alphabetic structure itself. While it brought about a much needed rationalization of the profession and a large increase in pay, the timing of events which followed somewhat spoiled its positive features. The new structure was agreed on in January of 1988, but guidelines on its implementation were not issued until May of 1988. Of note is that in the interim pay, scales for each of the new grades were issued by the Review Body in April of 1988

Given that pay scales and District budgets were determined prior to regrading, many nurses felt that it was not an independent exercise, when regrading finally got underway, but rather one conducted within rigid financial targets. A great deal of bad press resulted, as well as scattered industrial action, with many nurses contesting their grades. While the Government ultimately defused the situation by agreeing to provide extra cash to the authorities to meet the cost of the regrading, a backlog of cases still need to be resolved and most unfortunately, the profession once again felt cheated by the Government.[41] It will be some time before the effects of the exercise can be judged.

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41 Tutorial posts were regraded in a second phase between November of 1988 and March of 1989, while a regrading of management posts is still taking place. Of note is that the Review Body did not issue the pay scales for the tutorial grades until their regrading was complete.

Thus, while the Government in the 1980s took a more business-like approach to delivering health care, nurses initiated important changes within their profession. The reforms introduced were aimed at correcting weaknesses identified many times over in the enquiries in the preceeding decades. In theory, the quality of nurses' credentials has been strengthened through Project 2000 and their pay and promotional structure adjusted accordingly through the creation of the Review Body and the clinical regrading. All are very significant achievements which will potentially lead to the creation of nurses who are more productive and more committed to nursing than ever before.

However, while pay, human capital investments, and conditions on the job do affect nurses' work choices, they are but one group of factors among many which exert varying degrees of influence on nurse's employment decisions. It is an open question as to how important a role they play, and identifying these factors as well as their role in the decision-making process are the subjects of the following four chapters.

Chapter Three

A Review of the Existing Literature on Nurses' Labor Force Participation and of the General Literature on Female Labor Supply

Introduction

Having described various aspects of the environment in which nurses work, the discussion now turns to look at the participation behavior of women who have chosen nursing as their occupation. This decision is isolated for study as it was identified in chapter one as a market parameter determined by the choices of actors within the market, rather than one imposed by exogenous factors, and also one amenable to empirical investigation. This chapter examines the nature of the participation decision and thus provides an introduction for the formal model of participation presented and tested in chapter four.

In the U.K. the research on nurses and work catalogs their behavior or their attitudes towards work rather than rigorously examining what influences their participation in the nursing labor force. However, if the survey moves beyond the nursing field to the general area of female labor supply, a voluminous, quantitative literature on female labor force participation exists as well as several pieces which examine the labor supply behavior of nurses in America.

Reviewing this work is useful for several reasons. It establishes a framework for making a quantitative assessment of participation and it also provides a basis for comparing the behavior of nurses with other women and with other nurses, although this latter comparison will reflect cultural differences and differences in market structure.[1] This section begins with a profile of nursing labor force participation; it then discusses the relevant literature.

I. Participation in nursing

An examination of the evidence on nurses' labor force participation produces a fairly consistent profile of behavior over time. After qualifying, most nurses work for the NHS full-time with breaks in participation subsequently occurring with marriage or pregnancy, with the decision to take up further training, or with the need for time away from a stressful job. Following time off, many nurses return to the Service, but if the break was for marriage or pregnancy, it is often in a part-time capacity. For unqualified nurses, however, participation is much less predictable.

Auxiliaries are less tied to nursing as neither they nor their employers have made substantial investments in

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1 Neither difference is thought to be severe. Participation rates for women in both countries have followed the same trend and many American nurses work in monopsonistic markets.

training. Also, other types of jobs, offering similar pay, are usually available in the market.[2] This is not to say that auxiliaries are not committed to nursing and many clearly consider themselves to be nurses, but they are not the group with which employers are most concerned. They are included in the discussions in chapters four, six, and seven, but here the focus is on qualified nurses as this is the group whose behavior to date has been investigated.

Most research has examined the nature of the break from nursing: why it occurred, what happened during the break, and if the nurse is likely to return to the NHS. Again, the most extensive work on this subject was undertaken during the Briggs review in whose report actual participation rates for nurses are provided. Supplementary evidence has come in the form of work history and attitudinal surveys, many sponsored by the RCN. Taken collectively, the evidence suggests that most qualified nurses are committed to NHS nursing as on average the Health Service receives 14 years service from every nurse who qualifies, and furthermore, it is primarily family responsibilities which keep them out of the service.[3]

Figure 3.1 shows participation rates for nurses, compiled from supplementary surveys and the 1971 Census. Rates of

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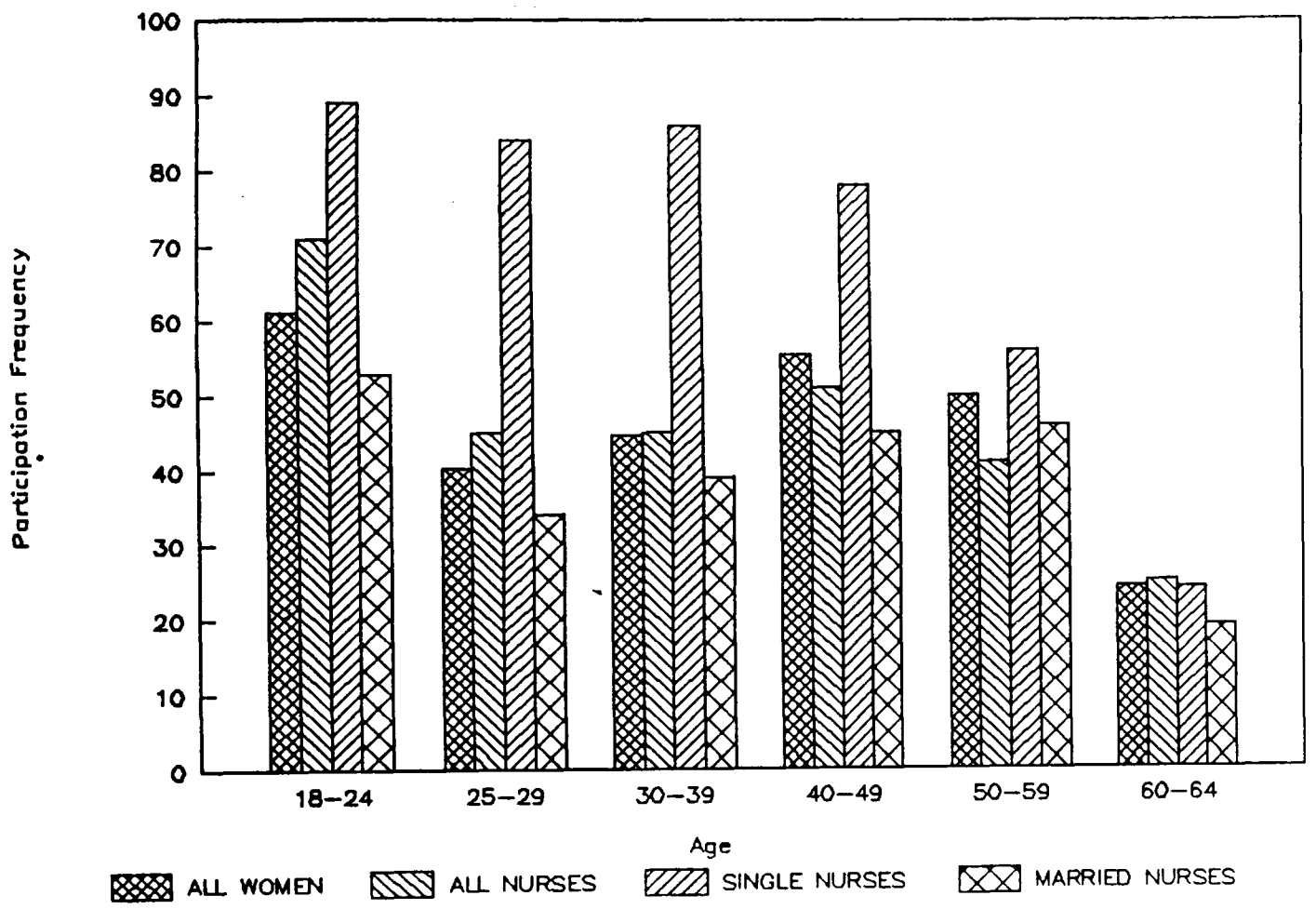
2 As noted in chapter two, the Pay Review Body considers ancillary workers and auxiliaries to be comparable groups.

3 Conversation with Richard Wilmer, data manager for the Department of Health, January 24, 1990.

economic activity for all women in Great Britain are included for comparison.

Figure 3.1: Participation Rates of All Women[a] and Qualified Nurses and Midwives By Age[b]



a *Annual Abstract of Statistics* (1974), tables 14, 15, and 143
b Briggs (1972) Table 25.

Figure 3.1 gives a frequency breakdown of the participation rates for all women in the U.K. by age and for nurses by age and marital status. Nurses under 30 have higher rates of participation than other women, while the rates converge in the 30 to 39 age range. From age 40 onwards nurses seem less likely to participate than other women, until after the age of 60 when the rates converge again at a low level. Thus, for all

women, participation is concentrated at younger ages falls and then rises again.

Not surprisingly, single nurses have significantly higher rates of participation at every age than married nurses. The first substantial drop in participation occurs at 40 or above, but even during peak periods of participation over 10% of all nurses are out of the workforce.

More recent figures on participation are available from the Labor Force Survey, conducted annually in Great Britain. Table 3.1 provides the participation rates for women with and without nursing qualifications and the percentage of those qualified who are working in nursing for the years 1983 to 1987.

Table 3.1 Participation Rates for Women With and Without Nursing Qualifications and the Percent of Those Qualified Working in Nursing

Year	% WOMEN ECONOMICALLY ACTIVE Without Nursing Qualification	With Nursing Qualification	% QUALIFIED Working in Nursing
1983	71.8	70.9	65.3
1984	-	79.5	65.6
1985	76.1	79.4	65.1
1986	76.8	80.5	63.6
1987	78.3	82.3	67.0

Source: Rates are compiled from Tables provided by the Institute for Economic Research, IER, which are based on annual the *Labor Force Survey*.

It suggests that nurses exhibit slightly more commitment to work than the general female population as for four of the five years their participation rates exceed those for the non-nursing population.[4] Of note as well is that two-thirds of all those qualified who are economically active work in the profession. Both sets of figures - from the 1970s and the 1980s- confirm that while commitment to the profession is strong, breaks in participation are common and that not all nurses who return to work return to nursing.

Other studies have documented the prevalence of breaks in nursing. For instance, in a survey of over 900 nurses in Yorkshire, Mercer (1979) found that over a third of the nurses in the sample had taken at least one break from nursing of at least six months, while 12% had taken two or more. He also found that while away from NHS nursing 31.8% took up other nursing jobs, 11.5% took up other types of work and 56.8% stayed out of work altogether (Mercer, 1979, 84). Further evidence from the *Labor Force Survey* indicates that working in the retail sector, as school and home helps, and as nursery nurses are common alternative occupations for those with nursing qualifications.[5]

Given these patterns, a number of studies have sought to identify: what caused the break and if the nurse is

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4 Elias (1987) finds that teachers and nurses have the highest participation rates among American women.
5 IER (1990), section III, table 4.

likely to return. As indicated in the table above, marriage has a significant effect on the likelihood of participation. This decline in participation can result from changes accompanying marriage itself or with pregnancies which often follow. Marriage alone can increase domestic responsibilities, entail moving to a new area, or negate the financial need to work, while children make considerable demands on their mothers' time. A great deal of evidence exists verifying the negative effect marriage has on participation.

For example, a recent study of two Districts indicated that 75% of those in the sample who were currently working had left the NHS at some point due to pregnancy or marriage (Martin and MacKean, 1990), while two-thirds of an OPCS sample of 700 nurses left for the same reasons. (Sadler and Whitworth, 1975). The latest Price Waterhouse (1988) study on recruitment and retention cites pregnancy as the greater barrier to participation.

It is important to note that the majority of nurses who are not currently working in the NHS state that they intend to return to the service. Consistently, at least half of every survey sample indicates that this is their intention (Sadler and Whitworth, 1975; Buchan et al., 1989).

Furthermore, the factors which are most likely to encourage nurses to return have been extensively

catalogued. They are: the availability of part-time work and the need for Service to offer more flexible hours to fit in with family responsibilities (Savage, 1990); availability of childcare and a more sympathetic/favorable attitude towards nurses with family commitments (DH, 1990; Savage, 1990); sponsoring refresher courses and pay (Martin and Mackeen, 1990; Waite and Hutt, 1987).

Given that it is primarily family responsibilities with which the NHS has to compete for qualified nurses' time, it is slightly surprising that the incidence of part-time employment in nursing has actually fallen over the last ten years. The numbers of nurses working part-time in the NHS by staff grade are given in table 3.2.

Table 3.2 Percent of Female Staff Working Part-time By Grade 1975 to 1985[a]

Year	Total	Registered Nurses	Auxiliaries
1975	44.4	43.5	71.8
1980	41.3	41.0	64.6
1985	38.4	34.6	61.5

a*Health and Personal Social Service Statistics*, (1978 and 1986), tables 3.16 and 3.17 respectively.

Additional information on hours of work can be extracted from the annual *Labor Force Survey*. Of note is that 60% of those in the sample with nursing qualifications who are employed as nurses in the health care sector work

full-time, while of further interest is that 75% of those working part-time work more than 20 hours a week. The survey also provides information on those with nursing qualifications who are working in other sectors and in other occupations. For both groups the percentage who work full-time and the number of hours worked by part-timers are similar.[6] This suggests that women are not leaving nursing for jobs which offer substantially more part-time work at reduced hours of work.

These figures, taken collectively, lend credence to a number of claims made about nurses' work behavior.[7] These include: 1) that nurses do not necessarily want to curtail participation dramatically, but rather that they want flexible schedules which allow them to combine jobs with family obligations and 2) that a minimum number of hours need to be worked to justify making childcare arrangements and incurring the associated costs. The latter is explored in the labor supply model presented in the next chapter.

In summary then, available evidence indicates that nursing labor force participation follows a consistent pattern, the predominant feature of which is that during years when family responsibilites are likely to be substantial, participation is intermittent or scaled back. It is important to emphasize that there is no

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6 These figures are based on IER (1990), section 3, tables 1 and 3.
7 See, for example, Buchan et al. (1989).

indication that this pattern is changing nor is there evidence which suggests that an increasing number of nurses are leaving the NHS permanently. Estimates consistently place the annual wastage figure at 10% (Briggs, 1972; Savage, 1990).

The expansion of the private health care sector and the increasing competitiveness of the labor market with the demographic changes taking place have produced concern over securing an adequate supply of nurses in the near future. One obvious way in which to increase supply is to attract back nurses who are out of the labor force or working in other occupations. While figure 3.1 and table 3.1 indicate that participation rates for nurses are high, the vast number trained means that a substantial reserve pool of nursing labor exists, the size of which has been been estimated to exceed 100,000 (Sadler and Whitworth, 1975).

Before the supply of nurses can be affected however, its determinants must be identified. Extant research has described various factors which potentially influence participation, but a more rigorous analysis of this decision is clearly called for. The next section examines the latest literature in the labor supply field where such analyses are commonplace. Given that the participation behavior of all women is heavily influenced by family responsibilities, a methodology for analyzing data on nurses is easily established from the work on

female labor supply. While most research in this area pertains to all women, a subset examining the participation behavior of American nurses exists and following the general discussion, it is reviewed in detail.

II. The Economics of Labor Supply

This section begins with a simple exposition of the neoclassical model of labor force participation. Following this, the results of labor supply estimates for women in Great Britain are reviewed along with extensions to the basic model which have appeared in the literature. Studies focusing on American nurses are then discussed and several key shortcomings are identified.

i. The Neoclassical Model

In a basic labor supply model utility is expressed as a function of leisure, L, and consumption, C:

(3.1) $U = U(C, L)$

where consumption is represented as a composite commodity with one price and leisure is assumed to be a homogeneous good whose price is the foregone wage, w.

The constraint on individuals is that total purchases cannot exceed total income. Spending on consumption is determined by the sum of earned and unearned income:

(3.2a) $PC = wH + y$ where PC = personal consumption
H = 1 - L or hours worked
equals total time less leisure
time and y = all nonwork income.

or if wages and income are converted to real values:

(3.2b) $C = WH + Y$.

In determining hours of work, utility (3.1) is maximized subject to the budget constraint (3.2b) and the resulting labor supply function is:

(3.3) $H = h(W, Y)$

and at this point, the marginal rate of substitution between consumption and leisure, MRS, and the market wage are equal.

If an individual supplies 0 hours, she is assumed to be a non-participant. In this case consumption is determined by nonlabor income and the MRS at this point is the reservation wage. For all individuals, the market wage offer must exceed this value or they will not work.

It is important to note that changes in W and Y can not only bring about changes in hours of work via conventional income and substitution effects, but they can also induce shifts in status from non-participation

to participation and vice versa. Given that many nurses and women are observed not working, the value of the reservation wage and factors which might generate discontinuities in this region, such as the cost of childcare associated with working, are of prime importance in labor supply estimations. More advanced work in this area has begun to incorporate these aspects of participation into research on women.

Based on this simple model however, most early studies produced variants of equation (3.3) for estimation. Linearity and continuity of the budget constraint were assumed and an error term and demographic variables were added to the equation to account for unobservable and observable differences in tastes respectively. Tastes had to be accounted for as models were based on the preferences of an individual or a household, while empirical tests were made on data involving groups of individuals or households.

Participation itself was measured in a number of ways: annual hours, weeks worked, or hours worked per week with the choice depending on the data. Typical control variables included marital status, age, number and age of children, education and training levels, income of spouse and local employment conditions and the estimation method commonly employed was OLS; see Boskin (1973) for an example.

This phase in the literature has been dubbed by many as first generation work. Numerous reviews of it and the elasticity estimates it produced exist (Borjas and Heckman, 1979; Smith 1980; and Killingsworth 1981 and 1983). The major problem with these models was that they estimated hours of work for those working, not participation, as they did not take into account those who supplied 0 hours of labor to the market. Most research on nurse labor supply, discussed in section three, falls in this category and while inadequate, the first generation studies served several functions.

They identified important demographic variables, such as having young children, which affected hours worked. They also indicated that women do respond to wage increases and that the substitution effect generally dominates the income effect. The suggested range for wage elasticities was: -1.18 to 4.60 (Killingsworth, 1983). Finally, work of this type brought to light the shortcomings of extant methodology, particularly in relation to female labor supply estimations. More sophisticated techniques had to be developed if the participation decision itself was to be examined.

Clearly, individuals work only if the market wage exceeds their reservation wage; otherwise they remain out of the labor force. As many women are observed supplying 0 hours to the market, one of the first advances in the literature was to develop a complete labor supply model

which incorporated this corner solution to the maximization problem. It recognized that the labor supply function consisted of two parts, one for those who worked and one for those who did not, which were linked by a crucial threshold condition.

On this view, the labor supply functions becomes:

(3.4a) $H = 0$ if $W_m < W_r$

(3.4b) $H > 0$ if $W_m > W_r$

where W_m equals the market wage and W_r the reservation wage and if an individual works, hours of work supplied are determined by the intersection of the market wage and a worker's indifference curve or, as in previous notation:

(3.5) $H = h(W, Y, X, e)$ if $H > 0$

where is a X is a vector of observable taste factors and e unobservable factors.

Several complications accompanied this new specification. In estimates of participation, the dependent variable is no longer a continuous value, hours, but a dichotomous one, participation or non-participation. Estimation by OLS is not appropriate for variables of this type and maximum likelihood techniques were thus introduced into labor supply analyses to estimate the probability of participation or the probability $W_m > W_r$.[8] A model based

8 OLS model can predict probabilities of participation outside the 0-1 range, while exclusion of nonparticipants from the regression leads to estimates that are biased

on probability of participation thus developed and although the estimation technique brought in was a familiar one, two variables critical to the estimation itself were missing: the reservation wage and the market wage of nonworkers.

The reservation wage cannot be measured directly. In theory it can be derived from the point where H=0 and empirically it can be expressed as a function of the factors which determine its value, namely anything which influences income and leisure tradeoff or changes in the nonlabor income.[9] For empirical work to proceed a proxy for this value had to be identified and for women various measures of household composition are now used to represent the reservation wage as the value of time spent out of the market is often a function of the number and age of children in the household.

Wage values for nonworkers also had to be produced for participation estimations to be possible. According to human capital theory, wages are a function of education, experience, and occupation chosen and on this basis wages for those not working can be estimated. Initially, such values were derived from the pay information of those who were working. Wage data for those employed in the sample

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towards 0 since the expected value of the error term cannot be assumed to be 0.

9 An exception to this is Lancaster and Chesher (1983) who the use minimum "asking wage" reported in a survey of the unemployed as a reservation wage. On this basis they find elasticities "not dissimilar" to those found in other microeconomic work.

were used to estimate the parameters of a simple equation such as (3.6):

$$(3.6)\quad W_i = aS_i + v_i$$

where S_i represents a vector of individual human capital characteristics and v_i an error term.

Using this equation and the estimated parameters, wage values were generated for those not working and, for consistency, often those working as well. Thus, reservation wages can be estimated by (3.7a) and market wages for nonworkers by (3.7b):

$$(3.7a)\quad W_{ri} = W_r(Z_i, Y_i, e_i)$$

$$(3.7b)\quad W_{mi} = W_m(S_i, v_i)$$

where Z_i is a vector of household composition variables, determining the reservation wage, Y_i is nonlabor income, S_i is a vector of human capital variables, and e_i and v_i are error terms.

Given estimates of both these values, participation can then be expressed as the probability that the market wage exceeds the reservation wage:

$$(3.8)\quad \Pr\{i \text{ works}\} = PR\{W_m > W_r\}$$

and by substitution and rearranging terms:

(3.9) $\Pr\{i \text{ works}\} = \Pr\{v_i - e_i > J\}$

$$\text{where } J_i = [W_m(S_i) - W_r(Z_i, Y_i)].$$

If the error terms of both these equations are assumed to be mean zero and normally distributed a specific functional form for estimation, the probit, can be derived and its parameters estimated using maximum likelihood techniqes.

An advance on this specification was introduced by Heckman (1976 and 1979) in a series of papers. He contends that basing wage estimates for nonworkers on information from workers is a biased process. On his account the fact that the expected conditional mean on the error term in the wage equation for an individual who works is not equal to zero and is different from that for an individual who does not work must be taken into consideration. He thus derives a selection bias correction term derived from the reduced form probit. This value, lambda, defined as the standard normal density function divided by the standard normal cumulative density function of the reduced form, is then used in the wage imputation equation to correct for any selection bias. The new wage equation thus becomes:

(3.11) $Wmi = (S_i, \lambda, v_i)$ where terms are as previously defined.

His correction for selection bias is now routinely used in the literature (Cogan, 1980b; Sprague, 1988).

Therefore, a complete model of participation explicitly acknowledges the two part labor supply function based on a threshold condition and takes account of the potential biases introduced due to missing data for nonworkers, particularly hours and wage data. A sample selection bias corrected probit model will be the participation model estimated for nurses in chapter four.

Of final note is that an alternative specification frequently employed is the Tobit. It is a conditional probability model in which hours of work are estimated by OLS techniques, conditional on the fact that those with positive hours are observed to be participating; the probability of participation itself is estimated using maximum likelihood techniques. Two criticisms of the Tobit are that it assumes that the labor supply function is continuous and that it potentially produces biased coefficients as hours of work are estimated from data on workers only. As such, it is subject to the same type of bias discussed above in relation to certain wage imputation procedures.[10]

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10 Killingsworth (1983) discussed the pros and cons of this model.

ii. Female Labor Force Participation: The Literature

a. General Estimates

Most papers concerning the labor supply behavior of women in Great Britain have focused on participation, and some have attempted to put general methodological improvements to use where data and computer resources allowed. Using various data sources -the *General Household Survey*, the *Women and Employment Survey*- fairly consistent results concerning the determinants of participation have been identified. The predominant finding is that women's participation is responsive to changes in the wage rate, although the degree of responsiveness depends on the specification used, and that both unearned income and spouse wage, if the woman is married, deter participation through their income effects.

A sampling of these estimates for British women are given in table 3.3.

Table 3.3: Elasticity Estimates for British Women

Author	Marital Status	Technique	Own Wage	Husband's or NonLabor Income[a]
Layard et al. (1980)	M	Logit	0.49	-0.28
Greenhalgh (1980)	M	OLS	0.36	-0.45
Joshi (1984)	M	OLS	0.22	-0.08
Joshi (1986)	M	OLS	0.45	-0.32
	S		0.35	-0.10
Sprague[b] (1988)	M/S	Probit	1.29	-

a. The value is nonlabor income if the women are single.
b. The elasticity is calculated by this author from Sprague's result.

Both Layard et al. and Greenhalgh make use of the *General Household Survey* (1971). Their results are fairly similar and they find that women increase their supply of labor in response to an increase in the wage, though the response is not elastic, while they work less when their husband's income rises. The dissimilarities between their findings arise primarily due to differences in estimation techniques. Layard et al. use the logit although the reasoning behind this choice is not clear as the probit is the appropriate form given their assumption about the distribution of the error term. Greenhalgh, on the other hand, uses OLS and claims that, although inappropriate, it introduces minimal bias on large sample.[11] Neither study corrects for potential sample selection bias.

Using the *Women and Employment Survey*, WES, Joshi extensively examines the determinants of female labor supply. She explored various definitions of supply: being economically active, working, and working full-time, and documented the effects of demographic variables on these different measures. The basic shortcoming of her work is her consistent use of OLS.

Sprague's work is also based on WES. Unlike the previous authors, she uses both the appropriate estimation

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11 These issues are addressed in footnotes: Layard et al. note 3, Greenhalgh notes 10 and 11.

technique and corrects for sample selection bias and it is important to note how correcting for this bias raises the estimate of women's own wage elasticity. Unfortunately, her model itself may suffer from misspecification as it does not include a measure of nonlabor income. Binary variables which indicate whether or not a woman is single and if a woman has an unemployed spouse or partner, but if these are to proxy nonlabor income, the relationship is not explained. Thus, it appears that providing reliable participation elasticity estimates for British women remains on the research agenda.

While an accurate measure of wage responsiveness has yet to be obtained, from the studies listed above and other similar work, a catalog of demographic variables which influence participation has been assembled. The presence of children, particularly in the age ranges of 0 to 2 and 2 to 5, have been found to decrease participation as they increase the value of a woman's time in the home and hence, her reservation wage. In some studies the total number of children has also been found to affect participation independently and negatively (Mincer, 1962; Cain et al., 1973; and Heckman et al., 1981). It is interesting to note that most authors assume children discourage participation through their effect on the reservation wage only; a few (Cogan, 1980b; Blank, 1988) have begun to consider the cost children impose on taking up employment.

Age has also been identified as an important determinant of participation. Age is believed to have a dual effect on partipation as it encapsulates not only the propensity of each generation to work, but also vacillations in the desire for employment over a woman's life. As a result, a specification commonly adopted was to enter both a linear and quadratic term into the supply equation. The effect of the former, capturing generational effects, has been found to be positive, while the latter, representing life-cycle effects, negative. See Joshi (1984) for discussion.

Education, rural or urban residence, ethnic origin, and amount and type of housing payment were also considered as determinants of participation, but their specifications in the literature have varied widely and the results concerning these variables have been mixed (see Dolton and Makepeace, 1986 for discussion).

Along with documenting the effects of demographic variables, attempts have been made to extend the basic model to endow it with greater realism. These include incorporating the effects of a nonlinear budget constraint, a product of a progressive tax system, of various forms of rationing in the job market, and of the fixed costs associated with work. Each is discussed in turn below as they have been addressed in the context of women's labor force participation, but as it is primarily

fixed costs which affect nurses, work on this topic will be discussed in somewhat greater detail.[12]

b. Extensions to the Basic Model of Female Labor Supply

1. Studies of functional forms

While the direct, individual utility specification outlined above is common in the empirical labor supply literature generally (see Fenn and Vlachonikolis, 1984; Blank 1988), it is important to note that other equally valid approaches exist. Labor supply estimations can be based on more complex functions. For instance, examining the household with its own utility function and budget constraint became popular in the late 1960s.[13] In such settings, interactions between family members work-leisure choices are as important as own-wage substitution effects.[14] Other alternatives are to look at an individual's utility against family income or to view household members as strategic bargainers within a single market.

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12 Fixed costs alone are addressed in chapter four because WES, the database used in the analysis, reports net income and there is no evidence of rationing in the nursing labor market either in terms of employment or hours of work.

13 Becker (1965) orginally described the household production function in which a woman's time is explicitly valued as the primary input into commodities produced within the household.

14 Most often cross-substitution effects are constrained to be equal; see Deaton and Muellbauer (1981) for further discussion.

Of note as well is that some approaches forego the direct utility specification and derive optimal hours and consumption levels from functions related to it. For example, minimum expenditure functions or indirect utility functions have all been used as the basis for deriving optimal C and H.[15] In the case of the former, leisure is treated like any other commodity with its own price and the demand for leisure is derived from its cost function; hours of work are the complement to this (Dickinson, 1980; Deaton and Muellbauer, 1981). Generally, the specification employed depends on the data available and on the proposed hypotheses to be tested.

In view of the variety of possible theoretical specifications, several authors (Blundell and Meghir, 1984; Stern, 1986) have examined the relationship between them and the empirical forms ultimately estimated. While one of the attractions of microeconomic studies is the close relation between the two, debate arises over the degree to which maintaining theoretical consistency, which requires selecting a stochastic specification where integration back to an underlying utility function is possible, should be allowed to restrict the data. Based on various estimations using data from the *Family Expenditure Survey*, Blundell and Meghir (1984) find evidence of trade-offs between consistency and

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15 For an alternative specifications, see Hausman (1980) or Zabalza (1983). For proof of their equivalence, see Smith (1980).

flexibility and recommend testing restrictions to ensure that they do not distort results.

2. The Budget Constraint

In the basic model outlined above, the budget constraint is assumed to be linear so that individuals face the same wage rate over all hours of work. Yet given the progressive tax systems which exist in many countries, this clearly is not so and a number of authors have examined the effects of nonlinearity, generated by such systems, on labor supply (Burtless and Hausman 1978; Wales and Woodland 1979). Furthermore, as the income of married women is often taxed jointly with that of their husbands, taxation can particularly complicate female labor supply estimations.[16]

Greenhalgh (1980) examines the effect of taxation on the labor supply of married women. She computes the tax paid and the marginal tax rate for each woman in her sample. Transforming these outcomes through the use of lump sums and a flat tax rate, she creates a nonprogressive tax system to generate a constant marginal tax rate and hence, a linear budget constraint, for all observations. Based on OLS results from the tax-adjusted model, she

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16 Independent taxation for women who were married became available in 1972. The 1987 and 1988 budgets also contained a number of reforms for taxing the income of married women.

computes an own wage elasticity of 1.00 for the sample population.

Nonlinear budget constraints, however, raise questions fundamental to the econometric specification of labor supply.[17] Under nonlinear budget constraints, the choice of hours worked determines the wage. The wage is thus endogenous and jointly determined with hours. Other authors have taken a different approach to account of this endogeneity (Zabalza 1983; Moffitt 1984).

Zabalza specifies a CES utility function in which all optimum hours of work have a unique corresponding income-leisure ratio.[18] He uses this relationship to divide his observations into three regimes: not working, working with no tax payments, and working with tax payments. Using a probit formulation, he estimates a conventional supply model and finds an average own wage elasticity of 2.00 and an income elasticity of -1.21 for all groups.

In a joint wage-participation model, Moffitt combines a linear labor supply model and the hours/wage offers to generate a probit model in which hours and wage are simultaneously determined. The budget constraint which results, nonlinear but differentiable, is approximated using a series of discrete points. He finds that hours affect the wage quadratically and that accounting for

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17 This problem is acknowledged by Greenhalgh, but not addressed in her study.
18 Zabalza uses a similar specification in an earlier paper.

nonlinearity reduces elasticity estimates which he calculates to be 0.21.

3. Continuity: Job Rationing and Fixed Costs

Along with the linearity of the budget constraint, another assumption which has begun to be challenged is the continuity of the labor supply function. Most models assume a continuous specification to ensure definitions for the resulting probability functions and as a result all hours of work are held to be available and desirable.[19] However, as the potential sources of discontinuties are numerous -the cost of childcare and transport, the needs of employers- many began investigating them and their effect on women's hours of work. (Hanoch 1980; Ham 1982; Blank 1988). Work in this area explores two basic ideas: job rationing and fixed costs.

Initially, most models assumed that workers freely chose their hours of work, but in reality employers often set minimum and maximum hours requirements to which workers must conform. Jobs themselves can be scarce and jobs offering the desired number of hours may be difficult to find. For instance, Moffitt (1982) suggests that men may be pushed into full-time work when they would actually

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19 Of note is that Heckman's two-step procedure allows for different parameter estimates for the participation and the hours decision and hence the existence of discontinuity.

prefer to work fewer hours.[20] In light of all of these factors, researchers began to account for the fact that the choices of many individuals concerning work are constrained (see Moffitt 1982; Blundell et al., 1986; Ham, 1986).[21]

Using a data set which provides specific information on hours constraints, Ilmakunnas and Pudney (1987) estimate wage elasticities for Finnish women. They model job opportunities for individuals based on personal and labor market characteristics and for a representative woman in their sample, they find full-time work to be available 66% of the time and part-time work to be available 33% of the time.[22] Their simulations, furthermore, confirm earlier findings that marriage, presence of a child under six, and a spell of unemployment reduce the probability of a woman finding full-time work. They then use these parameters as constraints in a multiple logit model, based on utility maximization, which places an individual in one of three regimes: part-time, full-time, or no work.[23]

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20 Moffitt (1982) examines constraints on prime age males and finds that desired hours reductions must often take the form of moving out of the labor market.
21 The substantial and sustained rise in unemployment in the early 1980s brought about a reconsideration of forces which constrain participation. See Nickell (1990) and Ham (1986) for various theories and evidence.
22 Ilmakunnas and Pudney (1987) used three probability models: an independent logistic, a bivariate probit, and a multinomial logit, all of which produced similar results.
23 Their strategy of placing individuals in one of three regimes resembles that of Zabalza (1983). Their unusual utility specification is adopted for compatibility with their probability forms.

Their estimates of own wage elasticities fall in the 0.5 to 0.7 range and are considerably smaller than other have reported. They contend that previous work has ignored the wage premia associated with full-time work which creates a spurious correlation between hours and wages.[24] In addition early studies ignore rationing which forces women who would like to work few hours either out of the labor market or into full-time work, magnitudes they compute to be 9% and 4% respectively in their sample. Thus, it depresses the hours-wage relation at low hours and strengthens it at high hours, further distorting the real elasticity.

Blundell, Ham and Meghir (1986) extend the standard Tobit model to account for legitimate unemployment, meaning a state of looking for work but reporting 0 hours. Their specification, similar to the Double-Hurdle model of Cragg (1971), allows varying demand side variables to affect participation through an index of macro and micro factors. The probability of an individual reporting zero hours is therefore the respective sum of the probabilities individuals are out of the labor market and individuals are unemployed.

The standard probit only allows changes in demand variables to work through the wage, an indirect effect;

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24 In their wage equation Ilmakunnas and Pudney (1987) include a 5.2% wage premium for full-time work; they do not correct for sample selection bias.

this specification allows for their decomposition into a direct effect, in increasing unemployment, as well as an indirect effect. They find significant reductions in participation resulting from unemployment, created by changing demand side variables.

Fixed costs of working, such as transport and child-minder's fees, are the second important source of discontinuity in the supply function. In the conventional model the reservation wage equals the marginal rate of substitution at 0 hours work for a given level of income. Fixed costs sever this link as the budget constraint shifts inward by an amount equal to these costs whenever work is taken up. Where such costs are present, the reservation wage is the slope of the indifference curve at a minimum number of hours of work, the reservation hours, where a woman is compensated for the value of foregone leisure and the costs associated with working. Most studies calculate the probability of working by comparing the market wage with the wage at reservation hours with variables, such as the number of children, acting as proxies for fixed costs.

Fixed costs were initially treated as a lump sum (Hanoch 1980). Now they are often broken down into two types: money and time costs which have different effects on labor supply. An increase in time costs, which are a function of the wage, decreases hours supplied, while an increase in money costs, such as transport or uniforms,

increases hours. The distinction is theoretically interesting, but it has proven difficult to explore due to a lack of data.

In what is known as the seminal work on the effects of fixed costs on labor supply, Cogan (1980b) presents a model which examines the tradeoff between time and money costs as women are allowed to choose between them at given rates of exchange. The model he estimates, however, includes fixed costs as an aggregate only. He uses a Tobit, which identifies the determinants of hours worked, based on a comparison of the wage at reservation hours and the market wage; the market wage is corrected for sample selection bias via Heckman's procedure. He finds evidence of large discontinuites around 0 hours and his results confirm that the reservation wage is not associated with 0 hours work, but rather a substantially greater magnitude, 1151.2 annual hours. His findings also suggest that studies which do not account for them are likely to overestimate the wage elasticity for women, by up to a factor of three. Finally, Cogan also calculates the cost of entry into the labor market for the average woman in his sample to be 16% of average annual earnings with each child under age six raising costs by $300.

Fixed costs are also incorporated into two later pieces by Hausman (1980) and Blank (1988) which examine other

aspects of labor supply. Hausman (1980) estimates a probit model in which participation and hours are jointly determined and the effects of both a nonlinear budget constraint, generated through tax and transfer systems, and fixed costs are investigated. As a unique reservation wage need not exist in the presence of nonconvexities and fixed costs, his model in based on a utility comparison in different regimes rather than wage comparisons alone.

He corrects for sample selection bias and for 1000 households headed by black females, he estimates fixed costs to be $19.71 a week where the mean wage earned in the sample is $1.96 an hour. He suggests that the paucity of women working part-time is evidence of the need to overcome fixed costs.

Building on a work by Hanoch (1980) and Hausman (1980), Blank (1988) develops a model of labor supply which examines the interactions between weeks of work and hours of work among female household heads. It also separates the participation decision from that concerning the volume and timing of work and investigates constraints on supply arising from the costs associated with working and from employers demand for a certain number of hours. She does not present structural models of these decisions, but rather reports results generated from the reduced form.[25]

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25 Blank used the reduced form to improve the efficiency of her estimates, but as a result little can be said

Her specification is derived from a model of utility maximization involving different types of leisure. It is estimated via the Tobit, in which the error terms of the participation, weeks worked, and hours worked equations take a trivariate normal distribution. Blank finds that decisions on participation, duration, and intensity of work are different, but that the latter two are made simultaneously, once the participation state has been selected. This suggests that using annual hours worked as a measure of labor supply is inappropriate. From the models estimated under different restriction, she also finds evidence of discontinuity which suggests that working women either face sizeable fixed costs or labor market rationing which inhibit their working low levels of hours and weeks.

This brief overview of the latest research has indicated that while labor supply analysis is still limited by its simplifying assumptions, such as those concerning the budget constraint and preferences, the literature in the last decade has made substantial progress in improving estimations of complex behavior in the face of data constraints. The move towards more realism in modelling is a step in the right direction, but it is important that each succeeding work build on extant research. This includes exploring new related ideas as well as making use of the latest econometric techniques. The next

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about the effect of wages on labor supply, however measured.

section of this chapter will examine the literature on nurses to demonstrate how studies of this occupational group have not kept pace with more general research. The analysis of chapter four attempts to remedy this situation as well as provide some analysis on the role of fixed costs in affecting women's labor supply in Britain.

III. Labor Supply Estimates for U.S. Nurses

Most quantitative studies concerning the labor supply of nurses set out to predict how they would respond to wage increases. While the work dove-tailed well with that being done on general female labor supply, a popular topic in the 1970s, the primary concern in the area of nursing was whether or not wage increases would help eliminate staff shortages, considered to be acute in the U.S. in the early 70s.[26] If nurse labor supply was not responsive to wage increases, raising wages would simply increase labor costs in the short-run.

As the vast majority of nurses in the U.S. are female, the methodology adopted in nurse labor supply studies was to apply extant models of female labor force participation to data on nurses to obtain the elasticity estimates such models produce. Also, given that a large proportion of women holding nursing qualifications are

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26 Substantial investment in the U.S. was made during the Johnson administration to increase nursing training facilities and to subsidize the costs of those who wanted to take up training.

married, important topics of investigation have been the effects of the spouse wage and the presence of children on participation. They also recognized that the supply response could come through increased participation or through increased hours from nurses already working thus efforts were made to investigate both magnitudes.

While nursing studies borrowed the ideas and equations of this literature, they generally neglected to develop the utility-maximizing foundations on which the models are based. Thus, the empirical work on nurses in this area tends to be ad hoc and it generally suffers from sample selection bias. Given that these results are intended to help policy makers choose the most effective way to increase supply, such as subsidizing training or raising wages to increase participation, it is unfortunate that none can be considered reliable.

The number of studies undertaken in this area has been fairly substantial: Altman, 1972; Benham, 1971; Bishop, 1973; Bognanno, Hickson, and Jeffers, 1974; Link and Settle, 1979, 1981a, 1981b; Sloan and Richupan, 1975; Dusansky and Walsh, 1980. The majority make use of microeconomic data and the results from a number of studies in this group are presented in the table below. Following that, the papers themselves are discussed in detail.

Table 3.4: Elasticity Estimates for U.S. Nurses[a]

Author/Year	Technique	Marital Status of Sample	Own Wage	Husband's or Nonlabor Income
Boganno et al. (1974)	OLS	M	0.33	-0.003
Sloan-Richupan (1975)	Tobit	M	2.81	-1.52
Link-Settle (1979)	Tobit	M	0.58	-0.72
Link-Settle (1981a)	Tobit	M and S	-1.49 to 0.11	-0.6 to 1.7

a. The dependent variable is annual hours worked by registered nurses.

The studies are listed and reviewed chronologically as authors tend to build on work which preceded their own. For the most part, these pieces resemble in form, conclusions, and shortcomings first generation work on female labor supply and like other studies in this category, the nurse literature suggests that women in this occupation group respond positively to wage increases, while they work less as their husbands' income or, if they are not married, their nonlabor income rises. The table above demonstrates the degree to which the estimates vary, while the discussion which follows indicate why it is impossible to deem any one value as correct.

Boganno et al. (1974) present two models of labor supply for a sample of Iowa Registered Nurses. Supply is presented as the probability of participation and a model, similar to those found in the early female labor

supply literature (Mincer, 1962; Cain, 1966) for both participation and hours of work for those who are working is estimated. No account, however, is given of its derivation. Also, while both aspects of supply are addressed, they are estimated using OLS, an inappropriate technique for identifying the determinants of a probability; the hours of work estimate, furthermore, is not corrected for sample selection bias.

Labor supply is expressed as a function of own wage, spouse wage, age, number of children, the presence of a child less than six, and whether the family is renting or buying a house. The wage is predicted to increase participation via dominance of the substitution and based on degree type, region of residence, field of specialization, grade, shift, and length of service, wages are imputed for the entire sample. No correction is made, however, for the fact that the imputation is based on information from workers only. Husbands' wages proxy nonlabor income for nurses and are expected to decrease participation.

The remaining variables which determine participation are age and hours of work. The effects of age are captured through binary variables which place each nurse in one of several age bands, while a similar technique is used to proxy the effects of different housing arrangements. Concerning housing, variables indicate whether the nurse is an outright owner, paying off a mortgage, or renting.

There are also two specifications concerning children. The first is total number of children, a continuous variable, while the second is presence of a child less than six which is a dummy variable.

The predicted effect of most these variables is straightforward. For instance, being age 30 to 39 is expected to decrease participation as marriage and pregnancy frequently occur during this period. The effect of renting, however, is considered to be ambiguous. The model of participation and hours of work with the predicted effect of each of its components is:

$$\text{(3.13) Hours} = f\{\ \overset{+}{WN},\ \overset{-}{WS},\ \overset{-}{C_1},\ \overset{-}{C_2},\ \overset{+}{A_1},\ \overset{-}{A_2},\ \overset{+}{A_3},\ \overset{?}{H_1},\ \overset{+}{H_2}\ \overset{-}{H_3}\}$$

where WN = nurse's hourly wage, WS = spouse's hourly wage, C_1 = 1 if the nurse has a child less than age six, C_2 = total number of children, A_1 = 1 if nurse is age 20-29; 0 otherwise, A_2 = 1 if nurse is age 30-39; 0 otherwise, A_3 = 1 if nurse is age 40-65; 0 otherwise, H_1 indicates renter, H_2indicates mortgage holder, H_3 indicates owns home outright.

Using OLS, Boganno et al. find that participation is primarily determined by spouse wage, having preschool aged children, and being age 20 to 29. All three variables are significant and have the expected sign. Holding a mortgage also significantly increases the likelihood of participation. Own wage, total children, and being age 30 to 39, while they enter with the expected signs, are all insignificant.

Re-estimating the equation for hours worked for those who are working, the authors find the results for the participation equation for the most part repeated. There are a few important exceptions. Own wages now significantly and positively affect hours worked, with the elasticity of hours worked with respect of the wage being 0.33, while total number of children significantly decrease them. Falling in the second age group significantly reduces hours, while renting accomodation increases them. Buying a home is no longer significant, although the sign on the coefficient is the same as in the participation equation.

While the findings generally seem robust, the results from the participation regression should be viewed with caution. OLS is not the appropriate estimation technique for estimating the probability of participation and the hours equation, as it refers to working nurses suffers only, from selection bias. The next three papers discussed attempted to remedy the first problem.

Sloan and Richupan, S-R, (1975) estimate a model of nurse labor supply using a Tobit specification which accounts for the fact that a number of women supply 0 hours of work. In the Tobit, an OLS hours of work equation, conditional on participation being observed, is estimated. While the estimation technique employed is a substantial improvement on OLS, the theoretical basis for their model remains undeveloped. The authors claim that

their model is based on utility maximizing behavior in which women compare the value of their market and nonmarket time, but no formal derivation is given.

In their model participation, measured as hours of work, is a function of the potential market wage, spouse wage, nonlabor income, presence of children by age group, presence of adults in the household other than spouse by age, race, being foreign born, having an unemployed husband, and age. The exact specification is:

$$\text{(3.14) Hours} = f\{\underset{?}{WN},\ \underset{-}{WS},\ \underset{-}{Y},\ \underset{-}{C_1},\ \underset{-}{C_2},\ \underset{?}{C_3},\ \underset{+}{C_4},\ \underset{+}{AD_1},\ \underset{?}{AD_2},\ \underset{-}{AD_3},\ \underset{+}{A_1},\ \underset{-}{A_2},\ \underset{?}{B},\ \underset{?}{F},\ \underset{-}{HU}\}$$

where WN = nurse's hourly wage, WS = spouse's hourly wage, Y= nonlabor income, C_1 = number of children less than age two, C_2 = number of children age two to five, C_3 = number of children age 6-15, C_4 = number of children age 16-19, AD_1= number of adults age less than 65, AD_2 = number of adults age 65-74, AD_3 = number of adults age 75 or above, A_1=1 if nurse age is less than 30, A_2 = 1 if nurse age 30 to 39, B = 1 if nurse is black, F = 1 if nurse is foreign born, HU = 1 if nurse's spouse is unemployed; the predicted effects of each variable is shown above.

Unlike general female labor supply studies, S-R contend it is impossible to predict the effect of wage increases on participation as it unknown as to whether the substitution effect or the income effect dominates; hence, no sign expectation is given for WN. Husbands' income and nonlabor income are expected to exert income effects, increase the demand for leisure, and hence discourage participation. The remaining variables are interpreted routinely.

The presence of young children and dependent adults in the house is likely to boost the nurses' home productivity and decrease participation, while older children and other adults can act as substitutes for nurses' time in the home and hence increase participation. Being less than age 30 is likely to increase participation as this is the period during their lives when most women work, while being age 30-39 is likely to decrease it as this is the time when many women stop working. The effects of being foreign born or black are unknown, but these variables are included to test for different tastes for work. Finally, having an unemployed spouse is expected to increase participation through a negative income effect.

Instrumental variable techniques are used to impute wages for all nurses and for their spouses. The wage equations are <u>not</u> given and little can be said about their formulation, except that they are potentially biased as nonworkers wages are based on OLS coefficients derived from estimations on workers only.

Two specifications are run: one on annual hours, the other weekly hours. Both produce the similar results and the expected signs with two exceptions: both age groups increase hours worked, instead of only the younger classification, and having adults in the household over age 74 does not discourage participation. Of note is

that being black or being foreign born discourages participation, but neither of these variables is significant. In fact, most demographic variables are insignificant, while the wage, income, and child variables are significant at the 5% level.

The elasticities from these estimations are sizeable as own wage estimates are 2.81 and 2.82 in the weekly hours and annual hours regression respectively, while those for spouse wage are -1.38 and -1.52 and for nonlabor income are -0.03 and -0.02.

Link and Settle (1979) extend the work of Sloan and Richupan (1975) by adding two new variables to their equation and by re-estimating it on a more recent data set, a micro sample of nurses from the 1970 census. They include dummy variables for being disabled and for years of education, with the breakdown being 13 to 14, 15, or 16 or more years of education. Another change is that they refine the measure of nonlabor income as in their data set employment related income can be identified and deducted completely due to improved data collection. Finally, as in the S-R piece, wages are imputed for workers and nonworkers alike, although the wage equation is again not provided; however, a wage squared term is included in the model to capture any of the nonlinear effects of the wage on hours of work.

