UNIVERSITY OF OSLO

HEALTH ECONOMICS RESEARCH PROGRAMME

Compensating differentials for nurses

Erik Magnus Sæther

The Ragnar Frisch Centre for Economic Research and HERO

Working Paper 2004: 10

Compensating differentials for nurses

Erik Magnus Sæther*

Health Economics Research programme at the University of Oslo
HERO 2004

JEL Classification: C25, I10, J31, J33.
Keywords: Registered nurses, compensating variations, switching regression, random utility models, discrete choice, shift work, labor supply.

* Author's address: Ragnar Frisch Centre for Economic Research, Gaustadalléen 21, N-0349 Oslo, Norway. Health Economics Research Programme at the University of Oslo (HERO). E-mail: e.m.sather@frisch.uio.no.

Thanks to Steinar Strøm, John K. Dagsvik, Michael Hoel, Tao Zhang and Jia Zhiyang for advice and comments. The project has received financial support from the Norwegian Research Council as part of the Health Economics Research Programme at the University of Oslo.

Health Economics Research programme at the University of Oslo
Financial support from The Research Council of Norway is acknowledged.
ISSN 1501-9071, ISBN 82-7756-141-5

Abstract

When entering the job market registered nurses (RNs) face job alternatives with differences in wages and other job attributes. Previous studies of the nursing labor market have shown large earnings differences between similar hospital and non-hospital RNs. Corresponding differences are found in some of the analyses of shift and regular daytime workers.

In the first part of this paper I analyze the wage differentials in the Norwegian public health sector, applying a switching regression model. I find no hospital premium for the shift RNs and a slightly negative hospital premium for the daytime RNs, but it is not significant for the hospital job choice. I find a positive shift premium. The wage rate is 19% higher for the shift working hospital RNs and 18% for the sample of primary care workers. The shift premium is only weakly significant for the shift work choice for the sample of hospital RNs, and not for the primary care RNs. I identify some selection effects.

In the second part of the paper I focus on the shift compensation only, and present a structural labor supply model with a random utility function. This is done to identify the expected compensating variation necessary for the nurses to remain on the same utility level when they are "forced" from a day job to a shift job. The expected compensating variations are derived by Monte Carlo simulations and presented for different categories of hours. I find that on average the offered combination of higher wages, shorter working hours and increased flexibility overcompensates for the health and social strains related to shift work.

1. Introduction

When entering the job market registered nurses (RNs) face job alternatives with differences in wages and other job attributes. Previous studies of the nursing labor market have shown large earnings differences between similar hospital and non-hospital RNs, and corresponding differences are found in some of the analyses of shift and regular daytime work.

I will analyze the wage differentials in the public health sector using two different methodological approaches. In the first part of this paper I analyze the wage differentials with a switching regression model similar to the set-up presented in Lanfranchi et al. (2002). I examine the existence of wage differentials between RNs working in hospitals and primary care institutions, and between shift and daytime workers. I control for the shift dimension when I focus on the hospital premium, and for the care level when I analyze the shift premium.

In an attempt to better capture the impact of preferences and choice I introduce a structural labor supply model with a random utility function in the second part of this paper. I limit the analysis to the shift compensation and shift choice, as the hospital premium is found to be insignificant. The RNs maximize utility, given a nonlinear budget set that incorporates taxes. The individual's labor supply decision can be considered as a choice from a set of discrete alternatives (job packages). These job packages are characterized by attributes such as hours of work, sector specific wages, shift type, and other job-type specific aspects. The approach is inspired by i.a. Aaberge, Dagsvik and Strøm (1995) and van Soest (1995). I use the structural framework to identify the expected compensation necessary for the nurses to remain on the same utility level when they are "forced" from a daytime job to a shift job. Using Monte Carlo simulations I present the distributions of the expected compensating variations for different categories of hours. The model may also be looked upon as a framework to inform public employers when deciding what size of wage compensation to offer.

Rosen (1986) gives an introduction to the literature on compensating variations.
"The theory of equalizing differences refers to observed wage differentials required to equalize the total monetary and non-monetary advantages or disadvantages among work activities and among workers themselves." These ideas go back to the writings of Adam

Smith. As presented by Rosen, the evidence of compensating variations related to a broad scope of working conditions, is mixed.

It is a well–known fact that the inability to observe workers' full labor market productivity can bias estimates of compensating wage differentials derived from cross-sectional labor market data. Hwang et al. (1992) demonstrate that the bias is a function of three factors: (i) the average share of total hourly remuneration taken in the form of wages, (ii) the proportion of wage dispersion due to the differing tastes of workers, and (iii) the degree of unobserved productivity heterogeneity. Their results provide the key for determining the likely size of the bias when estimating compensating wage differentials with real data.

Many nursing services must be accessible on a twenty-four hour basis, making shift work a necessity. This opens up an opportunity to combine work and family life, which is often especially appreciated during the years with small children. However, while shift work may bring some wanted flexibility to nurses' work schedule and additional income, it often introduces additional hardship on nurses providing services in complex environments and demanding interpersonal situations.

The health strain of shift work is