Based on a Tobit formulation, Link and Settle report results qualitatively similar to those of S-R. The nurse wage increases participation, while spouse wage and nonlabor income decrease it. The magnitude of the elasticity estimates, however, differ substantially for nurse and spouse wage. Link and Settle report much smaller responses with an own wage elasticity of 0.58 for nurses in their sample compared to 2.8 for S-R. Concerning the spouse wage, the comparable figures are -0.72 and -1.54. The nonlabor income elasticities, on the other hand, are quite similar for the two studies, -0.03 for Link and Settle and -0.02 for S-R.

Several factors potentially explain the varying results. Firstly, in the S-R sample over half the married nurses are out of the labor force compared to only a third in the latter sample. If working married nurses are constrained in the hours they supply, once working, due to family responsibilities, then as more make the initial transition into the labor force, elasticities are likely to fall as they can offer no further response to wage increases. Alternatively, the differences may result from different wage imputation procedures, although little can be said about this possibility as neither set of authors explicitly defines how they impute wages for nurses or their husbands. Of final note is that the wage squared term included in the model may be influencing the coefficient on wage. It is difficult to determine what these effects might be as its inclusion is not clearly

explained nor is it discussed in the text once the results are presented.

DemOgraphic variables exert roughly similar effects in both studies. Children less than age 12 negatively effect participation, while those age 16 or older, still living at home, have positive effects. For Link and Settle age variables are significant, with being 30 to 39 decreasing participation, while S-R find neither to be significant and the sign on the older classification to be positive. Interestingly, being nonwhite significantly increases participation while having an unemployed spouse significantly decreases it in the Link and Settle sample. In the earlier work the coefficients had opposite signs and neither was significant.

Concerning the additional variables, Link and Settle find that nurse disability and education greater than 16 years are both significant and both decrease participation. The former is to be expected, while the latter perhaps indicates that women with more education abandon nursing for other careers. In this specification, furthermore, the own wage elasticity increases to 0.58 which might be expected given that disability, an exogenous constraint on hours is accounted for.

In Link and Settle (1981a) the authors attempt to improve on their own earlier work. They estimate an amended version of their 1979 model using the same techniques

with the major difference between this model and the last being that family composition variables are omitted. The rationale for this adjustment is that fertility and labor supply are simultaneous decisions and as a result composition variables should not be included as determinants of labor supply. Also, for this estimation, they disaggregate the data by age group, adjust wages for taxes, and allow for the possibility that the RN labor supply curve may be nonlinear by assuming that the imputed RN wage is related to labor supply via a step function.

Using a Tobit specification and maximum likelihood techniques, they proceed to estimate the parameters of their revised model for five age groups: less than age 25, age 25 to 34, age 35 to 44, age 45 to 54, and age 55 to 64.

They find that husband's income and nonlabor income decrease the likelihood of supplying hours with the elasticities for these variables being -0.6 to -1.7 and -0.02 to -0.16, respectively. Taste for work variables, education, ethnic background, and region of residence, are insignificant, while having an unemployed husband increases the hours supplied by each nurse. Link and Settle find nurses unresponsive to changes in their own wage and evidence that, in fact, their supply curves may bend backward at certain levels; their estimates range from -1.42 to 0.11.

These own wage elasticity estimates are unique among labor supply studies on nurses and rare among studies on women in general. Yet rather than indicating that the labor supply curve for nurses has a shape decidedly different from that of other women, the results most likely arise from misspecification. A number of aspects of their approach cast doubt on their findings. There are two primary sources of concern: their wage calculations and the specification of their equation.

Instrumental variable techniques are used to impute wages for the entire sample. These figures are then adjusted for tax and regional price differences. The imputation equation is not detailed, but only described as containing variables for education, experience, region of employment, and mean temperature in January. The tax adjustments are based on three unjustified assumptions: 1) that RNs file jointly with their husbands; 2) that they claim the 10% standard deduction; and 3) that they claim a personal exemption of $600 per dependent in the household; price adjustments are again not detailed.

In theory, adjusting for taxes requires integration of the tax schedule and wages as tax rates and hours of work are in reality jointly determined. While examining net income in labor supply estimations is desirable, generating this measure, if it is not provided in the database, is not an easy task. Wage adjustments must be

made carefully as they dramatically affect results and it is not clear that approximated net income is better than unadjusted gross income if the estimates which result are not reliable. Link and Settle fail to make the case for their adjustments which is crucial to substantiating their results.

Secondly, in the Tobit model the wage is specified as a step function, but the original imputation procedure, prior to the adjustment for tax, assumed that the wage equation was linear. Hall (1973) discusses the potential bias arising when the linearity assumption is violated. The authors themselves admit that earlier work on this same database (see Link and Settle 1977, 1979) produced positive wage coefficients when data was not stratified by age and when tax adjustments were not made. The discrepancy, however, seems to have caused them little concern. While their wage adjustments are questionable, their basic specification is essentially unjustifiable.

Also, Link and Settle do not include family composition variables in their supply estimations. They contend that given the simultaneity of the fertility-work decisions these variables should be excluded. The authors, however, make no attempt to demonstrate the nature of work-fertility relationship nor do they explain why omitting variables is the appropriate way to address the issue.[27] They also suggest that with this exclusion

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27 Link and Settle (1981b) do attempt to flesh out the fertility-work relationship in a later piece; however, it

their results can be viewed as long-run elasticity estimates in which fertility is permitted to adjust over time to market wage incentives.

Concerning the first point, labor supply and fertility are certainly related decisions and may indeed have determining factors in common. Much research on their relationship has been undertaken: Mincer, 1985, Joshi et al., 1985; and Sprague, 1988. Some do emphasize the potential simultaneity aspect of these decisions in models in which choices made in one period affect outcomes and choices in the next (see Schultz, 1975, for further discussion). Such links over time, however, are not the domain of cross-section estimates which explain behavior at a particular point in time. Furthermore, a great deal of evidence exists documenting the large, negative impact of children on female labor force participation, particularly those children below school age. These effects may arise as tastes change and the reservation wage changes or from the fixed costs children generate. Link and Settle do not consider the latter issue and omitting these variables most likely leads to results which are seriously biased.

Concerning the second point, in no way does leaving out variables whose costs and returns change over time transform cross-section estimates into long-run elasticities. What is necessary is a model of how

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does not make their case any more convincingly than does the piece discussed in this text.

equilibrium changes over time and what brings about those changes, processes which cannot be inferred from a static model. Therefore, on the whole, little stock can be placed in their results.

Given this review, it seems there remains a great deal to be done in estimating nurse labor supply functions. Work to date indicates that the labor supply of nurses is very similar to that of other women and that it is responsive to wage changes. Spouse wage, family nonlabor income, and the presence of children definitely reduce labor supply, while educational attainment and region of residence appear to be important factors as well, although the results are not conclusive. While these results tally well with findings on women generally, the estimations suffer from misspecification and/or sample selection bias and thus can only indicate what affects supply, rather than provide an accurate guide on how it may be adjusted. Also, many issues such as the role of fixed costs and job rationing have yet to be addressed in the context of the nursing labor market. The model estimated in the following chapter corrects for these shortcomings.

Chapter Four

An Analysis of the Participation and Hours of Work Decision with Fixed Costs for Nurses in Great Britain

Introduction

Having assessed extant research on female labor force participation and having outlined an appropriate methodology for investigating this topic, this chapter develops and estimates a labor supply model for nurses. It corrects for misspecification and sample selection bias which potentially affected earlier work on this occupational group and examines the role of fixed costs in affecting the hours supplied by nurses who work. It therefore provides the first rigorous participation elasticity estimates with respect to the wage rate, nonlabor income, and fixed costs for nurses in Great Britain.

These results should be of interest not only to labor economists, but also to health care professionals generally, given the concerns over participation with the projected demographic changes. They may also shed light on the potential effects that changes in nurse education and training will have on supply.

The chapter is organized as follows. The first section outlines the model to be estimated, while the data and the empirical specification are discussed in the sections II and III respectively. The results are presented in section IV and the conclusions in Section V.

I. The Model

i. A Structural Model of Participation

In the neoclassical framework individuals choose to work (or not to work) by comparing their personal valuation of their time, from which their reservation wage is derived, with the wage they would be offered in the marketplace. If the market wage exceeds their reservation wage, they work; otherwise, they remain out of the labor force. Formally, the decision can be specified as follows.

Utility is defined as some function of leisure, L, and consumption, C.[1] If a particular functional form is assumed, an individual's utility function can be written as:

$$(4.1) \quad U_i = C_i^{\alpha} L_i^{\beta(zi)} + ei$$

where C=consumption, L=leisure, and $\beta(z_i)$ is a vector of observable factors affecting taste for leisure, while e_i represents unobservable influences on taste and is assumed to be normally distributed with a mean of zero.

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1 The Cobb-Douglas specification is one frequently assumed in the literature (Layard et al, 1980; Fenn and Vlachonikolis, 1984); for further discussion of functional forms, see chapter 3, section III.

For those who are working, total consumption of goods and leisure is determined by total income, earned and unearned, and the fixed costs associated with working. Earned income is a product of the market wage and hours worked, while market wages themselves are a function of human capital characteristics and unobservable features, such as ability. For those who are not working, consumption is a function of nonlabor income only.

Based on these relationships, the budget constraints for the sample are as follows:

$$(4.2a)\quad PC_i = w_i(S_i + v_i) * H_i + i_i - f_i; \text{ if } H>0; \text{ and}$$
$$(4.2b)\quad PC_i = i_i \qquad \text{if } H=0.$$

where PC_i=personal consumption, w_i= the market wage, S_i and v_i represent vectors of observable and unobservable human capital characteristics, respectively, which affect the market wage, H_i= hours worked, i_i = all nominal nonwork income, and f_i = nominal fixed costs.[2]

If hours of work are assumed to be freely chosen, the budget constraint can be incorporated into the utility function:

$$(4.3)\quad U_i = [W_i(S_i + v_i) * H_i + Y_i - F_i]^{\alpha} * [1 - H_i]^{\beta(zi)} + ei$$

where W_i = the real market wage, Y_i = all real nonwork income, F_i = all real fixed costs, and $1 - H_i$ equals leisure with total time scaled to one; for those not working W_i and F_i are obviously zero.

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2 No measure of fixed costs is in the database used, but an estimate of total average fixed costs can be obtained from hours regression results; this figure is presented in section IV.

Individuals chose desired combinations of consumption and leisure, based on the marginal rate of substitution (MRS), (dU/dL)/(dU/dC), derived from their utility function, and their budget constraint:

$$(4.4)\quad MRS = [b(z_i)/(1-b(z_i)] * [W_i(S_i + v_i) * H_i + Y_i - F_i]/[1 - H]$$

where $b(z_i) = \alpha/\alpha + \beta(z_i) + e_i$ and other terms are as previously defined.

An individual works if her market wage exceeds the reservation wage and hours of work supplied are determined by the intersection of the market wage and the marginal rate of substitution between consumption and leisure i.e. by solving equation (4.4) for H:

$$(4.5)\quad H_i = H_i(W_i, Z_i, Y_i, F_i).$$

If there are no fixed costs, the reservation wage is that associated with 0 hours of work, and W_r can be derived from (4.4) at the point where H_i is set to zero:

$$(4.6a)\quad W_{ri} = [b(z_i)/(1-b(z_i)][Y_i].$$

and can be written in log form as:

$$(4.6b)\quad \ln W_{ri} = \beta_0 + \beta_1 Z_i + \beta_2 \ln Y_i + e_i.$$

where Z_i is the non-stochastic element of $\ln [b(z_i) / (1 -b(z_i)]$, e_i is the stochastic element of Z_i, and other terms are as previously defined.

In the presence of fixed costs, the reservation wage, $W_{r(f)}$, is actually the slope of the indifference curve at

a positive number of hours of work, H_r, where H_r is determined by the tangency of the non-participation indifference curve and the reservation wage.

In order to identify $W_{r(f)}$, it is useful to employ the indirect utility specification. The reservation wage is the value of the market wage at the point where the indirect utility from working in the presence of fixed costs is equal to the direct utility of not working:

$$(4.7)\quad U^*(W_i,\ Y_i - F_i,\ e_i) = U(C_i,\ L_i,\ e).$$

If a Cobb-Douglas specification is assumed for both the indirect and direct utility function, as in (4.1), the budget constraint incorporated into the equation above, (4.7) can be written as:

$$(4.8a)\quad b(z_i)[W_i + Y_i - F_i]^{b(zi)} = [Y_i^{\alpha} / b(z_i)]$$

where $b(z_i) = \alpha/\alpha + \beta(z_i) + e_i$ and other terms are as previously defined.3

From (4.8a) the reservation wage is determined by solving for W_i:

$$(4.8b)\quad W_i = W_{r(f)} = [Y_i^{\alpha} / b(z_i)]^{1/b(zi)} - (Y_i - F_i)$$

and approximated in log-linear form:

$$(4.8c)\quad \ln W_{r(f)i} = \beta_0 + \beta_1 Z_i + \beta_2 \ln Y_i - \beta_3 \ln F_i + e_i.$$

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3 See Green (1971), chapter 9, pp. 136-137 for the derivation of the indirect utility form associated with the Cobb-Douglas direct utility function.

where Z_i is the non-stochastic element of ln [$b(z_i)$ / (1 -$b(z_i)$], e_i incorporates the stochastic element of Z_i and measurement error, and other terms are as previously defined.

The equations above have set out the components of a structural model of participation, where participation is a function of the market wage, the reservation wage, and an error term: $P_i = f\{W_i, W_{r(f)i}, e_i\}$. They have also provided the tools for verifying the existence of fixed costs and determining their magnitude. Before a procedure for examining fixed costs is described, however, the model of participation itself must be developed.

As discussed in chapter three, a woman is observed working only if the market wage exceeds her reservation wage: $W > W_r$. Thus, the probability that a nurse works can be expressed as:

$$(4.9)\quad \Pr\{i \text{ works}\} = \Pr(W_i > W_{r(f)i})$$

For convenience, the reservation wage and the market wage are assumed to be linear:

$$(4.10a)\quad W_{r(f)i} = \beta_0 + \beta_1 Z_i + \beta_2 Y_i - \beta_3 F_i + e_i$$
$$(4.10b)\quad W_i = \alpha_0 + \alpha_1 S_i + v_i$$

where Z_i represents a vector of individual characteristics, such as number of children, which affect the reservation wage.

Substitution of (4.10a and b) into (4.9) yields:

$$(4.11a)\quad \Pr\{i \text{ works}\} = \Pr[(\alpha_0 + \alpha_1 S_i + v_i)/\sigma > (\beta_0 + \beta_1 Z_i + \beta_2 Y_i - \beta_3 F_i + e_i)/\sigma]$$

$$= \Pr[(W_i)/\sigma > (\beta_0 + \beta_1 Z_i + \beta_2 Y_i - \beta_3 F_i + e_i)/\sigma]$$

$$= \Pr[(e_i)/\sigma > -J_i/\sigma]$$

where $J_i=[W_i - (\beta_0 + \beta_1 Z_i + \beta_2 Y_i - \beta_3 F_i)]$.

$$(4.11b)\qquad \int_{-Ji/\sigma}^{\infty} f(t)dt$$

where f(t)= standard normal density function;

$$(4.11c)\qquad = 1 - F(-J/\sigma)$$

where F = standard cumulative distribution function.

As e_i is assumed to be distributed normally, a specific form for the participation equation, the probit, can be defined; the parameters of which may be estimated using maximum likelihood.

If, in the sample, E of the total number are working and e are not working, the resulting likelihood function

$$(4.12)\quad L(\beta) = \sum_{i\epsilon E} \{1-F(-J_i/\sigma)\} * \sum_{i\epsilon e} F\{-J_i/\sigma\}$$

which is maximized with respect to β/σ .

It is useful to relate equation (4.12) back to the discussion in chapter three where labor supply was

demonstrated to depend on levels of wages, nonlabor income, other constraints such as fixed costs, and tastes. Following this methodology, this section defined a utility function and a budget constraint, comprised of the elements noted above, and from them an empirical specification for estimation was derived: equations (4.1-4.12). The coefficients estimated via (4.12) quantify the relationship between participation and its determinants.

However, before estimation of the structural model can proceed, several issues require discussion. They are: the lack of wage data for those nurses who are not working, a method for estimating the hours worked by those working, and a procedure for verifying the existence of fixed costs. Each is discussed in turn.

ii. Estimation Issues: Wages, Hours, and Fixed Costs

An unavoidable complication in modelling participation is that wage data are not available for women who do not work. A common response to this problem is to impute wages for the entire sample based on the data for workers only, but the values so produced are potentially biased. The technical solution, proposed by Heckman (1976 and 1979), will be employed here; it requires intially specifying participation as a reduced form.

From the model just developed, a reduced form model of participation is easily identified from (4.11). Using the maximum likelihood estimates from this model, a wage equation which accounts for the fact that only data from workers is available can be produced.[4] This involves adding a term, commonly denoted as lambda, $\hat{\lambda}$, to the wage equation to account for the nonrandomness of the sample. Lambda is defined as the standard normal density function divided by the standard distribution function from the reduced form noted above. Using this selection bias corrected equation, wage values are computed for the entire sample and these values are then entered in the structural model of participation.

Once the likelihood of participation has been established, a model of the hours worked by those who are working is estimated to complete the picture of labor supply. An OLS regression on hours of work is run, where $H_i = f\{W_i, Z_i, Y_i, F_i, e_i\}$, and hours are determined by the tangency of the indifference curve and the budget constraint which allows for fixed costs. Like the wage equation, the hours regression must be corrected for sample selection bias as it too is based on information from workers only. Thus, lambda from the reduced form probit is included in the regression to correct for such bias.

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4 The derivation of the reduced form estimates is analogous to that of the structural probit.

Finally, the participation and hours estimates can be used to test for the existence of fixed costs and, if their presence is confirmed, to assess their magnitude. If the minimum number of hours a nurse is willing to work is greater than 0, fixed costs can be said to exist and to affect participation. The minimum number of hours worked, the reservation hours, can be identified using the reservation wage and the estimated hours equation.

The value of the reservation wage itself is calculated from the estimated structural participation equation which gives the probability that the market wage exceeds the reservation wage. The reservation wage is equal to the market wage at the point where the probability of participation is 0. By entering the calculated reservation wage in the hours equation and solving for H, reservation hours are determined. If this value equals 0, then there are no fixed costs associated with employment. However, if this value is significantly greater than 0, this confirms that fixed costs exist, and the greater the costs, the greater the minimum level of hours worked.

Section three presents estimates of a model of participation and of hours of work for nurses. However, before the exact specification of the equations is examined, a discussion of the data is in order.

II. The Data

The data on nurses are drawn from the Women and Employment Survey. The survey was conducted by the Department of Employment in April of 1980 and during that month 5588 women between the ages of 16 and 59 were interviewed about their current and past work experiences. Information was also collected on their educational attainments, their marital and reproductive histories, and their general health. Previous research has investigated various aspects of this rich database: Martin and Roberts (1984a and b) present an overview of the information collected and Dex (1984) examines women's work histories. Several studies (Joshi, 1984; Sprague, 1988) have also used the survey to estimate labor supply equations for women.

For this thesis, two groups of women, those currently working as nurses and those who had previously worked as nurses, but who are now out of the labor force, were extracted to form the nurse sample. As auxiliaries comprise nearly a third of the nursing workforce, their inclusion was considered important and furthermore, would permit comparisons between their behavior and that of qualified nurses, a subject on which no previous work has been undertaken. Extraction was thus performed on the basis of the occupational codes defined in the survey rather than on nursing qualification alone as selection

on the latter basis would have excluded most auxiliaries.[5]

However, as other health care workers, such as radiologists and social workers, were included in the same classification as nurses, concern arose over the purity of the resulting sample.[6] After some consideration, the sample was judged to be acceptable for two reasons. Firstly, nursing is the predominant occupation for women in this classification. Based on 1980 Census data, nurses constitute 84.7% of this group and if WES data is assumed to be representative of the population, the presence of non-nurses in the sample is likely to be small. Secondly, important similarities exist between nursing and the other occupations encoded with it in terms of entry requirements and pay levels, so the inclusion of these other groups is not likely to distort the results.[7]

On the basis of occupation code, 403 cases constituted the nurse sample, 177 were working while 226 were not. Of note is that 31% of the sample live in the southeast,

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5 The model is estimated on both groups separately, so that their behavior can be compared.
6 Occupation code three in the Women and Employment Survey consists of SRNs, SENs, nursing auxiliaries, midwives, health visitors, children's nurses, matrons, dental nurses, dieticians, radiographers, physiotherapists, chiropodists, dispensers, medical technicians, houseparents, social workers, and occupational therapists.
7 The Pay Review Body for Nurses and Midwives, which replaced the Whitley Council wage arbitration board for nurses in 1983, considers these occupations to be comparable to nursing.

including London, while 33% are age 26 to 35 and 25% are age 36 to 45. 75% are married and 66% of the sample work part-time. Of note is that of those working part-time, 50% work 30 hours or more per week, while 80% work 20 or more hours weekly. Tables in Appendix 4.1 provide additional information about nurses from the Women and Employment Survey and for comparison, figures on the remainder of the general sample are also included.

Chapter three outlined a host of issues which can be explored in a participation model and the statistics listed above indicate which are most appropriate to investigate in the analysis of nurses' participation. The fact that the great majority of nurses are married suggests that spouse income will play an important role in determining participation. Also, as 55% of the sample falls within the age range in which family responsibilities are likely to be greatest, household composition is also likely to be a crucial determinant of whether or not a nurse works.

Finally, the incidence of part-time employment and the substantial number of hours worked by those nurses working part-time are both matters of interest. The prevalence of nurses in part-time work suggests that there are no constraints placed on actual hours worked by employers. This impression is reinforced by the myriad of job opportunities for nurses. While the majority of nurses in Great Britain are employed in the NHS, nurses

in this sample are not restricted to working in the Health Service and thus may be employed by nurse banks, by private agencies, in independent hospitals, in industry or in schools. Given the variety of work opportunities and the fact that some of these are specifically designed to provide employment flexibility, such as nurse banks, it is reasonable to assume that hours of work are freely chosen.

The choice of hours, however, may be influenced by the presence of children in the household. 36% of the women in the sample who are working have children who are less than age 6. As the need to secure childcare imposes costs on taking up employment, a substantial number of hours may be required to meet these cost and make working worthwhile. Fixed costs are investigated in section V.

Before estimation, the nurse sample was pared down because values were missing for certain key variables; the one which most affected sample size was the measure of nonlabor income.

In the survey total net household weekly income was potentially recorded for all respondents as falling within a particular band. Those for whom values were missing were excluded from the sample. To complement total household income, a measure of weekly labor income was generated for each nurse from the product of average weekly hours and hourly pay, both recorded in the survey.

These results were then banded to match those of household income. Nurses who reported highly variable weekly hours were excluded, as no reliable measure of weekly labor income was available for them, as were those for whom values were missing or miscoded.

The next step in the calculations was to compute the mean of each band of weekly labor income and weekly net household income. The computed means were then assigned as the values for that variable. Weekly labor income was then deducted from net weekly household income to generate a measure of weekly nonlabor income for each nurse. These calculations produced a final sample size of 319, 252 of which were married and 146 of which were working. It is important to note that for married women husbands' income is subsumed within nonlabor income.

The complete set of variables, their definitions, and means is presented in Table 4.1. Their use in the estimations for wages and participation is explained below.

III. Discussion

i. Wages

The market wage offers individuals receive depends on their qualifications, the level and extent of their work

Table 4.1: Variable Names, Definitions, and Means[a]

AGEYCH2 = 1 if nurse has children age two or less; 0 otherwise	0.36
AGEYCH5 = 1 if nurse has children age three to five; 0 otherwise	0.10
TOTCH = total number of children	1.07
MORT = 1 if nurse is paying off a mortgage; 0 otherwise	0.48
SINGLE = 1 if the nurse is single; 0 otherwise	0.07
REGW = 1 if the nurse resides in Wales; 0 otherwise	0.07
ADIN = all nonlabor income to which the nurse has access	81.25
AGE = age in months	37.88
AGE2 = age * age	1558.18
ALEVEL = 1 if the nurse has at least 1 A level; 0 otherwise	0.10
NQUAL = 1 if the nurse has a nursing qualification; 0 otherwise	0.45
QUAL2 = 1 if the nurse has at least 1 O level; 0 otherwise	0.53
LS16A = 1 if the nurse left school at age 16 or less; 0 otherwise	0.66
NOC3 = 1 if the nurse has had 2 or more occupations; 0 otherwise	0.44
JOBS5 = 1 if the nurse has held more than 5 nursing posts; 0 otherwise	0.41
EXP = months of experience in the labor market	157.52
PART = 1 if the nurse is working; 0 otherwise	0.52
IM(LW) = imputed Log Hourly Wage	0.58
LW = log of the reported hourly wage	0.66
HOURS[b] = reported weekly hours of work	30.00
LAMBDA = term to correct for sample selection bias	

a. Mean values are for the full sample.
b. Mean is for workers only.

experience, and the occupation and industry in which they search for a job. Several reviews of the occupational choice literature (see Routh, 1980). However, as the model assumes that women have chosen nursing as their occupation, the representative wage offer will reflect human capital elements specific to this profession.

Recall from earlier discussion that the equation for estimation (4.10b) is:

$$\ln W_i = \alpha_0 + \alpha_1 S_i + \alpha_2 \hat{\lambda} + v_i$$

where W_i= the market wage, S_i and v_i represent vectors of observable and unobservable human capital characteristics, respectively.

In order to identify the appropriate components of (4.10b), the features of nursing pay must be reviewed.

Pay for nurses is negotiated nationally. At the date of the survey, the Whitley Council for Nursing set the salary scales and an individual's place on the scale was determined by her education and experience. Until 1989 nursing was a three tiered profession with each level distinguished by type of uniform, educational requirements, and potential career path.[8] The <u>minimum</u> requirement for those undertaking the three year training to become registered nurses (SRNs) was to hold two O levels. However, it is not uncommon for nursing schools to require the possession of at least one A level for

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8 Implementation of an extensive reform package for nurse education, entitled Project 2000, began in 1989; one result is that SEN classification will be eliminated over the next five years

entry and most schools in the southeast require two A levels and five O levels (Delamothe, 1988a, 27).

The minimum qualification for those attempting to complete the two year course to become enrolled nurses (SENs) was proof of a good general education, but again, in many cases at least one O level was required. There were no formal or training requirements for auxiliary nurses and most receive basic training once on-the-job.[9]

Once in post, accumulation of experience on different wards and of specialty qualifications was the route to steady advancement for SRNs. While this basically held true for SENs, they were considered to be on a lower career track with definite limits to their promotional prospects and to the qualifications they could obtain. Auxiliaries, on the other hand, had minimal opportunity for advancement.

Unfortunately, the WES does not distinguish between different types of nursing qualifications nor length or service in the profession; both of which are key in determining wages and placement on the salary scale. Proxies, therefore, have been employed extensively to impute wages for the sample.

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9 Requirements for entry into the profession and training standards have been matters for debate for most of this century (Abel-Smith, 1960; White, 1985) and practices have varied across regions over time as conditions in the general labor market and the NHS have changed.

In the wage estimations dummy variables for possession of nursing qualifications, A levels, and O levels are included as is a variable for having left school at age 16 or less. The first two are expected to have a positive effect on the wage as they are basic requirements for any place on the nursing promotional ladder.

The latter two are expected to have a negative effect on the wage as leaving school at age 16 or less indicates that a significant amount of human capital investment has been foregone, while O levels alone are not sufficient to increase earning power within nursing.

Four variables are included to capture the effects of experience. In nursing both the length and type of experience are important in determining the wage. Nurses gain ward knowledge by changing posts relatively frequently. This effect of breadth of experience is captured by a dummy variable representing whether or not the nurse has held more than five nursing posts. Years in the profession also influence grade and pay. While a pure measure of years in nursing is not obtainable, a measure of general experience is. In the regressions it represents the joint effect of time in nursing and time in which general market skills are maintained. Both variables are expected to exert a positive effect on wages.

An additional variable is included to capture the effects of changing occupations on the wage. With such changes the value of specific human capital is lost and individuals often move to the lower wrungs of a new career ladder; thus, the regression contains a dummy variable representing whether or not the nurse in question has had two or more occupations. It is expected to exert a negative effect on the wage.

The following summarizes in notational form the components of the S_i vector in equation (4.10b) with the predicted sign of each variable indicated above it:

$$\text{(4.13a) IM(LW) [Imputed Log Wage]} = f\{\overset{+}{\text{alevel}}, \overset{+}{\text{nqual}}, \underset{-}{\text{qual2}}, \underset{-}{\text{ls16a}}, \underset{-}{\text{noc3}}, \underset{+}{\text{jobs5}}, \underset{+}{\text{exp}}, \underset{+/?}{\text{lambda}}\}$$

Lambda is the selection bias correction term. The conventional expectation is that it will be positive as it is likely that wage equation for workers overestimates wages for nonworkers (Killingsworth; 1983), although Dolton and Makepeace (1987b) contend its anticipated sign is ambiguous.[10]

Equation (4.13a) is used to impute wages for the full sample and for married women. For the models based on

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10 Dolton and Makepeace (1987b) in a two sector model suggest that there is no *a priori* interpretation for lambda as it can reflect the difference in the earnings' potentials of workers and nonworkers or a change in characteristics as the same individual moves between states of work and nonwork.

the subsamples of qualified and unqualified nurses, nqual must be eliminated from the estimation as it is the basis on which the samples are selected. The imputed wage equation for these two groups is:

$$\text{(4.13b) IM(LW) [Imputed Log Wage]} = f\{\underset{+}{\text{alevel}},\ \underset{-}{\text{qual2}},\ \underset{-}{\text{ls16a}},\ \underset{-}{\text{noc3}},\ \underset{+}{\text{jobs5}},\ \underset{+}{\text{exp}},\ \underset{+/?}{\text{lambda}}\}$$

ii. Participation

Participation is determined by comparisons between the market wage and the reservation wage, given preferences and the level of nonlabor income. This is reflected in the structural model of participation (4.9) which contains vectors which represent these magnitudes:

$$P_i = f\{W_i,\ W_{ri}(Z_i,\ Y_i,\ F_i,\ e_i)\}.$$

where again W_i = the market wage, Z_i = observable factors which influence the reservation wage, Y_i= nonlabor income, F_i = fixed costs, and e_i an error term.

For the estimation of the structural model through maximum likelihood, the market wage, W_i, is imputed through the process just described. Of note is that an increase in the market wage brings two conflicting forces into effect. Firstly, as income rises, nurses want to consume more leisure which can lead to a decline in hours worked. Offsetting this is the fact that leisure has now become relatively more expensive with the increase in the wage. Nurses may thus substitute market work and the goods purchased with earnings for leisure. Given that

the substitution effect has been found to be dominant for women, increases in the market wage are expected to increase participation.

The reservation wage, as it cannot be observed, is proxied by factors, such as household composition, which are likely to determine its value in so far as they affect a nurse's work/leisure preferences. In the estimations the structure of the household is represented by total number of children less than age 16, the number of children age three to five, and the number of children age two or less. Also included is a dummy variable for whether or not the nurse is single. As no measure of fixed costs is available from the WES data, the variables, related to children, also serve to proxy this value.

All three children variables are expected to have a negative effect on participation through the costs they impose on employment and through their influence on preferences. Having children age two or less or age two to five discourages participation as employment brings about a reduction in nonlabor income equal to the cost of childcare. Also, young children may increase the value of a woman's time at home and hence, her reservation wage.

As the separate effects of these variables -AGEYCH2, AGEYCH5, TOTCH- via fixed costs and tastes cannot be

identified, the coefficients produced represent their aggregate effect on participation. The effect is expected to be strongest for the variable representing the presence of children age two or less as this group makes unique, time-intensive demands on their mothers for which market substitutes are often not available or costly. Being single is expected to have a strong positive effect on participation.

Financial variables in the regression which measure the effect of different levels of nonlabor income on participation are the actual level of unearned income recorded in the survey and a dummy variable for whether or not the nurse in question is paying off a mortgage. Increases in nonlabor income are expected to reduce the likelihood of participation as they tend to increase consumption of leisure. Therefore, as the level of unearned income rises, participation is expected to fall and holding a mortgage obligation, as it can be viewed as an inward shift in the budget constraint or as reducing the level of nonlabor income, is expected to increase the likelihood of participation. It is important to note that changes in spouse income are viewed as changes in the nonlabor income of married women.

The three final variables in the regression are age and dummy variables for region of residence and for holding at least one A level qualification; all are included as proxies for differences in tastes for work. Age is

important as women often have an option not to work and hence their preferences for work are key in determining periods of participation. These preferences, furthermore, can change over time, as a result of social trends or changes in the household, but distinctly from either of them.

There are two documented trends which support the propositon that women's views about work change over time. First of note is the general increase in labor force participation among women in older age groups: women are increasingly willing to work later in life. Secondly, the age-participation profile for women over time, regardless of marital status or fecundity, has been M-shaped with most women dropping out of the labor force at some stage, and then some returning to work at a later date, although this pattern is becoming less pronounced.

To capture the effects of age on participation, an age and an age^2 term are entered in the regression. The former, representing the increased trend in participation for older women, is expected to increase the likelihood of participation, while the latter, capturing the nonlinear lifecyle effects, a negative one.[11]

Region of residence can also affect preferences for work as cultural factors distinctly influence women's career aspirations. In this model a dummy variable for

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11 Joshi (1984) on an OLS specification finds that age and age^2 best fit a full sample of *WES* data.

residence in Wales is included to capture such regional effects. Earlier empirical work (Martin and Roberts, 1984a; Joshi, 1984) suggests that this is an appropriate specification as Welsh women have not increased their rates of participation in parallel with women living elsewhere in Great Britain.

It is important to note that regional variables may capture more than preference effects. In some instances they may reflect a lack of employment opportunties for women rather than an absence of market work commitment. However, as the vacancy levels for nursing jobs are generally robust across Great Britain, including Wales, and as growth in nursing jobs in Wales has actually exceeded that in England for the 1975 to 1980 period, the potential for misspecification is small for this occupational group.

As previously discussed, holding an A level is an indicator of those on the "fast track" in nursing as entry may be gained into the profession without it. Nurses who made the investment in human capital to obtain this qualification are likely to have clearly defined career goals and exhibit greater attachment to the labor market than other groups. The dummy variable for having an A level is, therefore, expected to exert a positive, independent effect on participation over and above its effect on the wage.

A summary of the variables along with their predicted effects on participation as follows:

$$(4.14)\quad PART = f\{\ \underset{-}{ageych2},\ \underset{-}{ageych5},\ \underset{-}{totch},\ \underset{+}{mort},\ \underset{-}{regw},\ \underset{+}{single},\ \underset{-}{adin},\ \underset{+}{age},\ \underset{-}{age^2},\ \underset{+}{alevel},\ \underset{+}{im(lw)}\ \}$$

where $Z_i = f(ageych2, ageych5, totch, single, regw, regw, age, age^2, alevel)$

$Y_i = f(mort, adin)$ and $F_i = f(ageych2, ageych5, totch)$.

Estimation of the model proceeds in four steps. Initially, a reduced form probit, consisting of the exogenous determinants of the reservation wage and of labor force participation, is estimated; a measure of sample selection bias, lambda, is derived from this estimation and stored to be used in the wage regression.

The next step is to estimate a wage equation, using ordinary least squares, for those who are working. Lambda, derived from stage one, is included to correct for sample selection bias. These OLS coefficients are then used to impute wages for the entire sample. Step three consists of estimating a structural probit, using the wage estimates, for participation. Results for four groups are reported: the full sample, married women only, qualified and unqualfied nurses.

Finally, an hours of work equation is estimated for those who are working. The selection bias correction term lambda from stage one is included in an OLS regression on hours worked and again, the findings for the full sample and married nurses are reported.

The results of the maximum likelihood estimation of the reduced form probit for all four groups are presented in Table 4.2. They suggest that the model fits the data well with adjusted R^2, based on OLS starting values, exceeding 30% in all four cases. The OLS wage equations are listed in table 4.3, while the structural probit results for the full sample and for married women and for nurses, qualified and unqualified, are presented in tables 4.4 and 4.5, respectively. Table 4.7 contains the results for the OLS hours of work estimations. The results from wage estimations for the full sample and married women are discussed first.

IV. Results

i. The Wage Equation

Within the wage equation for the full sample all variables exhibit the predicted effects. A level and nursing qualifications increase the wage, while obtaining

Table 4.2: Reduced Form Probit Results for all Groups[a]

	Dependent Variable = PART			
Variable	Full Sample	Married Women	Qualified Nurses	Unqualified Nurses
A level	-0.0574427	-0.0689192	-0.0106486	-0.256713
	(-0.197)	(-0.246)	(-0.020)	(-0.640)
NQual	0.127527	0.0385191	-	-
	(0.708)	(0.303)	-	-
Qual2	0.0545133	0.193885	0.0142931	-0.0450131
	(0.273)	(0.949)	(0.045)	(-0.150)
Ls16	-0.522964*	-0.539595*	-0.650526*	-0.632495*
	(-2.468)	(-2.173)	(-2.060)	(-1.968)
Noc3	-0.159509	-0.141752	0.00348126	-0.338278
	(-0.800)	(-0.603)	(0.010)	(-1.239)
Jobs5	-0.218634	-0.0868966	0.262083	-0.558271*
	(-1.077)	(-0.406)	(0.816)	(-1.885)
Exp	0.00924263*	0.00948640*	0.0115255*	0.00943648*
	(5.981)	(5.045)	(3.956)	(4.474)
Constant	2.48967*	0.334594	3.18919	1.58373*
	(1.652)	(0.183)	(1.188)	(0.759)
Ageych2	-1.39639*	-1.34298*	-1.62148*	-1.26169*
	(-4.943)	(-4.215)	(-3.369)	(-3.252)
Ageych5	-0.769500*	-0.582370*	-1.16750*	-0.444223
	(-2.464)	(-1.710)	(-2.287)	(-1.015)
Totch	-0.208674*	-0.222352*	-0.476311*	-0.106188
	(-2.128)	(-2.006)	(-2.846)	(-0.773)
Mort	0.356502*	0.386499*	0.446972*	0.306113
	(1.910)	(1.847)	(1.496)	(1.154)
Single	0.517071	-	-0.140824	0.991504*
	(1.343)	-	(-0.180)	(1.968)
Regw	-0.596980*	-1.09907*	-1.18544*	-0.523923
	(-1.742)	(-2.526)	(-1.979)	(-1.148)
Adin	-0.00610078*	-0.00805547*	-0.00844590*	-0.00441395
	(-3.269)	(-3.613)	(-2.832)	(-1.542)
Age	-0.0460267	0.0720385	-0.0272376	-0.153341
	(-0.614)	(0.775)	(-0.200)	(-0.149)
Age2	-0.000380059	-0.00183337*	-0.00113471	-0.000523559
	(0.427)	(-1.632)	(-0.703)	(-0.427)
N	312	246	141	171
Log Likelihood	-159.28	-120.41	-59.92	-91.85

a. T statistics in brackets.
*significant at the 10% level

Table 4.3: OLS Wage Equation Results for All Groups[a]

Dependent Variable = LW

Variable	Full Sample	Married Nurses	Qualified Nurses	Unqualified Nurses
Constant	0.515649*	0.732841*	0.864003*	0.451718*
	(4.774)	(5.074)	(6.441)	(2.965)
A level	0.238126*	0.274798*	0.252661*	0.182808
	(2.538)	(2.617)	(2.081)	(1.246)
NQual	0.147884*	0.0741687	-	-
	(2.734)	(1.201)	-	-
Qual2	-0.0672500	-0.0572966	-0.111449	-0.0208078
	(-1.149)	(-0.814)	(-1.468)	(-0.219)
Ls16a	-0.165352*	-0.119949*	-0.111970	-0.216378*
	(-2.680)	(-1.645)	(-1.500)	(-2.071)
Noc3	-0.260794*	-0.258054*	-0.279752*	-0.272931*
	(-4.702)	(-4.047)	(-3.640)	(-3.332)
Jobs5	0.137533*	0.160135*	0.0685508	0.218619*
	(2.371)	(2.508)	(0.948)	(2.299)
Exp	0.00110628*	0.000389558	0.000666672	0.00123689*
	(3.344)	(0.995)	(1.591)	(2.426)
Lambda	0.0953782	-0.0111949	-0.0726449	0.138772
	(1.116)	(-0.172)	(-0.889)	(1.123)
N	144	113	71	73
R^2	.306	.204	.145	.243

a. T statistics in brackets.
*significant at the 10% level or less

only O levels and leaving school at age 16 or less decrease it. All of these factors are significant with the exception of having at least one O level.[12]

Like the various measures of qualifications, experience proves to be an important determinant of wages. Months spent in the labor market increase the wage as does having held more than five jobs. Having worked in two or more occupations, on the other hand, significantly decreases earnings.

In the OLS regression the coefficient on lambda is positive. This suggests that earnings for women in the sample who are working are likely to be higher than those for nonworkers. Some sample selection bias exists, but it is not significant.

The wage equation for married women produces very similar results to that for the full sample. The signs of the coefficients are the same, although the magnitude of certain coefficients and the significance levels of two variables is slightly different. Specifically, neither nqual nor months of experience is significant and the coefficients on both are substantially smaller than those for the full sample. Lambda is negatively signed, but wholly insignificant.

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12 Variables are significant at the level of 10% or less; see Tables 4.2-4.4 for details.

The results of the wage regressions for qualified and unqualified nurses are shown in columns three and four of table 4.3. The wage specification for these groups had to be amended slightly as nqual was the basis on which they were selected and hence it could not be included in the OLS regression. This reduces the explanatory power of the equation for the qualified group, but the remaining variables all produce the expected signs.

In the runs on the qualified sample the only variable wholly insignificant is that for jobs5, while qual2, ls16a, and exp are significant at roughly the 13% level. In the unqualified sample, only the alevel and qual2 variables are not significant. Of interest as well is that lambda is wholly insignificant for qualified nurses, while for the unqualified group it is positive and significant at the 20% level which suggests that earnings for equation for workers overestimates the pay of nonworkers.

ii. Participation

The structural probit estimations for the full sample and married women are contained in table 4.4, while those for qualified and unqualified nurses are found in table 4.5. In the results for the full sample, all variables produce the expected signs, with the exception of the coefficient on A levels, and most significantly affect

Table 4.4: Structural Probit Results for the Full Sample and Married Women[a]

	Dependent Variable = PART	
Variable	Full Sample	Married Women
Constant	-0.648111 (-0.509)	-2.82232* (-1.784)
Ageych2	-1.05873* (-4.092)	-0.938970* (-3.318)
Ageych5	-0.678196* (-2.249)	-0.482131 (-1.487)
Totch	-0.302051* (-3.327)	-0.301393* (-3.073)
Mort	0.434019* (2.408)	0.470728* (2.385)
Single	0.649957 (1.723)	- -
Regw	-0.639217* (-1.992)	-1.01425* (-2.613)
Adin	-0.00652060* (-3.714)	-0.00907715* (-4.371)
Age	0.0745470 (1.127)	0.179894* (2.205)
Age2	-0.00134384* (-1.654)	-0.00241490* (-2.395)
IM(LW)	1.94066* (4.690)	1.71651* (2.895)
A level	-0.554113* (-2.044)	-0.459043 (-1.324)
N	312	248
Log Likelihood	-173.67	-135.89

a. T statistics in brackets.
*significant at the 10% level

		Predicted	
	Total	0	1
Total	312	147	165
0	150	107	43
1	162	40	122

		Predicted	
	Total	0	1
Total	248	120	126
0	122	87	35
1	124	33	91

participation.[13] Confirming *a priori* expectations, the presence of young children, age two or less and age three to five, and the total number of children all have a significant negative effect on participation, with that of youngest children being the largest. Sprague (1988) finds similar results, while Joshi (1984), on the other hand, finds that once the presence and age of the youngest child has been accounted for the number and age of other children exert little effect on participation.

Holding a mortgage, being single, and age, all positively influence participation, although the latter is significant at the 25% level only. Of note as well is that nonlinear effects of age on participation are confirmed. While the effects of age and financial obligations are well documented, the evidence concerning the effects of marital status on participation is mixed. Sprague (1988) and Dolton and Makepeace (1986, 1987a) find marital status to be an important determinant of participation; Martin and Roberts (1984a), however, contend that marital status influences hours worked, not participation.

Similar to Sprague and Joshi, the presence of regional effects is confirmed with residence in Wales significantly reducing the likelihood of participation.

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13 Probit estimates, using selection corrected values, have been found to underestimate the standard errors of some coefficients. The bias which potentially results from this is not thought to be substantial; see Maddela (1983) for discussion.

Access to higher levels of nonlabor income is also found to affect participation negatively. This may in part explain why some nurses leave the labor force when they marry.

As predicted, wages prove to be a significant determinant of participation and the coefficient on the imputed wage variable of 1.94 suggests that the participation of nurses is highly elastic; actual elasticities are reported in table 4.7. Finally, the acquisition of A levels discourages participation in nursing. This was not the expected result, but a potential explanation for this finding is that the payoffs to this level of training are relatively poor compared to other occupations.

The results for married women parallel those of the full sample and conform to prior expectations. The signs, magnitude, and significance of the coefficients are roughly the same with only a few exceptions. Of note is that within the sample the effect of children age three to five is no longer significant at the 10%, while that for age is. Although the sign and size of the coefficient is very similar to that of the full sample, the effect of A levels is not significant for married women.

The coefficient on wage is sizeable at 1.72 and again significant which suggests that participation for married

women is also highly dependent on wage levels. The overall impression remains that exogenous family constraints reduce married women's participation, while wages are the key to increasing it.

Both the consistency of the results and the fact that they confirm prior expectations suggest that the model fits the data well. In order to judge how well the probit actually performs, Maddela (1983) recommends examining the proportion of successful predictions made by the model and computing a success index which is the sum of correct predictions made divided by the total number of predictions.[14]

The prediction success tables are shown at the bottom of table 4.4. They indicate the actual number of participants and non-participants in the sample, the number predicted to be participating and to be out of the market, and the number of the predictions that were correct and incorrect. On the basis of of Maddela's success index, the tables show that the model correctly predicts the outcome, participation or non-participation, 79% of the time for the full sample and 73% of the time for married women.

Finally, a version of the Chow test of structural change, the Wald test, the form appropriate for nonlinear models, was performed to determine whether or not both sets of

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14 For discussion of this and other indices, see Maddela (1983) p. 77.

coefficents were generated by the same model.[15] The resulting test statistic follows a chi squared distribution and can be used as the basis for accepting or rejecting the hypothesis that the models which generate both set of data are not significantly different. A comparison of the results for the full sample and married women, with $\chi(2) = 0.836$, supports the hypothesis that both sets of observations came from the same model.

Shown in table 4.5, the results from estimations of the structural probit for qualified and unqualified nurses are very similar to those of the full sample and married women. For the qualified group all the variables relating to children significantly reduce the likelihood of participation as does living in Wales and increasing levels of nonlabor income. Being single, however, has no effect on participation for this group. Age and age^2 increase and decrease participation respectively, while holding A levels, again, decreases the likelihood of participation, but the effect of this variable is not significant at the 10% level. Finally, the wage variable for this group is highly significant and the coefficient of 2.18 is even greater than that for the other two groups.

For unqualified nurses having children age two or less, the total number of children, and having children age

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15 This test is discussed in the LIMDEP manual, sections 15.5 and 17.6.

Table 4.5: Structural Probit Results for Qualified and Unqualified Nurses[a]

	Dependent Variable = PART	
Variable	Qualified Nurses	Unqualified Nurses
Constant	-2.15320 (-0.958)	-1.05719 (-0.591)
Ageych2	-1.24494* (-2.981)	-0.823173* (-2.290)
Ageych5	-1.05559* (-2.214)	-0.562436 (-1.359)
Totch	-0.526704* (-3.621)	-0.159688 (-1.228)
Mort	0.505070* (1.855)	0.343723 (1.369)
Single	0.115218 (0.153)	0.998042* (2.062)
Regw	-1.08860* (-2.072)	-0.505259 (-1.192)
Adin	-0.00983515* (-3.972)	-0.00315797 (-1.160)
Age	0.178029* (1.563)	0.0673093 (0.742)
Age2	-0.00277186* (-1.987)	-0.00110459 (-0.996)
IM(LW)	2.18123* (2.325)	1.85158* (2.915)
A level	-0.436929 (-0.933)	-0.645465* (-1.653)

a. T statistics in brackets.
*significant at the 10% level or below.

N	141	171
Log Likelihood	-70.449	-101.62

		Predicted	
	Total	0	1
Total	141	52	89
0	59	41	18
1	82	11	71

		Predicted	
	Total	0	1
Total	252	126	126
0	126	94	32
1	126	32	94

three to five all reduce the likelihood of participation, but the latter two variables are significant at the 17% and 22% levels only. Being single, on the other hand, significantly increases the likelihood of participation. Holding a mortgage and living in Wales increase and reduce the likelihood of participation respectively, but only at the 20% level. Higher levels of unearned income significantly reduce the probability of participation, but both age variables, while signed as expected, are insignificant. Holding an A level significantly reduces the likelihood of participation for this group. Wages are the most significant determinant of whether or not an unqualified nurse works and again, the coefficient is sizeable at 1.85.

The prediction success tables indicate that for qualified nurses the model predicts the correct outcome 79% of the time; however, it does not perform as well for the unqualified group where it predicts the correct outcome 69% of the time. Wald tests again confirm that both sets of results are generated by the same model with $\chi(2) = 3.19$.

In summary, all four sets of results indicate that the greatest barriers to female participation are exogenous family constraints as all three family composition variables exert strong, significant negative effects on participation. Having children discourages participation by influencing the reservation wage and/or by generating

fixed costs which must be met when employment is taken up. The regional variable and the levels of nonlabor income to which women have access also decrease the likelihood of participation.

The results in the above tables also appear to have sorted out the varying effects of education which produced mixed results in earlier nursing studies. A levels increase the wage in nursing, but discourage participation in the profession. O levels, on the other hand, simply decrease the nursing wage.

Finally, the structural probit indicates that wages are potentially an important mechanism by which the participation of nurses may be influenced. The coefficient on wages is large and highly significant and this is the only value over which employers have some discretion.

Based on the probit model (4.11), actual elasticities can be derived which can be used to determine what effect changes in the wage will have on participation.

From (4.11a), the probability a nurse works is:

(4.15) $Pr(W_i > W_r) = \Phi(W_i)$

where $\Phi(.)$ is the standard cumulative distribution function.

The elasticity with respect to wages is given by:

$$(4.16)\quad d\ln \Phi(W_i)/d\ln(W_i) = \phi(W_i)\beta_i / \Phi(W_i)$$

where $\phi(.)$ is the standard normal density function and β_i is the estimated parameter of the log wage in the probit model. As it is not expressed in log form, the elasticity with respect to nonlabor income, X_i, is:

$$(4.17)\quad d\ln \Phi(W_i)/d(X_i) = \phi(W_i)\beta_i\bar{X}_i / \Phi(W_i)$$

where $\bar{X}$ is the mean of X_i.

Based on equations (4.15 - 4.17) and calculations at the mean values of all the variables, table 4.6 shows the probability of participation and the elasticity with respect to the wage and to nonlabor income for each group.

Table 4.6 Estimated Probabilities of Participation and Wage and Income Elasticities By Group

Group	Probability of Participation		Elasticity of the Probability of Participation With Respect to:	
	Actual	Predicted	The Wage	Nonlabor Income
Full Sample	0.52	0.55	1.40	-0.38
Married Nurses	0.50	0.50	1.36	-0.68
Qualified Nurses	0.58	0.61	1.32	-0.55
Unqualified Nurses	0.47	0.54	1.36	-0.17

For the full sample the probability of participation is 0.55, very close to the actual value of 0.52. As might be expected from previous discussion, married nurses have the lowest rate of predicted participation at 50%, while

that of qualified nurses is the highest at 61%. Variations in the level of pay will elicit a substantial response in participation from all four groups with the largest response coming from qualified nurses. Changes in the level on nonlabor income also affect participation. Concerning this factor the strongest response again comes from qualified and married nurses.

The above table indicates how dependent the labor force participation of nurses, regardless of qualification and marital status, is on pay.[16] The elasticities suggest that a 10% increase in the real wage would increase participation of all nurses by 14.0%, while an increase in spouse or nonlabor income by the same percentage would decrease participation by 3.8%.

iv. Hours of Work

The results of one further estimation, the OLS equation which estimates hours of work for those who are working, are shown in table 4.7 for the full sample and married nurses. While the same set of factors which determine participation govern hours of work, the effect of the variables on the two magnitudes can differ due to discontinuities generated by fixed costs.

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16 Of note is that these results accord well with those produced using a similar estimation technique. For example, Cogan (1980a) finds a wage elasticity for white women, aged 30 to 44, to be 1.14, while Heckman (1980) finds a wage elasticity of 1.47.

Table 4.7: OLS Hours Equation Results for the Full Sample and Married Nurses[a]

	Dependent Variable = HOURS	
Variable	Full Sample	Married Nurses
Constant	39.7423*	38.1674*
	(10.504)	(5.768)
Totch	-1.08156	-1.21519
	(-1.402)	(-1.469)
Mort	-1.50693	-2.448045
	(-0.928)	(-1.216)
Regw	-13.7707*	-11.0067*
	(-3.426)	(-1.998)
Adin	-0.0762916*	-0.0662530*
	(-4.031)	(-2.647)
Age	-0.150845*	-0.156786*
	(-2.092)	(-1.603)
IM(LW)	7.53452*	9.33379
	(1.765)	(1.495)
A level	-7.45702*	-10.1997*
	(-2.649)	(-2.746)
Lambda	-2.04698	-2.72220
	(-0.738)	(-0.870)
N	144	113
R^2	.253	.164

a. T statistics in brackets.
*significant at the 10% level or below.

The results reported here suggest that some discontinuty exists as the sign, magnitude, and significance of the coefficients in the hours of work estimates generally differ from those of the participation equation.[17] The OLS hours results are for the most part consistent across the the two estimations in terms of the signs of the coefficients; the significance level, however, varies.

For the full sample, increasing numbers of children, living in Wales, higher levels of nonlabor income and holding an A level all decrease the number of hours worked. Interestingly, as age increases, nurses are more likely to participate, but they work fewer hours and similarly, holding a mortgage increases the likelihood of participation, but reduces the number of hours worked. Concerning the latter it may be that home ownership necessitates working, but that the responsibilites associated with it limit the time that can be spent in the marketplace. Higher wages increase the number of hours worked and the elasticity of hours worked with respect to changes in the wage is 7.53. Lambda is negatively signed, which suggests the hours of work equation underestimates this magnitude for nonworkers, but it, as well, is not significant.

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17 Again, as noted in chapter three, this is the primary difference between the Tobit and probit specification recommended by Heckman; under the former the coefficients on hours of work and participation are assumed to be equal.

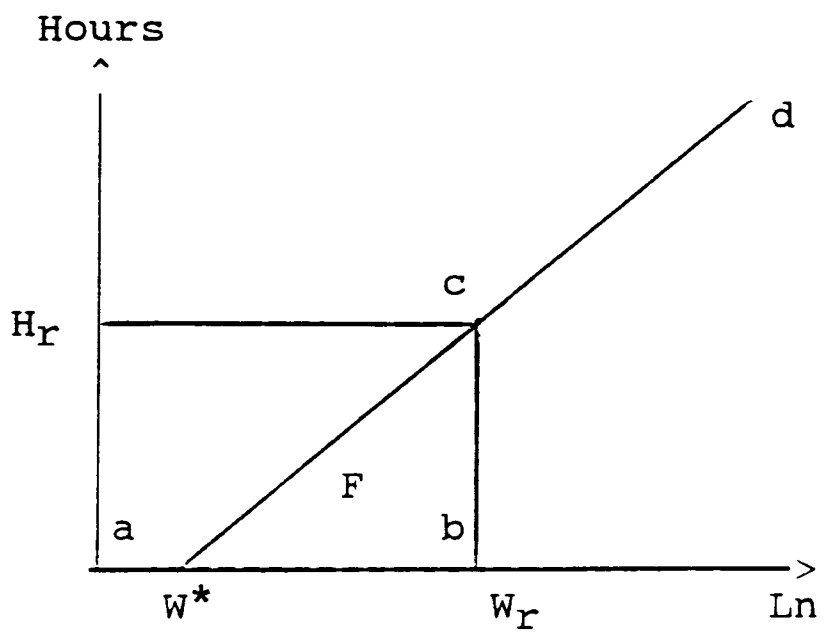
The second column contains the results for the subsample of married nurses. The coefficents exhibit the same sign and roughly the same significance level. The effect of the holding a mortgage is more significant in the married sample, while the influence of wage levels is less so. Lambda is again insignificant in the hours regression.

Using the results from the hours regression and from the structural probit, the reservation hours for nurses can be identified. The first step is to determine reservation wage from the structural probit. Recall from the probit model that if $W_i = W_r$, the nurse does not work and the probability of participation is 0. Thus, the probit is set to 0 and solved for the wage offer, IM(LW), which in this case equals the reservation wage. This value is then entered into the hours equation and reservation hours are produced.

The calculations were carried out for the full sample and for married women. The results suggested that fixed costs, as they are manifest in a minimum number of hours offered for work, are substantial. For the full sample, the hourly reservation wage was estimated to be £1.68, while reservation weekly hours were estimated to be 29.8. This accords well with the fact that while two thirds of the women in the sample worked part-time, most worked above 30 hours a week. For married women, the reservation wage was higher at £1.90 and reservation hours were comparable at 28.09.

Based on these figures and the participation and hours equations, the average total fixed costs encountered by nurses can be estimated. A diagram of the labor supply schedule is useful in illustrating how this value can be determined.

Figure 4.1 The Labor Supply Curve for Nurses



In figure 4.1, the results of the participation and hours estimation are combined to outline the labor supply schedule of the <u>average</u> nurse. If there were no fixed costs associated with employment, the reservation wage would be the wage offer at 0 hours of work, W^*, and the labor supply schedule would be continuous: acd. However, the results from the hours equation suggest that substantial discontinuity exists around 0 hours and that the resulting labor supply schedule is actually abcd and

the reservation wage, W_r, is that associated with a substantial number of hours of work, H_r or 29.8.

The discontinuity itself arises from fixed costs whose value equals the area of triangle, abc, labelled F in the diagram.[18] From the hours equation, the value of W^*, the wage offer at 0 hours, can be determined and given that W_r and H_r have already been identified, F is easily computed.[19] The findings for the full sample and married nurses are shown in table 4.8.

Table 4.8 Estimates of the Reservation Wage, Reservation Hours, and Fixed Costs of Employment for the Full Sample and Married Nurses

Category	Full Sample	Married Nurses
Hourly Reservation Wage	£1.68	£1.90
Weekly Reservation Hours	29.80	28.00
Average Weekly Fixed Costs (area F)	£24.44	£25.20
Average Fixed Costs as a % of Average Weekly Pay	42.1	40.9
Average Fixed Costs as a % of Average Weekly Income	19.7	17.8

The statistics in the above table indicate that fixed costs encountered by nurses are sizeable and constitute a significant barrier to their labor force participation. Total weekly fixed costs for the average nurse are £24.44, 42% of her average weekly net pay and nearly 20%

18 Note that the area of aW^*cH_r is equal to reservation income or the conventional value of foregone leisure time for which the woman must be compensated if she is to work. Cogan (1980b) presents a similar diagram with the axes reversed.

19 Note that W^* is the marginal rate of substitution at 0 hours.

of her weekly income. The findings for married nurses are similar, although their weekly fixed costs are slightly higher.[20] Cogan (1980b), using U.S. data, finds that fixed costs constitute 16% of average annual earnings, a percent significantly less than the findings here indicate for British women. This may reflect structural differences in the two markets, but more research would be required to identify the sources of the cost differential.

Finally, from these results and the wage elasticity, calculated earlier, the elasticity of participation with respect to changes in fixed costs can be approximated. Fixed costs inhibit participation by raising the reservation wage and if the wage elasticity which measures how participation responds to wage changes is adjusted by a fixed cost factor, which is equal to total fixed cost divided by reservation income, the product of the reservation wage and reservation hours, the elasticity of participation with respect to changes in fixed costs can be produced:

$$(4.18)\quad d\ln \Phi(W_i)/d\ln(FC_i) = [\phi(W_i)\beta_i/\Phi(W_r) * FC/(H_r*W_r)]$$

where FC_i is average fixed costs, H_r equals reservation hours, W_r is the reservation wage, and $\phi(W_i)\beta_i/\Phi(W_r)$ is $-[\phi(W_i)\beta_i/\Phi(W_i)]$.[21]

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20 Cogan (1980b) finds that fixed costs constitute 16% of average annual earnings.

21 The author is grateful to Paul Fenn for assistance in deriving this formula.

From 4.18 the elasticity of participation with respect to changes in fixed costs is -0.67 for the all nurses and -0.64 for married nurses. This suggests that a childcare subsidy which led to a 10% fall in fixed costs would increase the participation of nurses by 6.7% and by married nurses by 6.4%.

It is important to note that fixed costs, while recognized and discussed as an important determinant of female labor supply, have not been examined extensively in the literature.[22] Furthermore, they have never been explicitly investigated in the context of the labor market in Great Britain. These figures, based on data for nurses, suggest that they are a factor which should be included in models of female labor supply.

V. Conclusions

The results of these estimations should be of great interest to policy makers concerned with securing an adequate supply of nurses for Great Britain. They clearly identify the factors which affect participation and they underline the dependence of nurses' labor supply on their rate of pay and the costs associated with employment. Furthermore, the findings demonstrate that the decision to participate of all nurses, whether married, qualified, or unqualified, is determined by

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22 The three extant pieces which incorporate fixed costs are discussed in chapter three, section II.b.3.

similar factors and thus, initiatives directed at any one group will have beneficial effects on the participation of nurses generally.

The supply function indicates that family composition, financial obligations and resources, wages, and holding A level qualifications determine whether or not a nurse works. The first point of interest is the effect of the latter variable, holding A levels, on participation.

These results suggest that their effect is to reduce the likelihood that nurses will work in nursing. This may be due in part to the fact that A levels are transferable qualifications which are valued in the labor market at large and that nurses with them are thus drawn into alternative occupations. Alternatively, it may be that women holding A levels require higher wages to participate in the nursing labor market or have raised expectations about nursing work which actual employment does not meet.

This is an important finding as when Project 2000 is fully implemented, all nurses will be required to have A levels. If the reforms are not to decrease supply, it is imperative that suitable career structures and remuneration levels for these nurses are simultaneously developed and that an appropriate place is found for these women in the hospital hierarchy. At present such changes are not part of the Project 2000 package, but

rather considered to be complementary to it. These findings indicate that the beneficial effects of the reforms will be severely diminished if the Service, after increasing its human capital investment in nurses, fails to ensure their participation in the nursing labor market.

Given that they are the only variable employers can affect in the short run, the effect of wages on participation is obviously of great importance. Raising real wages is the key to attracting women currently out of the labor force into nursing and to keeping nurses working. While managers themselves do not set wages, this is an important piece of information of which they, the Review Body, and employee representatives should take note.

The results also indicate that children are a primary barrier to participation. They may diminish, to a degree, women's taste for work, but the additional findings on labor supply discontinuity suggest that they are likely to play a more significant role through the cost they impose on taking up employment. Thus, policies to influence participation should clearly take account of the family responsibilities many women face.

Family-oriented policies could take several forms. A relatively inexpensive approach, as it primarily requires organization and planning, is to provide term-time

employment and shifts which take into account school hours. Alternatively, a plan for the longer term could involve employers providing childcare facilities or offering subsidies to help women meet the cost of childcare, secured from other sources.

While these results indicate various mechanisms by which the supply of nurses can be increased, such initiatives are not costless and it is important that those which are most cost effective be identified. The results presented here provide information on elasticities which is crucial for such evaluations. However, before a comprehensive examination of various policies aimed at altering the labor supply of nurses can take place, it is necessary to understand how any proposed initiatives would affect nurses' decisions to leave the profession. The quit decision itself is thus examined in the next three chapters and a policy discussion, taking into account the results from both investigations, is the subject of chapter eight.

Appendix 4.1

Tables 4.1a-d provide comparative statistics for the nurse sample and the remainer of the observations from Women and Employment Survey. 403 women in the sample were either working in nursing or had previously worked in nursing, but were now out of the labor market, and were thus considered to be nurses, while 5185 observations were not. The tables suggest that the nurse sample in terms of age, breadth of work experience, region of residence, marital status, and education is representative of the WES generally.

4.1a: Age of Respondents
Percent By Group

Age	Nurses	Others
17-20	4.3	11.2
21-25	10.3	10.1
26-30	17.5	9.4
31-35	16.0	10.1
36-40	13.0	11.5
41-45	12.5	13.8
46-50	10.0	12.5
51-55	8.0	11.1
56-59	8.5	10.5

4.1b: Number of Occupations
Percent by Group

Number of Occupations	Nurses	Others
1	23.8	34.4
2	34.2	29.5
3	24.8	20.5
4	10.4	9.9
5	6.2	3.1
6	0.5	0.8
7	0.0	0.1
8-9	0.0	0.0006

4.1c: Various Statistics

Category	Nurses	Others
Percent Married	75.0	72.9
Percent with at least one A level	15.9	16.6
Percent with at least one O level	68.3	17.0
Percent who work full-time	30.8	33.8

4.1d: Region of Residence: Percent by Area

Region	Nurses	Others
North	5.7	6.9
Yorkshire and Humberside	7.7	9.6
Northwest	9.4	12.4
East Midlands	7.9	7.6
West Midlands	6.0	10.1
East Anglia	3.2	3.1
Greater London	9.7	11.4
Southeast	21.3	18.1
Southwest	7.2	7.4
Wales	6.2	5.5
Scotland	15.6	7.9

The median age of both groups falls within the 36 to 40 age band, while a majority of nurses and non-nurses have worked in two occupations or less. A greater percentage of the nurse sample hails from Scotland and substantially more hold at least one O level, but otherwise the differences between the two groups are very small.

Chapter Five

A Review of Quits in Nursing and of Voluntary Job Terminations in the General Labor Market

Introduction

Having examined the decision to participate in the nursing labor market, the discussion now turns to the related choice of how long to remain in a post once employment has been accepted. While historically an estimated 20 to 30% of nurses leave their posts each year, scant information is available on mobility within the profession. In an effort to remedy this situation, an in-depth investigation of the decision to terminate employment is undertaken in chapter seven, while the aim of this section is to assess what information is available on quits in nursing and on job mobility in general to establish a background for the subsequent empirical investigation.

As is further demonstrated shortly, minimal quantitative analysis of quits in the profession has been undertaken other than attempts to assess their magnitude. It is thus helpful to examine work by economists who have investigated the general issue of turnover and voluntary job separations at length. They have identified many important aspects of the decision to quit and their findings are reviewed to see what insights they provide on the situation in nursing.

Before reviewing this literature, an explication of quits, their relation to turnover, their measurement, and emergence as an issue of concern in the nursing profession are in order. The findings from the descriptive and attitudinal studies of the nursing literature are included in this section.

I. Quits in the Nursing Profession

Turnover refers to total separations from a firm be they voluntary, such as job to job moves by workers, involuntary, workers being fired, or unavoidable, due to death or injury. Voluntary turnover or quits are the focus of this discussion as in the nursing profession, any other type of separation is extremely rare.[1] As noted in chapter one, for the calendar year ending March 1988, 0.8% of all nurses in the NHS who left their posts were dismissed, while only 0.4% were made redundant.[2] Thus, in nursing it is the quit rate which is of interest.

Quits can be measured in a variety of ways. They can be expressed as a crude rate, based on some unit of calendar time, of the number of employees who leave their jobs or it can be based on the survival or wastage rate of a particular cohort of workers over a given period.

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1 The interested reader is referred to Baily (1974) for a discussion of involuntary separations.
2 Figures are from the 1988 Korner Manpower Return, KM46, and were supplied by the Department of Health.

Alternatively, the cumulative length of service of employees in post can be used as a gauge of quits, while another option is to examine separation probabilities, computed as the ratio of the number of employees who depart at time t, given the number in post at time t.[3] The method selected most often depends on the data available and what questions initiated the study. The general picture of voluntary job terminations in nursing, which arises from such assessments, is that it is significant among all staff grades.

However they are measured, extant data suggest that annual job quits in nursing are substantial. For instance, most hospitals must replace 20 to 30% of their nursing staff every year, although the magnitude of quits varies by Region (Beardshaw and Robinson, 1990, 15). While a certain amount of turnover is considered necessary for the labor market to function efficiently, quits can be a cause for concern as they impose costs on both workers and employers. Firms must pay the recruitment, selection, and training costs associated with replacing employees, while workers themselves bear the expense of search and moving, if it is required. Given the costs involved with job changes, the type of move taking place becomes critically important.

Classifying moves among nurses in the NHS is important as different types of moves potentially have different

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3 For a discussion of these issues see Incomes Data Services (1979), Study #199.

causes and impose costs at different levels of the service. When quitting their jobs, nurses can move to other employment, become unemployed to intensify search, leave the labor market altogether or move to another nursing job. In the Health Service job changes themselves can be interdistrict, interregional, intersector, involving transfers from the public sector to the private, or interoccupational, such as nurses leaving their posts for alternative employment.

Job to job changes primarily impose costs on individual hospitals and nurses themselves and determine the distribution of nurses across the country. Other types of mobility - interoccupational, intersectoral, and exits from the labor force- concern not only the local employers, but also the Department of Health as they affect the absolute supply of nurses available for work in the system. As the discussion in chapters three and four indicates, the evidence to date suggests that there is some movement in and out of the service and that a substantial number of nurses change jobs each year; the mechanisms behind both types of transfers are discussed in chapter seven.

It is important to note that most quit statistics are based on number of nurses who leave their post each year at either the hospital, District, or Regional level. They do not refer to the nurse's destination and are thus

slightly ambiguous as it is not known whether those who quit leave the nursing labor force or simply change jobs.

For instance, using data available on numbers employed for twelve months or less, Briggs (1972, 124) estimates annual wastage among senior nursing grades to be roughly 9%, while it rises to 24.5% for staff nurses, midwives, and enrolled nurses. The estimates for part-time staff nurses are slightly lower, while for auxiliaries the figure is slightly higher at 27.3%. Based on information from DHAs, the Waite and Hutt (1987) gauges annual wastage rates for sisters to be 10 to 15% and 15 to 20% for registered and enrolled nurses.[4] The latest figures on nursing quit rates can be computed based on information from the Korner Report on leavers, KM46, and the Department's annual NHS staff census. These are shown in the table below.

The figures in table 5.1 indicate that quits are sizeable for all grades and for both whole-time and part-time workers, the one exception being whole-time nurse managers. Quit rates for registered nurses exceed those for enrolled nurses, while midwives and auxiliaries display the highest rates of turnover for all whole-time grades.

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4 Gray et al. (1988) provide a table of various estimates over time.

Table 5.1: Annual Quit Rates for NHS Nursing Staff by Grade and Contract: March 1988 to 1989[a]

Grade	Quit Rates Whole-time Staff	Part-time Staff
Managers	9.8	30.5
Registered Nurses	19.4	21.9
Enrolled Nurses	15.3	16.8
Midwives	23.4	-
Auxiliaries	25.9	19.3
Total Staff	18.7	19.3

a. In view of the fact that the vast majority of leavers are voluntary terminations, the quit rate is calculated as total leavers divided by number of staff in post.

Whole-time managers exhibit comparatively low rates of turnover which suggests that senior nurses are a fairly immobile group, a finding not too surprising given that few jobs at this level are regularly available. Part-time managers, similar to most other staff grades, have higher quit rates than their whole-time counterparts. A potential explanation for this is that part-time nurses are attempting to combine work and family responsibilities and the difficulty of this task is reflected in their higher turnover rates.

While the KM46 returns represent a potentially rich data source for future research into worker mobility in the nursing profession, at this stage little else can be gleaned from them beyond the total number of leavers from the NHS. Summaries of the 1988/89 returns indicate that 24.6% of nurses leaving their posts moved to other nursing jobs within the NHS, 16.3% definitely left the

service, while 59.1% of leavers are ambiguously classified as voluntary resignations. As reporting improves and time-series information is developed, a great deal of information about nurses' work behavior generally will become available.

To date, the most detailed study on mobility in the profession is by Mercer (1979). Based on a sample of over a 1400 Yorkshire nurses from nine District general hospitals, he provides several estimates of nursing turnover, which again are essentially quits. Table 5.2 presents his findings on completed length of service for his sample population.

Table 5.2 Completed Length of Service in Current Post in Years By Grade (Yorkshire Sample)

Staff Group	Mean	Median	Mode
All Grades	3.1	1.7	1.5
Enrolled Nurses	3.4	2.1	1.5
Staff Nurses	1.6	0.9	0.7
Ward Sisters	4.0	2.0	1.5

Source: Mercer (1979), p. 49.

Considering all staff grades, the average completed length of service in post is just over three years, with the median value being less than two years. The differences between grades are quite striking. Staff nurses, on the whole, have spent considerably less time in post than other grades, while sisters have been in post the longest.

Mercer also examines data on the entire nursing staff of one hospital taking part in his survey. He finds that 37% of all nurses in this sample have been in post less than one year, while 80% have been in post less than five years.

As discussed in chapters three and four, most nurses leave the Service due to increasing family commitments or to take up further training; when leaving their posts, however, many simply move to other nursing jobs. Mercer also records the destination of nurses who left their posts in his survey. His findings are shown in table 5.3.

Table 5.3: Destinations of Those Who Left Their Posts[a] (Yorkshire Sample)

Destination	Staff Group[b] SEN	SRN	WS	F	M
Another NHS post	28.2	27.5	28.0	26.9	41.9
Training	6.9	25.3	3.5	14.0	19.4
Non NHS nursing	6.1	7.9	6.3	7.4	-
Other work	2.3	1.3	-	1.1	3.3
Out of Labor Force	33.6	30.6	50.3	39.0	6.5
Retirement	8.4	-	2.1	2.3	9.7
Unknown	14.5	7.4	9.8	9.3	19.4

aMercer (1979) p.81.
bSEN=state enrolled nurse, SRN=state registered nurse, WS=ward sister, F=females, M=males totalling 131 in survey 29 left within the survey period.

The table shows that most sisters who leave their posts leave the labor force altogether, although over a quarter

leave for other jobs. Demonstrating a great deal of prior job mobility, 40% of all sisters have held four or more posts. Staff nurses and enrolled nurses frequently leave for both inactivity and for other NHS jobs, although slightly more leave the labor force in both cases. Of note is that 25.3% of all staff nurses who leave their posts undertake further training and that very few nurses leave for non-nursing work.

Evidence from several sources indicates that a substantial portion of job to job moves are intra-regional. The Department of Health reports that 33.2% of nurses joining the NHS, who were previously working, take up posts in the same region, while 56.7% of those who move from other NHS stay in the same region.[5] Mercer also finds that most nurses are intra-regional job movers, although more qualified nurses are likely to move farther. 45.4% of all nurses, remaining in the profession, move from their current post to one within the district and another 34.3% move from within the region. Furthermore, for those for whom their current post is also their first, less than 20% had come from outside the region.

Quits are clearly a significant force in the Health Service on both a macro and micro level. Nurses changes jobs frequently and it is estimated that hospital

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5 These figures are based on data from the KM45 report for 1989. Joiners whose origin is not known or who were not previously working are excluded from the calulations.

manager's must replace a quarter to a third of their nursing staff every year and that the NHS loses 10% of its nursing staff annually.[6] As the discussion indicates, the phenomenon is not new and for a variety of reasons the historical attitude to staffing has been to focus on replacement rather than retention; this policy, however, is under review.

II. NHS Policy: Replacement not Retention

The dependence on replacement arises from two sources. First of note is that a high quit rate is a byproduct of the system by which nurses advance their careers. Nurses need to change post frequently to accumulate experience for promotion. This belief is reflected in the new clinical grades which reward experience and in the behavior of nurse managers themselves. As recently described by an NHS consultant, "managers believe that nurses must get experience in every department, so the nursing team keeps changing".[7] Thus, as turnover is accepted as necessary for good nurses to develop, it has not been discouraged.

The other aspect of nursing which encourages a policy of replacement is the fact that the staff nurses are overwhelmingly young females. A certain loss is thus

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6 *Second Report on Nursing Staff, Midwives, and Health Visitors* (1985), p. 7.
7 *Observer*, Sunday July 22, 1990, p.6.

anticipated due to marriage and childbirth and as recruits have been generally available and cheaper, retention has not been a pressing issue.

Several factors are now bringing about a reassessment of this approach. The new managerialism of the NHS has made personnel departments more aware of the costs of turnover at the hospital level. Coupled with this, however, is the belief that the quit rate is increasing and that the NHS is beginning to lose nurses to the private health sector and to other occupations. The number of private beds in nursing homes, hospitals and clinics nearly doubled from 1982 to 1986 and according to a recent poll of 72 private nursing homes, 28% of their staff had come directly from the NHS (Thomas et al., 1988). A postal survey, conducted in 1986 of 2700 RCN members, indicated that 47% of those who were currently working in the NHS were considering leaving the Service, while 45% of those in the 18 to 24 age band were considering applying for jobs outside it (Waite and Hutt, 1987). Although the match between stated intent and action is not perfect, these statistics suggest there is cause for concern.

The management initiatives are not the only impetus to improve retention. The number undertaking nurse training is expected to fall significantly over the next five years with the general decline in the number of 18 year olds and hospitals may have difficulty securing recruits to nursing. Also of note is that as the reforms of Project 2000 are introduced, the Government will be

increasing its investment in nurse training and securing a maximum return from this investment mandates retaining staff.[8] Growing concern over nursing quits suggests that the decision to leave a job needs to be examined in more detail. This is the topic of chapter seven, but before this analysis begins, it is useful to review the general economic literature on voluntary separations to see if they hold any lessons for nursing.

Similar to the situation in nursing, quits comprise the majority of total separations in industry. For instance, Mackay et al. (1971) find quits constitute 70% of total separations and as a potent market force, they have been investigated at length by economists. The general theory and the resulting empirical work, which concentrates primarily on job to job transfers involving male employees, are now reviewed. As they examine quits from a slightly different perspective, two pieces within this literature are of particular interest. The first is by Shorey (1983) who examines differences in the quit behavior of men and women, while the second is a study of job mobility in teaching, a profession which has several features in common with nursing.

Given that the interest here is to identify lessons for the nursing labor market, the literature is not surveyed in great detail; Parsons (1977 and 1988) provides such as service. In what follows, important themes are

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8 One of the selling points of Project 2000 was the reduction in nurse turnover it was likely to bring about.

identified and discussed in relation to nursing. Finally, the two quantitative studies on nurse turnover by Mercer (1979) and Gray (1988) are reviewed and the section concludes by introducing the model, presented and estimated in chapter seven.

III. Research on General Voluntary Job Terminations

i.The Theory

Economic theory identifies wages as the central factor determining quits. As in the decision on whether or not to participate, quitting is the result of the utility maximizing behavior of workers which is based on comparative valuations of time. In this instance, workers take account of wage rates both inside the firm and in alternative employment, and valuations of their time out of the market.[9] Quits arise as workers re-evaluate their intial employment decision in light of changes in market conditions or in their own circumstances and decide not to continue employment. The quit behavior of workers is clearly influenced by the firm through the employment package on offer and in turn worker decisions to terminate employment affect the wages offered by the firm.

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9 In practice the nonmarket valuation is ignored as most studies focus on men; one exception is Flinn and Heckman (1983) who discuss changes in the value of nonmarket time.

Generally, firms are assumed to maximize profits each period subject to a number of constraints, such as product demand and the amount of labor supplied. In models of turnover, however, labor supply is calculated not only in terms of hours worked, but also in view of the number of workers who quit.[10] The firm decides on its profit maximizing output and it sets wages to obtain the desired labor input for each period.[11] The labor available at time t is the labor input from the previous period minus quits, themselves a function of last periods wages. Wages must be adjusted each period to attract sufficient numbers to replace quits and to retain those employed in view of any changes in conditions in the marketplace.

While comprehensive models of voluntary separations need to address the link between firm and worker behavior, the subject is most often approached either from the worker's or firm's perspective due in part to the form in which data are available. Initial discussions from either approach focused on a host of issues about wages, such as the amount of information available about them and the methods and costs of obtaining it, and on the motives of firms and workers over time. Concerning the latter, it was noted that firms want to secure a workforce which enables them to meet product demand and to retain

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10 For an example of a concise formal model of this kind, see Shorey (1980).
11 Of note is that firms derive their power to set wages from the existence of search costs.

employees in which they have made a substantial investment, while workers, on the other hand, want to ensure that they are employed in the most productive situation possible. Based on these ideas a number of propositions about the quit relation were put forward which centered on information and training.

General imperfections in market information were recognized as a primary source of quits. Unanticipated or unforseeable changes in market conditions potentially affect workers' perceptions of the value of alternative employment and lead them to quit. Alternatively, an idea that quickly developed was that jobs are "experience goods" and the value of employment cannot be ascertained by "inspection ".[12] Over time workers learn about their productivity on a job (Mortenson, 1978) or about its nonpecuniary characteristics (Wilde, 1979) and reassessments, based on acquired information, may lead them to terminate employment if the returns to the current job were overestimated.

The cost of information about other employment opportunities was also discussed as having an important effect on quitting. The fact that information is not freely available and that its acquisition can be costly had been addressed in the job search literature. Tobin (1972) suggested that most workers remained employed while searching and the prevalence of on-the-job search

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12 The teminology is Hirshleifer's (1973).

was subsequently documented by Mattila (1974). Following this, the job search and turnover literatures effectively merged and models incorporating search strategies which could produce quits were formulated (Burdett, 1978).

These models are based on assumptions about the wage offer distributions workers face and their search costs. In a nutshell an employed worker will undertake search if the expected wage gains are greater than the costs associated with searching. Any factor which increases the cost of search, decreases the likelihood it will occur and hence the likelihood a worker will quit. Alternatively, factors which reduce the cost of search, such as quality information about jobs being freely available, are likely to increase quits.

Along with information, skill levels or the amount of human capital in the workforce was also considered to be an important determinant of the level of voluntary job terminations. Firms make substantial investments in hiring, screening and assigning workers to jobs, as do workers in searching for jobs and acquiring the necessary training. In many cases, firms further increase their investment by providing training on-the-job. Such careful cultivation often results in a uniquely productive match with benefits for both the worker and the firm which both want to protect.[13]

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13 These ideas were originally developed by Oi (1962) and Becker (1975).

Given the firm-specific skills which the worker has acquired, he or she is now more productive in the present job than in any other alternative and both firms and workers are thus concerned with protecting their respective investments. Much work has examined how the cost and returns to such training investments should be shared so that inefficient separations are avoided.

Parsons (1972) examines investment sharing in a two period model in which firm-specific training takes place in the first period and production in the second. He finds that the firm's investment share will be higher the less responsive the worker's quit rate is to wage changes. It also increases the more responsive the supply of trainees is to variations in wages. Later work expands on these ideas by investigating the array of feasible contracts in a world with imperfect information and a heterogenous workforce.[14]

Taking a simpler approach, Salop and Salop (1976) suggest that job tenure and wage growth are correlated as firms structure wages so that workers with a high propensity do not take up employment. The firm discourages workers who are likely to quit by intially offering low wages and only increasing pay as workers with length of service at the firm.

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14 Parsons (1988) provides a review, while important work has also been done by Mortenson (1978).

As data became available, empirical tests of these propositions were initiated. Primarily, two types of studies have been undertaken: those using longitudinal data which focus on the quit behavior of individuals and cross sectional studies of industries. Of note is that studies based on individual data focus on the supply side of quits as demand data is often not available and those which focus on industry often overlook the fact that the firm affects the quit level by the wage it sets. Flinn (1986) and Curran (1981) are examples of typical individual and cross-section studies respectively.[15] The results from cross-sectional work are discussed first.

ii. The Empirical Findings

While the models are based on firm behavior, the empirical work generally focuses on quit rates across industries as the lack of appropriate data precludes investigations at the firm level. Cross sectional studies have consistently confirmed that industry wage levels are inversely related to their quit rates and that the wage in alternative employment i.e. the average in other industries is positively related to voluntary separations. Based on U.S. manufacturing data, Pencavel (1970) finds that increasing the wage by $100 would

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15 The latest industrial studies have moved beyond the single time period to examine how variations in quit rate over time affect the speed by which manufacturing industries can change the size of their workforce due to product demand. For an example see Burgess (1989).

reduce yearly quits by 27 per 1000 workers. While for U.K. industries, Shorey (1980) finds that increasing the wage by a similar percentage would reduce quits by 17 per 1000 workers per annum.[16]

Features of the workplace have also been found to affect quits. Pencavel (1970) finds a positive relationship between the regional concentration of various industries' and the number of observed quits. Presumably, the travel costs, associated with search, are lower in connurbations and information is easier to obtain than in less concentrated areas. The presence of unions, on the other hand, has been found to deter quits as worker dissatisfaction is more easily communicated to the firm (Stoikov and Raiman, 1968; Freeman, 1976). Finally, firm size itself has been found to reduce quits as in larger firms personnel policy addressing workers' concerns is likely to be more developed than in smaller firms (Shorey, 1983).

The composition of the workforce is another factor which has consistently affected the quit rate. Unskilled workers generally have higher quit rates than skilled workers as they are less attached to any one firm. Furthermore, women have been found to have consistently higher quit rates than men (Mackay, 1971; Jovanovic, 1979). The latter results from the fact that women are less likely to have been involved in firm- specific

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16 The author's intent was to provide information for a direct comparison.

training and they are more likely to be employed in less skilled jobs. In cross-sectional studies both the proportion of females and the proportion of unskilled workers employed in the industry are entered as dummy variables and are found to raise the quit rate (Parsons, 1972; Shorey, 1980; Burgess, 1989).

Based on studies of panel data of individuals' work histories, researchers have attempted to identify the role of job to job changes on wage growth as well as measure the effects of search costs and market information on quits. A number of longitudinal studies (Bartel and Borjas, 1981; Black, 1979) confirm that wage gains are generally achieved by changing jobs if such moves are preceded by search.

Black (1980) uses Michigan Income Panel data to assess the effect of job changes on earnings growth for males between 1971 and 1973. He finds that workers who quit without prior on-the-job search suffer a decline in earnings and that conditions of high unemployment reduce the return to job changes. He proxies relative wage opportunities by imputing a wage for each observation in the sample and by then dividing the difference between the imputed wage and current wage by the current wage; he finds that opportunities, so proxied, significantly affect wage growth.

Bartel and Borjas (1981) examine wage growth across jobs and within jobs for movers and stayers respectively. For those that changed employment, wages in their new jobs are compared with estimates of what their wages would have been in their old jobs had they not quit. The authors find that jobs changes significantly benefited younger workers. In the sample most older workers changed jobs as a result of dissatisation with their initial employer and as a result did not experience increased earnings.

They also examine the factors affecting the growth of wages for workers who stay with the same employer. They find that working in a large labor market with alternative employment opportunities increases the wage growth of stayers. Expected tenure on-the-job is also found to affect wage growth. This value is proxied by the length of the completed time on-the-job and their findings indicate that this proxy and wage growth are positively related. While completed employment spells are not an ideal proxy as they misrepresent the intended time in post by those still employed i.e. they censor the data, the proxy should, if anything, underestimate the actual effect of tenure on wage growth and it is informative that the relation remained strongly positive.

Other studies using data based on individuals attempt to explain the proposed and observed relationships between individual characteristics, such as age, time on-the-job,

skill level, and labor market conditions on turnover. Age has been identified as being a strong deterrent to quitting. As age increases, workers are less likely to leave their jobs as a steady, secure income is valued as a result of the family responsibilities and financial obligations that routinely increase with age. Young workers, on the other hand, are less tied down and Hall (1972) finds that they constitute a large pr( )rtion of those who gather information about the labor market by moving from job to job.

Length of service on-the-job is another factor which is negatively related to quits. For instance, Mincer and Jovanovic (1981) report that annual separation rates drop by 90% from the first year to the sixth year of employment. This observation is consistent with the idea that jobs are experience goods and that quits are likely to occur at a low level of tenure as expectations about the job match are confirmed or negated.

Jovanovic in a series of papers (see 1979 for example) has explored the potential structural duration dependence associated with the employment relationship. He claims that as workers remain on-the-job, their assessment of their productivity improves. As a result, the probability that they will leave a job in which they are productive falls and the wage offer required to induce them to leave their jobs subsequently increases. This idea is difficult to test given population heterogeneity

- the fact that workers with high quit probabilities will select themselves out.

Mincer and Jovanovic (1981) attempt to control for heterogeneity through measures of previous job mobility. On this basis they conclude that 50% of the observed relationship between tenure and quits is due to structural duration dependence which arises from refinement of the productivity estimate; the remainder reflects the worker's response to changes in market conditions or their own circumstances.

Several studies verify that skill levels and turnover are also inversely related. Pencavel (1972) confirms that worker investment in training reduces quits. While other studies emphasize the role of search costs in reducing the mobility of skilled workers. As skills increase and hence, become more concentrated, fewer appropriate jobs are be available. For example, Shorey (1980) finds that skill specificity reduces the mobility of manual workers. Also of note is that for non-manual workers, nonpecuniary benefits are an important part of the employment package. They, however, are difficult to identify and assessing these elements in potential jobs requires more detailed and costly search.[17]

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17 For instance Hughes and McCormick (1981) examine the nontransferability of pension rights as cost of changing jobs.

The state of the labor market has also been found to affect quits. A strong negative relationship is frequently observed between the quit rate and the level of unemployment (Woodward, 1975/76; Curran, 1981). Parsons (1972) finds that quits are positively related to the number of job openings, measured by monthly industrial vacancies and that workers process this information fairly quickly as the impact of this variable is greatest in the first period, although the rate lagged one period still has some effect.

Both types of studies, individual and cross-sectional, confirm *a priori* predictions about quits. They are negatively related to wage rates, the costs of search, and skill levels, and they are affected by labor market conditions and characteristics of the workforce. Of note is that these relationships have been primarily established through research on male samples. Given that nursing is predominantly a female profession, it is important to review in detail work which has examined quit rates for women and differences in quit behavior of men and women.

Some work has been undertaken to dissect the source of these differences. Based on data for the U.S., Barnes and Jones (1974) suggest that men are more likely to quit their jobs for other jobs than women, but that women are far more likely to leave the labor force altogether. Harris (1966) estimates that quits into inactivity

constituted 30% of all females quits and this propensity to quit into inactivity is estimated to be three to ten times greater than that for men (Shorey, 1983). Given that male and female quits appear to be different types of moves, this suggests that determinants of the quit decision will vary substantially between men and women.

Shorey (1983) presents an in-depth investigation of differences in female and male quit behavior. His model is based on firms setting wages at a level which allows them to maximize production profits with the quit function of female workers acting as a constraint on this process. Similar to his earlier paper, Shorey (1980), wages are instrumented according to a wage equation, used by other authors, to avoid problems with simultaneity. Using the resulting model, he estimates a quit function for women which is then compared to the earlier function which he estimated for men.

Female quits are a function of wages, the mean wage in alternative industrial employment, the variance in the alternative wage and the number of job openings in other industries. The latter two proxy returns to search. Plant size and firm size, being age 20 to 35, as women in this age group are most likely to quit due to family commitments, percent of unskilled workers in the workforce, regional concentration, being married and the firm offering shift work are also included in the model.

Shorey finds that quits by female workers are responsive to the wages set by firms and that raising the wage by 10% will reduce quits by 17%. The alternative employment wage and the regional concentration variables are also significant and both positively affect quits. Finally, the results suggest that quits into inactivity, as signified by the age and marital status terms, are highly significant.

Shorey then runs the same model on the female sample and the male sample from his 1980 piece. The Chow test on the results indicates that significant differences exist in the behavior of the two groups, while a second run on the aggregated data with a sex dummy included to capture gender differences reinforces these findings. The results also indicate that the quit elasticity of women to the wage in the firm is greater than that for men; however, the male responsiveness to outside wages is greater than that for women. This suggests, *ceteris paribus*, that high wages within an industry are more likely to retain women currently employed and to attract new male employees.

To explore further differences in behavior, Shorey ran two regressions which mixed the male coefficients and female variable values and male variable values and female coefficients. He finds that if females reacted to circumstances the way men did i.e. male coefficients and female variable values that quit rates would rise. Also,

if females faced male circumstances i.e. male variable values quit rates would be lower. On this basis he concludes that the general propensity for women to quit is less than that for men, but this is overshadowed by quits into inactivity which men do not experience.

Reviewing the turnover literature has identified a set of important factors which consistently affect quits. It has also established that while women have higher quit rates than men, due to quits into inactivity, they are subject to the same influences in deciding whether or not to continue employment and are more responsive to changes in their wages. It is useful to assess this catalog of quit determinants in relation to conditions in the nursing profession. This exercise itself suggests that quits at the firm level, be it hospital or District, are likely to be sizeable.

IV. Quit Theories and the Nursing Profession

The first and most important point to note is that in nursing firms have no discretion over wages: the most important tool employers have to influence quits. Wages are determined nationally by the Pay Review Body for Nurses, Midwives and Health Visitors and by virtue of this process alone, pay cannot address or reflect the varying conditions of local markets beyond the standard London weightings. If real wages fall in response to

cost of living in an area rising relative to other areas, employers cannot increase pay to retain staff. Similarly, if a nurse wants to move to alternative employment, employers cannot make a counter offer to discourage such transfers.

Another feature of the nursing labor market which potentially encourages quits is that the costs of searching for new employment within the profession are minimal. A number of trade journals regularly publish nursing job advertisements and openings within the NHS are posted at other NHS hospitals. If the nurse decides to apply for a job, the potential employer pays transport costs to the interview and all she must do is arrange the meeting, undergo the interview, and complete the necessary paperwork. Thus, the costs of locating another job are minimal and in no way discourage quits.

The allocation of training costs also does little to discourage job terminations. The Health Service essentially pays for nurses to be trained as up to now students have been salaried employees and the salaries were set with an eye to attracting the requisite number of recruits and providing the appropriate pay incentives for students to qualify.[18] Furthermore, nurses who take up post-basic training are not penalized in terms of pay as they are either seconded from their jobs or receive a grant from the nursing school for training.

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18 See the *Second Report on Nursing Staff, Midwives, and Health Visitors* (1985), p. 14.

It is also important to note that nurses constantly receive on-the-job training which is valued at a multitude of other firms. In some sense these skills may be firm-specific as practices vary from hospital to hospital, but generally, all acquired skills are easily transferable. Nurses bear no costs of the training they receive on-the-job and, furthermore, they capture all rewards in terms of pay increases which can be secured on the basis of this acquired training. The firm has no way to protect its investment through negotiating pay on an individual basis, although when possible, it can promote nurses to retain them, and no choice but to provide the training necessary to deliver its product.[19]

Aspects of the latest initiatives make limited moves to provide managers with some leverage to affect quits. Within certain bounds, the clinical regrading exercise allows nurses to be rewarded for tasks actually performed rather than according to a uniform rate of pay for nurses in the same nominal grade. Also, the pilot scheme is aimed at using pay to fill posts which otherwise would remain vacant. These, however, do not compensate for the inflexibility national pay bargaining imposes on the system.

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19 Mercer (1979) found some evidence of an internal labor market within Yorkshire hospitals as 17.6% of those who were staff nurses in 1975 and were still in post one year later had been promoted to junior ward sister, while 17.9% of junior ward sisters had been promoted to senior ward sisters, while others have found none; see IER (1990).

V. Empirical Studies: A Final Review

i. A Study of Mobility Among Teachers

At this point it is useful to return to the literature to examine the results of a study by Zabalza (1978) which examines mobility in the teaching profession. In view of the substantial similarities that exist between teaching and nursing in terms of market structure, it is important to review his findings in some detail. He looks at job quits and transfers from two perspectives: those between schools and those between regions. Given that teachers' salaries are determined nationally, wages cannot be the factor determining mobility, he thus concentrates on pecuniary differentials arising from other sources.[20]

Zabalza contends that it is differences in promotion prospects between institutions which affect mobility. An index representing the existing salary structures in schools is constructed as a proxy for promotional opportunites and it, along with a time trend, are regressed on the annual national rate of interschool mobility from 1963 to 1969. He finds that both men and women respond to promotion prospects, as measured by the

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20 Zabalza notes that nonpecuniary factors may play a role, but these cannot be quantified.

index, but that the effect for women is not significant.[21]

In explaining interregional mobility, Zabalza looks to a number of factors which can create pay differentials. As wage variation arises by region from differences in the age structure of the staff, mix of schools in the area, and the London allowance, a standardized wage value is included in the regressions. Again, considering promotion opportunites to be crucial as they affect future pay, he includes the proportion of teachers promoted during the year as a proxy for opportunities for advancement. Average housing costs are entered to capture differences in the cost of living by region, while the distance between regions is included as a proxy for moving costs. The rate of growth in student numbers is another regression variable as teachers are more likely to move into growth regions. Finally, as most mobiliity in the teaching profession, 66%, occurs before the age of 30, age is also included.

Age and distance are identified as having the strongest effects on mobility and both are inversely related to it. House prices in the region of origin are found to increase migration, while wages and the promotion proxy show the expected retentive and pulling effects. Wages in the region of origin are negatively related to quits, while those in the region of destination are positively

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21 The author admits this specification is not ideal, but again, he is constrained by the information available.

related to it; the same holds for the promotion prospects variable. Significant differences, however, exist between the behavior of men and women.

The size of the coefficients on housing costs and age are larger for men than for women. Also of note is that salaries and promotions are more likely to pull women into regions rather than keep them in post. For men the coefficients on the promotion proxy in the region of origin and that in the region of destination are roughly equal. The coefficient on the salary variable in the region of origin is larger than that in the region of destination, which suggests that wage differences encourage retention of male staff.

His findings are important concerning the behavior of workers in a profession in which pay is determined nationally. They indicate that teachers clearly respond to earnings differentials, which exist in spite of uniform salary scale, as well as to promotion prospects which affect future earnings. Furthermore, high housing costs discourage teachers from remaining in their posts.

While it would not be surprising to find that nurses, like teachers, moved in response to earnings differentials created by differences in cost of living and to promotion opportunities, little quantitative work on the determinants of nursing turnover has been

undertaken. The pieces available to data are the study by Mercer (1979) and a pilot study by Gray et al. (1988).

ii. The Quantitative Research on Nursing Turnover

Mercer surveyed 1400 nurses in nine District General Hospitals in Yorkshire with follow-up interviews being conducted with 1000 who remained in post over a year. Extensive interviews with 149 leavers and 78 stayers were also completed. Tables which summarized some his important findings were presented earlier, but it is important to note as well that based on this data, Mercer attempted some OLS regression analysis of quits in nursing.

Mercer models quits as a function of job features, job attitudes, and personal and domestic circumstances. However, it is difficult to assess his findings as the quit rate is specified as a dichotomous variable according to whether or not the nurse left her post and, as discussed in chapter three, OLS is not the appropriate technique for estimating a dependent variable of this form. Also, the effect of the independent variables is gauged by their contribution to the R^2 which assumes that the model itself is not misspecified. Given that no theoretical justification has been provided for the variables he includes, this presents serious difficulties for evaluating his results.

Given these caveats, he finds that intent to leave is positively related to the quit rate, while length of service and size of hospital are negatively related to it; these three factors explained the most variance in R^2 with intent to leave being most important. A similar regression was run with the quit rate specified as a trichotomous variable: staying, leaving for another post, and leaving for nonparticipation which were defined as zero, one, and two respectively. He finds that those who are married, who do not have young children, and who have a favorable view of their promotion prospects are more likely to leave their posts.

In a pilot study for the Department of Health, Gray et al. (1988) present a cross-sectional study of quits based on information from nine DHAs. No theoretical foundation is given for the model, but the authors' basic premise is that quits are related to local labor market conditions. Using regression analysis, they find a significant negative relationship between the quit rate and the male unemployment rate and a positive relationship between turnover and the average female non-manual wage and the number of beds in private nursing homes in the area.

The authors also report some evidence on the number of nurses who are leaving for other jobs within the NHS. Based on information from five Districts, they find that leavers to other jobs constitute 8% to 15% of all quits.

Given the size of the sample and some potential problems in reporting, they suggest the figures be used with caution and the thrust of their study on the whole is a call for further research.[22]

VI. An Agenda for Research

Quits are an important phenomenon in the nursing labor market, yet this review indicates that little is known about the subject other than its magnitude for various staff groups. Important data on it direction and its determinants are clearly lacking and further research is clearly called for. A number of factors suggest that the most beneficial approach would be a study which examined the individual behavior generating these rates.

First of note is that given the structure of the market, it is individuals' decisions alone, in response to changes in local conditions, which are generating these rates. As previously discussed, managers have no power to influence behavior by changing remuneration packages. Furthermore, tracking behavior at the individual levels seems, at this stage, to be the promising way of identifying the type of quit occurring.

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22 Gray et al. are currently working on a cross-sectional study of turnover in the NHS which will make use of the KM45 and KM46 data.

Extant research suggests a number of factors which need to be taken into account such as domestic circumstances, age, skill level, promotion prospects, and market conditions. It also makes clear that no data is readily available for such an investigation to be undertaken. The next chapter outlines a data base assembled specifically for this purpose, while the one which follows presents and estimates a model of the decision to terminate employment.

Chapter Six

A Description of the JRII Data

Introduction

As the survey of the nursing literature chapter in five indicated, no data source exists which would enable a rigorous examination of why nurses leave their posts to be undertaken. A database was thus created for this purpose using information from the personnel files at the John Radcliffe Hospital, referred to in the following discussion as the JRII.[1] This chapter describes in detail the content of this database and begins by explaining how the data were collected.

I. The Data Collection

The object of the collection exercise was to compile a database suitable for examining the duration of employment of individuals and the factors which prompted them to leave their posts. Personnel and payroll officers at both the

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1 The John Radcliffe Hospital complex has two parts: a maternity hospital, established in 1973, the JRI and an acute hospital, opened in 1979, the JRII. They are run as separate institutions and this study focuses exclusively on the latter.

Oxford Regional and District Health Authorities and the Department of Health were contacted about the possibility of extracting work history information on individuals from their payroll systems. All indicated that this was not possible and recommended contacting hospitals individually.

As it has a reputation for promoting nursing research, an approach was made to the JRII in Oxford about the content and use of their nursing personnel files. The Chief Nursing Officer for the District, Mr. Malcolm Ross, and the hospital's Director of Nursing Personnel, Ms. Margaret Thurlow, granted access to the personnel records. Of prime importance, however, was the fact that a staff record card, for every nurse ever employed at the JRII, was available in the files which contained the bulk of information required for a study of employment duration. A data collection procedure was planned and information was extracted from the hospital's files from November of 1988 to March of 1989.

Due to the organization of the files, generating a random sample from all nurses employed since the hospital's opening in June of 1979 was not possible. It was possible, however, to separate nurses by date of hire and thus two groups were selected: those who were hired during the first year of operation, June 1979 to 1980, and a second group hired between June of 1984 and June of 1985. They are referred to in the text as cohort I and cohort II respectively.

This method of sampling was chosen for several reasons. Selecting the group first hired would allow the greatest period for observation and hence reduce the incidence of censoring in the sample. Furthermore, it would ensure that nurses of all grades, particularly those more senior who do not change post frequently, were included in the survey. The second cohort was chosen as it would enable comparisons between the type of nurses hired by the hospital in the two periods and reasons for leaving over time. Also, as the economy itself changed substantially during the decade, an analysis of the behavior of the two cohorts, so spaced, would most likely indicate whether or not these changes affected quit behavior.

Information on these two groups of nurses was available from three sources: staff record cards, extant personnel files, and exit interview forms. A staff record card which contains information on age, sex, marital status, work history, any on-the-job training received, days off for sickness, any maternity leaves taken, and terms of employment is available for any nurse ever employed at the JRII. Nursing qualifications held are also recorded on these cards for trained staff. On the back of the cards, for all staff, date of departure, reason for leaving, and destination are given.

For staff currently employed and for those who left their post in 1985 or later, complete personnel files are available to supplement the staff record cards.2 These contain information on the number and age of children in the nurse's household, qualifications earned at school, and performance evaluations while in post. Finally, separate exit interviews are also on file for post 1984 leavers.

Appendix 6.1 contains copies of the staff record cards, standard employment forms from the available files, and the exit interview forms used by the hospital. Individual case histories for nurses in the two cohorts were recorded from these sources and computerized for analysis. The following section provides a summary of the information collected by cohort and grade.

II. The Data

The data are presented in five sections which give details on: personal characteristics, terms of employment, work histories, nursing qualifications, and general qualifications held for each cohort for both qualified and unqualified nurses. A key to the discussion, tables, and figures is as follows:

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2 A policy of keeping the files on past personnal was not insitituted until 1985.

KEY: Group One is unqualified staff, auxiliaries and nursery nurses, in Cohort I;
Group Two is qualified nurses, enrolled nurses and grades above, in Cohort I;
Group Three is unqualified staff in Cohort II;.
Group Four is qualified staff in Cohort II.

i. PERSONAL CHARACTERISTICS

This section presents data on the personal characteristics of each group of nurses. The categories are the breakdown by sex, age at hire and departure, marital status, the number of those who married or became pregnant while in post, and area of residence.

TABLE 6.1: SEX OF NURSES BY GROUP

Sex	Group I	Group II	Group III	Group IV	Sample Total
Male	4	3	0	3	10
Female	224	568	34	177	1003
Total	228	567	34	180	1013

Table 6.1 shows the size of each group as well as its breakdown by sex. The figures indicate that very few men were employed at the JRII during either period and as this is a study of female labor supply, males are exluded from the subsequent tables; they are mentioned occasionally in the discussion. There are 792 female nurses in cohort I,

compared to 211 females in cohort II; 71.2% of the nurses in cohort I and 83.9% of cohort II are qualified.

On the following page, figures 6.1 and 6.2 give the frequency distributions for age at hire and age at departure for both skill groups in each cohort, while the means and medians for all groups for these statistics for all groups are shown below in table 6.2.[3]

TABLE 6.2: AGE AT HIRE AND AGE AT DEPARTURE
MEANS AND MEDIANS BY GROUP

Category	Group I	Group II	Group III	Group IV
AGE AT HIRE				
mean	31	28	26	25
median	33	25	24	24
AGE AT DEPARTURE				
mean	34	30	29	27
median	32	27	25	25

The figures indicate that most nurses who join the JRII are relatively young as are those who subsequently leave. The mean age at hire of three of the four groups is less than thirty, while the same holds true for the median. 74.6% of the qualified nurses in cohort I and 88.7% of those in cohort II are less than thirty when hired. Most departures also occur at a young age. In three of the four groups, the majority of staff had left before the age of thirty: 63.9%

3 No information on age was available for four qualified nurses in cohort I, i.e. group II.

FIGURE 6.1: AGE AT HIRE BY GROUP

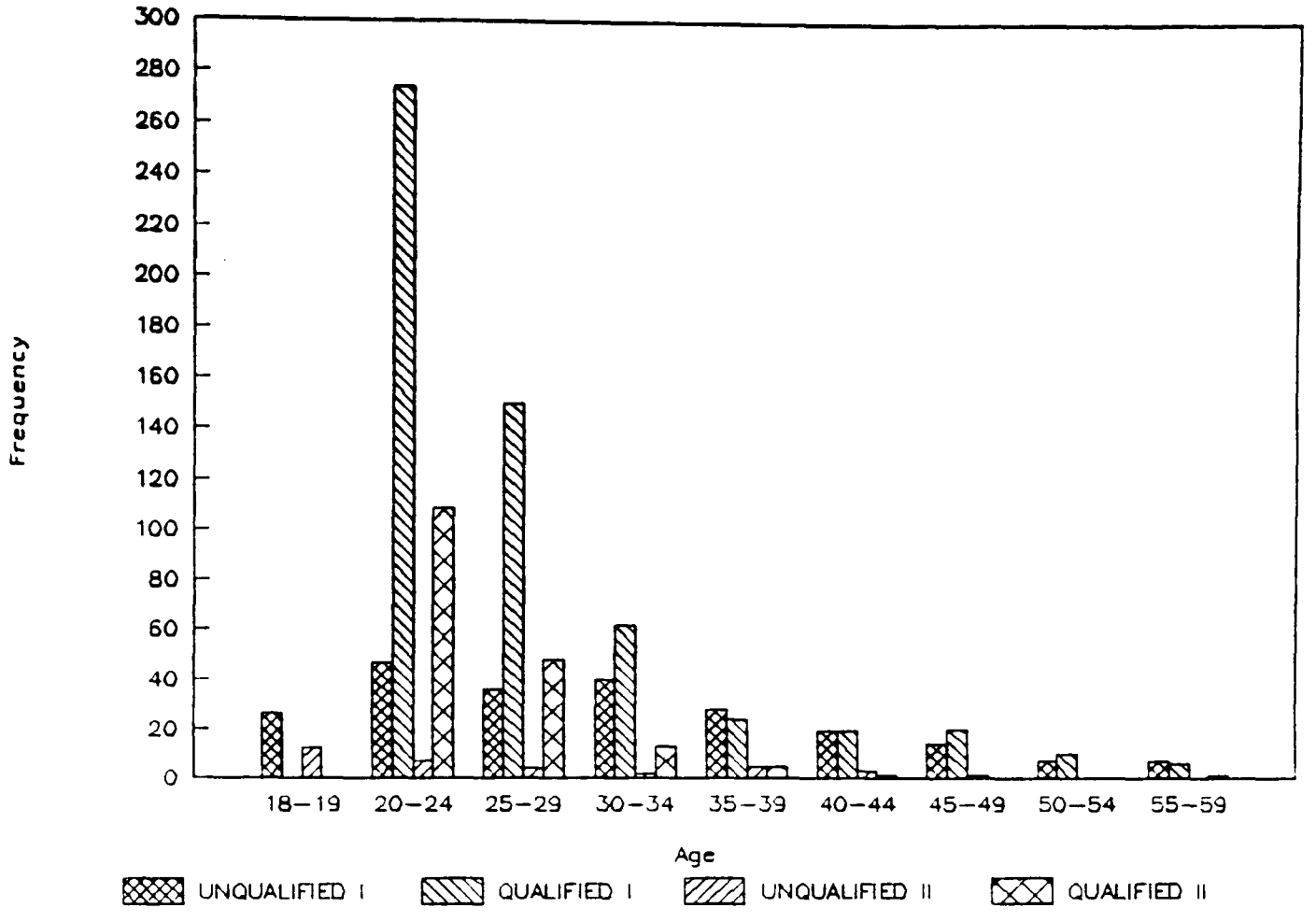
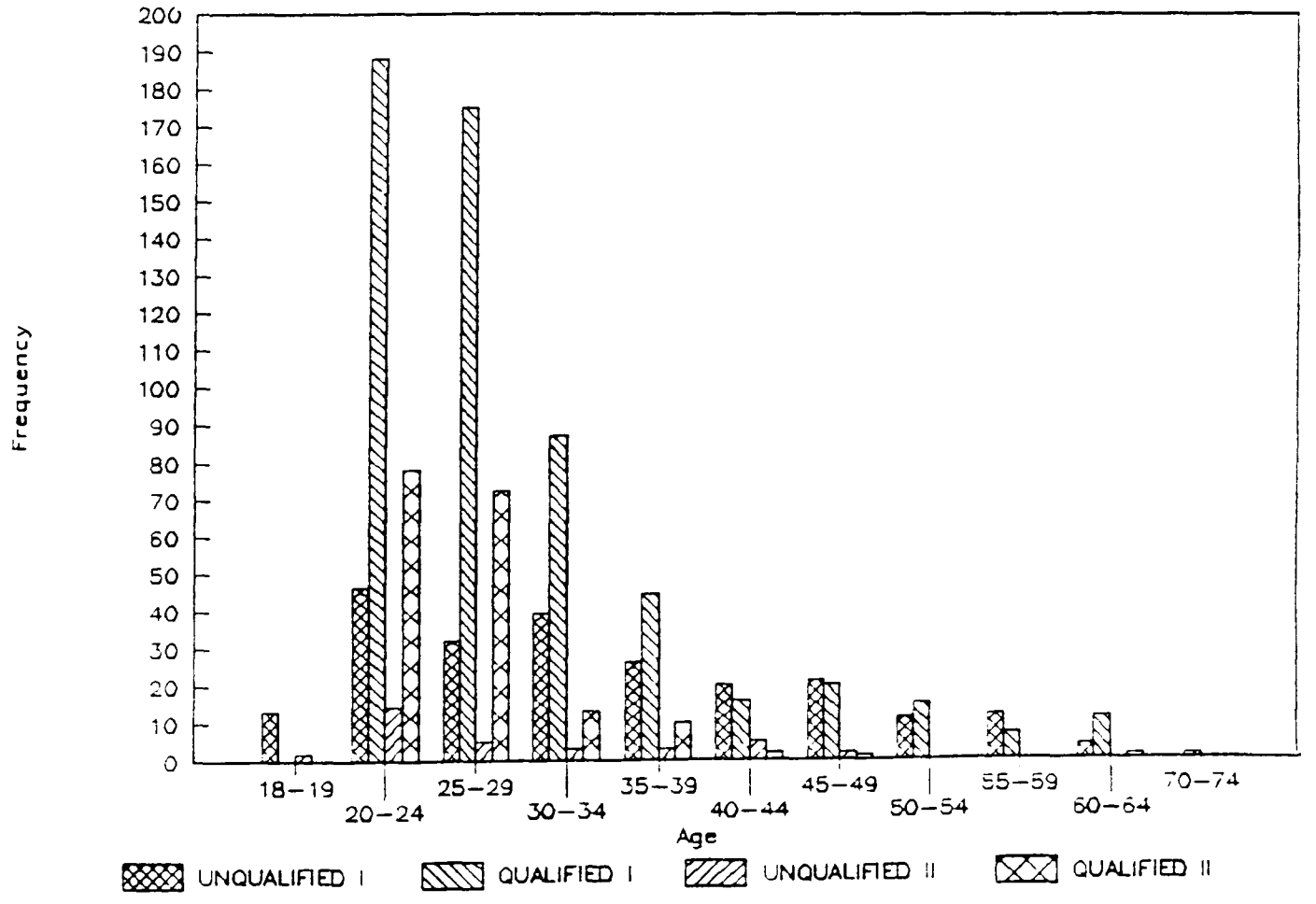


FIGURE 6.2: AGE AT DEPARTURE OR AS OF DECEMBER 1988 IF THE NURSE DID NOT LEAVE HER POST BY GROUP



in group II, 61.8% in group III, and 84.7% in group IV. Of note is that the mean age of unqualified workers at both age of hire and age of departure is greater than that of qualified nurses in the same cohort. Also, the nurses in cohort I are slightly older on average than those in cohort II.

The figures and the accompanying table both emphasize the hospital's dependence on young workers. This is a reflection, in part, of a nursing school being located on the hospital premises which means that many young nurses are available regularly for employment. The slight seniority of cohort I is explained by the fact that far more senior posts were likely to be available when the hospital opened than during 1984-85 when cohort II was hired.

Figure 6.3, on the following page, shows the marital status of the sample by group, while the tables, 6.3 and 6.4, indicate the number who married or became pregnant while in post. 57% of all nurses in the sample are single as are the majority of qualified nurses in both cohorts; most unqualifed nurses, 67.4%, are married. Only 3.5% of the sample are widowed, divorced, or separated, and <u>all</u> nurses, who changed marital status during employment, married. 76 nurses in the sample married while in post and 67% of those who married left their post with marriage. Of note is that all 10 men hired during either period were single.

FIGURE 6.3: MARITAL STATUS AT HIRE BY GROUP

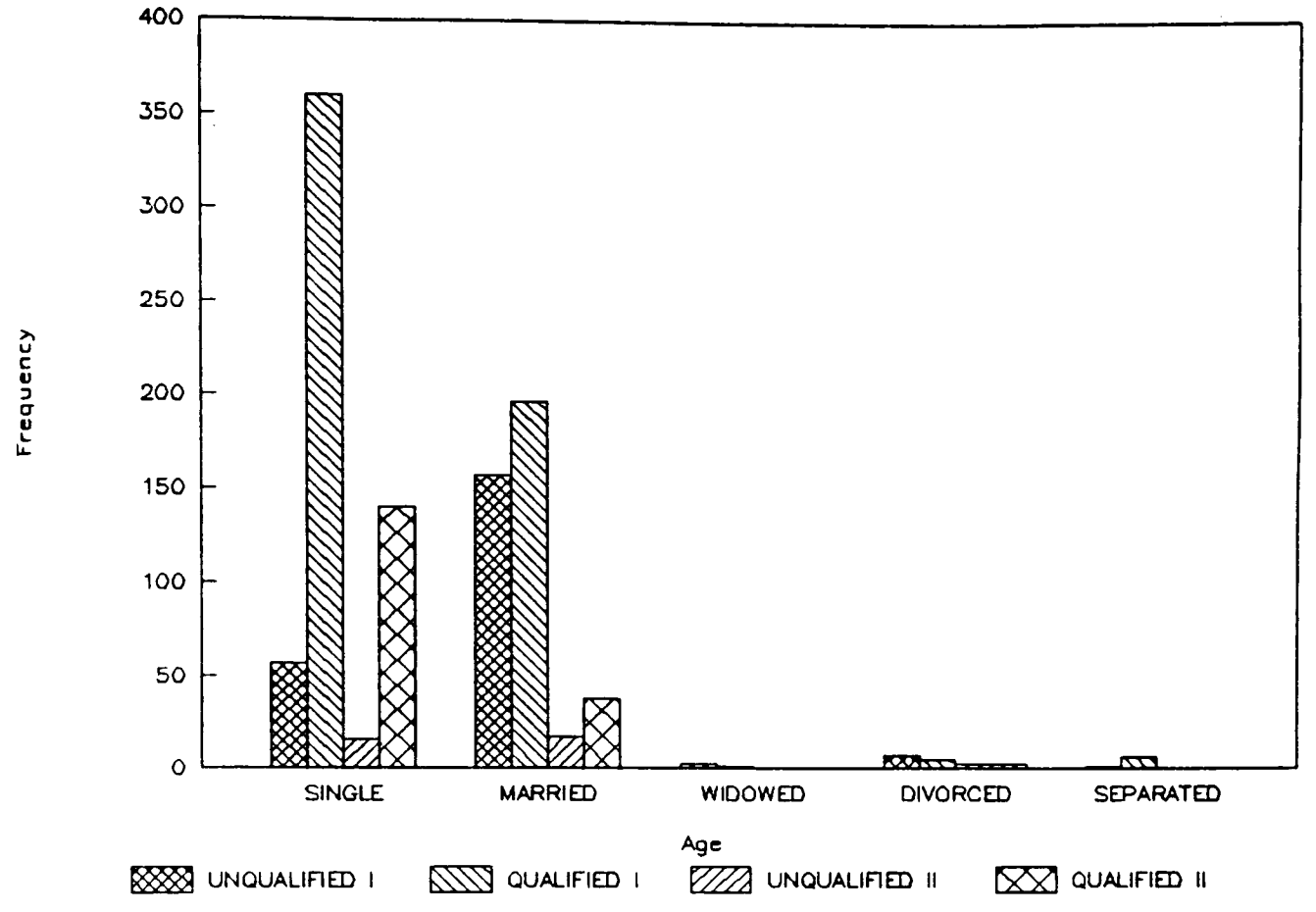


TABLE 6.3: NUMBERS WHO CHANGED MARITAL STATUS DURING EMPLOYMENT BY GRADE

Category	Group I	Group II	Group III	Group IV
No change	219	525	31	155
Married	5	43	3	25
Left post with marriage	2	31	0	18
Total	224	568	34	177

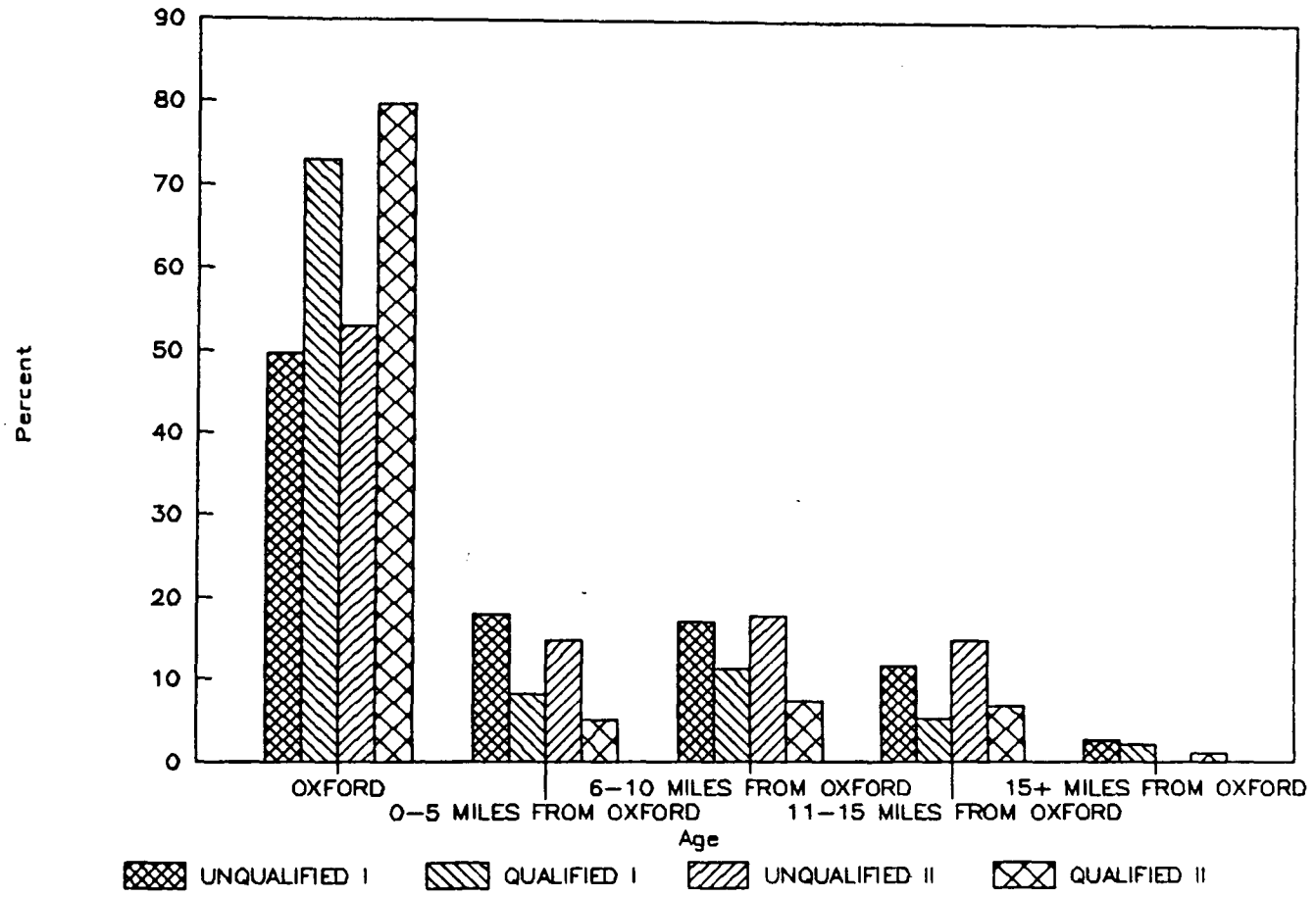
TABLE 6.4: NUMBERS WHO BECAME PREGNANT DURING EMPLOYMENT BY GRADE

Category	Group I	Group II	Group III	Group IV
None	219	495	31	166
One	25	70	3	10
Left with birth	24	53	3	5
Two	0	3	0	1
Left with birth	0	0	0	0
Total	224	568	34	177

Table 6.4 shows the number of maternity leaves by group. The majority of staff in all four groups took no leaves, while roughly 10% took at least one leave. 79% of those taking one leave left their post when leave ended; however, none of the nurses who took a second maternity left her post following the birth.

Figure 6.4 indicates where nurses in each group live in relation to the hospital.[4]

FIGURE 6.4: AREA OF RESIDENCE BY GROUP



In this instance Oxford is defined as the area within the ring road and the diagram shows that the majority of nurses in three of the four groups live in Oxford. Furthermore, in

4 Information on area of residence was missing for three nurses in group I and one nurse in group II.

both cases more qualified nurses live within the ring road than those who are unqualified: 72.9% of group II and 79.7% of group IV, compared to 49.5% of group I and 52.9% of group III. This may reflect the fact that the hospital offers in-town housing to all qualified staff. Unfortunately, it was not possible to determine with any accuracy who lived in hospital housing, who moved while in post, or which nurses were homeowners.

ii. DETAILS OF CURRENT EMPLOYMENT

Having examined the personal characteristics of the nurses in each cohort, the discussion now turns to features of their employment at the JRII. Table 6.5 gives the grade of staff employed by cohort.

TABLE 6.5: GRADE OF PRESENT POST BY COHORT

Grade	Cohort I	Cohort II
Senior Nursing Officer II	1	0
Nursing Officer I	3	0
Nursing Officer II	2	0
Senior Sister I	6	1
Senior Sister II	67	10
Night Sister	16	1
Senior Staff Nurse	5	9
Staff Nurse	318	133
Senior Enrolled Nurse	14	4
Enrolled Nurse	136	19
Nursery Nurse	13	0
Nursing Auxiliary I	43	3
Nursing Auxiliary II	168	31
Total	792	211

As expected, given that they were the hospital's initial cohort of workers, a greater percentage of cohort I hold senior posts compared to nurses in cohort II. Many of the advanced posts were likely to be unavailable during the hiring of cohort II as fewer of these posts exist and they are less likely to become vacant than posts of a lower grade.

In terms of general grade distribution, 11.8% of cohort I have posts at grade sister or above, while 59.1% of this cohort falls within the category of staff or enrolled nurse; 28.2% hold unqualified posts. On the other hand, the vast majority of cohort II, 73.9%, are staff or enrolled nurses; comparatively fewer hold the post of night sister or above, 5.2%, or are unqualified, 16.1%. Note that all grades above nursery nurse are considered qualified staff.[5]

Figures 6.5 and 6.6 provide information on hours and shifts worked by each group. Figure 6.5 gives the hours worked by nurses in each group. As shown in the percentage breakdown, the majority of nurses in three of the four groups work full-time: 82.9% in group II, 61.8% in group III, and 92.6% in group IV, while the percentage for group I is 45.1. Reflecting the fact that more qualified nurses work full-

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5 This division is based on conversations with the Director of Nursing Personnel.

FIGURE 6.5: HOURS WORKED PER WEEK AT DATE OF DEPARTURE OR AS OF DECEMBER 1988 IF THE NURSE DID NOT LEAVE HER POST BY GROUP

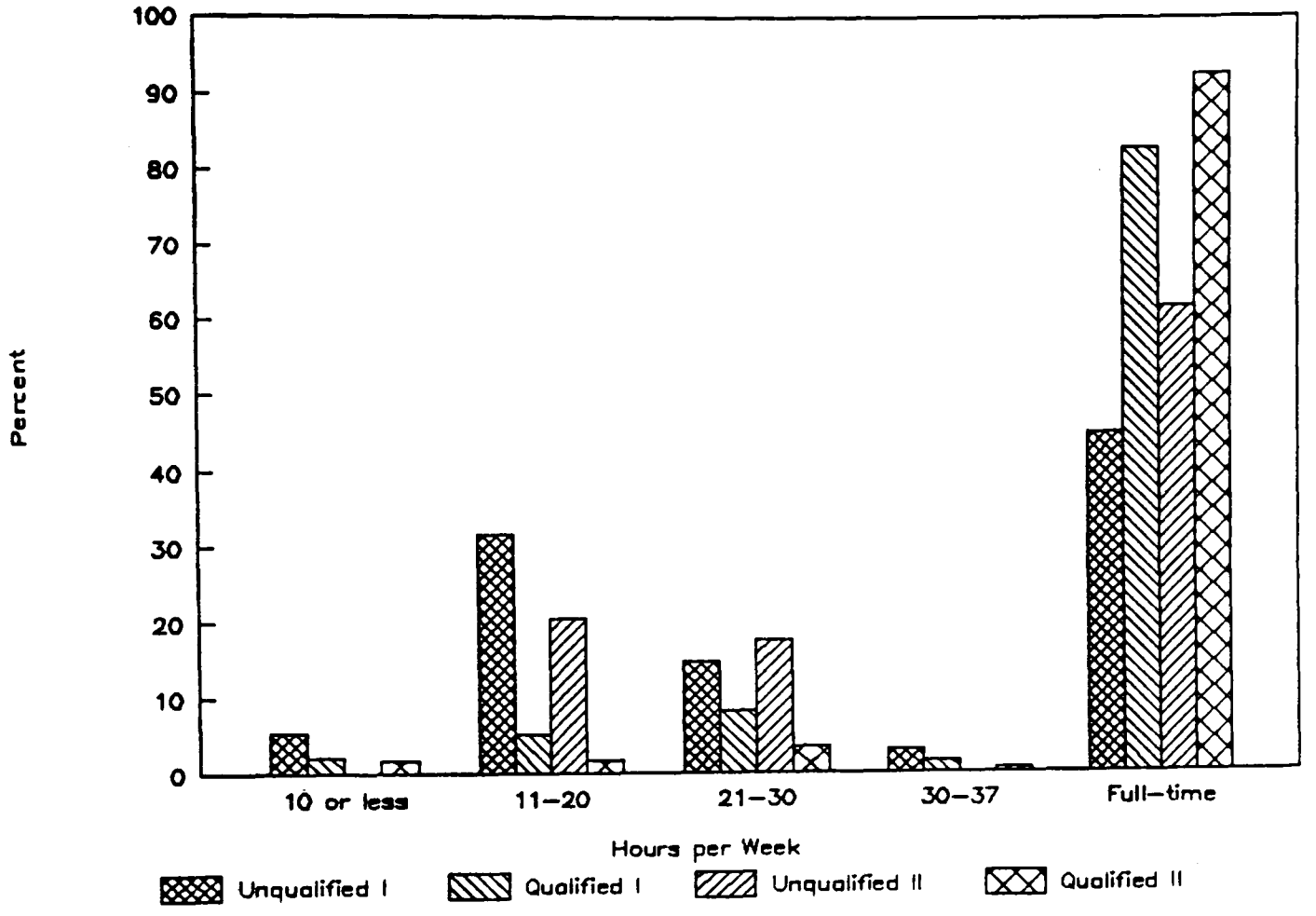
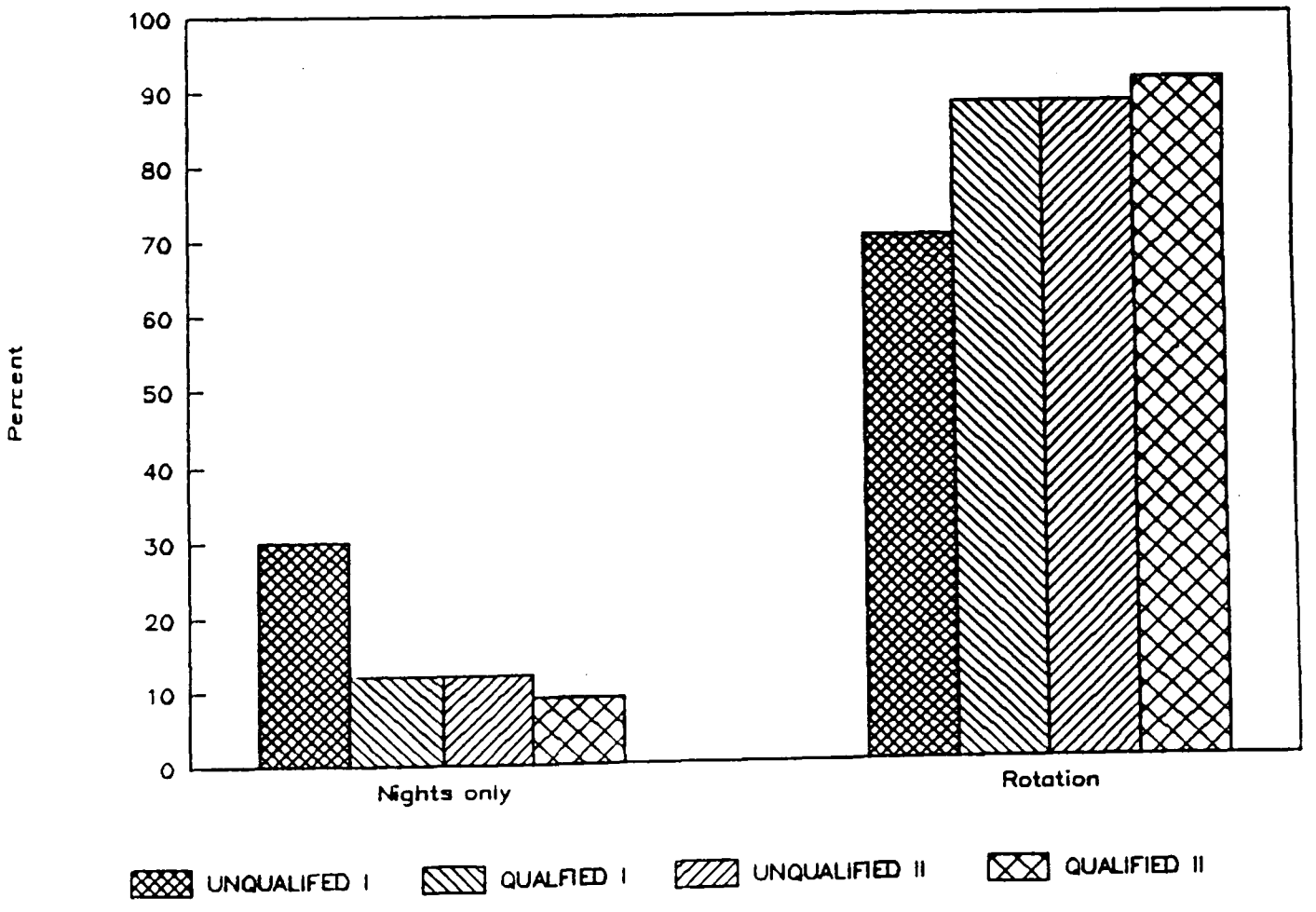


FIGURE 6.6: SHIFTS WORKED BY GROUP AT DATE OF DEPARTURE OR AS OF DECEMBER 1988 IF THE NURSE DID NOT LEAVE HER POST BY GROUP



time, the mean hours worked for qualified nurses in both cohorts is 36.2, a figure substantially higher than that for unqualified nurses. The means for unqualified nurses are 28.7 hours and 31.7 hours for cohorts I and cohort II respectively. Of note is that in January of 1980, the full-time work week for nurses was reduced from 40 hours per week to current level of 37.5 hours. The figures on mean hours thus reflect this alteration.

Also of interest is that more nurses in cohort II work full-time than in cohort I. This is most likely due to the fact that nurses in cohort II are younger and thus are less interested in part-time work, while older nurses with family responsibilities are more likely to be in cohort I.

Figure 6.6 shows that the majority of staff in all four groups work shifts on a rota. A minority in each group works nights only, although the figure is substantially larger for group I at 31.7%, than for the other three: 12.0% for group II, 11.8% for group III, and 9.0% for group IV. In both cohorts unqualified nurses are more likely to work nights only than qualified nurses.

Table 6.6 shows the number of nurses who changed their conditions of employment in terms of hours, shift worked or grade, while in post. Both qualified and unqualified

negotiated some change, but it was less than 10% of the group total in all cases.

TABLE 6.6: NURSES WHO CHANGED THE TERMS OF THEIR EMPLOYMENT CONTRACT WHILE IN POST BY GROUP

Type of change	Group I	Group II	Group III	Group IV
Hours/Shift/Grade	14	48	3	13
Grade only	3	27	0	8
Total	224	568	34	177

Figures 6.7 and 6.8 on the following page provide information on the length of time spent in post by nurses in all four groups. Figure 6.7 gives the survival curve for each group, while figure 6.8 shows the number of months spent in post before leaving by nurses in each group who quit during the survey period. Both figures suggest that the average duration of employment for nurses is a relatively short period.

FIGURE 6.7: THE PERCENT REMAINING IN POST OVER TIME BY GROUP

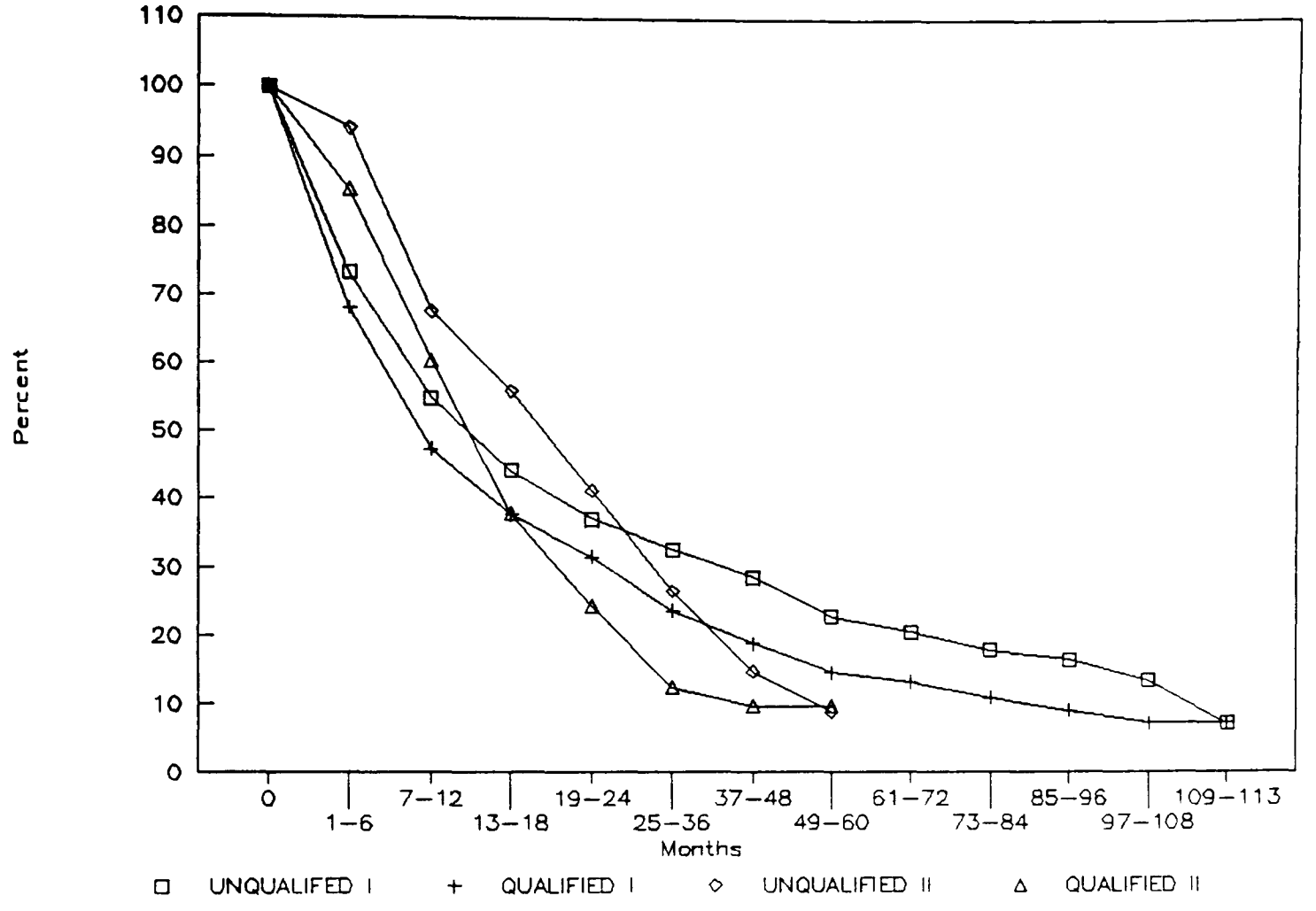
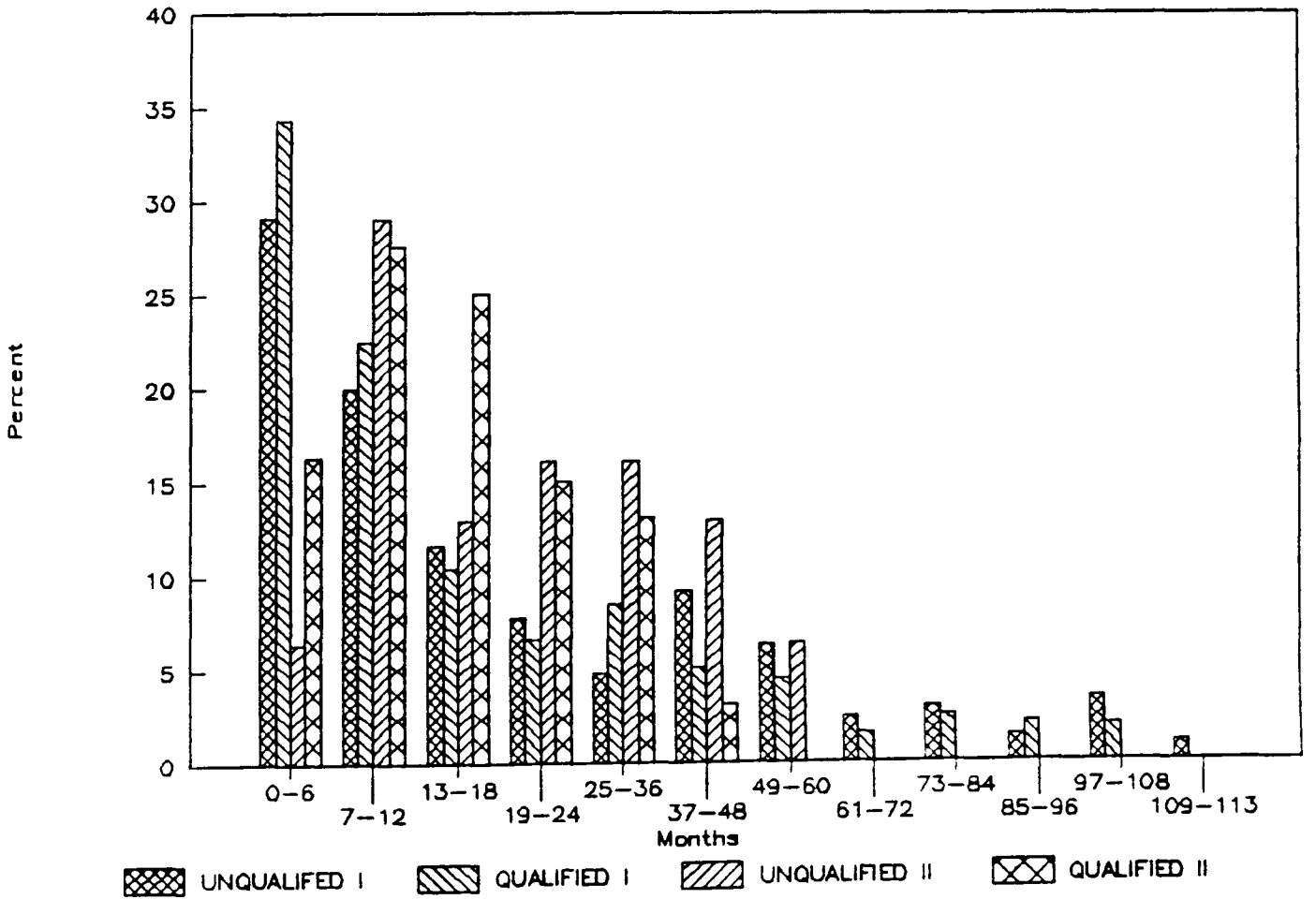


FIGURE 6.8: THE NUMBER OF MONTHS SPENT IN POST BY THOSE WHO SUBSEQUENTLY QUIT BY GROUP



The survival curve indicates that the quit rate for all four groups rises initially and then falls, with the rate rising for a longer period for those nurse in cohort II. Together the figures reveal that at least two thirds of all four groups had left at the end of two years with most of the departures within the first year for groups I-III and in the second for group IV. At the end of the first year, 54.9% of group I was left, 47.4% of group II, 61.8% of group III, and 60.4% of group IV. The comparable figures for the end of the second year are 37.1 for group I, 31.5 for group II, 41.2 for group III, and 24.3 for group IV. Interestingly, roughly the same percentage of each cohort is left in post at the end of the observation period: 7.4% of cohort I and 9.5% of cohort II.

While it might be argued that the "teething pains" associated with starting a new organization could have led to a higher quit rate for the first cohort, the difficulties encountered in being part of a new organization are potentially offset by the advantages of a clean, modern working environment. Of greater importance, however, is that nurses accepting posts during this period knew that they were joining a new ward and would have adjusted their expectations about the job accordingly. Thus, both cohorts should have been subject to similar degrees of uncertainty about working conditions; most of which can only be eliminated by doing the job itself.

Another factor which could have led to different quit rates being observed between the two cohorts is the possibility that different hiring standards were in operation during the two periods. Standards may change in relation to how badly staff are needed or if the individual in charge of hiring changes. Formal selection procedures, which should minimize the possibility of the latter happening, have been in place since the JRII opened. However, staffing the JRII was a major undertaking and while other hospitals in the area shed posts when the JRII opened as part of a district reorganization, it may be that the initial push for staff led to less stringent hiring criteria being followed than that subsequently in force. This may in part explain why more nurses quit in the first six months in cohort I than in cohort II: they were less suited to the job. A final piece of information on duration in post is given in table 6.7.

TABLE 6.7: MEAN AND MEDIAN MONTHS IN POST FOR LEAVERS AND STAYERS BY GROUP

Months	Group I	Group II	Group III	Group IV
Mean				
Leavers	25	20	22	15
Stayers	111	111	44	50
Total	32	27	24	19
Median				
Leavers	13	10	20	14
Stayers	112	113	43	51
Total	15	12	22	15

Table 6.7 provides the means and median lengths of stay for all four groups. As suggested above, the means of length of stay for unqualified nurses are longer than those for qualified nurses by five months in each cohort. Similarly, the medians for the unqualified groups exceed those of the qualified, but it is interesting to note that while the mean length of stay of cohort I is greater than that of cohort two, the median is actually less. This situation arises because nurses in cohort I who have remained in post throughout the period of observation will have extremely long lengths of service, in most cases over 10 years, while many nurses in cohort I had relatively short stays. Again, 8.0% of group I, 7.2% of group II, 8.8% of group III, and 9.6% of group IV were in post at the end of the survey period.

Along with time spent in post before quitting, the reasons given by nurses within each group for leaving are of great interest. Table 6.8 provides a breakdown of the reasons for leaving by group.

TABLE 6.8: REASON FOR LEAVING POST BY GROUP

	Group I	Group II	Group III	Group IV	Sample Total
Dismissed	2	1	2	0	5
To Change Hours	7	4	1	3	15
Promotion	1	61	0	11	73
Experience on a Different Ward	13	112	1	37	163
Illness	28	6	3	1	38
For Training	29	100	5	35	169
Pregnancy	24	53	3	5	85
Marriage	2	31	0	18	51
Moving with Husband	9	16	2	3	30
Moving	5	30	0	4	39
Family Reasons	6	4	0	0	10
Dissatisfied with job	8	15	3	2	28
Wanted to Travel	3	19	0	7	29
Retiring	8	11	0	0	19
Personal/Unstated	34	18	0	4	56
Emigrating	10	27	1	30	68
Change Occupations	17	19	10	0	46
Total	206	527	31	160	924

For qualified nurses in both cohorts, the most common reason for leaving a post was to gain experience on a different type of ward; 19.7% of group II and 20.9% of group IV left for this reason. The second most frequent reason given for the qualified group was to undertake training: 17.6% and 19.8% for groups II and IV respectively. For qualified nurses in cohort I the third most prevalent reason for leaving post was marriage - 5.5% left for this reason- while for those cohort II it was for immigration, at 16.9%.

The reasons for leaving for unqualified workers differed substantially. Most of the workers in group I left for

personal reasons, 15.2%, while the second most popular reason for leaving was to take up training, 12.9%. Illness and pregnancy came in a close third and fourth. For unqualified workers in cohort II, however, the most common reason for leaving was to take up another kind of work. 29.4% left for this reason which suggests that this group is responding to increased non-nursing job opportunities.

Of note is that five nurses or .005% of the total sample was dismissed from the JRII.

FIGURE 6.9: DESTINATION AFTER LEAVING POST BY GROUP

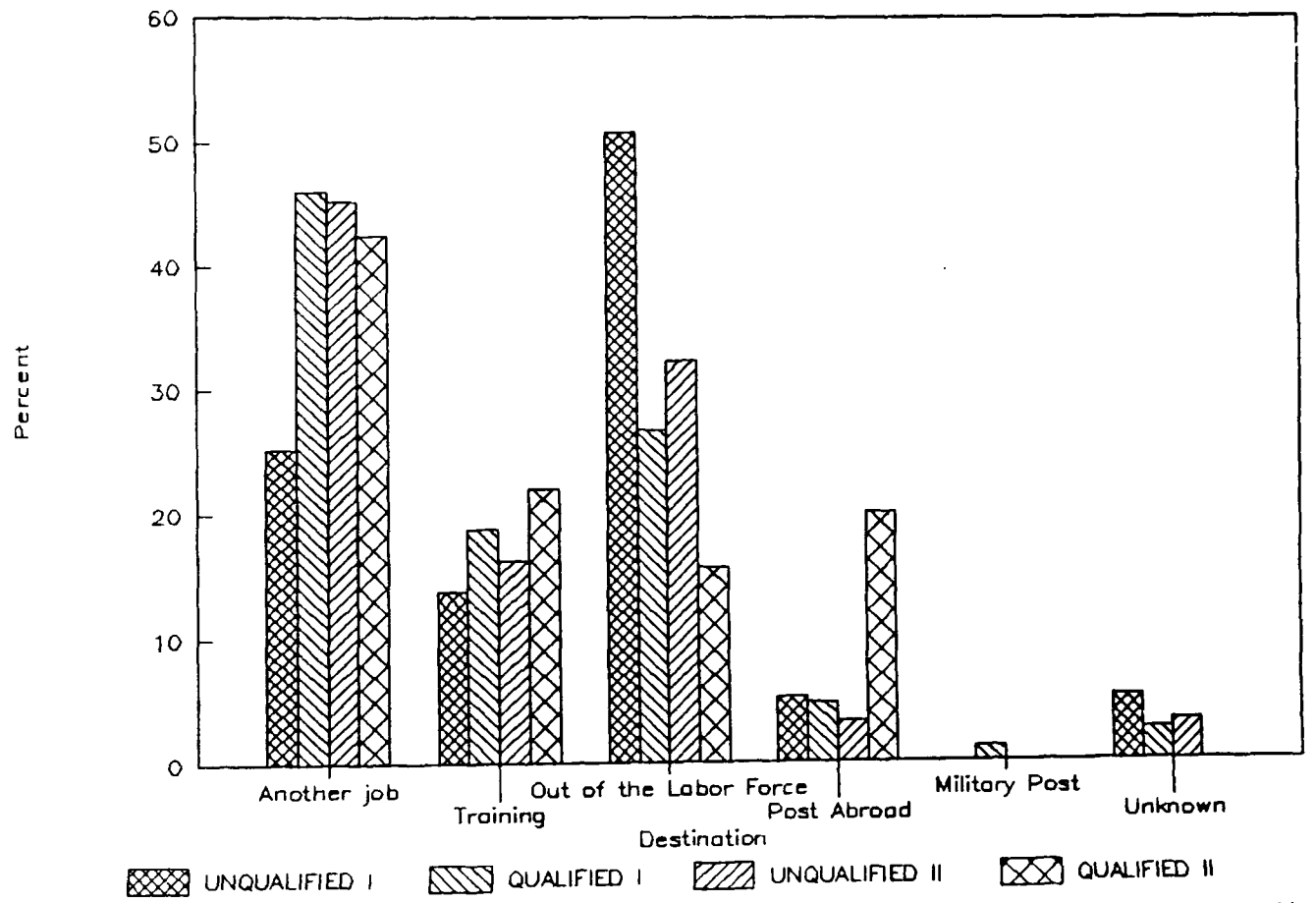


Figure 6.9 shows the anticipated destination of nurses once they left their posts. After leaving their posts, 47.8% of the unqualified nurses in cohort I became non-participants in the labor market; 23.7% took up employment in other jobs:

12.0% nursing and 11.6% non-nursing and 11.1% began formal nurse training. In cohort II, 29.4% left the labor market for general non-participation, 41.2% left for other jobs: 32.3% non-nursing employment and 8.8% employment in nursing, while 14.7% took up nurse training.

Similar to the unqualified groups, leaving to non-participation and to take up training were common for the qualified nurses. In cohort I 25.2% of the qualified group left the labor force altogether, while 16.5% took up further training in nursing. The comparable percentages for qualified nurses in cohort II were 14.1% and 16.3%. It is interesting to note that among the qualified groups, a small percentage of those who left the labor force altogether, left to travel: 11.9% of cohort I and 28.0% of cohort II. This reflects the fact that many of the qualified nurses hired were single, while the unqualified were married.

The destinations of qualified and unqualified nurses who left posts differed substantially in one important respect: the vast majority of qualified nurses who left for other jobs remained in nursing. Only 3% of the qualified nurses in cohort I took up non-nursing jobs after leaving the JRII, while none of the qualified nurses in cohort II moved out of nursing. For all four groups of nurses who remained in nursing, most took up posts within the NHS: 74.1% in group

I, 98.7% in group II, 66.7% in group III, and 92.6% in group IV.

Finally, of note is that 4.0% of the unqualified nurses in cohort I and 6.5% of the qualified nurses from both cohorts who worked at the JRII and left were subsequently rehired.

Figures 6.10 and 6.11, on the following page, provide information on the seasonality of quitting and the incidence of sickness among each cohort. Figure 6.10 shows the time of year in which most nurses left their posts. Here Summer is defined as June to August, Fall is September to November, Winter is December to February, and Spring is March to May and the diagram shows that there is some seasonality to quit in nursing as the largest percentage of each group leaves in summer. Over 60% of the nurses in cohort I leave in Summer, while the same is true for 40% of the nurses in cohort II. The prevalence of Summer quits may be due, in part, to increased childcare responsibilites during Summer vacation, the desire to have a break before taking up training in the fall, or to the fact that Summer is considered by most as the optimal time to travel.

Finally, figure 6.11 shows the average number of days sick per month for each group. The diagram shows that the incidence of sickness among qualified nurses is less than that among unqualified groups. 83.2% and 91.5% of the

FIGURE 6.10: SEASON OF DEPARTURE BY GROUP

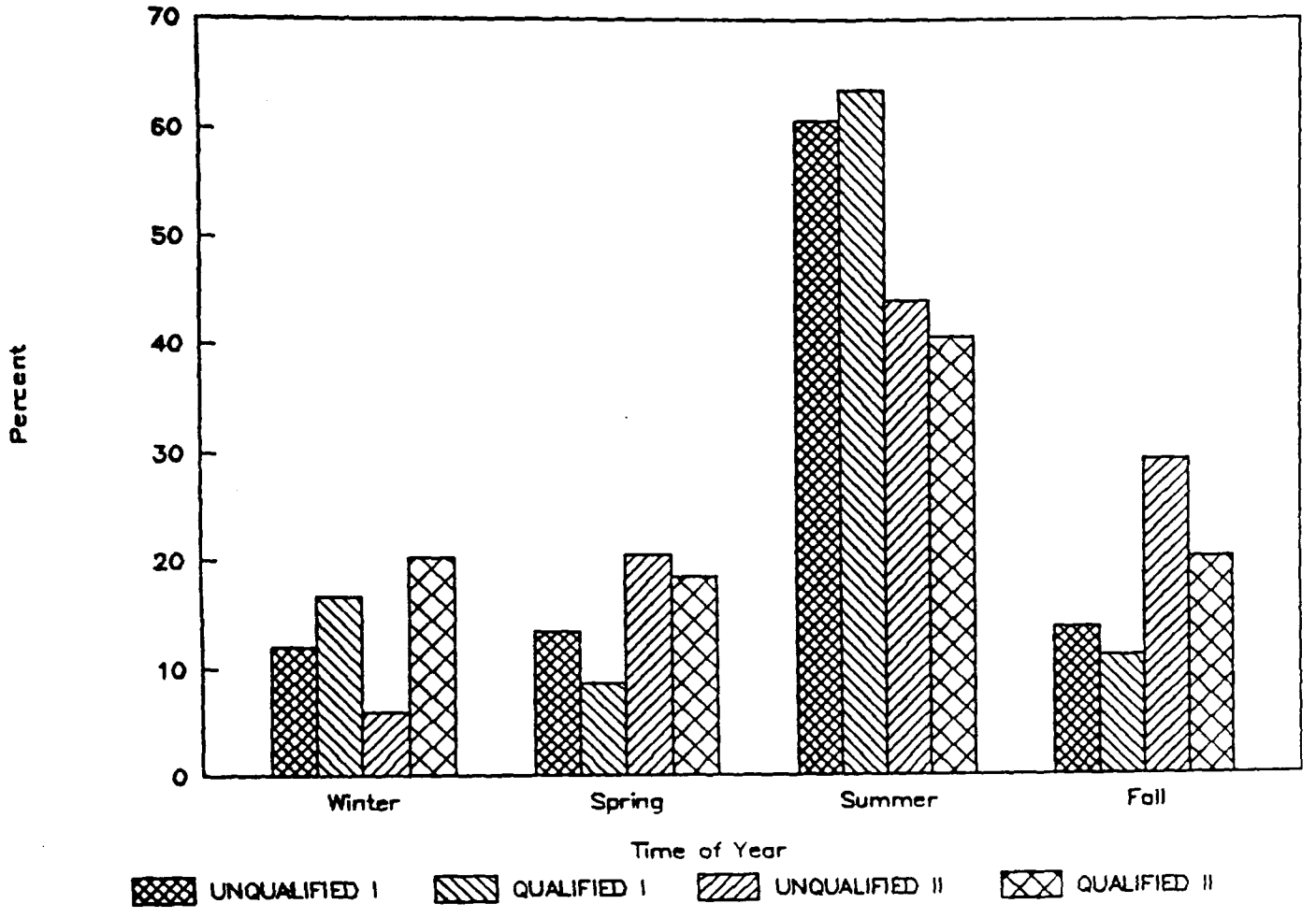
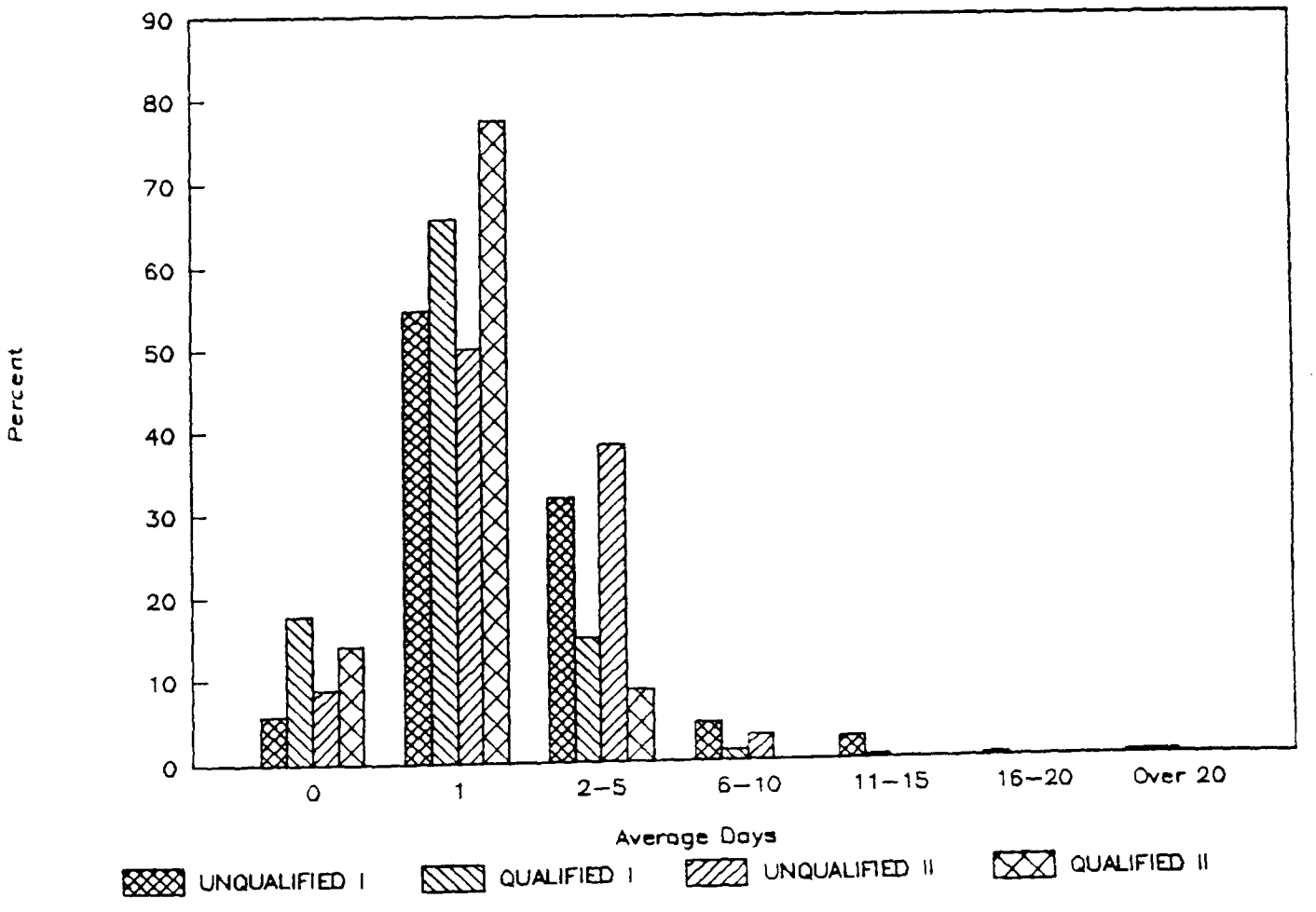


FIGURE 6.11: NUMBER OF TOTAL DAYS OFF SICK DIVIDED BY MONTHS IN POST BY GROUP



qualified nurses in cohorts I and II respectively are off sick on average one day a month or less, while the percentages for the unqualified nurses by cohort are 60.3% and 58.8%. The mean days off sick per month provide further support for this claim as they are 2.1 days, 1.0 days, 1.6 days, and 0.6 days for unqualified and qualified nurses in cohorts I and II respectively. These statistics reveal that unqualified nurses in both cohorts are off sick twice as much as their qualified counterparts.

iii. WORK HISTORY

This section presents data on the employment experiences of qualified and unqualified nurses in both cohorts. The work history information consists of details on the number of previous nursing posts held, number of non-nursing jobs held before a nursing career was begun, and on the labor force status of each nurses before taking up her post.

On the following page figure 6.12 shows the frequency breakdown on previous nursing experience by group. Both qualified and unqualified nurses in cohort I have more experience on average than those in cohort II. The mean number of previous nursing jobs for qualified nurses in cohort I is 2.4, while for those in cohort II it is 1.7; the respective figures for unqualified nurses are 0.8 and 0.6. For 32.3% of the qualified nurses in group IV, working at

FIGURE 6.12: THE NUMBER OF NURSING POSTS HELD PRIOR TO JRII EMPLOYMENT BY GROUP

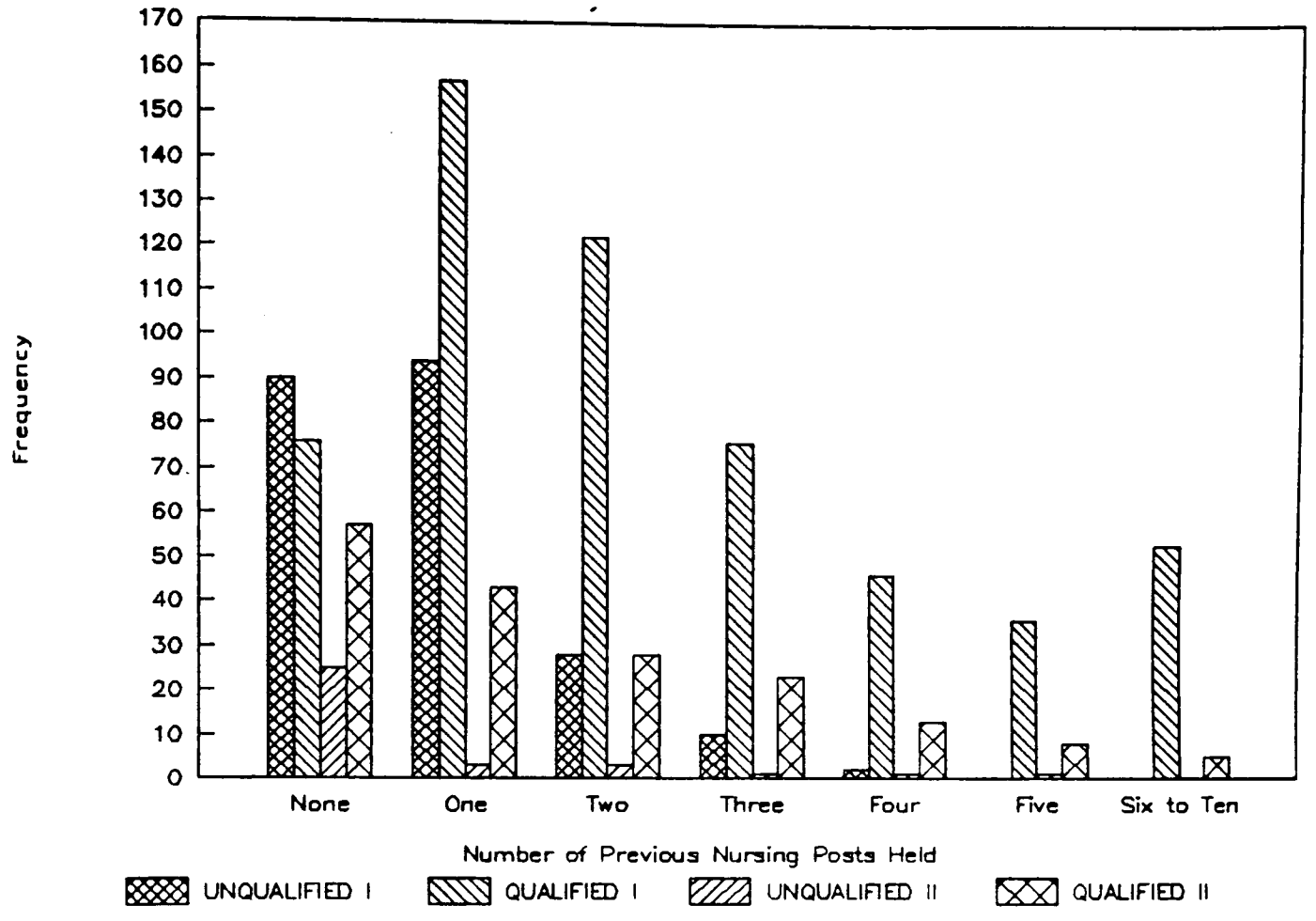
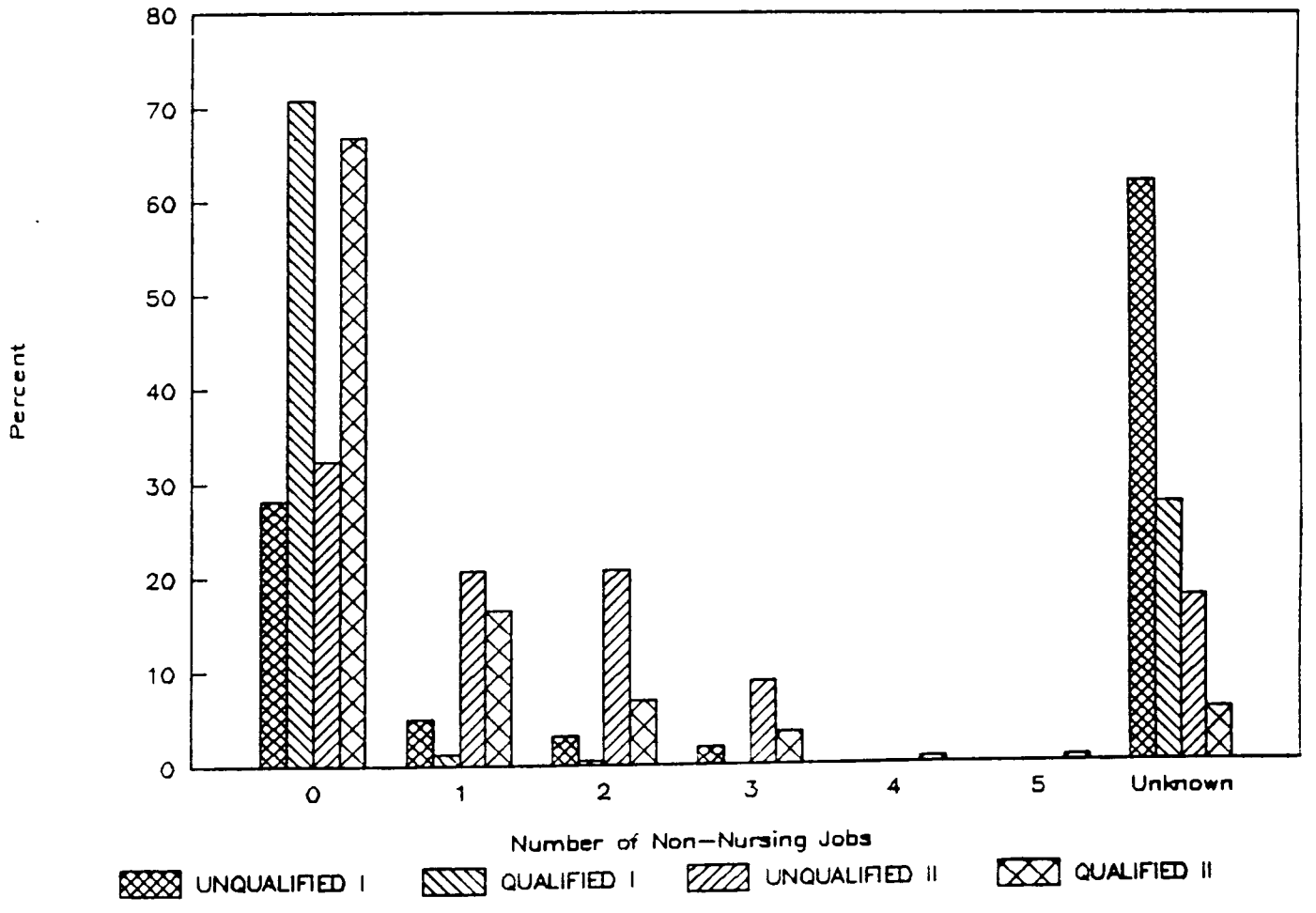


FIGURE 6.13: THE NUMBER OF NON-NURSING JOBS HELD BEFORE BEGINNING NURSING CAREER BY GROUP

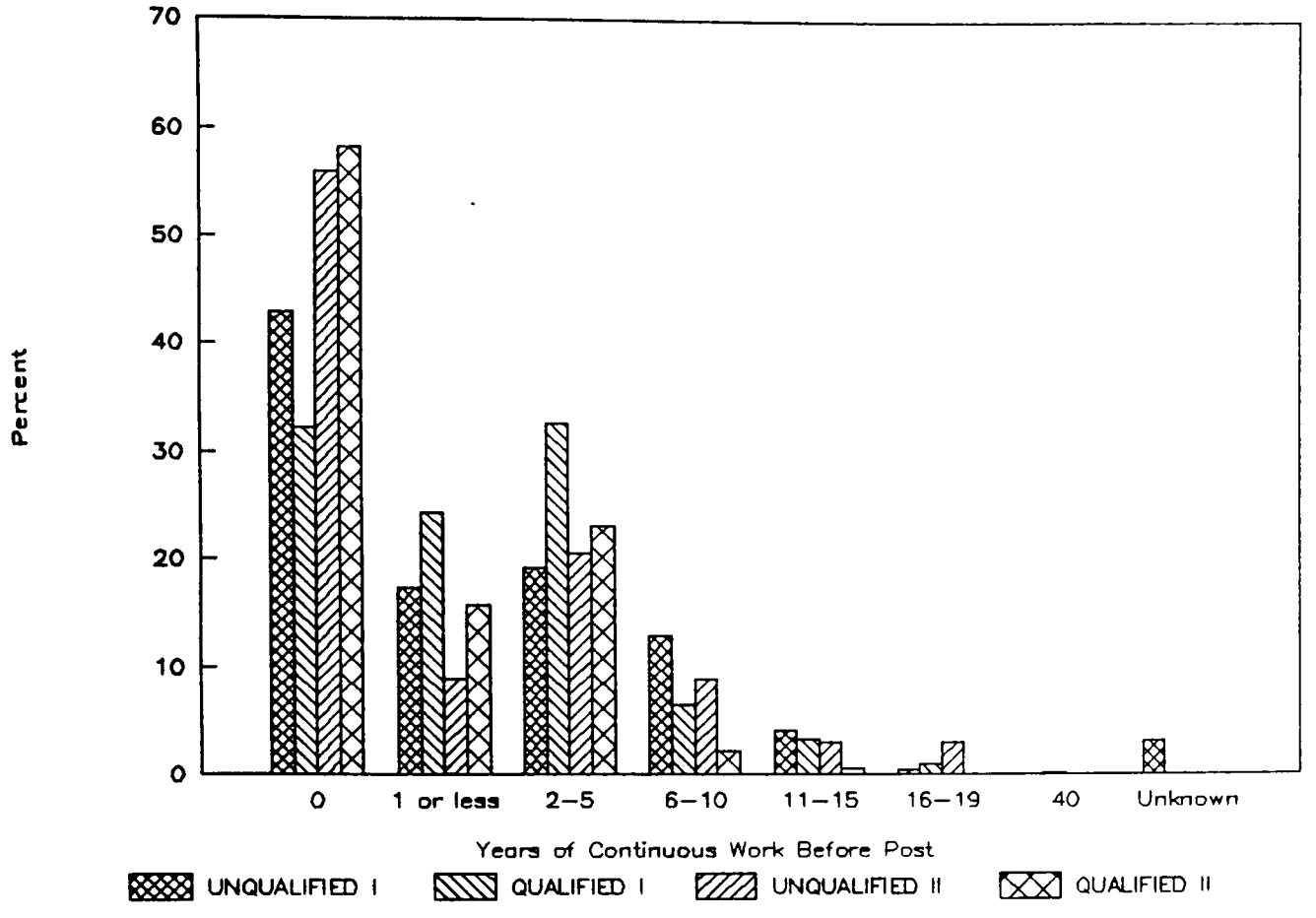


the JRII is their first nursing job, while the same is true for only 13.4 of those in cohort I. For unqualified nurses in cohort II, 73.5% have never worked in nursing before being hired at the JRII.

Information on the general labor market experience was also available for a large portion of the sample; it is shown in figure 6.13. For 63% of the nurses in cohort I and 92% of the nurses in cohort II, the number of jobs held in other occupations before a nursing career was begun was recorded. Figure 6.13 shows that the majority of three of the four groups had not worked in other occupations before beginning their nursing careers; however 60.7% of unqualified nurses in cohort II had worked in at least one other job before working in nursing. Also of note is that very few nurses, 2.2% of the sample, held jobs in other occupations after beginning nursing work. The results from figure 6.8 above indicate that this may be changing for unqualified nurses.

Figure 6.14 presents the number of years a nurse had been working before she took up her post.

FIGURE 6.14: YEARS OF CONTINUOUS EMPLOYMENT BEFORE POST BY GROUP



More nurses in cohort I had been working prior to employment at the JRII than in cohort II and in both groups III and IV the majority of nurses were out of the labor force prior to taking up their jobs. Generally, nurses in cohort II had spent significantly less time on average in the labor market prior to their JRII posts than those for cohort I, a statistic attributable to Group IV. While the average months spent in the market were very similar for nurses in groups I to III at 25.9, 24.4, and 23.8 months respectively, while qualified nurses in cohort II had only spent 10.5 months in employment prior to taking up their posts at the JRII.

Figures 6.15 and 6.16 provide more detail on nurses' labor market status prior to their employment. Figure 6.15 gives information on the labor force status of nurses by skill group and cohort before taking up the JRII post. Most nurses in cohort I were either employed in nursing or out of the labor force; 21.6% of the qualified nurses in this group came from straight from training to the JRII. 50% of group III was out of the labor and the remainder were employed roughly equally in nursing and non-nursing jobs. In group IV 50.3% were previously in nurse training and 38% were employed in other nursing jobs.

Figure 6.16 details the posts held by those working in nursing jobs prior to JRII employment. Among those employed in other nursing jobs, the majority in all four groups transferred from posts within the region: 57.6 group I, 55.8% group II, 76.5% group III, and 67.8%. Only 30.6% of qualified nurses in cohort I transferred from outside the region, while the same is true for only 22.0% of the qualified nurses in group IV which suggests that the primary market for job to job transfer in nursing is regional.

FIGURE 6.15: LABOR FORCE STATUS OF NURSE PRIOR TO EMPLOYMENT AT JRII BY GROUP

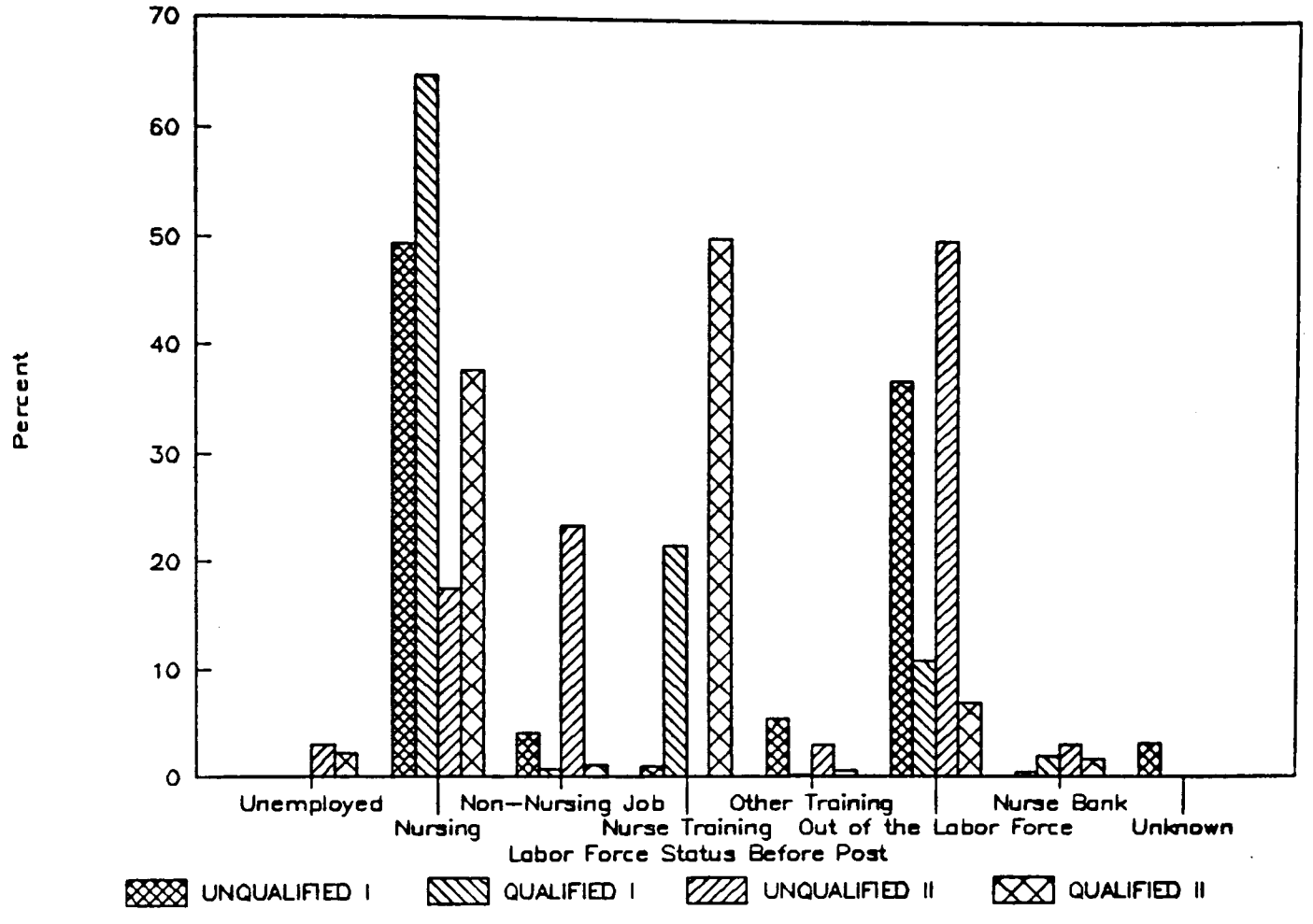
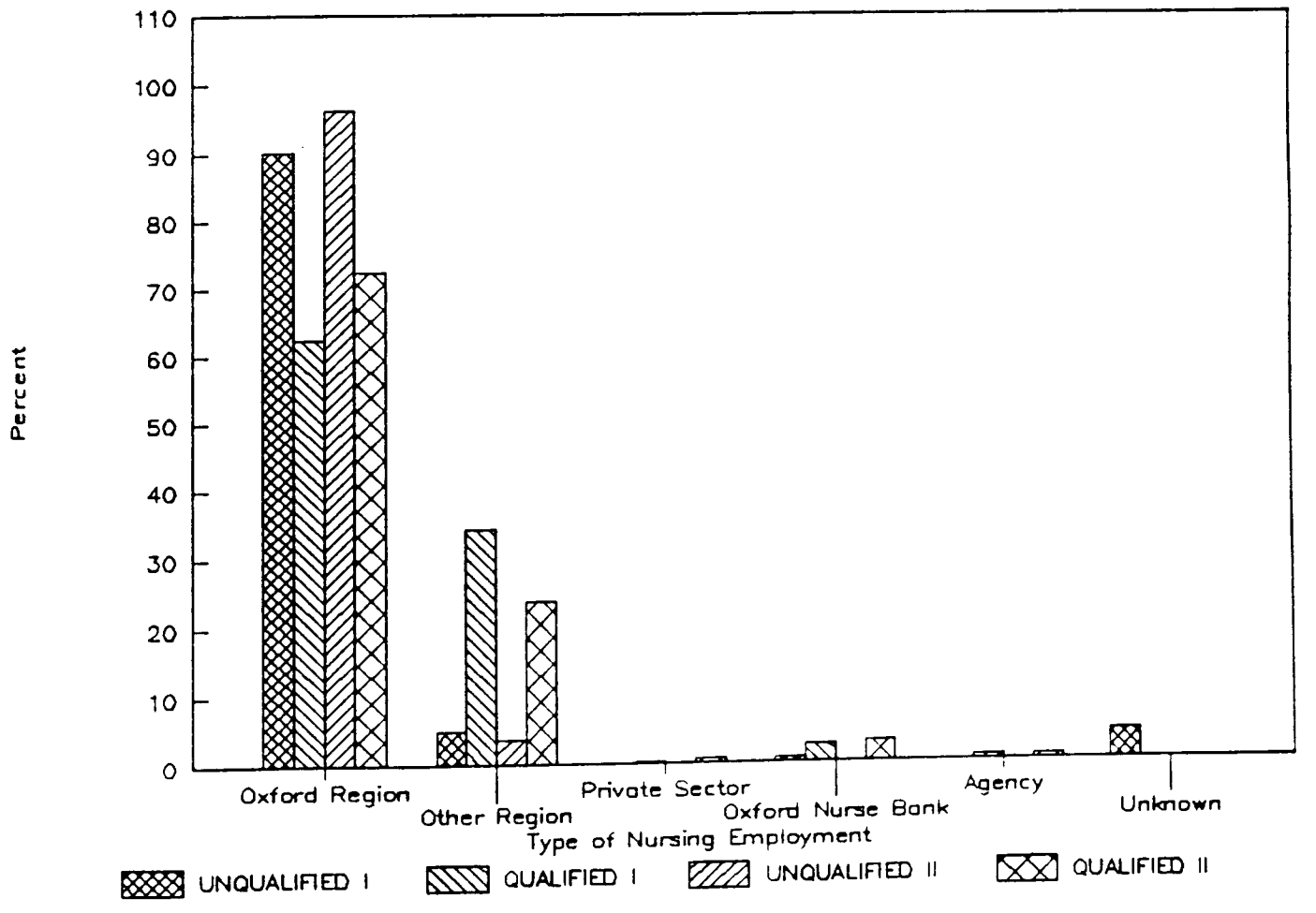


FIGURE 6.16: TYPE OF NURSING EMPLOYMENT HELD IF WORKING IN NURSING PRIOR TO JRII EMPLOYMENT



iv. NURSING QUALIFICATIONS

This section outlines the nursing qualifications, basic and post-basic, held by those joining the JRII staff. As few auxiliaries or nursery nurses hold qualifications, the discussion focuses primarily on enrolled nurses and above in each cohort i.e. groups II and IV.[6]

On the following page figures 6.17A and 6.17B show the primary nursing qualification held by qualified nurses in each cohort. The vast majority of nurses in the sample, 73.5% of cohort I and 86.4% in cohort II, are certified SRN/RGNs which indicates that registered rather than enrolled status is preferred by the JRII.

Figures 6.18, A and B and table 6.9, on the page which follows, indicate the extent and diversity of post-basic training among nurses at the JRII. The first gives the number of qualifications held by nurses in groups II and IV, while the latter provides a list of the type of qualifications held. 29% of qualified nurses in both cohorts have taken at least one and up to 5 training breaks and nearly one third hold two or more qualifications; the range of which is listed in Table 6.9.

---

6 One nurse in group III and twelve nurses in group I hold a nursery nurse qualification.

FIGURE 6.17A AND B: TYPE OF BASIC NURSING QUALIFICATION HELD BY QUALIFIED NURSES BY COHORT

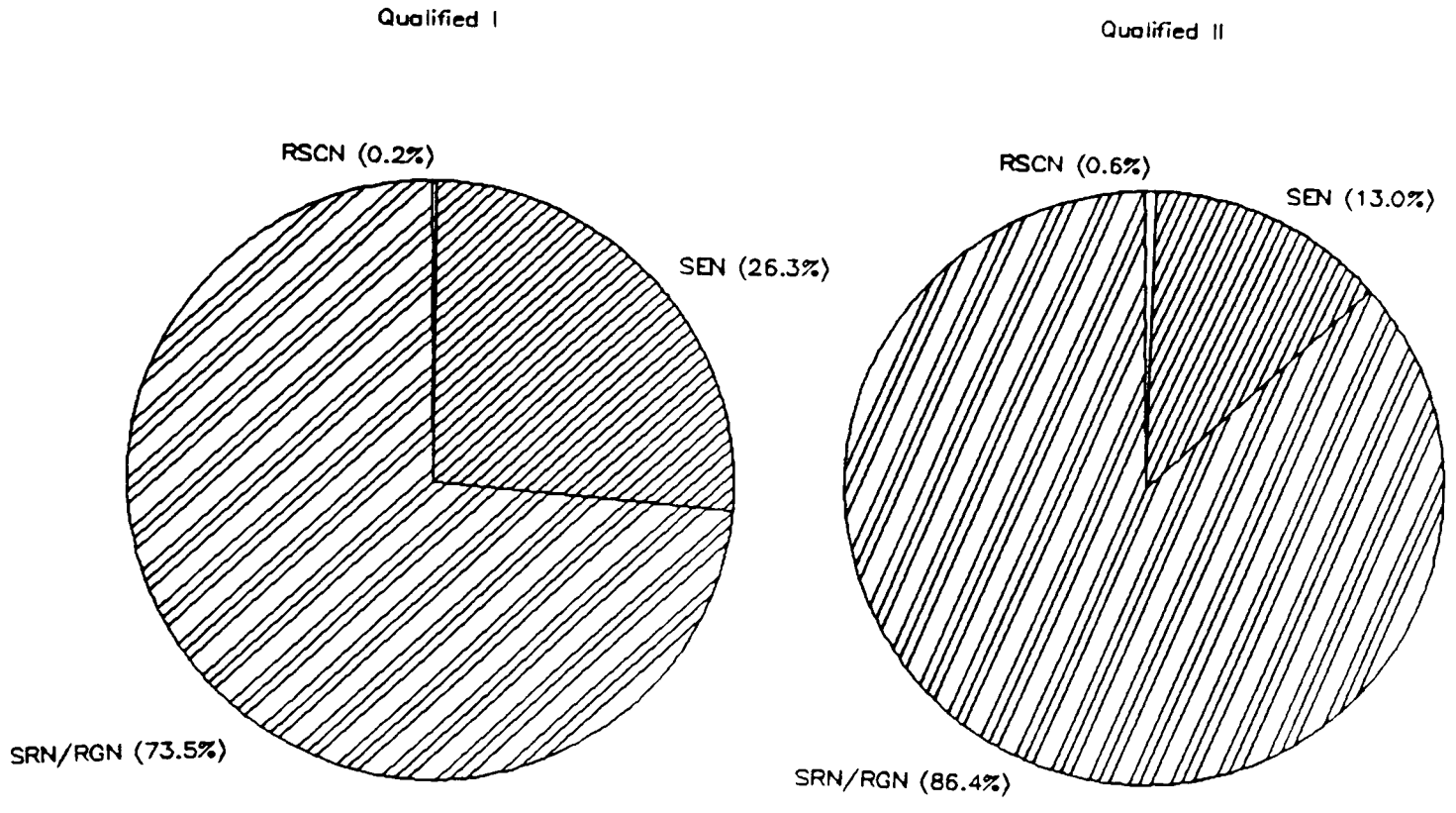


FIGURE 6.18A AND B: THE NUMBER OF NURSING QUALIFICATIONS HELD BY QUALIFIED NURSES BY COHORT

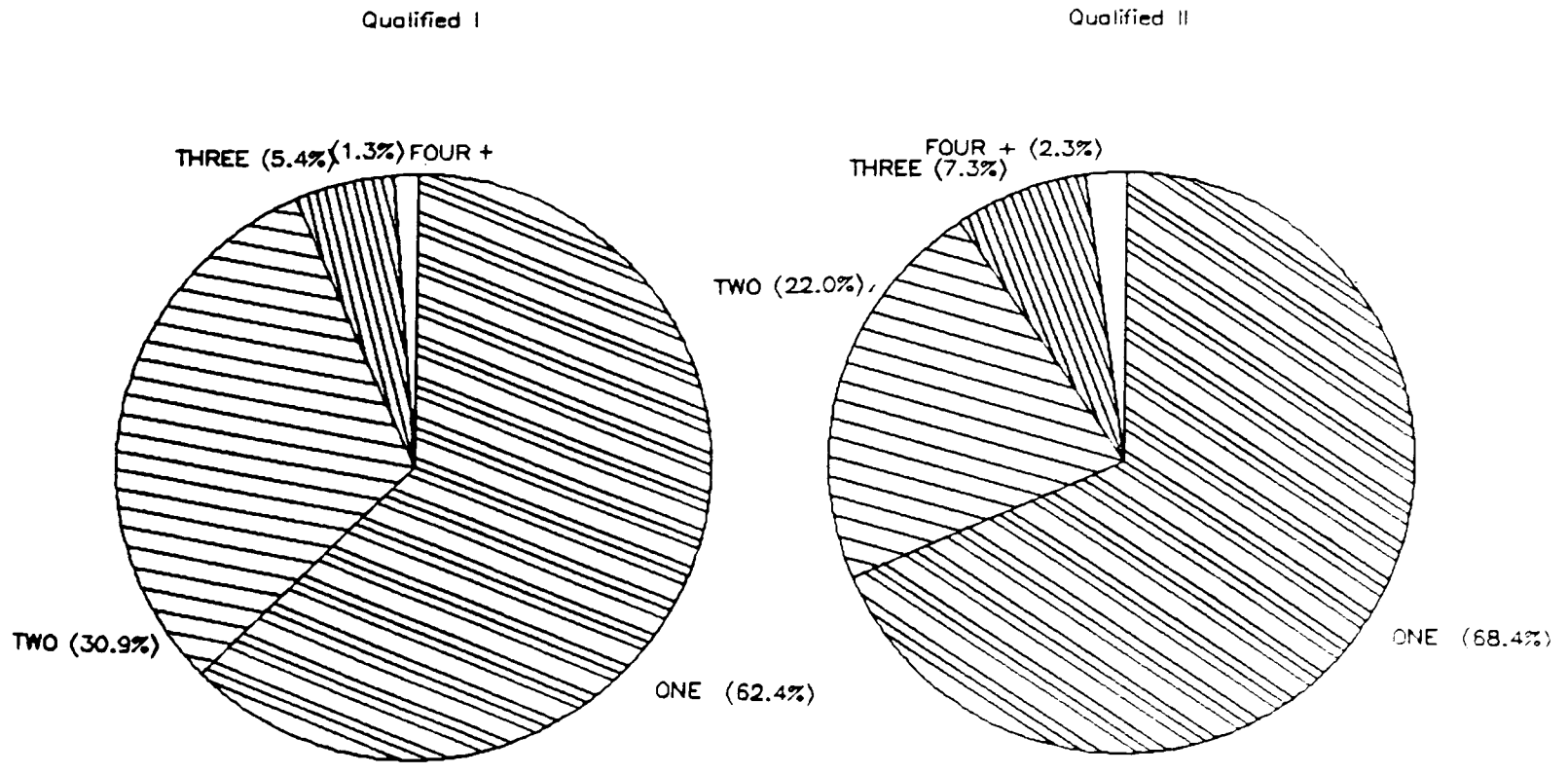


TABLE 6.9: ADDITIONAL QUALIFICATIONS HELD BY NURSES IN GROUPS II AND IV

Category	Group II	Group IV
Orthapedic	31	4
Intensive Care	27	17
Accident and Emergency	9	3
Midwifery (SCM)	82	10
Sick Children (RSCN)	48	18
Cardiac Thoracic	1	2
Clinical Teaching	1	1
Anaesthetics	8	6
Nursing Diploma	3	4
Obstetrics	5	2
Theatres	9	2
Clinical Research	0	1
Certificate in Nursing Studies	0	1
Pediatrics	1	1
Coronary Care	1	2
Geriatrics	3	1
Enrolled Nurse	3	1
Mental Health (RMN)	10	1
Psychology	1	0
Plastic Surgery	1	0
Endoscopy	1	0
Neurology	1	0
Management	3	0
Psychiatry	1	0
Angioplasty	2	0
Nursery Care (NNEB)	2	0
Opthalmic	1	0
Radiotherarpy	1	0
Infection Control	2	1
District Nursing	0	1
Not specified	11	1

v. OTHER EDUCATIONAL QUALIFICATIONS

This section presents information on the general educational qualifications of a portion of the sample for whom such data were available: primarily groups III and IV and the nurses from cohort I who remained in post or were rehired at some point prior to December 1988. These statistics are reported below, but note all percentages are based only on the numbers for which information is available.

Table 6.10 shows the number of nurses in each group who attended higher eduation.

TABLE 6.10: UNIVERSITY AND FURTHER EDUCATION QUALIFICATIONS BY GROUP

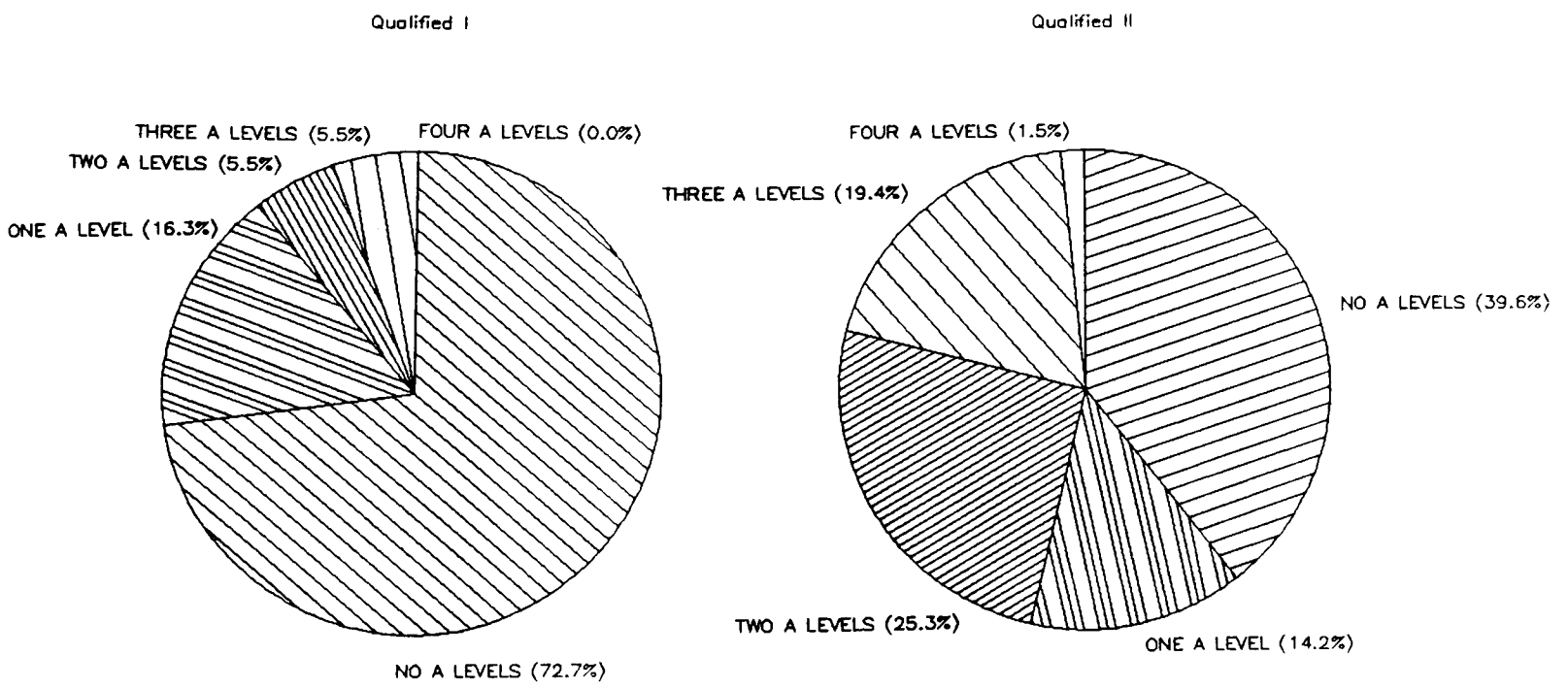
Qualification	Group I	Group II	Group III	Group IV
Degrees				
Have degree	1	1	0	3
No degree	55	557	26	173
No information	168	10	8	1
Further Education				
Attended	8	6	9	9
Did not attend	48	551	17	164
No information	168	11	8	4

As shown in table 6.11, the records indicate that one nurse each in groups I and II and three nurses in group IV hold university degrees. It is likely that the one unqualified nurse holding a university degree was preparing to take up

formal training. Further education was more popular with all groups, particularly the unqualified, as 14.3% of these nurses in cohort I and 34.6% of them in cohort II attended such courses.

Information on school-leaving qualifications was recorded for 20% of group I, 10% of group II, and 75% of both groups III and IV. The following figures show the percentage of qualified nurses in each cohort, for whom information was available, who hold A levels, O levels, and CSEs.

FIGURE 6.19A and B: NUMBER OF A LEVELS EARNED BY QUALIFIED NURSES IN EACH COHORT



Figures 6.19A and 6.19B contain information on A levels earned by qualified nurses in both cohorts. Less than 1% of unqualified staff in cohort I and none in cohort II hold A levels; thus, they were not included in the figure. 29% of

the qualified nurses in cohort I hold at least one A level, while the same is true of 60% of the qualified nurses in cohort II.

Similar figures for O Levels and CSEs are shown on the following page. Figures 6.20 and 6.21, A and B, contain information on the number of O levels and CSEs earned by nurses in groups II and IV. The majority of qualified nurses in both groups hold O levels, 69.1% in cohort I and 97% in cohort II, while 37.9 in group II and 29.0% in group IV hold CSEs. A considerable number of unqualified nurses also hold these qualifications. 26% of the unqualified nurses in cohort I hold O levels as do 34.6% of the unqualified group in cohort II; 15.5% in group I and 53.8 in group III hold CSEs.

FIGURE 6.20A AND B: THE NUMBER OF O LEVELS HELD BY QUALIFIED NURSES BY COHORT

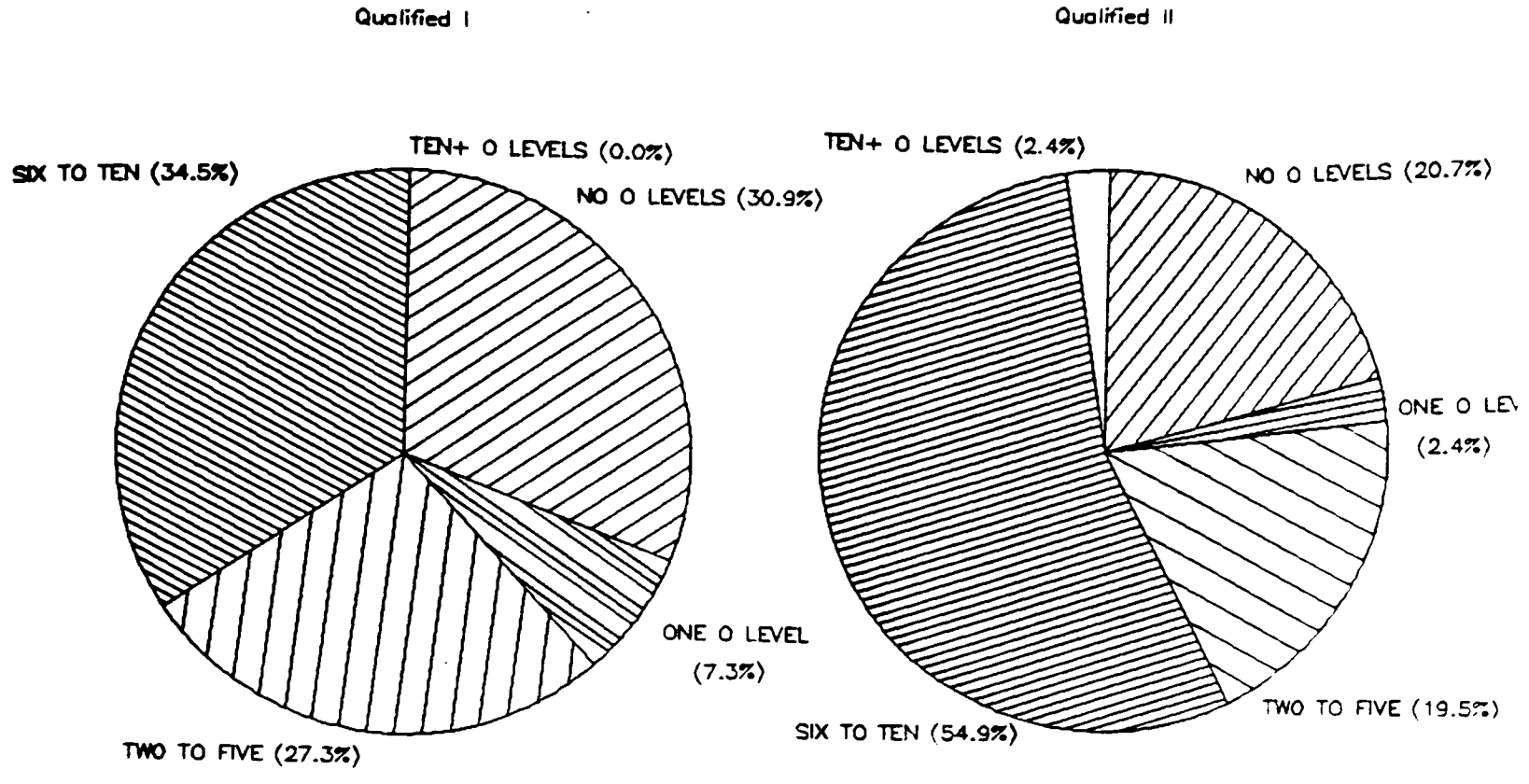
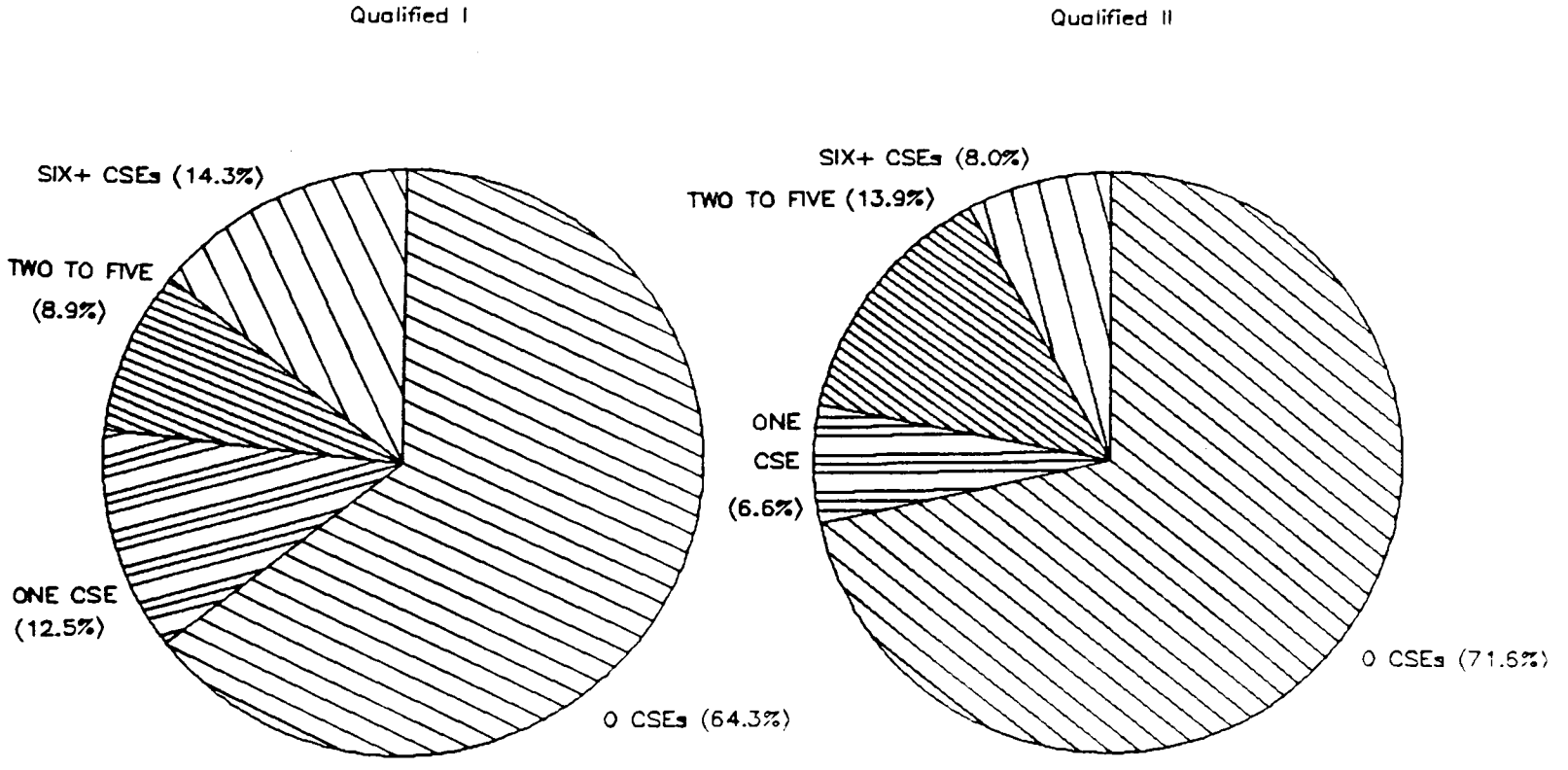


FIGURE 6.21A AND B: THE NUMBER OF CSES HELD BY QUALIFIED NURSES BY COHORT



III. Conclusions

The preceding survey has outlined a very rich database which can be used to investigate the quit decisions of nurses, both qualified and unqualified. The primary difference between the two cohorts is that the first joined the JRII at its opening and as a result of this a larger proportion of senior nurses are included in cohort I as well as more from outside the region. It is also possible that the first cohort was hired under less stringent criteria due to the need to staff the hospital which may to a degree have affected their quit behavior.

Aside from this, the similarities between the two cohorts are striking. Most qualified nurses are young, single and registered, while unqualified nurses are likely to be slightly older and married. Nurses in all four groups tended to leave their posts during the summer and most left to other jobs. Qualified nurses appear to make intra-occupational moves, while unqualified nurses, particularly those in cohort II, often move to non-nursing jobs. Non-participation and training were also popular destinations for quitters, while a significant number of qualified nurses in cohort II chose to emigrate.

The average and median durations of all four groups on the whole were similar and relatively short. On average

qualified nurses in cohort I left their posts after twelve months, while qualifed nurses in cohort II remained in post on average three months longer. Unqualified nurses in cohort II had a much longer average length of stay, 22 months, than their counterparts in cohort I, at 15 months, or either qualified group.

Despite the variety of reasons given for leaving, quit behavior, in terms of how long a nurse spends in a post and why she ultimately leaves, follows definite patterns. As indicated in table 6.8, the impetus to terminate employment for any individual basically arises from a change in one of three categories: personal circumstances, other labor market opportunities, or conditions on-the-job. When combined with data on the labor market, the information reviewed here can be used to explain rigorously the relationship between quitting and such changes; this is the subject of the next chapter.

i. Record Card for Qualified Staff

TRAINED NURSING STAFF RECORD

HOSPITAL

LOCATION OF POST/TYPE OF EXPERIENCE

SURNAME	FORENAMES	MARITAL STATUS		MAIDEN NAME
DATE QUALIFIED	REGISTRATION/ENROLMENT NO.	RELIGION	DATE OF BIRTH	NATIONALITY
GRADE	FULL TIME / PART TIME HOURS	(DETAILS ON REVERSE) W.T.F.		DATE OF COMMENCEMENT
LOCAL ADDRESS				TEL.NO.& CODE
HOME ADDRESS				TEL.NO.& CODE
CHANGE OF ADDRESS				TEL.NO.& CODE
NEXT OF KIN (NAME,RELATIONSHIP)	ADDRESS			TEL.NO.& CODE

NURSING EXPERIENCE

FROM	UNTIL	BASIC & POST BASIC TRAINING- WHERE HELD	QUAL.	DATE

OTHER NURSING POSTS

GRADE	WHERE HELD	FROM	UNTIL

EXTENDED ROLE ASSESSMENTS	DATE
1.	
2.	
3.	
4.	

COURSES,CONFERENCES,SEMINARS ETC (HALF DAY OR LONGER) DHA

TITLE-VENUE	FROM	UNTIL

SICK LEAVE

FROM	UNTIL	CALENDAR DAYS (INC)	WORKING SHIFTS	FROM	UNTIL	CALENDAR DAYS (INC)	WORKING SHIFTS
TOTAL							

ANNUAL-STAT.HOLS-SPECIAL LEAVE (RED)

DUE IN CURRENT FINANCIAL YEAR			EXCESS		
FROM	UNTIL	WORKING SHIFTS	FROM	UNTIL	WORKING SHIFTS

ii. Record Card for Unqualified Staff

AUXILIARY NURSING STAFF RECORD HOSPITAL

LOCATION OF POST/TYPE OF EXPERIENCE

SURNAME | FORENAMES | MARITAL STATUS | MAIDEN NAME

RELIGION | DATE OF BIRTH | NATIONALITY

GRADE | FULL TIME | PART TIME HOURS | (DETAILS ON REVERSE) W.T.E | DATE OF COMMENCEMENT

LOCAL ADDRESS | TEL. NO. & CODE

HOME ADDRESS | TEL. NO. & CODE

CHANGE OF ADDRESS | TEL. NO. & CODE

NEXT OF KIN (Name, Relationship) | ADDRESS | TEL. NO. & CODE

NURSING EXPERIENCE

FROM	UNTIL	INDUCTION COURSES

OTHER NURSING POSTS

GRADE	WHERE HELD	FROM	UNTIL

COURSES, SEMINARS ETC (½ DAY OR LONGER) OAHA(T)

TITLE – VENUE	FROM	UNTIL

SICK (blue) or SPECIAL LEAVE (red) INCLUSIVE PERIODS

FROM	UNTIL	DAYS	FROM	UNTIL	DAYS

iii. Final Report Card for All Staff

DETAIL PART TIME HOURS/SHIFTS ETC.			FIRE INSTRUCTION	DATE

FINAL REPORT

1. PROFESSIONAL ABILITY

2. LEADERSHIP AND INITIATIVE

3. MANAGEMENT ABILITY AND POTENTIAL

4. SPECIAL APTITUDES

5. ANY PARTICULAR EXPERIENCE IN THIS POST

6. CLINICAL KNOWLEDGE

7. TEACHING ABILITY

8. STANDARD OF NURSING CARE

9. PERSONALITY

10. RELATIONSHIPS AND COMMUNICATIONS.— PATIENTS

RELATIVES AND VISITORS

NURSING AND OTHER PROFESSIONAL STAFF

OTHER STAFFS

11. APPEARANCE IN UNIFORM

12. REASON FOR LEAVING

13. SUITABILITY FOR RE-EMPLOYMENT (DETAIL)

14. ADDITIONAL COMMENTS

LAST WORKING DAY LAST DAY OF SERVICE

FORWARDING ADDRESS

SIGNATURE GRADE DATE

iv. Staff Leaving/Change Form

OXFORDSHIRE HEALTH AUTHORITY

Treasurer's copy

STAFF LEAVING/CHANGE FORM

Place of Work Unit ..... Dept. .....

Name (in full) Surname ..... Forenames ..... *Dr / Mr. / Miss / Mrs.

Appointment Job Title ..... Grade .....

*Weekly/Monthly paid

TERMINATION DETAILS

Last working day .....

Date of termination ..... including ..... days leave and ..... lieu days

Leave to be carried forward to new NHS appointment ..... days

Leave taken in excess to be deducted from final payment ..... days

Please state reason for termination: .....
.....

.....

Superannuation: Refund required *Yes/No

New employment details:

Name and address of new employer .....

.....

.....

Address for future correspondence ..... final payment and any arrears payment .....

.....

TRANSFER WITHIN O.H.A.

Effective date ..... New Unit/Dept. .....

(appointment form to be completed by new appointing officer)

CHANGES

Change to present appointment information (e.g. acting allowance – start and finish/change of grade, change of hours/resident)

.....

.....

.....

.....

.....

	Cost Centre	Exp Code	Cost Code
New Financial Code:	0 10 8		
New Occupational Code:		DHSS UNIT CODE	

Effective Date:

AUTHORISED BY

Signature ..... Title .....

Date .....

*Delete as appropriate

*QN2 5 5

Chapter Seven

An Analysis of Nurses' Quit Decisions

Introduction

Building on the labor supply model presented in chapter four, this chapter presents a model of the decision to terminate employment. The data described in chapter six are the basis of the analysis and not only is this the first study to use individual case history data to examine rigorously the decision to quit in nursing, but it is also the first time quitting in Great Britain has been investigated from the worker's perspective.

As nursing pay is set by an independent Review Body, individual nurse employers, unlike firms in other labor markets, cannot adjust their wage offers to influence quits. Thus, the number of job quits observed in any given period is the aggregate response of nurses to the set wage rate and to changes in their own circumstances and in the market conditions they face. Before an informed discussion of collective quits can take place, the mechanisms behind the different reasons for quitting, which make up the aggregate figure, and the distinct behavior of qualified and unqualified nurses need to be examined. The discussion in chapter six showed that in nursing most quits are motivated

by the desire to take up another job, to leave the labor market altogether, or to take up nurse training. These decisions are the focus of this chapter; it is organized as follows.

The first section presents the model to be tested and explains how conditional probabilities, or more specifically hazard functions, can be used to determine empirically how long a nurse is likely to stay in post. The following section outlines the labor market data assembled to complete the data base, while part III discusses the empirical specification of the models to be estimated. The results are presented in section IV and the conclusions in section V.

I. Model

This section presents a model to explain the quit behavior of nurses. As this decision is based on wage comparisons, it is similar in theoretical structure to the participation model presented in chapter four. In this instance, however, the magnitude of interest is the conditional probability of quitting over time once employment has been accepted and as a result the model is empirically specified as a hazard function.

Two formulations of the hazard are presented: a log-logistic model and a proportional hazards model with time-varying covariates. Using each specification a model of three distinct quit decisions is estimated: quits to other jobs, quits to non-participation and quits to take up training for qualified and unqualified nurses. Following this, an aggregate quit model is estimated for both groups which shows how the individual quit decisions combine to produce the aggregate quit rate.

The results all suggest that quits are dependent on the nursing wage and that local market conditions and personal circumstances influence voluntary job terminations. Of note as well is that the proportional hazards model proves to be the superior specification as changes which occur during employment, such as getting married, are best expressed as time-varying covariates.

i. Leaving a Job

The model in chapter four demonstrated that a nurse's decision to accept paid nursing employment is based on comparing the value of her time in market work versus that in nonmarket activities. Expanding on the idea of wage comparisons can help explain why a nurse, after having chosen to work, may subsequently leave her post for another job, for non-participation, or to take up further training.

Recall from earlier discussions that a nurse chooses to work in any period if a market wage offer exceeds her reservation and that the highest wage available is chosen. Given these conditions, two relationships are known to hold if a nurse takes up employment; they are:

(7.1a) $W_c > W_r$
(7.1b) $W_c > W_a$

where W_c is the value of the current employment package, W_r is the reservation wage, and W_a represents the value of an alternative market activity, which for this discussion is either working in another job or taking up training. This interpretation is used as the third most common reason for nurses to leave their posts is to obtain a nursing qualification and it is potentially informative to set the desire to pursue training in the wage comparison context. In terms of the notation above, W_a can be viewed as the value of the training package which must be less than the value of current employment, W_c, if the nurse chose employment over training.[1]

At this stage it is also important to note that the alternative wage offers relevant to qualified and unqualified nurses, in training or in other employment, are different. Job moves for the former group occur within the

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[1]This assumes that taking up training is an unrestricted choice; a point discussed later in the text.

nursing, while the latter occasionally transfer to jobs in other occupations. Taking up training, even though it is used by both groups as a mechanism to increase earnings within the profession, is a also a different type of decision for qualified and unqualified nurses. For those who have not yet obtained a basic nursing qualification, the choice is one which commits them to the nursing labor market and limits the jobs they will consider taking up in the future, while for those already qualified, it is analogous to accepting a promotion as this is the result that acquiring an additional credential is most likely to produce.

For all nurses, it is changes in the value of W_c, W_a, or W_r which lead to quits in subsequent periods. For example, nurses may revise their valuation of W_c after beginning work if the job fails to meet their expectations or as conditions on the job change. Other possibilities are that over time new market opportunities may arise which raise the value of alternative employment or changes in personal circumstances may bring about revisions of W_r. If reassessments of any of the wage values in light of new information alters either of the inequalities listed above, then a nurse will terminate employment. Formally, the decision can be described as follows.[2]

2The model presented is similar in structure to Burdett (1978) and Parsons (1973).

A nurse beginning work in period t receives an employment package valued W_c.[3] Other wage offers in the market can be described by a nondegenerate distribution $F_{ij}(w)$, with an associated density function of $f_{ij}(w)$ where i refers to qualified (Q) or unqualified (U) nurses and j to the type of wage offer: nursing only (N), nursing or non-nursing (G), or training (T). $(1 - F_{ij}(W_c))$ is the probability that a nurse, who considers an alternative market activity in any period, receives an offer W_{ij}, where i and j are as defined above and $W_{ij} > W_c$. The probability that the reservation wage in any period equals or exceeds W_c is τ, a function of changes in personal characteristics.

Having accepted employment in the current period, a nurse has various options concerning how she spends her time in the following interval, t + 1. She has the choice of: remaining in her current post (option one); moving to another job (option two); leaving the labor market altogether (option three); or taking up training (option four). The last three options entail having to locate an acceptable wage offer, in or out of the market, and immediately quitting when one is found. Each option yeilds a different income stream and a nurses chooses the one that generates the greatest expected lifetime income, net of the related search and transfer costs, in any period.

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[3] W_c is the total valuation, including non-pecuniary characteristics, of holding the current job, not strictly the wage.

If $u_1(W_C, t)$ denotes the maximum expected lifetime income associated with option one and $u_2(W_C, c_2, t)$, $u_3(W_C, c_3, t)$, $u_4(W_C, c_4, t)$ are the streams associated with options two, three, and four respectively, then the maximum expected lifetime payoff to a worker employed at t at wage W_C is:

$$(7.2)\quad \Psi(W_C, t) = \max\{u_1(W_C, t), u_2(W_C, c_2, t), u_3(W_C, c_3, t), u_4(W_C, c_4, t)\}.$$

If W_{QN}, W_{UG}, W_R, W_{QT}, and W_{UT} are the wages on offer in t+1, the four possible income streams can be specified in greater detail and from them, quit functions derived.

Equation (7.3) shows the payoff to remaining in post in the next period for both groups. It is simply the income from working this period plus the expected discounted income from the next:

$$(7.3)\quad u_1(W_C, t) = W_C + \delta\ \Psi(W_C, t+1)$$

where δ is $1/(1+r)$ and r is the nurse's discount rate.

The value of searching for alternative employment for qualified and unqualified groups is given by (7.4a) and (7.4b). It is the sum of wages in the current period less the cost of searching for another job plus the expected discounted lifetime earnings in either the current post next

period or in alternative employment, if a job is secured.

For qualified nurses, the value of option two is:

$$(7.4a)\quad u_2(W_c,\ c_2,\ t) = W_c - c_2 + \delta F_{QN}(W_c)\,\Psi(W_c,\ t+1) + \delta(1-F_{QN}(W_c)) * E[\,\Psi(W_{QN},\ t+1) \mid W_{QN}>W_c]$$

where $(1-F_{QN}(W_c))$ is the probability of a qualified nurse finding a suitable nursing job and other terms are as defined previously.

For unqualified nurses, on the other hand, it is:

$$(7.4b)\quad u_2(W_c,\ c_2,\ t) = W_c - c_2 + \delta F_{UG}(W_c)\,\Psi(W_c,\ t+1) + \delta(1-F_{UG}(W_c)) * E[\,\Psi(W_{UG},\ t+1) \mid W_{UG}>W_c]$$

where $(1-F_{UG}(W_c))$ is the probability of unqualified nurses locating other employment, nursing or non-nursing.

As indicated above, the opportunities for finding alternative employment differ for qualified and unqualifed nurses because the search domains for each group are different.

The income stream associated with option three is the expected discounted earnings in t+1, based on either the expected discounted reservation wage, if a nurse does leave the market, or next period's wage in the current post, plus earnings in period t less any costs associated with bringing about a change in W_r. Equation (7.5) is applicable to both groups:

$$(7.5)\quad u_3(W_c, c_3, t) = W_c - c_3 + \delta(1-\tau)\Psi(W_c, t+1) + \delta(\tau)E[\Psi(W_r, t+1) \mid W_r \geq W_c]$$

where τ is the probability that a change in the reservation wage occurs.

Finally, the payoff associated with applying for training for qualified and unqualified nurses respectively is identical in structure to that of finding another job, i.e. (7.4a) and (7.4b). The income streams for both groups are given below:

$$(7.6a)\quad u_4(W_c, c_4, t) = W_c - c_4 + \delta F_{QT}(W_c)\Psi(W_c, t+1) + \delta(1-F_{QT}(W_c)) * E[\Psi(W_{QT}, t+1) \mid W_{QT}>W_c]$$

where $(1-F_{QT}(W_c))$ is the probability that a qualified nurse secures a place on a post-basic training course;

$$(7.6b)\quad u_4(W_c, c_4, t) = W_c - c_4 + dF_{UT}(W_c)\Psi(W_c, t+1) + \delta(1-F_{UT}(W_c)) * E[\Psi(W_{UT}, t+1) \mid W_{UT}>W_c]$$

where $(1-F_{QU}(W_c))$ is the probability that an unqualifed nurse is able to begin basic training.

As quits occur when an acceptable wage offer is located, options two through four generate job terminations and constitute the basis of three distinct quit functions. They are shown below where Qij denotes each function, i refers to qualified (Q) or unqualified (U) nurses, and j to the type of quit: to another nursing job (N), to a nursing or non-

nursing job (G), to non-participation (R), or to training (T), and (A) refers to aggregate quits.

Equations (7.4a and b) indicate that for qualified and unqualified nurses respectively quits to other jobs are a function of their current wage, their expectations about their current wage and that in alternative employment, their search costs, and the probability of finding a satisfactory alternative wage offer:

$$(7.7a)\quad Q_{QN} = f[W_c,\ W_c^*,\ W_{QN}^*,\ c_2,\ (1-F_{QN}(W_c))]$$
$$(7.7b)\quad Q_{UG} = f[W_c,\ W_c^*,\ W_{UA}^*,\ c_2,\ (1-F_{UG}(W_c))].$$

where terms are as previously defined, * denotes expected wage values in period t+1, and expectations are perfect.

From (7.5) quits to non-participation for both groups are determined by similar factors:

$$(7.8)\quad Q_R = f[W_c,\ W_r^*,\ c_3,\ \tau,\ W_r^*]$$

as are quits to training for qualified and unqualified nurses:

$$(7.9a)\quad Q_{QT} = f[W_c,\ W_c^*,\ W_{QT}^*,\ c_4,\ (1-F_{QT}(W_c))]$$
$$(7.9b)\quad Q_{UT} = f[W_c,\ W_c^*,\ W_{UT}^*,\ c_4,\ (1-F_{UT}(W_c))].$$

Finally, equations (7.10a) and (7.10b) give the aggregate quits function for each group:

$$(7.10a)\quad Q_{QA} = f[W_c,\ c_2,\ (1-F_{QN}(W_c)),\ W_{QN}^*,\ c_3,\ \tau,\ W_r^*,\ c_4,\ (1-F_{QT}(W_c)),\ W_{QN}^*];$$

(7.10b) $Q_{UA} = f[W_C, c_2, (1-F_{UG}(W_C)), W_{UG}^*, c_3, \tau, W_r^*, c_4, (1-F_{UT}(W_C)), W_{UN}^*]$.

Hazard functions are used to test empirically models of all three decisions: leaving to other jobs, to non-participation, and to training as well as that of the aggregate quit function; they are discussed below.

ii. Hazard Functions

Hazard functions are commonly employed to examine the duration of events, for example the length of a spell of unemployment (Lancaster and Nickell, 1980), the length of a strike (Kennan, 1985), or the length of a career interruption following the birth of a child (Even, 1987); the event of interest here is the duration of employment for nurses.

The hazard is defined as the rate at which spells will be completed at time t given that they last until t. Hazard functions are particularly useful as through them a special likelihood function, indexed by the time spent in the interval, may be constructed. Conventional likelihood estimations, such as the one used in the chapter four, only relate explanatory variables to the probability of an event; they provide no information about the link between the

explanatory variables and its timing. However, the likelihood, based on the hazard, relates a set of explanatory variables from the quit function, summarized for now as X, to the length of time spent in post.

Hazard functions are also convenient forms for dealing with data which contain censored observations. In the JRII sample 58 qualified and 21 unqualified nurses have not left their posts at the end of the period of observation; thus their total time in post is not observed and is censored. As hazard functions are based on conditional probabilities - they represent the risk of an event ocurring given the population at risk, they can accomodate censored observations as long as these observations are randomly generated.

The hazard function can be estimated in a various ways. Possible techniques include nonparametric estimations involving life tables, parametric estimations which make assumptions about the functional form of the hazard, and proportional models which assume explanatory variables shift a baseline hazard, itself a function of time.[4] This chapter presents the results of two models: the log-logistic, a parametric specification of the hazard, and a proportional hazards model including time-varying covariates.

4Newman (1983) and Keifer (1988) provide evaluations of each of these approaches.

The log-logistic model was chosen as it is an intuitively appealing form for the hazard rate for nurses and investigations of the raw data confirmed it was the appropriate specification. As any group of nurses taking up employment in a given period is likely to be diverse, the interactions within the cohort are likely to produce a hazard which rises to a maximum and then falls.[5]

For all nurses there will be an initial period of settling in as they learn about their specific post. After this period of adjustment, some will leave as they revise their evaluations of W_C. Consequently, a hazard which initially rises would be anticipated. Another faction contributing to a rise in the hazard is career nurses who need to change posts fairly frequently to gain experience for promotion. This means that they spend a relatively short time on a given ward where they master the skills to be learned and then move on. Along with these "high risk" cohorts, however, there are nurses seeking stable, steady employment: those returning to work, those in senior posts, and those no longer interested in promotion. The combined behavior of all these nurses suggests a nonmonotonic increasing hazard which reaches a maximum at some point and then declines.

On the following page, figures 7.1A and 7.1B show the actual hazard rates for qualified and unqualified nurses in the

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5This is also suggested by Mercer's findings (Mercer, 1979).

FIGURE 7.1A: THE EMPIRICAL HAZARD RATE FOR QUALIFIED NURSES IN THE JRII SAMPLE

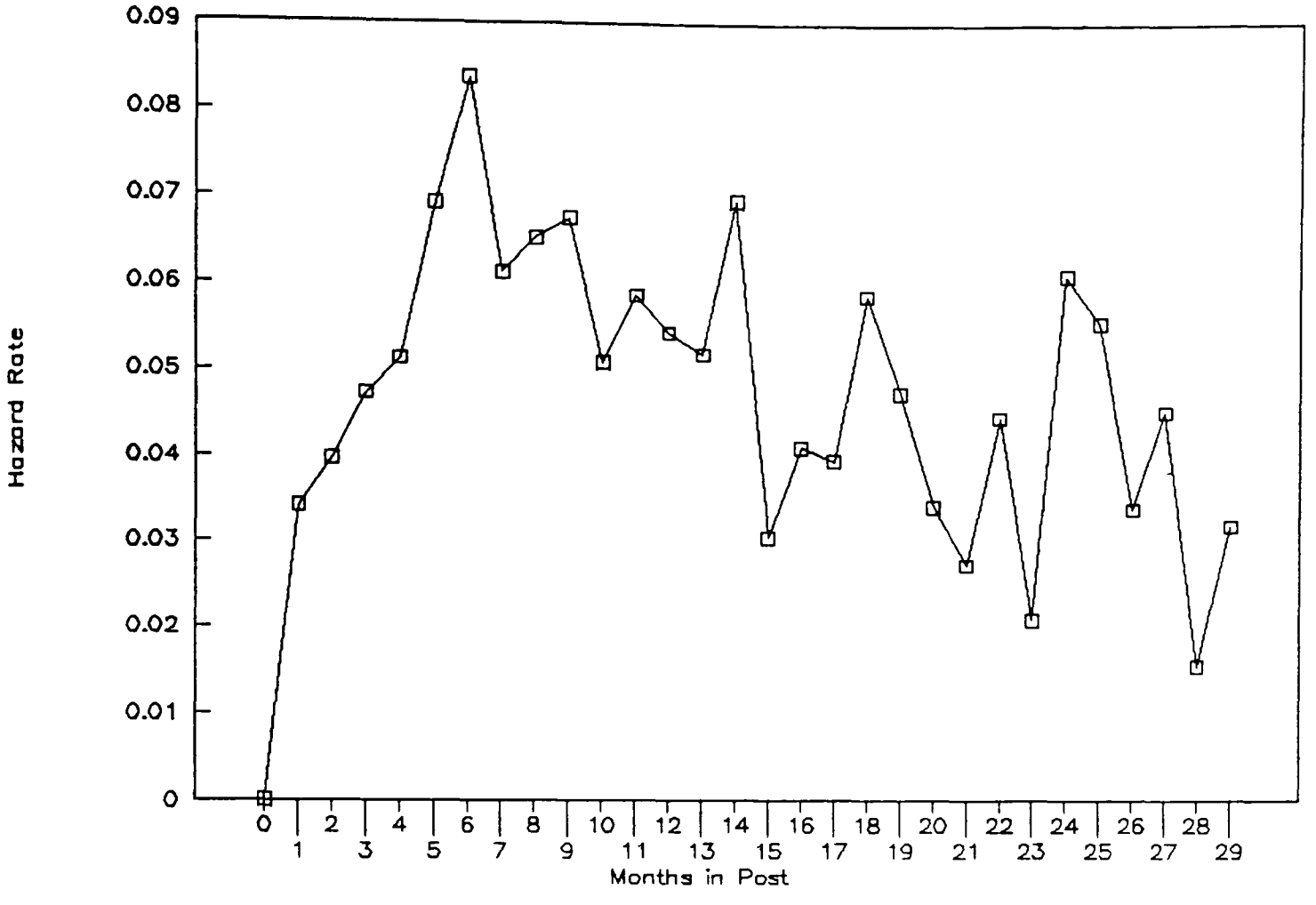
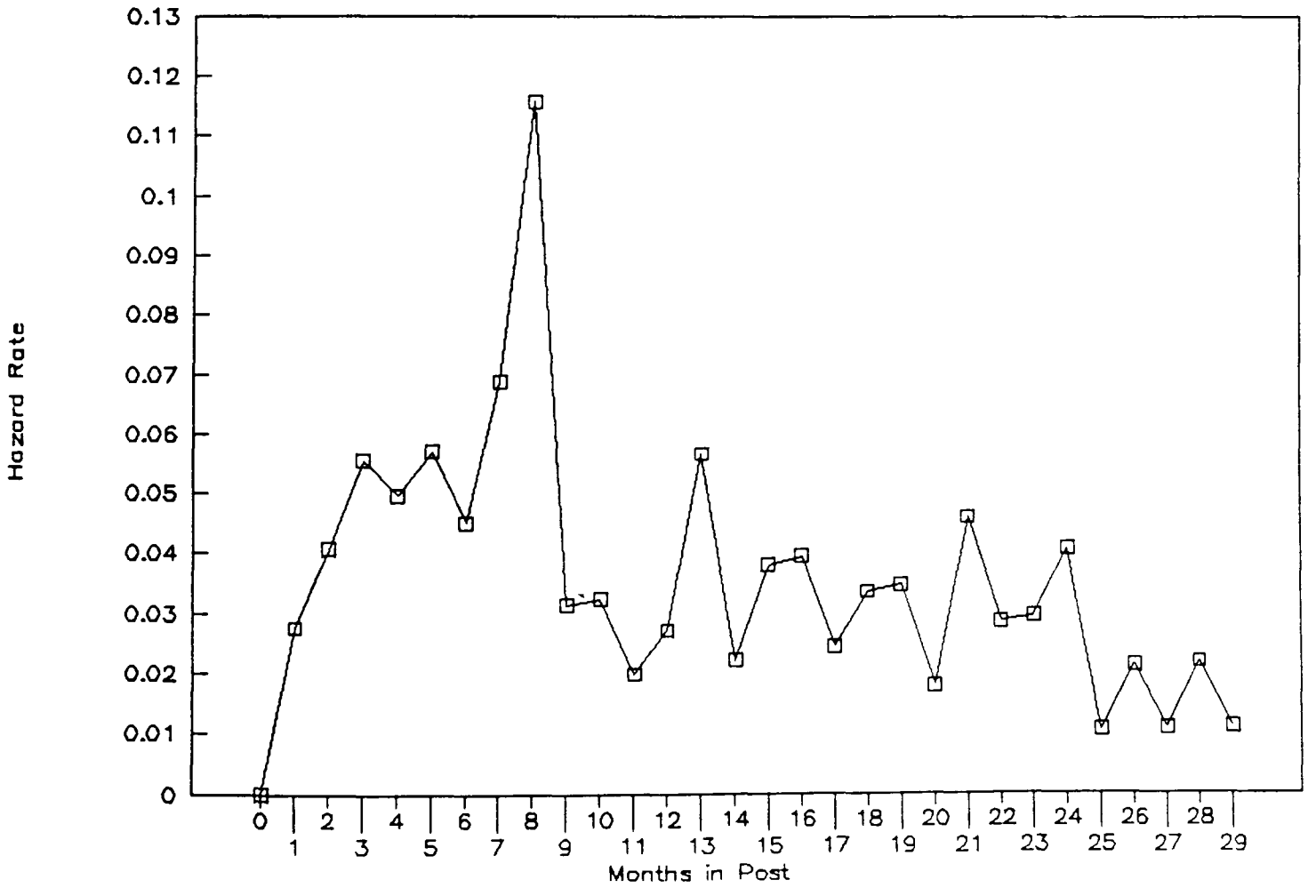


FIGURE 7.1B: THE EMPIRICAL HAZARD RATE FOR UNQUALIFIED NURSES IN THE JRII SAMPLE



JRII sample. The raw data tend to confirm the expectation of an initially increasing hazard, followed by a gradual fall after the first year of employment.

A Cox model was also selected for testing for two reasons. It places no restrictions on the shape of the hazard, and, of greater importance, it allows explanatory variables themselves to vary with time. This is a useful feature as the effect of changes in a value during the course of employment on duration can be estimated rather than just the relationship between the variable at date of leaving. Both models are discussed below.

iii. The Log-Logistic and the Cox Model

a. The log-logistic model

The hazard function for the log-logistic model is derived formally in the following text as are a number of definitions that are useful in specifying the likelihood.

Let F(t) represent the log-logistic distribution of duration with parameters $\lambda>0$ and $p>0$ where

$$(7.11) \quad F(t) = Pr(T<t) = 1 - [1/(1 + ßx(\lambda t)^p)]$$

which gives the probability that random variable T is less than value t. The density function f(t) = dF(t)/dt is:

$$(7.12)\quad f(t) = \lambda p \beta x (\lambda t)^{p-1} \,/\, (1 + \beta x (\lambda t)^{p})^{2}.$$

Let S(t) represent the survivor function which gives the probability that the random variable T will equal or exceed t:

$$(7.13)\quad \begin{aligned} S(t) &= Pr(T>t) \\ &= 1-F(t) \\ &= [1/(1 + \beta x (\lambda t)^{p})] \end{aligned}$$

The resulting hazard function is:

$$(7.14)\quad \begin{aligned} \phi(t) &= f(t)/S(t) \\ &= \lambda p \beta x (\lambda t)^{p-1} \,/\, (1 + \beta x (\lambda t)^{p}) \end{aligned}$$

Note that for p>1 the hazard first increases with duration and then decreases, while for 0<p<1 the hazard decreases with duration.

Finally, a useful specification is that of the integrated hazard:[6]

$$(7.15)\quad \Lambda(t) = \ln(1 + \beta x (\lambda t)^{p})$$

which relates to the survivor function:

$$(7.16)\quad S(t) = \exp[-\Lambda(t)].$$

From these definitions the likelihood can be constructed. The standard interpretation of the likelihood function,

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[6]The integrated hazard is important as it can be used to check the specification of parametric models; see Keifer (1988) for details.

$L(\theta)$, is as the joint probability distribution of the sample as a function of the parameters of distribution, represented by θ. However, amendments have to be made when forming the likelihood to take account of length of time spent in the interval and censored observations.

The sample contains two types of individuals. One group consists of those who began work in June 1979 to June 1980 or June 1984 to June 1985 and were still in post when observation was discontinued; their spells of employment are censored. The other is made up of those nurses who began work at either date and left at some point during the observation period. An individual in the first group contributes $S(t_n, \theta)$ to the likelihood if the spell is censored at t_n, while a nurse from the second group contributes density $f(t_i, \theta)$. If $d_m=1$ if the spell is uncensored and $d_m=0$ if the spell is censored; then the likelihood function $L(\theta) = \ln L^*(\theta)$ for the ith individual is:

$$(7.17)\quad L(\theta) = \sum_{i=1}^{n} d_i \ln f(t_i, \theta) + \sum_{i=1}^{n} (1-d_i) \ln S(t_i, \theta)$$

$$(7.18)\quad L(\lambda,p,\beta,x) = \sum_{i=1}^{n} d_i \ln p + \sum_{i=1}^{n} d_i \ln \beta + \sum_{i=1}^{n} d_i \ln \lambda$$

$$+ \sum_{i=1}^{n} \ln x_i + (p-1) \sum_{i=1}^{n} d_i \ln(\lambda t_i)$$

$$- 2 \sum_{i=1}^{n} d_i \ln(1 + \beta x_i (\lambda t_i)^p)$$

$$- \sum_{i=1}^{n} (1-d_i) \ln(1 + \beta x_i (\lambda t_i)^p)$$

where X_i represents a pooled vector of the determinants of the quit function.

Given that $f(t, \theta) = \phi(t, \theta)/S(t, \theta)$ and that $\ln S(t, \theta) = -\Lambda(t, \theta)$ the log likelihood can also be written in terms of the hazard.[7]

Note that equation (7.18) is the form used in the estimations; the specifications of the vectors X_i for the different quit models are discussed in section IV.

b. The Proportional Hazards Model

The second type of model estimated is the Cox proportional hazards model. In this specification, the hazard rate is a

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[7]The likelihood in terms of the hazard is:

$$L(\theta) = \sum_{i=1}^{n} d_i \ln \lambda(t_i, \theta) - \sum_{i=1}^{n} \Lambda(t_i, \theta)$$

function of baseline risk factor, which is a function of time and an unknown parameter, and a vector of explanatory variables, which shift the baseline risk:

$$(7.19)\quad \phi(t,x,x(t),\beta,\alpha) = \lambda(x,\alpha)\phi(t,x(t),\beta)$$

Note that some of explanatory variables themselves vary with time. For convenience, an exponential form is adopted for the shift factors so:

$$(7.20)\quad \phi(x,x(t),\beta) = e^{(\beta x_j + \beta x_j(t))}.$$

As explanatory variables do not affect the time path of the hazard directly, all information about the baseline hazard comes from the order of durations. The likelihood is constructed by summing the individual hazard rates for observations in the sample where the hazard rates for individual j is the ratio of an individual's probability of leaving at t_i divided by the sum of the hazard rates for all individuals, R, in the sample who could have left at t_i. The hazard rate for individual i is:

$$(7.21)\quad \phi_j(t) = e^{(\beta x_j + \beta x_j(t))} / \sum_{j\epsilon R} e^{(\beta x_j + \beta x_j(t))}$$

and the resulting log likelihood is:

$$(7.22)\quad L(\beta) = \Sigma[\beta x_i + \beta x_i(t) - \ln \sum_{j\epsilon R} e^{(\beta x_j + \beta x_j(t))}].$$

If $m_i > 1$ exit at time t_i, the log likelihood becomes:

$$(7.23)\quad L(\beta) = \Sigma[\beta x_j + \beta x_j(t) - m_i \ln_j \Sigma_{\epsilon R} e(\beta x_j + \beta x_j(t))].$$

Note censored observations enter the denominator, but not the numerator, of the aggregate likelihood.

Equation (7.23) is the form estimated in the Cox models in section IV. Both the log-logistic model and the Cox model are estimated using Limdep and the results of both formulations are presented in section IV.[8] The data and the specification of the equation for estimation are discussed in the next two sections.

II. The Labor Market Data

Most of the data used in this analysis, as explained in chapter six, were collected from the personnel files of the John Radcliffe II Hospital Nursing Department and are based on the employment histories of two groups of nurses: those who took up employment between June 1979 and June 1980 and those who took up employment from June 1984 and June 1985. This data set contains information on each nurse's length of service, reason for leaving, and destination after quitting. It also provides data on changes in employment status, such as grade, shift or hours, which would potentially affect the valuation placed on the current job as well as changes in

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8Limdep is a computer program created by William Green in 1986.

personal circumstances which could be used to proxy changes in the reservation wage. In order to estimate the quit models outlined in section I, additional information on the local labor market is required to proxy changes in the other quit determinants.

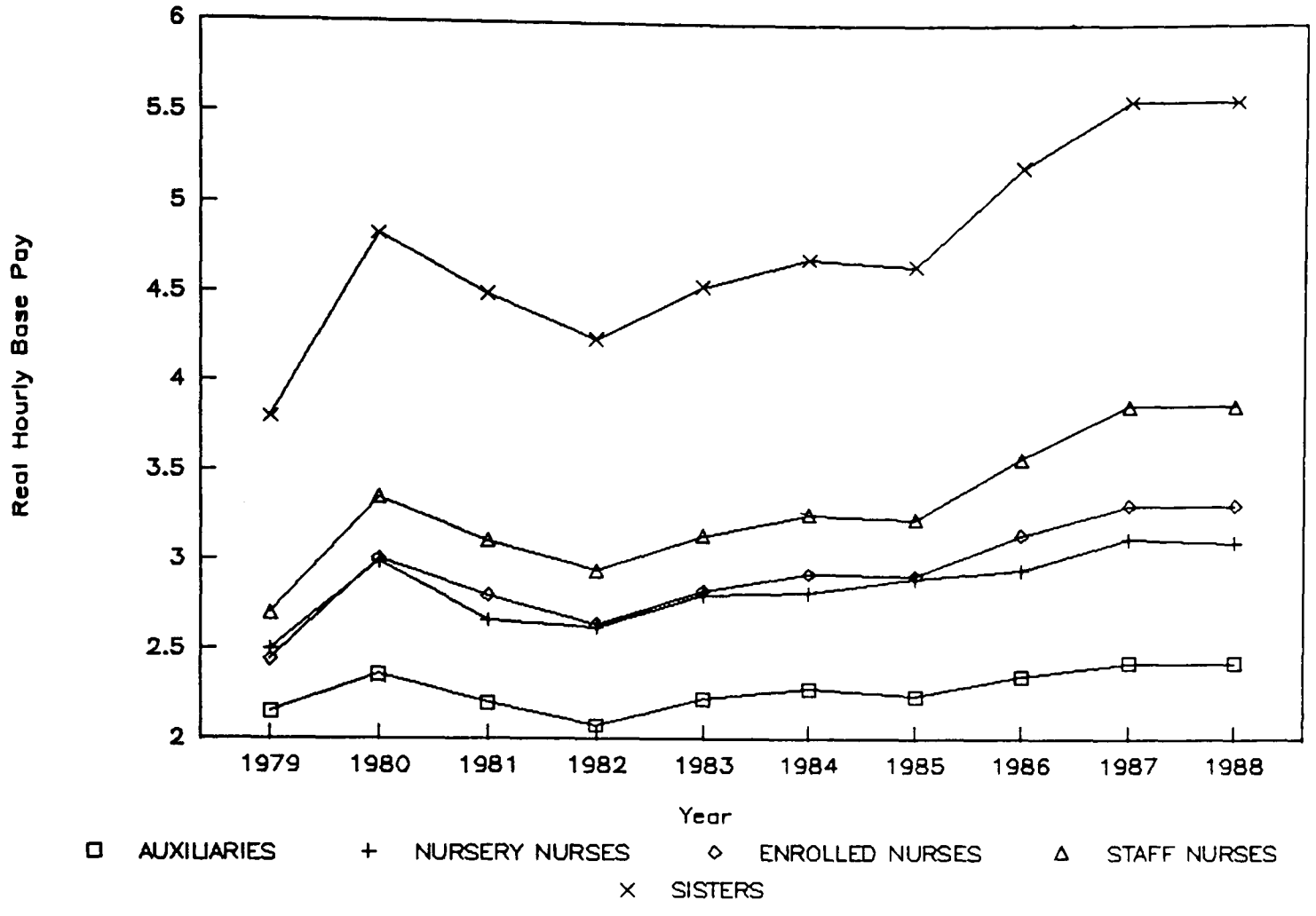
Information on a number of local labor market indicators from 1979 to 1988 was collected for use with the duration data. This included data on the number of vacancies in qualified and unqualified nursing jobs during the period, the number of vacancies in alternative (i.e. non-nursing) employment, and the number of beds in private nursing homes and independent hospitals in the Oxford region; all of which serve to proxy the availability of alternative employment. The male unemployment rate for Oxford, which potentially affects the value of the reservation wage, and the ratio of house prices in the Oxford local authority district relative to the national average, a factor likely to affect the value of holding a job in Oxford, were also recorded. Finally, hourly earnings for all grades of nurses and for non-manual and manual full-time female workers were also taken down. Details on each of these measures are provided below, while a full explanation of their use in the model is given in section III.

The complete set of nominal basic hourly pay scales in force over the nine year period were provided by the Oxford

District Health Authority finance department at Manor House. From these documents the basic hourly rate in effect in April of each year for all grades of nurses was identified and real values, based on 1988 prices, were computed.

The scales themselves contained figures for twelve grades of nurses with each grade having an average of six pay spines. On the basis of the grade recorded in her file, each nurse was allocated a place on the District's scale. For instance, one scale was provided for all registered staff nurses, both senior and general, for most of the ten year period. Those whose files identified them as senior staff nurses, now referred to as Grade E/F, were placed on the mid-point of the scale, while staff nurses, now grade D/E, were placed on the first pay spine. A similar procedure was followed for auxiliaries, enrolled nurses, and nursing sisters. As is explained at the end of this section, each nurse was assigned the average real value of hourly pay during her time in post. Figure 7.2 shows the movement of real hourly basic pay over time for various grades of nurses.

Figure 7.2: Real Hourly Base Pay By Grade



The diagram indicates that hourly pay for qualified groups: sisters, registered nurses and enrolled nurses was variable and followed the same general trend for most of the period. Differentials between these groups only began to widen in the late 1980s. Pay for nursery nurses tracked closely that of enrolled nurses from 1979 to 1983 after which it levelled off. Finally, basic remuneration levels for auxiliaries showed little variation over the period.

As identified in chapter two, the nurses' earnings are comprised of basic pay, special duty payments, over-time, and special allowances.[9] While it is impossible to identify

9Based on figures from the *New Earnings Survey*, basic pay constituted 95% of earnings of registered and enrolled

the components of each nurse's salary, a breakdown of the Oxford Regional nursing paybill provides some indication of what on average its composition might be. For the year 1983/84 basic pay constituted 85.5% of the Regional nursing paybill, while the respective figure for 1987/88 was 86.7%.[10] It thus seems reasonable to assume that movements in basic pay proxy well changes in the total pay received by nurses.

The average hourly wage for full-time female non-manual and full-time female manual workers working in the southeast in April from 1979 to 1988 were recorded from the *NES* for the appropriate years and were adjusted to 1988 prices. They are used as a measure of the wage available to nurses in alternative, non-nursing occupations. The wages of manual workers are the appropriate comparator for nursing auxiliaries and nursery nurses, while the relevant group with which to compare the pay of qualified nurses, enrolled and above, is non-manual workers. Figure 7.3 shows the real hourly wage rate for all registered nurses, auxiliaries, and non-manual and manual workers.

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nurses throughout the 1970s, and after a slight decline at the end of the decade, the percentage remained stable at the slightly lower level of 90% throughout the 1980s.

10These figures were provided by Richard Wilmer at the Department of Health.

Figure 7.3: Real Hourly Wages for Registered Nurses, Auxiliaries, Non-Manual and Manual Workers

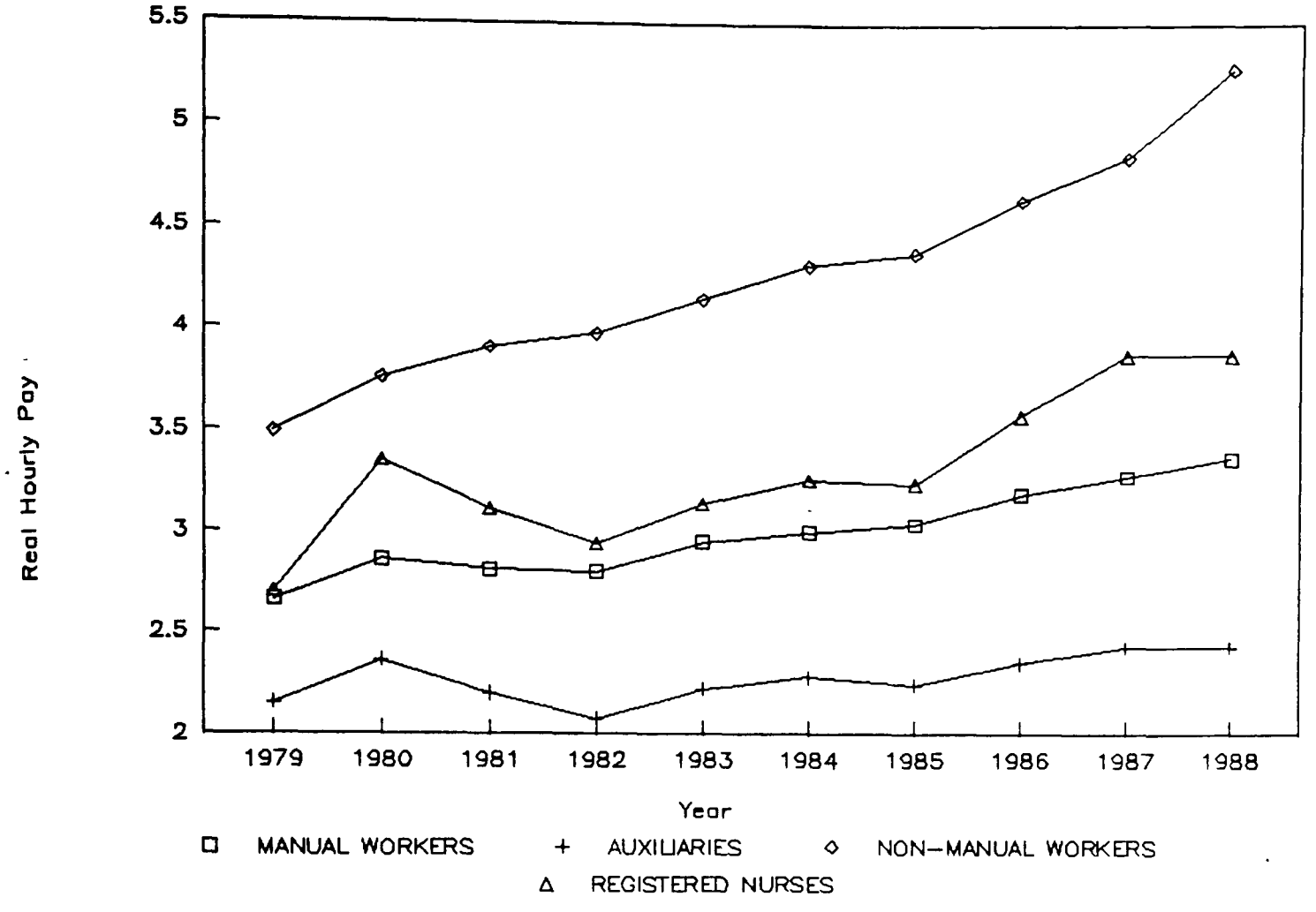

Figure 7.3 shows that the wages of nurses follow the same general pattern over time as the pay of all women, particularly after the establishment of the Review Body in 1983. The pay of all groups is trended upward, but that for non-manual and qualified nurses rises much steeply than that for manual workers and unqualified nurses.

As previously noted, information on local labor market conditions was drawn from several sources. Before reporting these data however, the concept of a local labor market itself needs to be addressed. For this discussion the phrase refers to the relevant job market in which a nurse is

likely to look for work and the area in which the nurse lives, as conditions such as housing and rental costs affect the value of holding a job in a particular location.

Methods of job search and workers' commuting patterns have received much attention over the last fifteen years.[11] The predominant finding is that skilled workers are generally more mobile than less skilled workers and that the size of the relevant labor market increases with the human capital embodied by the worker (Toppel, 1986). The influence of variables such as the unemployment rate and house prices on labor mobility have also been extensively documented (Toppel, 1986; Muellbauer and Murphy, 1988).

While all nurses to a degree are influenced by conditions in the area in which they live, the relevant job market for a nurse is highly dependent on her grade. For the vast majority of qualified nurses, job to job transfers are moves within the profession and as noted by Mercer (1979) and in chapter six, most are intra-regional. Individual preferences and the investments made in learning about an area both tend to limit the range of movement, but an important role is also played by regional health authorities which help create regional markets through their humanpower

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11Owen et al. (1984) provide a good example of the work on commuting patterns, while the job search literature is discussed in chapter five.

planning efforts and the information they provide on jobs in other hospitals in their jurisdiction.

For unqualified nurses, considerably more interoccupational transfers occur. As suggested by figure 6.8, auxiliaries review opportunities in the general market as well as in that for nursing when considering a job change. Given that their skills are less specific, they can consider a wider range of jobs and hence look in a smaller area in which the costs of information, transport, and moving are minimized: the local area.

Several measures of alternative employment opportunities were thus collected. These included: unfilled vacancies in nursing jobs in the southeast for staff nurses and above, codot classification 038, and unfilled vacancies in the southeast for auxiliaries and nursery nurses, codot classification 039. Unfilled vacancies in the Oxford travel-to-work area for secretarial help, clerical work, selling, security services, personal services, and catering were aggregated to produce the alternative vacancies measure.[12] A travel-to-work area or ttwa is a local labor market, defined from the 1980 Census of Population data on commuting, in which 70% of the people who work in the area also live in the area. The three sets of figures, are

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12The vacancy data for 1979-1983 are groups 7-10 from the NOMIS 68X series and occupations 3-9 for years 1984-1988 from the 552 series.

yearly averages of semi-annual Job Centre data and were extracted from NOMIS, the National On-line Manpower Information Service, available through Durham University.

Finally, as a proxy for jobs in the private health care sector, the number of private hospital and nursing home beds within the Oxford region was recorded from various editions of the *Hospital and Health Services Yearbook*. Information on the private sector is also available from the *Directory of Independent Hospitals* and from registration lists held by Local Councils, but the source selected is the only one which could produce a consistent series for the years 1979 to 1988.

Figure 7.4 shows the movement of these measures: regional nursing vacancies in the southeast for qualified and unqualified nurses, alternative vacancies in the Oxford travel to work area, and regional private nursing home and hospital beds.

Figure 7.4: Employment Opportunities for Nurses: Vacancies and Private Beds

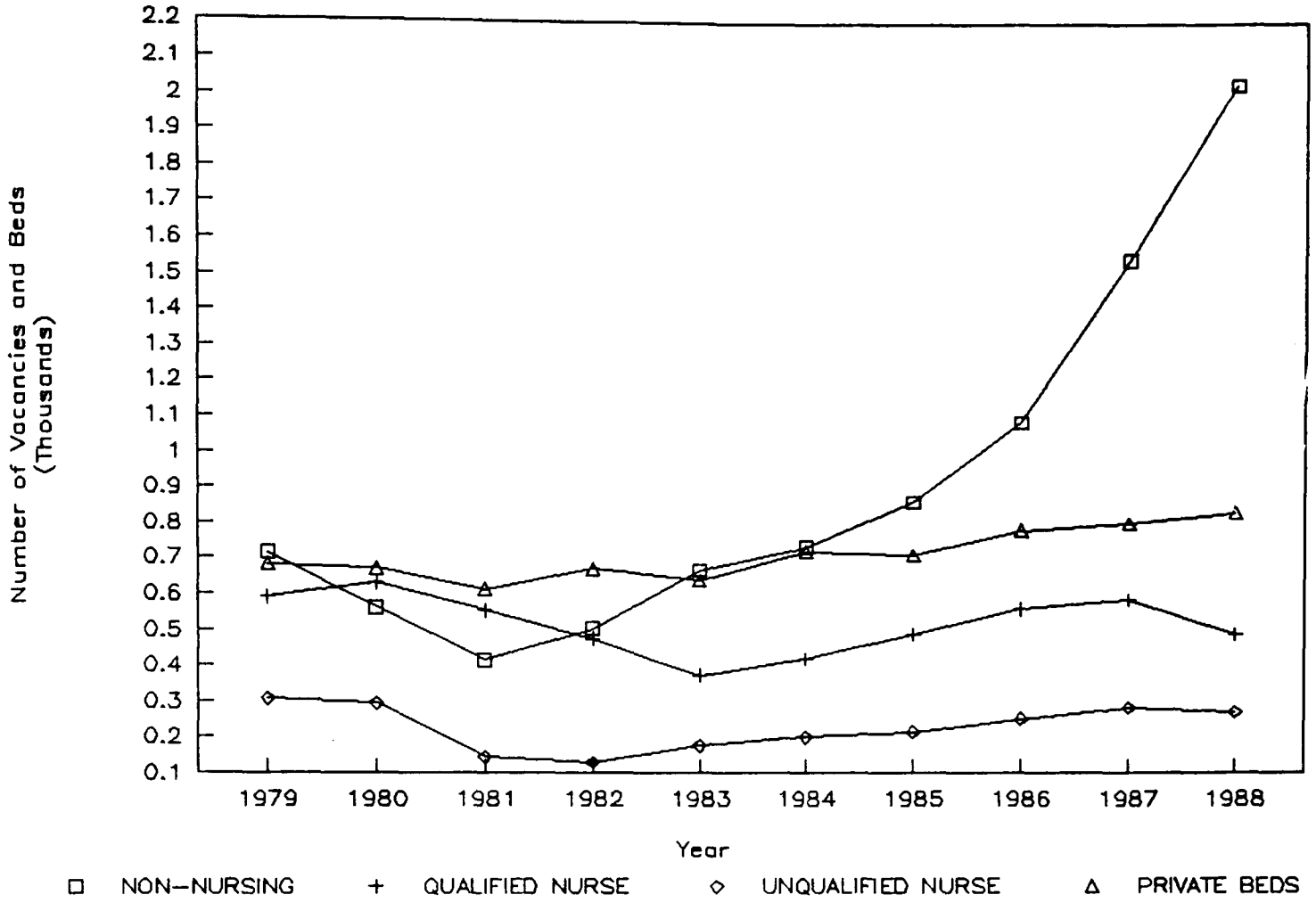


Figure 7.4 shows the trends in vacancy statistics and in the number of hospital beds in private institutions over the ten year period. Vacancy levels for auxiliaries displayed remarkable stability and declined only slightly from 1980 to 1982. Vacancies for qualified nurses appear to follow a cyclical pattern and reach low points in their cycle in 1983 and in 1988.[13] After falling for the first two years, alternative vacancies rose sharply over the remainder of the period. Similarly, private beds fluctuated over a small range and then increased dramatically after 1983. The data

13Ensuring the latter was a cyclical trough would require data on subsequent years.

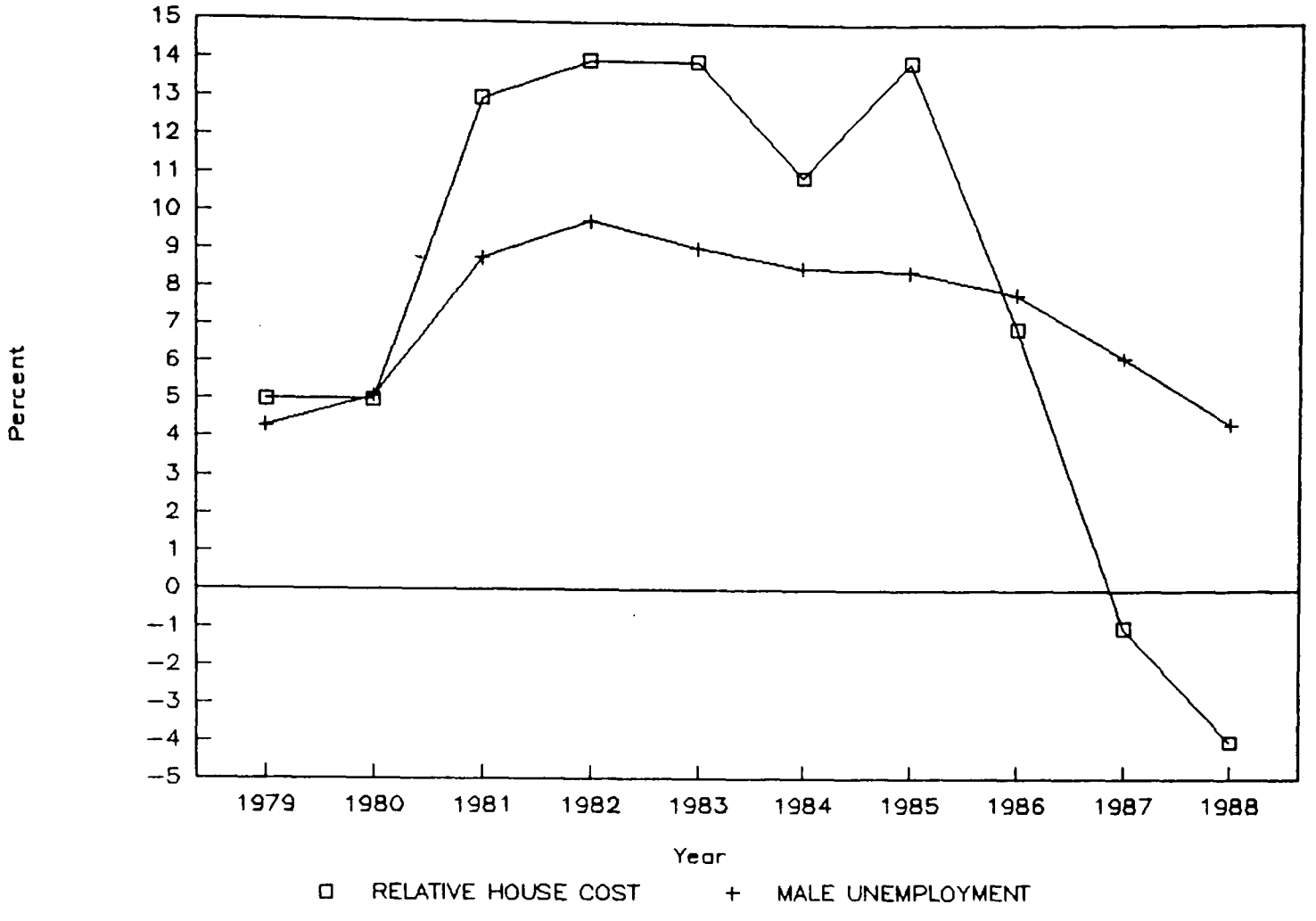
in chapter six definitely suggest that auxiliaries were responding to these latter trends.

Two final indicators of local market conditions were drawn from NOMIS and the Nationwide Anglia Building Society respectively. The male unemployment rate in the Oxford travel-to-work area was calculated using NOMIS data. The total number of unemployed men, based on a monthly average, was taken from the Press Notice Data and an estimate of the economically active male population was obtained from the Base-Rate denominator series. From these two statistics unemployment rates for men in the Oxford ttwa for 1979 to 1988 were generated.

Finally, average nominal house prices in the Oxford Local Authority District, LAD, and in England for the period were provided by Anne Green, Department of Town Planning, Cardiff, courtesy of the Nationwide Anglia Building Society. Both were converted to real values and the ratio of real house prices in Oxford to the national average was calculated.

A graph of the male unemployment rate in the Oxford ttwa and the percentage difference between real house prices in the Oxford LAD and the rest of the country are shown in Figure 7.5.

Figure 7.5: Male Unemployment and House Prices Differences



The diagram indicates that real house prices in Oxford at the beginning of the period were 5% higher than the national average. This difference then rose to a peak of 14% in the mid 1980s and began to decline after 1985. By 1987 house prices were one percent below the national average and the difference continued to fall in the following year. The male unemployment rate rose substantially at the beginning of the period. It reached its peak in 1982 and slowly declined in subsequent years.

This completes the description of the labor market data to be used along with the individual case histories presented in chapter six. At this stage, however, it is important to note that trended variables may complicate the analysis undertaken later in the chapter. Isolating and identifying the individual effects of variables which are highly correlated is a difficult task. As these diagrams suggest that correlations may exist, such as between male unemployment and relative house prices, their use in the estimations is monitored carefully.

Table 7.1 lists the variables and their definitions. It is important to note that all non-binary variables take on their <u>average</u> values during the period the nurse spends in post. This ensures that when a variable's effect on duration is assessed, its assigned value reflects the actual value it took on while the nurse was in post. Thus, the appropriate value for each variable depends on when the nurse joined and left the JRII.

As each nurse took up employment in one of four years: 1979, 1980, 1984, or 1985, and then either left in the same year, left in any one of the following years until 1988, or remained in post throughout the period of observation, 28 length of stay combinations were possible and each had different variable values associated with them.

Table 7.1: Variable Names, Definitions, and Means[a]

AAD = age at departure or age in December of 1989 if the nurse did not leave her post	30.15
SIND = total days off sick divided by months in post	1.18
SBR = the average yearly staff to bed ratio at the JRII during her employment	1.08
RHP = the average yearly index of real house prices in the Oxford Local Authority district divided by real house price in England	107.60
MUNE = the average male unemployment rate in the Oxford travel-to-work area during her employment.	6.32
RBED = the average annual number of beds in private nursing homes and independent hospitals in the Oxford region during her period of employment	691.23
NVAC = the average annual nursing vacancies in the southeast during her employment; staff nurse vacancies and above for qualified nurses, auxillary vacancies for unqualified nurses	475.22
SNVAC = the average annual skilled nursing vacancies in the southeast during the employment of an unqualified nurse	566.50
ALVAC = the average annual vacancies in in alternative employment in the Oxford ttwa for an unqualified nurse her period of employment	691.23
LNWAGE = the log of the average hourly base wage of a nurse during her employment	1.09
LAWAGE = the log of the average hourly pay of full-time female manual workers in the southeast during her employment for an unqualified nurse	1.05
RWAGE = the log of the average hourly base wage of an unqualified nurse to that of staff nurse during her period of employment.	0.74
CHP[b] = 1 if the nurse changed her conditions of employment while in post; 0 otherwise	.08
CHM[b] = 1 if the nurse married while in post; 0 otherwise.	.10
CHPG[b] = 1 if the nurse became pregnant while in post; 0 otherwise.	.08
SIGMA = parameter of logistic distribution	
ONE = constant required by logistic estimation	

a. Means are for the full sample except where the value clearly pertains to only one group, such as rwage.
b. The specification of chp, chm, chpg is time-varying in the Cox models and binary in the log-logistic.

Furthermore, as wage values differed for each of the 14 grades, 28 X 14 values were possible for the nursing wage.

Values for each joining and leaving combination for each variable were computed and assigned to each nurse based on when she was in post. The variable means are provided in table 7.1 and their use in the estimations is explained below.

III. Discussion

Given the richness of the data base, it is possible to estimate separate structural models for three different types of voluntary separations, outlined in section I: those to other jobs, those to non-participation, and those to further training as well as for an aggregate quit function. Unfortunately, it is not possible to estimate (7.7) through (7.10) directly as measures of certain variables are not available. However, if expectations about future wages are assumed to be functions of current wages and if proxies are employed for the values of some of the quit determinants, then a model of job terminations, amenable to empirical estimation, can be constructed. The empirical specification of each of the models is discussed in turn below.

i. Quits to Other Jobs

Recall from equation (7.7a) and (7.7b) that models of the decision to quit for other jobs for qualified and unqualified nurses are:

$$Q_{QN} = f[W_c,\ W_c^*,\ W_{QN}^*,\ c_2,\ (1-F_{QN}(W_c))]$$
$$Q_{\tilde{U}G} = f[W_c,\ W_c^*,\ W_{\tilde{U}G}^*,\ c_2,\ (1-F_{\tilde{U}G}(W_c))].$$

For this decision, as in the others, values for the current employment package, the probability of finding another job, its value, and the opportunity costs of search need to be identified for both groups.

Four variables serve to gauge the value of the current employment package, W_c, over time.[14] The first is the log of the wage earned in nursing, LNWAGE, while another is a dummy variable, CHP, which indicates whether or not the nurse has changed posts, hours worked, or shift while employed. SBR, the staff to bed ratio, proxies changes in a nurse's workload, and finally, RHP, the ratio of house prices in Oxford relative to the national average is

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14Adequately capturing changes in this hospital's working environment is extremely difficult. The JRII was opened in stages from mid 1979 on, so the physical environment itself was expanding over the first few years. Also, of note is that the JRII is a teaching hospital for both nurses and doctors and staff composition is thus highly variable. Another consideration is that general NHS reforms affect conditions on the job. Quantifying any of the factors, however, is nearly impossible due to the lack of available data.

included as a measure of the changing costs of holding a job in the Oxford area.[15]

Several variables are also used to measure changes in the value of other employment opportunities and the likelihood of finding an acceptable job over time. For qualified nurses job to job changes take place within the profession and thus no alternative wage measure is involved. Pay may change if the nurse is promoted, but as many transfers are lateral moves to gain experience, this is not necessarily the case. Rather the influential factor is the availability of nursing jobs over time which is proxied by two variables: NVAC and RBED. NVAC is the average number of yearly unfilled vacancies for <u>qualified</u> nurses in the southeast, while RBED is the total number of beds in private nursing homes and hospitals in the Oxford Region.

For unqualified nurses the likelihood of finding jobs in nursing is the same as that for qualified nurses. The relevant vacancy factors for this group are NVAC, defined as the number of <u>unqualifed</u> nurse vacancies in the southeast, and RBED, defined as above. Unqualified nurses, however, do quit to take up employment in other occupations, thus the alternative employment conditions that need to be considered

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15The staff to bed ratio, SBR, was compiled from data provided by the District Nursing Officer, Mr. Malcolm Ross. It is the average number of whole-time equivalent staff in post divided by the number of beds in the hospital at the end of the fiscal year.

extend beyond the realm of nursing. Along with the probability of finding other nursing employment, two additional variables are included to determine the value of non-nursing employment and the likelihood of locating a job in this sector. They are: LAWAGE, the log of hourly wages of female manual workers in the southeast, and ALVAC, the number of vacancies in non-nursing jobs in the Oxford ttwa.

Along with the value of W_c and W_a, the costs of search for both groups must be addressed. Two features of job search within the NHS are important to note. Nursing vacancies within the Region, and often within the Service generally, are posted regularly at the hospital and the costs of transportation to the interviews themselves are paid by the interviewing authority. Thus, applying for a nursing job within the NHS for either qualified or unqualified nurses is a relatively inexpensive exercise. For those moving to non-NHS posts or for unqualified nurses taking up other types of employment, job centres minimize the cost of locating jobs, while other employers may subsidize interview costs. Other expenses, such as moving, potentially arise in relation to job transfers, but there is no obvious way to gauge their magnitude. As a proxy for moving costs, age is included in the model as older nurses are more likely to have made housing investments which potentially increase the cost of changing jobs and they are also more likely to have children

who can complicate transfers if new arrangements for schooling and childcare must be made.

Age is also included in the model as it is likely to affect quits in two other ways. Age reduces the likelihood that a nurse will find a job as older nurses are less likely to be hired than those who are younger. Age can also affect mobility as older workers become less concerned with seeking transfers to improve their career prospects and are less likely to undertake job search.

Finally, as it was noted that a number of qualified nurses changed jobs because they were getting married and leaving the area, CHM, indicating whether or not a nurse married while in post, is included in the regression as a locational constraint.

Having identified proxies for determinants of the quit function, a model of quits to other jobs, for qualified and unqualified nurses respectively, is easily constructed. The model to be estimated is summarized below along with the predicted relationship between each variable and the conditional probability of quitting:

$$\underset{}{} \quad \overset{-}{} \quad \overset{-}{} \quad \overset{-}{} \quad \overset{+}{} \quad \overset{+}{} \quad \overset{+}{} \quad \overset{+}{} \quad \overset{+}{}$$

$$\text{(7.24a)} \quad P(Q_{QN}) = F\{AAD\ SBR\ CHP\ RHP\ LNWAGE\ RBED\ NVAC\ CHM\}.$$

$$(7.24b)\quad P(Q_{UG}) = F\{\underset{-}{AAD}\ \underset{-}{SBR}\ \underset{-}{CHP}\ \underset{+}{RHP}\ \underset{-}{LNWAGE}\ \underset{+}{RBED}\ \underset{+}{NVAC}\ \underset{+}{LAWAGE}\ \underset{+}{ALVAC}\}.$$

where terms are defined in table 7.1.

For both groups increases in LNWAGE and the staff to bed ratio, SBR, and having changed the terms of employment, CHP, are all expected to decrease the probability of leaving to take up another job as they increase W_C. As the nursing wage increases, the probability of leaving declines as it becomes less likely that the wage in an alternative employment will exceed it. A positive value for CHP, as it represents a voluntary contract change, is likely to indicate improved conditions on the job, while increases in the staff to bed ratio, SBR, should also signal improved working conditions as rises in its value suggest that the workload is declining. Both, therefore, should have a negative effect on quits.

Rising house prices in Oxford are likely to increase the probability that a nurse will leave her post, but the mechanism by which this occurs depends critically on whether the nurse is a renter, a potential buyers, or a home owner. The latter case, as it involves changes in the reservation wage, is discussed below in subsection ii, the first two here.

If real house prices in Oxford rise relative to the national average, it is more difficult for first time buyers to afford a house. Also, as rents in an area generally follow house prices, accommodation itself is likely to become more expensive. For these two groups, therefore, rising house prices decrease the value of holding a job in Oxford and hence increase the likelihood that nurses in either category will leave their posts, most likely to work in an area where the cost of living is lower and hence, the payoff to employment higher.

As the likelihood of finding other jobs rises, it becomes more probable that a nurse will find a job where W_a exceeds W_c. Thus, all proxies for job availability NVAC and RBEDS for qualified nurses and NVAC, RBEDS, and ALVAC for unqualified nurses are expected to be positively related to quits. It is also important to note that private sector nursing may offer a more attractive employment package in terms of shifts and availability of part-time work. Therefore, irrespective of pay considerations, growth in beds in independent hospitals and private nursing homes could attract those who want to stay in nursing but who would consider leaving the NHS.[16]

For the unqualified nurses LAWAGE, the wage in alternative employment, is expected to be positively related to quits as

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16Concerning pay, indications are that the private sector has kept pace with the scales set by the Pay Review Body.

the higher the alternative wage the more likely it is to exceed W_C.

Finally, age, AAD, is likely to decrease the conditional probability of quitting of both qualified and unqualified nurses. Older nurses are more likely to have made housing investments which may restrict their mobility. Also, they are less likely to secure job offers *ceteris paribus* than younger workers and generally to be less concerned with seeking transfers to improve their career prospects.

ii. Quits to Non-Participation

From (7.8), quits to non-participation for both groups can be specified as follows:

$$Q_R = f[W_C, W_C^*, c_3, \tau, W_r^*]$$

Again, an empirical specification must be derived from the formal model and when examining leaving to non-participation, the values that are of interest are those of W_r, the likelihood that a change in the reservation wage occurs, and W_C.[17] While the composition of the latter value, W_C, was outlined above, several variables, described below, are included to capture changes in the reservation wage. These include dummy variables for whether or not a

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17A measure of c_3, the cost of bringing about or of experiencing a change in the reservation wage, is impossible to identify and thus is not included in the model of this decision.

nurse married or had a child during the course of employment and an index measuring the total number of days off sick divided by the number of months in post, SIND. Age is again used as proxy, but in this case it represents the likelihood that a nurse will experience a reservation wage change, τ.

Changes in market conditions may also affect the reservation wage. While nursing itself is not directly affected by economic downturns, changes in male unemployment potentially affect the probability of nurses leaving through the effect on their spouses or partners.[18] Finally, it is important to note that a rise in relative house prices may produce an income effect for nurses who are homeowners in the Oxford area.[19] Changes in RHP thus potentially influence the reservation wage as well as the value of holding a job in Oxford.

Thus, the model to be estimated for quits to non-participation for all nurses is:

$$\underset{(7.25)}{P(QR) = F\{}\underset{}{\underset{-}{LNWAGE}\ \underset{-}{CHP}\ \underset{-}{SBR}\ \underset{+}{RHP}\ \underset{-}{AAD}\ \underset{+}{SIND}\ \underset{+}{CHM}\ \underset{+}{CHPG}\ \underset{?}{MUNE}}\underset{}{\}.}$$

18While those in nursing employment are not directly affected such as through job losses or cuts in pay, they may be indirectly affected as expenditure on the Health Service is cut back.

19Unfortunately, it was not possible to tell whether or not the nurse was a homeowner from her hospital records.

As discussed in earlier chapters, household composition is an important factor determining the reservation wage. Marriage, as it can be viewed as an increase in nonlabor income, potentially increases this value and the likelihood that a nurse will leave her post. Similarly, pregnancy may lead to non-participation in two ways. It increases the likelihood that $W_r > W_c$ as the presence of young children can increase the value of time spent at home or it may lead to non-participation as young children, who require childcare, generate substantial costs to remaining in employment.[20] Thus, a positive value of CHP or CHM is expected to increase the conditional probability of leaving.

A rise in the sickness index, SIND, as it signals a decline in health, is likely to increase the reservation wage and hence the probability of quitting, while increases in age, AAD, are expected to reduce this probability. Age and the likelihood of quitting are expected to be inversely related because marriage and pregnancy are less likely to occur as women grow older and their families are also likely to make fewer demands on their time.

Finally, rising house prices, if the nurse is a homeowner, may produce an income effect which may prompt her to leave the labor market. The effect of an increase in male

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20While this issue cannot be explored here, the results from chapter four indicate that the fixed cost element is of great importance in affecting labor supply.

unemployment, on the other hand, is less straightforward. Increases in male unemployment may decrease the probability of leaving as they decrease the amount of nonlabor income to which the nurse has access and hence decrease the likelihood that she will leave to non-participation. In addition, if the nurse becomes the primary or sole earner in times of high unemployment, the security of current employment may also increase its attractiveness.

Alternatively, if nurses are considered secondary earners and choose to accompany partners who seek employment elsewhere, then rises in male unemployment are likely to increase the probability of leaving for nurses. Rather than influencing the value of the reservation wage, MUNE in this case acts as an exogenous constraint on the location of employment. The strength and direction of the effect of this variables clearly depends on the type of work in which the spouses or partners of nurses are employed. Unfortunately, no information on this was available in their records.

iii. Leaving for Training

As outlined in section I, the models for quits to training for qualified and unqualified nurses are:

$$Q_{QT} = f[W_C,\ W_C^*,\ W_{QT}^*,\ c_4,\ (1-F_{QT}(W_C))]$$
$$Q_{\tilde{U}T} = f[W_C,\ W_C^*,\ W_{\tilde{U}T}^*,\ c_4,\ (1-F_{\tilde{U}T}(W_C))].$$

Similar to the other cases, empirical specifications must be derived for this quit model, but in this instance measures of the benefits and costs of taking up training are difficult to identify due to the unique features of the nursing labor market, described at length in the first two chapters.

The conventional approach to explaining human capital investment is to demonstrate that the costs of acquiring credentials, c_4, are more than offset by the benefits, W_{QT}^* and W_{UT}^* for qualified and unqualified nurses respectively. These benefits include the potential consumption aspects of being a student as well as the increased earnings likely to result, but they as well as the costs of taking up nurse training, however, are difficult to measure.

To individual nurses, qualified or unqualified, the costs of training appear to be minimal. Qualified nurses receive a stipend equivalent to their pay from the sponsoring authority, while auxiliaries who become student nurses experience little change in income.[21] The benefits ultimately generated by acquiring training are also difficult to quantify as they depend critically on the level of the real nursing wage over time, the particular jobs

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21For instance in April of 1985, the annual basic pay of auxiliaries on the first and second pay spines respectively was £3950 and £4142, while that of first year student nurses was $4100.

available after the nurse receives her new qualification, and the nurse's own preference structure.

An additional complication in regards to this decision is that taking up training is not a choice made by the nurses alone; nurses must be selected for training. While no detailed information is available on the number of training places available over time nor on the specific selection processes, the structure of the system itself suggests that post-basic training is severely rationed.

As described in chapter two, basic training is offered at numerous institutions across the country whose standards, outside the southeast, vary substantially. Most of these have two to three intakes of students each year. In the majority of cases, therefore, if nurses are persistent and flexible, they are likely to be able to secure a place on a basic training course. The situation concerning post-basic training is quite different.

Post-basic training is sponsored by district and regional health authorities. As they themselves fund the courses, training is not offered at regular intervals, but rather in response to district or regional needs. Furthermore, both are known to use further education courses to attract qualified staff when conventional recruitment methods have proven unsuccessful. As a results it is important to note

that what may be observed in the case of qualified nurses are the conditions in which post-basic training is offered and those in which they are selected for sponsored courses, rather than the circumstances under which they choose to take it up.

Although it is clear that this is not a comprehensive model, the desire to leave the current post for training can be examined as one in which the value of the alternative activity -training- exceeds that of current employment. For qualified nurses, this decision is analagous to leaving for another job. Thus, a value for the current job, W_C, must be identified and again a measure of the availability of training places. A measure of the alternative wage, W_{QT}, is not included as pay does not change during training nor necessarily after, while costs, for reasons just discussed, are assumed to be negligible.

W_C, the value of the current employment package is as previously defined, a function of the log of the nursing wage, LNWAGE, the staff to bed ratio, SBR, the ratio of house prices in Oxford to the national average, RHP, and a binary variable, CHP, indicating whether or not the nurse changed her terms of employment while in post. As training courses are often used to attract qualified staff, the availability of places is likely to be a function of vacancies; nursing vacancies in the southeast and regional

beds, NVAC and RBED. Finally, age is also included as a measure of the likelihood of securing a training place, as well as a measure of the likelihood of applying for training.

Equation (7.26a) summarizes the quits to training model for qualified nurses with the effect of each variable listed above:

$$\overset{\quad -\quad -\quad -/?\quad +\quad -/+\quad +\quad +}{(7.26a)\ P(Q_{QT}) = F\{AAD\ SBR\ CHP\ RHP\ LNWAGE\ NVAC\ RBED\}.}$$

If the demand for training is dominant, all factors which increase the value of the current employment package, the staff to bed ratio, SBR, having changed contract terms, CHP, and LNWAGE, are likely to discourage the nurse from leaving, while relative house prices, RHP, which decreases its value, to encourage quits. Increases in vacancies, NVAC and RBED, as they proxy the availability of courses, are likely to increase quits, while age, AAD, to decrease them. As nurses grow older, they are less likely to be able to secure a place on a course and they are also less likely to apply for one.

On the other hand, if supply factors dominate the market, as anticipated, the expected signs on two of the variables, LNWAGE, and CHP, may change. High wages, like high vacancies, may indicate conditions under which the demand for nurses is rising. LNWAGE, may therefore be positively

related to the conditional probability of quitting as it too proxies course availability. CHP, having changed the terms of employment, may signal a particularly valuable employee as she has either been promoted or an effort has been made to retain her by renegotiating her contract. From this perspective it may increase the probability a nurse will leave for training as it potentially identifies one more likely to be selected for a course.

For the unqualified group, leaving to take up training can be viewed as a lateral job move to increase future earnings. The value of W_C is as previously defined, while the probability of securing a place on a course is likely to be a function of the demand for skilled nurses represented by skilled nurse vacancies, SNVAC. They are also likely to affect the probability that a nurse will search. Taking up training does not change earnings in the short-term, but a measure of the potential benefits is RWAGE, the ratio of the log of the real hourly wage of unqualified nurses to that of registered staff nurses. Finally, age is included in the quits to train model as older, unqualified nurses are less likely to be interested in leaving for training or selected for courses.

The model for quits to training for unqualified nurses is:

$$(7.26b)\quad P(Q_{UT}) = F\{\underset{-}{AAD}\ \underset{-}{SBR}\ \underset{-}{CHP}\ \underset{+}{RHP}\ \underset{-}{LNWAGE}\ \underset{-}{RWAGE}\ \underset{+}{SNVAC}\}.$$

Factors which make the current post held more attractive are likely to discourage such quits. Thus, good working conditions as captured by a high nursing wage, LNWAGE, a high staff to bed ratio, SBR, and the nurse having changed employment conditions are again likely to decrease job terminations to take up training. Rising house prices, on the other hand, as they translate into higher rents, reduce disposable income and may encourage nurses to take up training to increase income.

As the benefits to taking up training rise, i.e. as the RWAGE, the wages of unqualified relative to qualified, falls, then unqualified nurses are more likely to pursue training opportunities. Similarly, a rise in the number of qualified posts available in both the private sector and the NHS is likely to lead to more unqualified nurses applying for and taking up training as they both suggest that future employment opportunities are improving. Also, a rise in skilled vacancies suggests that more places on courses may be offered.[22]

Before presenting the results from the various estimations, it is useful to review the differences between the log-logistic and the Cox model.

22Many claim that the NHS has followed a policy of continual replacement rather than retention; see Beardshaw and Robinson, (1990).

In both the Cox and log-logistic models, individuals are assigned the <u>average</u> value taken by the non-binary variables over their period of employment. The impact of the variables is determined by comparing their value and the length of employment for all observations in the sample. For instance, if relatively high numbers of nursing vacancies are associated with relatively short durations of employment, then the models will produce a positively signed coefficient for NVAC which indicates that increases in its value have a positive effect on the conditional probability of leaving. In the log-logistic model, which assumes that the hazard rate follows a logistic distribution, the same holds true for the binary variables.

There are two important differences in the Cox model. The first is that no distributional assumptions are made about the hazard function and the second is that the values of the variables representing marriage, pregnancy, and changes in terms of employment are allowed to vary over the course of employment. This means that the Cox model actually measures the effect of changes in variable levels on duration rather than the effect of the levels themselves.

It is also important to note that in the estimations of the distinct quit models, nurses who left for other reasons are treated as censored observations. This means that prior to

their leaving for a reason not being considered, they contribute information to the hazard calculations.

IV. Results

The results from the Cox and the log-logistic estimations for quits to other employment are presented in tables 7.2 and 7.4 for qualified and unqualified nurses respectively. The results from the models for leaving to non-participation for both groups are shown in table 7.5, while the estimations for the models of leaving to train are found in tables 7.6. Finally, table 7.7 contains the results for the aggregate quit model for qualified and unqualified nurses.

i. Quits to Other Jobs

a. Qualified Nurses

Table 7.2 provides the results for the Cox and log-logistic models for quitting to other jobs for qualified nurses. In both models most of the variables proxying changes in the value of the current employment package and the alternative employment package are significant and have the expected effect on the likelihood of a nurse leaving her post for another job with the exception of CHM in the log-logistic model.

Table 7.2: Results For Models of Quits to Other Jobs for Qualified Nurses

Dependent Variable = Conditional Probability of Quitting

Variables	COX MODEL	LOG-LOGISTIC MODEL
One	-	16.2669*
		(2.673)
AAD	-0.0458779*	-0.0394718*
	(-4.795)	(-8.090)
SBR	-0.361862*	-0.206296*
	(-8.030)	(-9.303)
RHP	0.0907153	0.0193331
	(1.251)	(0.511)
LNWAGE	-1.80397*	-1.35579*
	(-4.096)	(-4.770)
RBED	0.0107991*	0.00588544*
	(3.286)	(3.017)
NVAC	0.00491637	0.000821733
	(1.200)	(0.369)
CHP	-0.254332	-0.711082*
	(-0.793)	(-4.337)
CHM	0.816978*	-0.332575*
	(3.492)	(-2.291)
SIGMA	-	0.512369*
		(20.872)

*Significant at the 10% level or less.

Quits to Other Jobs	319	319
Total Sample	736	736
Log-likelihood	-1689.9	-98.102
Lambda	-	0.04034
P	-	1.95172

In the Cox model increases in the nursing wage and in the staff to bed ratio decrease the probability of a nurse quitting, as does changing the terms of employment, although the latter is not significant.

The results also indicate that nurses are more likely to leave their posts as house prices in Oxford rise relative to the national average. Given that a substantial number in the sample are young women, the average age being thirty, most are either likely to be first time buyers or renters who would be discouraged from staying in an area where housing costs are high. This result to an extent confirms the finding of several other surveys which suggest that nurses are sensitive to differences in regional living costs (Buchan et al., 1989; Martin and MacKean, 1989). The effect of RHP, however, is significant at the 21% level only.

Variations in market opportunities also affect the length of time a nurse spends in a post. As the positive coefficients on nursing vacancies and the number of regional beds, NVAC and RBED, indicate, a rise in the number of nursing jobs available, in either the NHS or in the private sector, increases the likelihood that nurses will leave their current posts; NVAC is significant only at the 23% level.

Finally, the predicted effects of being older or getting married are confirmed. Older nurses are less likely to leave for other jobs in nursing, a phenomenon that results from the fact that older nurses are more likely to have commitments which tie them to an area and less likely to be concerned generally with career moves. The time-varying covariate, CHM, is included in the regressions as a locational constraint. The positive coefficient on this variable indicates that getting married while in post is likely to lead to the nurse leaving for another job.

The results from the log-logistic estimation are very similar to those for the Cox model. Most of the variables entered with the same sign and significance levels, although the significance levels on NVAC and RHP were considerably smaller. The only dissimilarities arise in the effects registered by the binary variables for changing posts and getting married. While also negatively signed, CHP was highly significant in the log-logistic run and contrary to the results of the Cox model, CHM was significantly negative. Given that the time-varying covariates in the Cox model are specifically designed to measure the effect of changes in the values of certain variables on duration, they are the preferred form and suggest that the binary specification in the log-logistic model is not, in all cases, reliable.

While both models produce consistent results concerning the labor market variables, a degree of concern arose over the specification of the binary variables for marriage and pregnancy in the log-logistic models. As an informal check on specification in parametric models, Keifer (1988) recommends comparing the integrated hazard of the model in question with that for the unit exponential distribution. On this basis, the log-logistic model appears to perform well. Log-logistic results are thus reported in the quit models which follow as comparators to the Cox results.

It is important to emphasize that, as predicted, an increase in the nursing wage significantly decreases the likelihood of leaving to another job as wage gains can be secured without changing jobs. In the Cox model the coefficient on LNWAGE is the elasticity of average duration with respect to the conditional probability of leaving, while the negative of the coefficient of the log-logistic model is interpretable as the elasticity of median duration with respect to the nursing wage.[23]

As it is preferable to discuss the implications of the models in terms of duration, rather than in terms of conditional probabilities, the elasticity of median duration with respect to the wage is commented on in the text. For qualified nurses who ultimately leave for other jobs, median

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23See Green (1986) p.22.22.

duration is 25.29 months and this value is highly dependent on the wage as the elasticity of median duration with respect to the nursing wage for this group is 1.36.

b. Unqualified Nurses

The results for the Cox and log-logistic estimations for leavers to other jobs are provided in table 7.4. Given that the sample of unqualified nurses is considerably smaller than that for qualified nurses, 248 compared to 736, and that a number of variables are highly correlated, the model estimated from this group was slightly modified. Examining the correlations matrices for variables for this group indicated that several of them were highly correlated.

The correlation coefficients for the labor market variables for unqualified nurses are shown in table 7.3.

TABLE 7.3: CORRELATION COEFFICIENTS FOR LABOR MARKET VARIABLES FOR UNQUALIFIED NURSES

Variable	LAWAGE	RBED	ALVAC	NVAC	MUNE	SBR	RHP
LAWAGE	1.000						
RBED	.746	1.000					
ALVAC	.738	.879	1.000				
NVAC	-.563	- .140	.336	1.000			
MUNE	.737	.334	.455	-.963	1.000		
SBR	.758	.628	.752	-.739	.795	1.000	
RHP	.424	.026	.140	-.737	.911	.575	1.000

The table shows that several variables which describe conditions in the local market: RHP, MUNE, and NVAC are highly correlated. Multicollinearity can bias results, but the feasible antidote in this case -eliminating variables- introduces the risk of misspecification. In the estimations which follow, the less important of two variables, known to be highly correlated, is eliminated as long as the significance levels on the remaining variables improve and the alteration produces no suggestion of misspecification. From (7.24b), the revised model for estimation is:

$$(7.27)\quad P(Q_{UG}) = F\{\underset{-}{AAD}\ \underset{-}{SBR}\ \underset{-}{LNWAGE}\ \underset{-}{CHP}\ \underset{+}{LAWAGE}\ \underset{+}{NVAC}\ \underset{+}{ALVAC}\ \underset{+}{RBED}\ \underset{-}{CHP}\}$$

The results for the Cox and log-logistic models for unqualified nurses who left their posts to take up other jobs are provided in table 7.4. Most variables have the predicted effect on the conditional probability of an unqualified nurse leaving for another job and all are significant at the 10% level or less with the exception of private beds in the region, RBED.[24]

In the Cox model older nurses are again less likely to leave for other employment, while changing the terms of employment and rising nursing wages also reduce this likelihood. As

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24SBR is not shown in the table as it was wholly insignificant in both models and deleted from the estimations.

Table 7.4: Results For Models of Quits to Other Jobs for Unqualified Nurses

Dependent Variable = Conditional Probability of Quitting

Variables	COX MODEL	LOG-LOGISTIC MODEL
One	-	-17.3660* (-6.507)
AAD	-0.0328461* (-2.113)	-0.0141433* (-2.057)
LNWAGE	-5.08702* (-2.111)	-2.50947* (-2.188)
RBED	0.0183303 (1.248)	0.00434802 (1.017)
NVAC	0.0478110* (5.948)	0.0188167* (7.834)
LAWAGE	36.5202* (3.728)	9.64584* (3.051)
ALVAC	-0.00628297* (-4.698)	-0.00168063* (-6.488)
CHP	0.895329 (1.540)	-0.515884 (-0.199)
SIGMA	-	0.348176* (10.818)
*Significant at the 10% level or less.		
Quits to Other Jobs	66	66
Total Sample	248	248
Log-likelihood	-241.66	-127.122
Lambda	-	0.03095
P	-	2.87211

the availability of nursing jobs increases, higher levels of nursing vacancies and regional beds, NVAC and RBED, encourage unqualified nurses to quit for other jobs, although the effect of the latter is not significant.

The model produces two surprising results. The first is that the sign on CHP is positive which suggests that nurses who change their terms of employment are more likely to leave. In this instance CHP could be signalling a productive employee, as an effort has been made by management to retain her, who is more likely to be able to find another job, or alternatively, one who is dissatisfied with work as manifest in her having altered her shift or hours or work. It is impossible to identify which explanation applies.

The other surprising result is the sign on ALVAC. Increases in the number of alternative vacancies in Oxford decrease the likelihood of nurses leaving for alternative employment. This is an unexpected result as the data indicated that unqualified nurses were indeed leaving for other types of work and there is no reason why a high level of alternative vacancies should decrease the likelihood that unqualified nurses will leave their posts; if the effect is not positive, it should be wholly insignificant. A probable explanation for this is that the model has produced a spurious correlation which can occur in duration models when

a variable exhibits a strong upward or downward trend and the sample size is small.

Recall from figure 7.3 that ALVAC is strongly trended upward. A number of nurses will have left their posts in response to rising vacancies, but as ALVAC has continually increased since 1982, those who have remained in post, for other reasons, will have the highest levels of alternative vacancies associated with their lengths of stay. Thus, as high levels of alternative vacancies are associated with long stays, they will appear to affect negatively the likelihood of leaving; this correlation, however, is spurious.

This model, like that for qualified nurses, suggests that the quit behavior of this group is very responsive to wage levels. A rise in the wage in alternative employment significantly increases the conditional probability of quitting, while an increase in the nursing wage discourages it.

The results from the log-logistic model confirm the Cox results. Changing contract terms, CHP, when specified in binary rather than time-varying form, is signed as expected, but insignificant. The log-logistic model produces a median duration of employment of 32.36 months and the coefficient on the nursing wage indicates that duration for this group

is even more responsive than that of qualified nurses as the elasticity of median duration with respect to the wage is 2.51.

ii. Quits to Non-Participation

The results of the estimates for both groups for those who leave their posts and the labor market altogether are shown in Table 7.5. Disappointingly, it was not possible to estimate the Cox model for either group because of difficulties in achieving convergence with three time-varying covariates, thus only the log-logistic results are presented in the table. The results for qualified leavers are contained in column one, while those for unqualified leavers in column two.[25]

All variables in the model of quits to non-participation for qualified nurses, for which predictions were made, exhibit the expected sign and are significant at the 5% level, with the exception of age, AAD, which is significant at the 19% level only. Changing the terms of employment and increases in the nursing wage significantly decrease the likelihood that nurses will leave their posts to non-participation. As expected, the coefficent suggests that the nursing wage has

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25RHP is not included in the estimations for either group as it is highly correlated with MUNE -see table 7.3- and including both values in the model reduced the significance levels of several other variables. Of note is that when MUNE was excluded RHP proved insignificant.

a strong effect on time spent in post. Median duration, 49.05 months, for this group is substantially longer than that for leavers to other jobs, while the elasticity of median duration with respect to the nursing wage is somewhat lower at 0.86.

The results also confirm a number of other predictions. Older nurses are also less likely to leave their posts and the labor force altogether, while getting married, becoming pregnant, or declining health increase the likelihood a nurse will leave her post to non-participation. As previously discussed, marriage proxies an increase in nonlabor income, while having a baby proxies an increase in the reservation wage or a rise in the costs associated with employment. All models indicate that nurses are significantly more likely to leave to non-participation if either event occurs during employment.

b. Unqualified Nurses

The results for unqualified nurses closely parallel those for qualified nurses with only a few exceptions. Age positively affects the likelihood of leaving to non-participation for this group, although the effect is not significant at conventional levels and CHP, while negatively signed is wholly insignificant. Median duration for this group is slightly shorter than that for unqualified nurses

Table 7.5: Results for Leavers to Non-Participation for Qualified and Unqualified Nurses

Dependent Variable = Conditional Probability of Quitting

Variables	LOG-LOGISTIC MODEL Qualified Nurses	LOG-LOGISTIC MODEL Unqualified Nurses
One	18.9914*	17.6111*
	(5.812)	(4.843)
AAD	-0.00898227	0.00730917
	(-1.286)	(1.062)
HIND	0.000694693*	0.000620820*
	(2.533)	(4.545)
SBR	-0.185790*	-0.152899*
	(-5.769)	(-4.663)
MUNE	-0.129630*	-0.365771*
	(-2.203)	(-4.966)
LNWAGE	-0.864409*	-2.35499*
	(-2.012)	(-1.876)
CHP	-0.785671*	-0.260912
	(-3.647)	(-0.794)
CHM	0.813882*	0.694427*
	(5.347)	(2.312)
CHPG	1.00951*	0.865508*
	(6.828)	(4.303)
SIGMA	0.525238*	0.447648*
	(13.804)	(12.569)
*Variables are significant at the 10% level or less.		
Number of Quits	162	115
Total Sample	736	248
Log-likelihood	-363.38	-193.52
Lambda	0.02039	0.03344
P	1.90390	2.23390

leaving for other jobs; it is 29.90 months. The elasticity of median duration with respect to the nursing wage is again sizeable at 2.35.

iii. Quits to Take Up Training

a. Qualified Nurses

Table 7.6 contains the results of the models for leaving to take up training. It is recognized that this is not a complete model and variables which were highly insignificant were eliminated from the estimations. The results for the Cox and log-logistic models for qualified leavers are shown in columns one and two, while those for unqualified leavers are shown in columns three and four.

The results from both models for the first group are quite similar and they suggest that the model primarily captures the conditions under which training is supplied rather than those under which qualified nurses would choose to take it up. In the Cox and log-logistic models high wage levels and vacancy levels, and an increase in the number of regional beds increase the likelihood that qualified nurses will leave their posts to take up further training, although only nursing vacancies are significant. As higher values for these variables indicate periods when the demand for nurses is relatively high, it is likely that what is revealed here are conditions under which post-basic courses are offered.

Table 7.6: Results for Model of Quits to Training for Qualified and Unqualified Nurses

Dependent Variable = Conditional Probability of Quitting

	COX MODEL	LOG-LOGISTIC MODEL	COX MODEL	LOG-LOGISTIC MODEL
Variables	Qualified Nurses		Unqualifed Nurses	
One	-	-5.72739* (-2.080)	-	-7.63131* (-1.186)
AAD	-0.278142* (-7.012)	-0.188123* (-8.346)	-0.141653* (-4.331)	0.100413* (-5.370)
LNWAGE	0.896351 (1.102)	0.609728 (0.917)	-17.5541* (-2.824)	-10.1658* (-3.162)
NVAC	0.0128376* (4.739)	0.00833196* (5.216)	-	-
SNVAC	-	-	0.0223385* (3.035)	0.0157936* (3.968)
RBED	0.00358889 (1.135)	0.00224514 (0.769)	0.0117846 (1.570)	0.00439775 (0.755)
CHP	-1.40819 (-1.347)	-1.73669* (-2.578)	-12.4945 (-0.009)	-0.419376 (-0.677)
SIGMA	-	0.616197* (13.113)	-	0.534600* (5.029)
a.Variables are significant at the 10% level or less.				
Number of Quits	122		30	
Total Sample	736		248	
Log-likelihood	-649.81	-342.47	-120.59	82.777
Lambda	-	0.06516	-	0.01003
P	-	1.62286	-	1.87056

The wage variable, furthermore, potentially indicates not only when training is more likely to be supplied, but also which nurses are likely to be selected for training. The positive coefficient on the nursing wage signals a more qualified nurse as they are the ones who are receiving higher pay and as well are the candidates most likely to be chosen for further training.

As expected, as age increases, nurses are less likely to leave their posts to take up training. This potentially reflects the fact that older nurses are less likely to pursue training as well as the fact that older nurses are less likely to be selected for training. Finally, having changed posts, CHP, significantly decreases the likelihood that a nurse will leave for training.

b. Unqualified Nurses

For unqualified nurses, the Cox and the log-logistic model of the models of quits to training produce consistent results. Older nurses are less likely to leave for training, while more nurses are likely to leave as vacancies for skilled nurses rise. As the wage in the current job rises, unqualified nurses are less likely to leave for training, but the effect of changes in the relative pay of unqualified to qualified registered nurses, RWAGE, is

insignificant and the sign is counterintuitive. Changing terms of employment does not significantly affect this decision.

In both the log-logistic model for qualified and unqualified nurses, median duration is implausibly high. The figure is 82.46 months for qualified nurses, while it is 99.72 months for unqualified nurses. This clearly suggests that more information than is available here is needed to specify adequately a model of quits into training.

V. Conclusions and the Results of the Aggregate Model

Before presenting the results from the aggregate model, it is useful to summarize the findings for disaggregated models for individual quits decisions. The results from two of them, quits to other jobs and to non-participation, prove to be highly satisfactory and quite informative about different reasons for leaving and their determinants.

For leavers to other jobs, the results suggest that market conditions in terms of job availability are important in affecting quits. The availability of nursing jobs in both the private sector increases the likelihood that qualified nurses will leave their posts. Unqualified nurses respond both to nursing vacancies, in both the public and private sectors, and to alternative vacancies, although the sign on

the latter variable was problematic. For leavers to non-participation, changes in personal circumstances such as marriage, pregnancy or declining health clearly induce quits, while increases in male unemployment lead to fewer quits of this kind. Both decisions, furthermore, are affected by working conditions.

Employment conditions affect quits to other jobs and to non-participation in several ways. Increases in the workload, as proxied by the staff to bed ratio, increase quits, while flexibility, in terms of changing shifts, hours or posts, decreases them for qualified nurses. Rising wages significantly reduce the likelihood of leaving for any reason for qualified and unqualified nurses, although the response varies by group and by type of quit.

As might be expected, qualified nurses who have already committed themselves to nursing by investing in training, are less influenced by financial incentives than unqualified nurses who may move in and out of the profession. Also, it is important to note that for both groups the decision to leave the labor market altogether is less influenced by wage changes than that to move to another job.

Of interest as well is that relative house prices were not found to be a conventionally significant determinant of quits to other jobs or to non-participation. There are

several potential explanations for this finding. House prices tend to vary interregionally, while most nursing job to job moves are intra-regional. As a result differential house prices may not affect the decisions of nurses who are planning to change jobs. A second factor potentially decreasing the significance of relative house prices is that all qualified nurses at the JRII have access to NHS housing, which is partially subsidized by the Service and thus insulates them to a degree from rising rents and house prices.[26] Finally, the fact that most nurses in the sample were not in employment during the period when house prices in Oxford rose dramatically may in part explain why no house price phenomenon was observed. Information, not presently available, would be required to explore this finding in greater detail.

Also, of note is that the results indicate that older nurses, on the whole, are likely to remain in post longer than younger nurses. This suggests that increasing the average age of a nursing staff would increase the length of time most nurses stay in post and reduce quits.

Given that part of the motivation behind this examination of quitting was the desire to find ways to affect these decisions, it is worth emphasizing that raising wages and altering terms of employment are not only two important

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26A program to align gradually NHS rents with those in the relevant housing market has been underway since 1984.

deterrents to quitting, but they are also factors over which managers potentially have some discretion. The models above suggest that responding to employee needs, in terms of altering contract requirements, will reduce the quits of qualified nurses. They also underline the degree to which the Pay Review Body influences the quit rate through the nursing wage they set.

While the models above identify the responses of certain types of leavers to changes in remuneration levels, it is important to consider the net response to changes in pay as this is what will determine gains or losses in retention from the actions of the Pay Review Body. An aggregate model, as it identifies the overall response from nurses to a change in pay, provides such a gauge for policy makers.

The results from the collective quit models are presented for qualified and unqualified nurses in table 7.7.[27] Columns one and two contain Cox and log-logistic results for the first group, while the third contains log-logistic results for unqualified nurses only. The models generally confirm the results of the previous estimations and only the wage coefficients and the effects of the time-varying covariates versus the binary specifications in the Cox and

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27This includes nurses who left for reasons unknown, who emigrated, who left for non-nurse training, who joined the military and so on. Table 6.9 gives a complete account of reasons for leaving for all nurses in the sample.

Table 7.7: Results for the Aggregate Quit Models for Qualified and Unqualified Nurses

Dependent Variable = Conditional Probability of Quitting

	COX MODEL	LOG-LOGISTIC MODEL	LOG-LOGISTIC MODEL
Variables	Qualified	Qualified	Unqualified
One	-	14.9415*	-16.4640*
		(8.998)	(-3.446)
AAD	-0.0577828*	-0.0459459*	-0.0107278*
	(-7.773)	(-13.510)	(-2.452)
HIND	0.000263793	0.000232616	0.000193324
	(1.078)	(1.548)	(1.423)
SBR	-2.85862*	-0.159998*	0.0589406*
	(-8.745)	(-8.730)	(1.814)
MUNE	-0.0774967	-0.0890370*	-
	(-1.333)	(-3.024)	
LNWAGE	-0.790674*	-1.29026*	-2.76843*
	(-2.676)	(-6.115)	(-3.515)
RBED	0.00679383*	0.00565654*	-
	(4.029)	(5.220)	
LAWAGE	-	-	4.81279*
			(2.661)
NVAC	-	-	0.0228022*
			(10.370)
ALVAC	-	-	-0.00149886*
			(-7.195)
CHP	-1.24031*	-0.678732*	-0.1179061
	(-6.669)	(-5.391)	(-0.504)
CHM	1.34590*	-0.0818876	0.0152900
	(9.675)	(-0.807)	(0.069)
CHPG	1.29546*	-0.192998*	0.0434684
	(9.786)	(-2.056)	(0.325)
SIGMA	-	0.424776*	0.335221*
		(29.426)	(18.224)
*Variables are significant at the 10% level or less.			
N	736	736	248
Log-likelihood	-3530.8	-817.05	-220.84
Lambda	-	0.06965	0.05683
P	-	2.35418	2.98311

log-logistic models for qualified nurses merit further discussion.

In the Cox model CHM and CHPG are specified as time-varying covariates, while CHP had to be left in binary form for convergence to be achieved. All three significantly affect the conditional probability of quitting and are signed as expected. Changing the terms of employment decreases this likelihood, while getting married or becoming pregnant significantly increases it. In the log-logistic model, however, CHM and CHPG decrease the likelihood of quitting, with only the latter being significant. This again calls into question the reliability of the binary specification for dichotomous values. Of note is that while insignificant, the binary specifications are signed as expected in the model for unqualified nurses.

All three models indicate that nurses are responsive to changes in their pay. From the log-logistic estimations an aggregate elasticity of median duration with respect to the nursing wage for qualified and unqualified nurses who leave for any reason can be identified. Along with those from two previous models, table 7.8 presents these elasticities and the values of median duration for each group.

TABLE 7.8: ELASTICITIES OF MEDIAN DURATION WITH RESPECT TO THE NURSING WAGE BY REASON FOR LEAVING AND BY SKILL GROUP

Leavers	Qualified Nurses	Unqualified Nurses
To Other Jobs		
Nursing Wage Elasticity	1.36	2.51
Median Duration (Months)	25.29	32.36
Number of Quits	(319)	(66)
To Non-Participation		
Nursing Wage Elasticity	.86	2.35
Median Duration (Months)	49.04	29.90
Number of Quits	(182)	(115)
Aggregate Quit Model		
Nursing Wage Elasticity	1.29	2.77
Median Duration (Months)	15.53	18.07
Number of Quits	(678)	(227)
Total Sample	(736)	(248)

The figures in the above table suggest that raising the real nursing wage by 10% will increase the median time a qualified nurse spends in post by 12.9%, while for an unqualified nurse by 27.7%. This means that if the hourly pay of a registered staff nurse rose by 10%, she would remain in post an additional two months. Those unqualified nurses who were planning to leave and received a similar rise would stay in employment an additional two months.

These figures demonstrate the gains in terms of extended service that can be achieved from increasing nursing pay. Used in conjunction with the results from chapter four,

furthermore, they provide a means of evaluating policies to increase the supply of nurses as both the effects on participation and retention, i.e. inflow and outflow, can now be taken into account. Several supply options are evaluated in chapter eight, but before that discussion begins, a few remarks on the differences between the findings of the Cox and log-logisitic models used in this chapter are in order.

As previously stated, the Cox model is preferred in theory to the log-logistic as the effect of changes in important variables, such as marital status, can be measured when they occur through time-varying covariates, TVCs, rather than simply being recorded as having occurred in the binary specification. Using TVCs, however, places substantial demands on the computer programs which estimate these models as they necessitate computations with three dimensional matrices instead of two. It is, thus, not surprising that convergence on small samples with several time-varying specifications can be difficult to achieve.

At present, the statistical packages available do not allow construction of complex time-varying covariates nor can many of them be included in one model. The results here indicate that time-varying specifications are superior to binary ones as the variables used here, CHM and CHPG, take on the sign known to be correct when specified in the time-varying

format. As the facilities become available, use of TVCs in hazard function analysis should become widespread.

Chapter Eight

Conclusions of the Analysis and the Evaluation of Four Policies to Increase the Supply of Nurse Labor

Introduction

The preceeding seven chapters have provided a comprehensive examination of the nursing labor market in Great Britain and of the labor supply decisions of nurses, both qualified and unqualified. The characteristics of the market itself and the conditions of work, of training, and of pay bargaining for nurses, an occupational group involving over half a million women and a wage bill of £5600 million a year, were discussed in the first two chapters, while in the latter five both static and dynamic labor supply models were developed and tested for women in this profession.

This chapter summarizes earlier findings and uses the results from the supply models to analyze four plans to increase the nursing workforce. Supply augmenting polices are focused on as securing and maintaining an adequate supply of nurses is a growing concern for most Regions and Districts in light of anticipated demographic changes and increasing competition from the private sector. The financial constraints they face, furthermore, make choosing the most cost effective policy a priority. The chapter concludes by discussing the

implications of the policy analysis and by identifying areas which call for further research.

I. The Findings to Date

Through a review of its structural features, the first chapter demonstrated that the nursing labor market is one driven by exogenous constraints and by the labor supply behavior of nurses themselves. The demand for nurses is a function of the resources allocated by the Treasury to the Department of Health rather than an amount derived from the demand for health care. It was shown to be closely related to general economic growth or the GDP per capita. As nurse training schools and student salaries/bursaries are funded by the Department through Regional Health Authorities, a dimension of supply, student labor, is also determined by government expenditure.[1] Over the last two decades the inflow of students into nursing has remained constant with roughly 55,000 in SRN training each year.

The wage rate as well is set outside the market by the Review Body for Nurses, Midwives, and Health Visitors, and supply is a function of this rate. Based on comparisons between the remuneration levels set by the Review Body and the valuations of their time in other activities, nurses choose whether or not to take up

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1 This assumes that applicants exceed funded places, an issue discussed in chapters one and two.

employment or to remain in post. It is these supply decisions, furthermore, which were found to drive the market.

Supply is comprised of those who have chosen nursing as an occupation and who are willing to work at a given point in time. Over time it can be expressed as a function of those working (the current stock of nurses) plus the inflow of new workers minus the number who leave employment, the outflow. Data from this period show that the number of nurses employed, particularly those qualified, rose dramatically, while both student inflow and the rate of outflow of nurses from the Service remained constant. Thus, the increase in the numbers working appears to have come from increased rates of participation among nurses generally.

In the nursing labor market the wage rate set by the Review Body determines the observed level of employment. Given demand and student supply, if pay is set at a level above which the market, without this interference, would clear, the budget allocation determines the observed level of employment and nurse unemployment occurs. On the other hand, if pay is set below this level, employment is determined by the labor supply curve of nurses or the number willing to work at a given wage. As non-frictional unemployment is rare in the profession and vacancies are the magnitude predominantly monitored, the

supply curve was found to determine the level of employment.[2]

Evidence on dismissals and redundancies reinforces the impression that the market is supply driven. The data, available, while limited, indicate that dismissals from NHS posts are extremely rare and that redundancies in the Service are minimal.[3]

Given that individual supply decisions, in terms of participation and quitting, dominate the market, an investigation of these choices was clearly called for. Furthermore, in light of the market's structure, they could be examined in isolation rather than in a general equilibrium framework. The following chapters thus set out to present and test models of these choices.

Before a quantitative analysis of supply was undertaken, however, a more detailed picture of important aspects of working in the profession was required as certain features needed to be taken into account in formulating and interpreting the supply models. The areas of interest were: the conditions of employment within the NHS, the nation's primary nurse employer, the training

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2 Of note is that Review Body statistics from 1985 on indicate that the number of vacancies has been small, less than five percent, which suggests that in the late 1980s the market was fairly close to a constrained equilibrium point.

3 If redundancies occur, they most often involve a redistribution of labor between Districts or Regions rather than posts being lost. This was mentioned in conversations with Department officials and a number of District personnel managers.

arrangements for nurses, and pay bargaining. Of note is that the 1980s was a decade in which nurses were adjusting to or instituting significant reforms in all three areas.

Concerning employment in the Health Service, nurses were adapting to a dramatic change in their position in the NHS hierarchy and to changes in the Service itself. When the Service was first established, they, along with administrators and doctors, formed a tripartite management team to govern hospitals. Nurses initially had difficulty in exercising their full authority and the first Health Service reorganization attempted to remedy this situation. The second, however, abandoned consensus management altogether for streamlined decision-making by general managers in which nurses played a solely advisory role.

Along with the new managerialism, a climate of increasing fiscal stringency was emerging. This included drives to improve efficiency and to introduce, where possible, elements of competition and explicit pricing into the Service's structure. The resulting changes have placed a great deal of pressure on nurses. Cutbacks in expenditure have affected the physical environment in which they work, while measuring their productivity, necessary for reward under the new efficiency criteria, has been frustratingly difficult due to the nature of

their work and of health care itself. Both have had a deleterious effect on morale.

Concomittant with the many changes that were occurring within the Health Service, the profession itself was grappling with a reform package for nurse training, entitled Project 2000. Throughout this century a debate has raged about whether nurses are clinicians or semi-skilled carers and this disagreement, along with concerns over national nurse supply and financial constraints, has precluded a rational educational system for nurses being established. As a result, over the last 40 years, two types of nurses, SRNs and SENs, with their own training courses and career structures have existed, but the cohabitation has not proven satisfactory nor resolved concerns over supply.

Along with the second Health Service reorganization in 1979, a four country regulatory body for nursing, the U.K.C.C. was founded. Under its auspices, a consensus around the view of nurses as clinicians was formed and proposals for education reform followed. The result is Project 2000, a 10 year program, introduced in 1989, which eliminates the category of enrolled nurse, converts students from employee to supernumerary status, and rationalizes the nursing curricula, basic and post-basic. While initial training for each nurse will be more costly and the service contribution of students will be reduced, the Health Service is expected to benefit from a decline

in student wastage, nurses becoming more productive generally, and staff requiring less post-basic training due to improvements in the core curriculum.

Of final note is that the system for determining nursing pay has also been recently reformed. Given that the NHS is a monopsonistic employer and that no obvious comparator group for nurses exists, remuneration levels have been a source of contention between them and their employers for decades. Pay for nurses was initially negotiated via the Whitley Council, the system used to determine the pay of all NHS employees. After Government inquiries in 1974 and in 1979 and industrial action by nurses themselves, an independent Review Body was established in 1983 to set nursing salary scales; a streamlined Council remained in place to deal with working conditions.

The establishment of the Review Body was welcomed and under its jurisdiction, the pay of qualified nurses has generally moved in line with that of other female non-manual workers. The Government's refusal on subsequent occasions to fund pay awards in full or to implement immediately the recommended rises, however, has undermined the effectiveness of the new machinery.

Shortly after it was reformed, the new Council initiated a restructuring of the profession. The auxiliary to senior sister designations were abandoned for a simpler,

alphabetical system which attempted to align task performance and assigned grade. However, the fact that nursing pay budgets and salary scales for the new grades were set before the regrading took place called into question the independence of the exercise. It is most unfortunate that establishing the Review Body and the professional regrading, both significant achievements for nurses, were enacted in ways which minimized their effectiveness.

Given that chapter two provided a clear description of the environment in which nurses work, the chapters which followed focused on a quantitative analysis of supply at the micro level. Chapters three and four addressed the question of participation at a particular point in time, while five through seven dealt with the quit decision, a dynamic choice over time. Chapter three outlined the descriptive information available on nurses' participation behavior and emphasized that they, like many other women, work full-time until they marry or have children after which they work intermittently or part-time. Of note was that nurses who work part-time, work a considerable number of hours.

Also, included in the chapter was a survey of the general literature on female labor force participation. It indicated that application of the static, neoclassical model of labor supply to this occupational group would be useful. While several attempts had been made to analyze

data on U.S. nurses in this way, the models were neither rigorously defined nor appropriately estimated. The survey also revealed the existence of a database, the *Women and Employment Survey*, which could be used for this purpose.

Chapter four presented a probit model of labor force participation for nurses in Great Britain. Selection bias corrected wage and hours equations were included as part of the estimation procedure as well as a test for supply discontinuity. The results indicate that participation and hours worked are primarily determined by the market wage, the amount of nonlabor income to which the nurse has access, and the presence of children in the household. For the full sample, the elasticity of participation with respect to the wage was found to be 1.40, while that for hours worked, 7.53. Of great importance is that the labor supply curve itself was found to be discontinuous with a large number of hours of work. 29.9, being associated with the reservation wage. This discontinuity arises from the fact that taking up employment generates substantial expense for nurses and as over half the nurses out of the labor force had young children, the costs were believed to be those associated with childcare. The elasticity of participation with respect to fixed costs was calculated to be 0.67.

Chapters five, six, and seven, investigated the related decision to quit. Chapter five reviewed the information

available on nursing quits and the related economic literature. Aside from estimates of their magnitude, little is known about voluntary job terminations in nursing as data on this subject are scarce. While the economic literature has identified factors which affect quits generally, such as market conditions, the costs of search, and expectations about future pay, most of this work has concentrated on men whose decisions differ substantially from those of women. Unlike their female co-workers, males seldom willingly leave the market for non-participation. Thus, the conclusions of this survey were that data which identified quits and the reasons behind them needed to be collected and a methodology for analyzing this decision for nurses to be developed.

Chapter six described in detail the data collected from the John Radcliffe II Hospital in Oxford for the purpose of examining nurses' quit decisions. The employment histories of two groups of nurses: those hired in June of 1979 to June 1980 and those hired from June 1984 to June 1985, made up the database. For both qualified and unqualified nurses taking up employment in either period, the three primary reasons for quitting were to start another job, to take up training, or to leave the labor force altogether. Job changes for qualified nurses were intra-occupational, while those for close to a third of unqualified nurses were not. Both cohorts were young, highly skilled, and stayed in post a relatively short

time. The average length of time spent in post for all four groups was relatively short, less two years.

Chapter seven extended the model of chapter four to examine participation over time. It was based on a comparison of wage values: that in the current job, W_c, that in alternative market activity, W_a, and that out of the market, the reservation wage, W_r. It also included the probability of finding another acceptable job or of a change in the reservation wage occurring and the costs of search. The decision to quit a job in any one period was viewed as evidence that either W_a or W_r had exceeded W_c and a conditional probability model or a hazard function was used to identify the relationship between the likelihood of leaving and changes in the various wage values.

Three quit decisions: to leave to another job, to leave non-participation, and to leave to take up training were examined for qualified and unqualified nurses and both a parametric and a non-parametric form of the hazard were estimated. While the non-parametric specification, a Cox model with time-varying covariates, was the superior formulation, it proved difficult to achieve convergence in several cases. The log-logistic, on the other hand, performed satisfactorily and proved useful as the estimated coefficients represent the elasticity of median duration, the complement of the conditional probability of leaving, with respect to changes in each variable.

For both qualified and unqualifed nurses, the likelihood of quitting to take up another job was found to depend on the availability of alternative employment, conditions on-the-job, and the wage in the current post. The median duration of qualified nurses who left for this reason was 25.3 months, while for unqualified nurses it was 32.4 months. The elasticity of median duration with respect to the current nursing wage for leavers to other jobs was 1.36 and 2.51 for qualified and unqualified nurses respectively.

Quits to non-participation for all nurses were affected by changes in personal circumstances i.e. getting married or becoming pregnant as well as changes in working conditions and again, the current wage. Median duration of qualified nurses who left to non-participation was substantially longer at 48 months and the elasticity was lower at 0.86. For qualifed nurses both values remained relatively unchanged: 29.9 months and 2.35.

The models for leaving for training were not successful as the wage comparison framework failed to capture important elements which affect this decision. For qualified nurses the conditions under which training opportunities were supplied appeared to be revealed, while for unqualified nurses those under which training is demanded. This is an area where additional research is needed.

Finally, a model which aggregated the various quit decisions was estimated to show how quits overall respond to changes in various values, particularly the wage. For both groups the likelihood of quitting significantly declined as the wage rose. The median duration of qualified nurses was 15.5 months, while 50% of all unqualified nurses stayed in post for a slightly longer period, 18.1 months. The elasticity of median duration with respect to the current wage was 1.29 for the former group and 2.77 for the latter. Along with the effect of the wage, it is important to emphasize the role of conditions on-the-job in affecting all types of quits for qualified nurses. The higher the staff to bed ratio the less likely nurses are to quit their jobs, while having negotiated a change in shift, hours, or post also significantly reduces the likelihood of quitting for any reason.

Together the supply models from chapters seven and four present a comprehensive picture of the work behavior of nurses. Participation and the number of hours worked are a function of family responsibilities, financial commitments, and the wage on offer, while quitting reflects changes in personal circumstances, market opportunities, and conditions on-the-job, particularly the wage rate, over time. Given that both decisions are influenced by working conditions and pay, the Review Body and managers have significant leverage to affect these

choices and the supply of nursing labor, an important national resource. The next section uses the findings from earlier chapters to evaluate several policies designed to increase supply and discusses the costs and benefits implicit in each.

II. Policy Options

As previously discussed, the supply of nurse labor can be expressed as a function of those working in a given period (the stock), plus inflow, less outflow. This description implies that supply can thus be adjusted by recruiting new workers, increasing staff retention, or extracting more hours of work from those currently working. For this discussion four policies designed to increase the supply of nurse labor are examined below. They are: training new staff, attracting those who are out of the labor force back to work through pay increases or childcare subsidies, or using overtime.

The latest Review Body surveys indicate that while vacancy rates vary by type of post and District, the national vacancy figure has ranged from two to five percent. With this in mind, the desired increase in WTE nursing staff is assumed to be five percent and based on the findings in chapters four and seven, the information available on expenditures for nurse training and recruitment, and a few assumptions, the respective costs of the policies listed above can be estimated.

Tables 8.1a and 8.1b provide some points of reference for the discussion. The first summarizes the elasticities and employment durations produced from the models in chapters four and seven which are used to analyze the four supply policies, while the second indicates how a five percent increase in labor supply would translate into additional hours of work and numbers of WTE nurses, qualified and unqualifed.

Table 8.1a: A Summary of the Results from Chapters Four and Seven Used to Evaluate Policies to Increase Supply

Elasticity and Duration Estimates	Category of Nurse	
	For All Nurses	
Elasticity of Participation		
with respect to the nursing wage	1.40	
with respect to fixed costs	0.67	
Elasiticity of Hours Worked		
with respect to the nursing wage	7.53	
	Qualified	
Unqualified		
Elasticity of the Median Duration of Employment with respect to the nursing wage		
before leaving to non-participation	0.86	2.35
before leaving for any reason	1.29	2.77
Elasticity of the Median Duration of Employment with respect to fixed costs[a]	0.41	1.13
Median Duration in Post in Months		
before leaving the labor market	49.04	29.90
before leaving for any reason	15.53	18.07

a. This value is calculated, based on assumptions explained below, rather than directly from the results of an empirical model.

All values in the table 8.1a have been presented in earlier chapters with the exception of one: the elasticity of the median duration of employment with respect to fixed costs. As it is useful in the analysis which follows, this value was approximated. The calculation assumes that the ratio of the elasticity of participation with respect to the nursing wage and the elasticity of participation with respect to fixed costs is the same as the ratio of the elasticity of median duration with respect to the nursing wage and the elasticity of median duration with respect to fixed costs. For example for qualified nurses: 0.67/1.40 = x/0.86, where x = the approximated elasticity of median duration with respect to fixed costs.

Table 8.1b: Nursing Workforce Statistics for 1989[4]

Total Nursing and Midwifery Staff	WTE	369019.0
Qualified Staff		272336.0
Unqualified Staff		96683.0
Total Number of Hours Worked Yearly	millions	650.4
Total Nursing Paybill	millions	5378.0
Average Annual Nursing Salary	pounds	14573.8
5% Increase in WTEs		
Additional Nursing Staff	WTE	18451.0
Qualified Staff		13617.0
Unqualified Staff		4834.0
Additional Nursing Hours	millions	32.5

4 Staff numbers for 1989 are projections, based on figures given in the *Health and Personal Social Service Statistics* (1989). The number of hours worked assumes five weeks holiday, while the annual paybill figure is taken from the *Sixth Report of the Review Body for Nursing Staff, Midwives, and Health Visitors*. All subsequent cost estimates are in 1989 prices.

Table 8.1b shows how a five percent increase in inflow translates into additional workers or hours of work. In 1989 the total number of WTEs employed, both males and females, was 369,019; 74% of the staff was qualified.[5] The number of hours of work supplied by all nurses was just over 650 million at a cost to the Department of Health of nearly £5400 million. To increase the supply of nursing labor by five percent, with the qualified to unqualified ratio held constant, an additional 13,617 qualified nurses and 4834 unqualified nurses would be required or an extra 32.5 million hours of nurse labor from some source. The various initiatives for securing this laborpower with their associated benefits and costs are discussed below.

a. Increase Numbers in Training

One way to increase the supply of nurses is to train more women (and men) to registration and to hire extra auxiliaries. If students currently in training are assumed to be replacements for nurses who are retiring or leaving the labor force, an additional 13,617 recruits would need to be trained and an additional 4834 unqualified nurses hired to increase the labor force by

5 A sex breakdown for WTE staff is not given for any NHS staff groups.

five percent. The cost of securing each contingent is outlined in turn.

In their evaluation of the costs and benefits of Project 2000, Price Waterhouse (1987) estimate the costs of nurse training under the current system and under the new proposals. If these figures are adjusted for inflation, the average cost of training a nurse to registration in 1989 prices is £24007.0 and under Project 2000 it is £31298.4. While specfic details on the estimates can be obtained from the Price Waterhouse report, the latter figure essentially accounts for an improved student/teacher ratios, for converting students to supernumerary status, and for their reduced service contribution under Project 2000. If the 13,000+ extra trainees could be accomodated <u>within</u> the educational resources budgeted for above and the increased numbers could be attracted from the declining number of 18 year olds, the human capital investment required to secure these additional workers would be £326.9 million under the current system and £426.2 million under Project 2000.

To the inital training investment must be added the cost of hiring these nurses once qualified and that of paying their salaries once in post. Gray et al (1988) estimate the cost of hiring, advertising a post, interviewing the applicant, and processing paperwork, at £275 per employee.[6] The 1989 report from the Review Body listed

6 This is the midpoint of Gray's estimate based on a survey of six southeast DHAs.

the starting salary for a registered staff nurse; it was £9175; both these figures are used in the calculations in table 8.2.

Hiring additional unqualified staff is a less complex proposition. Given the participation elasticity of 1.40, the average wage of unqualified nurses would have to be increased by 3.6% to secure a five percent increase in staff numbers. Thus, the rise for existing workers, the pay of new workers, and the hiring costs all need to be taken into account. Table 8.2 summarizes the costs of increasing staff numbers by training additional qualified staff and hiring more unqualified nurses.

Table 8.2: Costs of Increasing WTEs by Training New Staff and Hiring Additional Unqualified Staff in £ Million

	Current	Project 2000
Cost of Newly Trained Qualified Staff		
RGN Training	326.9	426.2
Pay for New Workers[a]	124.9	124.9
Cost of New Unqualified Staff		
Pay for New Workers[b]	27.8	27.8
Cost of Pay Increase for Staff in Post	20.9	20.9
Hiring Costs	5.5	5.5
Total	506.0	605.3

a. Newly qualified RGNs are assumed to be hired on the midpoint for Grade D.
b. New auxiliaries are assumed to be hired on Grade A, point one plus 3.6% percent, while the average auxiliary is assumed to be on the midpoint of the Grade A scale plus 3.6%.

The table above shows that the cost of increasing the labor supply of nurses through training and hiring is substantial. The estimated total under current training arrangements is £506.0 million, while it is £605.3 under Project 2000. The primary drawback of the scheme is that 74% of the additional workers, the newly trained, would not be available for employment until three years after investment was begun; prior to this, their service contribution, depending on which program was in operation, would vary between twenty and fifty percent of their time.

It is important to note that the figures above are likely to be underestimates given that the calculations assume that educational facilities themselves would not have to be expanded. Also, note that they assume that all trainees take up full-time work, that no wastage occurs from the course, and again, that a sufficient number of applicants would come forward for training.

b. Recruiting From Those Out of the Labor Force

An alternative to training and hiring is to increase supply by recruiting from those who are already trained, but out of the labor market. Given that 60 to 65% of qualified nurses are presently working, a recruitment pool of approximately 146,000 potentially exists.[7] There

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7 These percentages come from tables 3.1 and 4.6 respectively and the reported figure assumes 272336 represents 65% of the qualified population.

are two obvious mechanisms for tapping this reserve and for encouraging women currently out of the labor force back to work. The first is through a general pay increase, the approach used in the case of auxiliaries above; it is now applied to all grades of nurse.

Given the participation elasticity of 1.40, pay would have to rise by 3.6% to attract the additional workers. This policy entails increasing the current paybill by 3.6% or raising the average nursing salary, given in table 8.1, from £14573 to £15092. Along with the general increase, the cost of hiring and paying the additional 18,451 nurses would have to be met. These costs are summarized in table 8.3.

Table 8.3: The Cost of Increasing the Workforce by Hiring Those Already Trained in £ Million

Pay Rise to Staff in Post	193.6
Pay of New Staff	278.6
Hiring Costs	5.5
Total	477.7

Increasing inflow by five percent under this option would cost the Health Sevice an estimated £478 million, less than either amount in table 8.2, and staff would be available immediately for employment. However, it is also important to note that supply would increase by substantially more than five percent as this policy would

significantly reduce outflow as well. Based on the estimates in chapter seven, a 3.6% rise in pay would reduce outflow for qualified nurses by 3.1% and for unqualified nurses by 8.5%.[8]

Table 7.8 estimated the median length of service to the NHS before leaving to non-participation to be 49.0 months for qualified nurses and 29.9 months for unqualified nurses with the respective elasticites of median duration with respect to the nursing wage being 0.86 and 2.35. As a result of the wage increase, qualified staff would remain in post an additional 1.5 months and unqualified staff, 2.5 months. This translates into an additional 61.3 million hours of work from the current qualified stock of nurses and 36.2 million hours from the unqualified stock, an average of 54.7 for all WTEs.

Relevant to each District is the fact that qualified nurses would remain in their current posts an additional month before leaving for any reason, while the median length of stay of unqualified nurses would increase by 2.4 months.[9] At the District level the figures translate into an additional 150 hours of work from each qualified nurse in employment and 360 hours from each auxiliary

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8 Nurses would also be willing to work more hours, but this would entail a District willingness to fund overtime; this is discussed in subsection c.
9 The elasticities on which these figures are based and the median length of service for leavers to non-participation are given in table 7.8; the aggregate median length of service of two years is the average from table 7.8 and the latest figures available from the Oxford Region from 1988 and 1989.

before the costs of hiring a replacement must be incurred.

A second mechanism which could be used to attract those currently out of the workforce back to work is to provide assistance to meet the cost of childcare. The results from chapter four indicate that the costs associated with taking up employment, thought to consist primarily of childcare, severely inhibit participation. As half the nurses out of the labor market have children less than six, the pool of potential recruits is quite large.

To increase the inflow of workers by five percent, based on the elasticity of 0.67 listed above, the subsidy would have to reduce the fixed costs of employment by 7.5%. Two estimates of these costs are available. The first, the low estimate, is £50 per week and is the 1980 estimate of average fixed costs from table 6.8, adjusted to 1989 prices. The second, the high estimate, assumes that these costs represent the same percentage of weekly labor income in 1989 as in 1980, approximately 40%. Based on 1989 prices, the high estimate is £124.[10]

In the first case, a subsidy of £3.75 a week per nurse would be required to increase the inflow of workers into nursing by 5%, while in the second the amount is £9.30 per week. Adding to the costs of this program are again

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10 Average weekly income is computed as average annual income from table 8.1b divided by 52. The high estimate is 40% of this figure.

the expenses of hiring new workers and the fact that this subsidy would have to be offered to nurses who are currently employed and who have children, estimated to be 35% of the workforce.[11] The total cost of this initiative is shown in table 8.4.

Table 8.4: The Cost of Increasing the Supply of Nurses By Subsidizing the Fixed Costs of Employment

	Low	High
Subsidy to New Workers	3.2	8.1
Wages of New Workers	268.9	268.9
Hiring Costs	5.5	5.5
Subsidy to Workers in Post	22.8	56.4
Total	300.4	338.9

Based on the figures above, a policy to increase participation by subsidizing childcare is estimated to cost over £100 million less than the least expensive option discussed so far. Two other features of this approach merit comment. This first is that this policy does limit the potential recruitment pool to a degree, but given that an estimated 55% of nurses out of the workforce have children, the restriction would not appear to be severe. The second is that a subsidy to those working would be equivalent to an increase in their nonlabor income which would potentially lead them to reduce the number of hours they worked. Thus, take up of

11 In the *WES* 42% of the nurses out of the labor force had children aged two or less, while 13% had children aged three to six; the corresponding percentages for working nurses were 29% and 6%.

the subsidy by those currently employed would need to be accompanied by an agreement to hold hours constant.

Finally, it is important to note that the subsidy offered to those in post would potentially increase their length of service as well. An estimate of the elasticity of median duration with respect to fixed costs is presented in table 8.1a; it is 0.41 for qualified nurses and 1.13 for unqualified nurses. On this basis qualified nurses again remain in post an additional 1.5 months in response to a childcare subsidy of 7.5%, while unqualified nurses increase their median length of stay by 2.5 months. Note that the rate of outflow falls for only those who receive the subsidy, roughly 35% of the workforce.

While the cost of childcare has been emphasized in this discussion, a related policy would be to provide childcare facilities or to fund childcare places in areas where it is a lack of facilties rather than simply their price which keeps women with children from working. Local research would be required to identify where this alternative might be a more appropriate policy.

c. Increase Hours of Work By Those Working

Given the responsiveness of hours of work to the wage rate, a final option is to increase the hours of work of those working to generate the additional 32.5 million hours of labor. If all nurses work an equal amount of

overtime, each nurse would increase the weekly hours worked by two hours or 5.3%. The results in chapter four indicated that the elasticity of hours worked with respect to changes in the wage rate is 7.5%. Thus, to generate 32.5 million hours of labor, only a small pay increase, 0.71%, would be necessary; it alone would add only £38.2 million to the paybill.

Overtime, however, is paid at time and a half, so the 32.5 million extra hours are actually purchased at an average cost of £12.50 per hour or £406.3 million. Thus, the total cost of of increasing supply through overtime is £444.5 million. It is also important to note that by purchasing extra hours in this way no recruitment drive is necessary, but that the Service might be buying less productive hours as well as more costly ones. Finally, as a result of the pay rise, the rate of outflow of qualified nurses will fall by 0.3% and for unqualified nurses by 0.5%.

Having reviewed all the policy options, table 8.5 summarizes the findings.

Table 8.5: Summary of the Costs of Various Policies to Increase the Supply of Nurse Labor: Inflow by Five Percent or Hours by 32.5 Million

Policy	Cost to Increase Inflow (£ million)	Additional Hours from Reduced Outflow (millions)	Cost Per Total Hours Secured (£ per hour)
Training/Hiring	506.0 to 605.3	0	15.6 to 18.6
Wage Rise	477.7	54.8	5.5
Childcare Subsidy	300.4 to 338.9	19.2	5.8 to 6.5
Overtime Plan	444.5	10.9	10.2

The figures in the above table make clear that different policies to increase supply have radically different costs associated with them. As might be expected, given the significant amount of human capital a qualified nurse embodies, training recruits to registration is the most expensive way to increase the supply of nurse labor. Using overtime to secure more laborpower is at least one third less expensive than training additional workers, although it is likely to be an option feasible for the short-term only. The acceptability of a permanent increase in the work week is questionable, and again, the issue of the quality of the hours bought is raised. If a substantial, long-term increase in the supply of nurse labor is required, by far the most cost effective options are to increase pay generally or to offer a childcare subsidy to working mothers.

Table 8.5 also underlines the significant gains in terms of reduced outflows which arise from a pay rise or childcare subsidies. In the first case, the NHS actually receives a greater volume of hours from the workers it retains, 54.8 million, than from the new workers it hires, 32.5 million.

Finally, while the preceeding discussion has focused on a five percent increase in inflow and the total effect on the nursing stock, it is important to emphasize that the cost relationships presented in the table hold true for increases of any magnitude.

III. General Conclusions

As a result of the research presented here, a great deal is now known about nurses' work behavior which makes the formulation of numerous supply policies possible. First of note is that all dimensions of supply behavior are affected by pay. As their salaries or potential salaries rise, nurses are more likely to work; they will work longer hours; and they are less likely to leave their posts for any reason. Thus, remuneration levels are a very powerful labor management tool and it is <u>most</u> unfortunate that due to national pay bargaining Districts are denied access to this instrument.

In theory such a system operates to ensure equal pay for equal work and to protect nurses' interests against those

of a monopsonistic employer. In practice, however, given that the cost of living in different areas of the country varies dramatically, setting salaries at the national level actually precludes the equalization of pay. It is not clear, furthermore, that allowing Regions or Districts to set their own remuneration levels would not better serve the interests of nurses and actually bring about the balance that the other system claims, but fails, to achieve.

Some flexibility has been introduced into the system by the Review Body through the London supplement scheme and the bonus payments attached to posts which have proved difficult to fill, both discussed in chapter three. As would be expected, they have eased recruitment problems and it is important that policies which devolve authority to the local level or take into account local conditions be brought in to the system, albeit gradually. Of great interest is the fact that the pay of the new grade of nurse, created under Project 2000, the assistance, is to be determined locally. Also, given that auxiliaries themselves are beginning to respond to non-nursing employment opportunities, it is most sensible that Districts be allowed to offer a salary to auxiliaries which is competitive with that in other jobs in the <u>local</u> market.

The results also suggest there are significant gains to be had from reducing the inflow of students and

increasing staff retention and recruitment among nurses who are out of work. However, as various laborpower policies distribute expenses differently throughout the Service, there may be little enthusiasm for a reduction in student numbers. For instance, a District is wholly responsible for funding overtime, while its contribution to training costs is far less. Student labor, for the most part, is funded separately by the Department of Health from an education budget and Districts benefit from the labor which they obtain at a reduced rate. Yet rather than pursuing policies which minimize costs at any given level, the Service should be concerned with those that are most cost effective overall. The goal should now be to maximize the <u>return</u> in terms of service received from those trained rather than to maximize the <u>number</u> trained.

Furthermore, as the implementation of Project 2000 increases the cost of training nurses to qualification as well as reduces their labor contribution, increasing supply through training should become a less attractive option throughout the Service. Also, as student recruitment itself becomes more difficult due to the demographic changes taking place, the Service may be forced to adopt other measure to ensure an adequate supply of nurses.

Along with attracting nurses via pay, the results of the supply models clearly indicate there is much scope for

non-pecuniary intervention. A prime competitor of the Health Service for a nurse's time is her family. Having children discourages participation and decreases the number of hours worked, while becoming pregnant often leads to a nurse leaving the labor market altogether. The efficacy of a policy to subsidize childcare was discussed in section II and the importance of providing employment which allows women to integrate work with family responsibilites cannot be stressed enough. Such initiatives could take various forms: flexible shifts, term-time employment, sponsoring a holiday creche, organizing job-shares, or expanding nurse banks.

The primary cost of such policies is their administration, but the predominant barrier to their implementation may be inflexible attitudes to the delivery of nursing care and to expectations about nurses themselves, both of which must be revised if the NHS is to avoid future staffing problems. If fewer nurses are trained due to declining enrollments or as a result of increased training costs under Project 2000, retention of qualified staff will become increasingly important and fewer and fewer nurses will have no family commitments or major responsibilities other than work. Increased competition from the private sector for qualified nurses may as well call for some creative personnel policies if a battle over pay is to be avoided.

Another option which deserves greater consideration is that of hiring older workers generally. This group is less likely to work in nursing, but once employed they are less likely to leave their posts for any reason. Thus, if the participation barrier can be overcome, there are significant benefits in terms of reduced quits associated with hiring older workers. The key is to identify what discourages participation. Unless it is a result of unalterable preferences about work, reticence arising from the belief that their skills are outdated or that their employment prospects are poor, can be countered through refresher courses and recruitment drives.

A final recommendation is based on the results from chapter seven. In the JRII sample over 50% of the qualified nurses who left their posts for other nursing jobs made lateral job moves to gain experience. This statistic indicates that introduction of a system of internal rotation within hospitals, which allows nurses to change jobs at set intervals, could be an effective policy to reduce quits. While a workable rotation system would have to be designed and administered, the costs of this are most than likely to be offset by reductions in turnover. The hospital may also benefit from increased recruitment as it was seen by potential applications as a highly desirable employer as a result of the system.

In summary, this thesis has revealed a great deal about the labor supply behavior of nurses and the context in which their decisions are made. Using the results of the supply models, it has also identified the most cost effective policy for increasing supply. The investigation has also uncovered several areas which merit further research. For instance, a number of nurses in the JRII sample emigrated to another country when they left their posts. It would be interesting to investigate how often this occurs and what, if any, are the international dimensions to the nursing labor market. Another area which would benefit from further analysis is that of nursing training. Is nurse training a first option for most women who apply? What is the ratio of applicants to places? How does the number of post-basic training courses sponsored annually differ by Region and why? Given the large number of women involved, the vast expenditure on managing this resource, and the useful information which can be gained from quantitative research, further exploration of this occupational group would appear to be desirable.

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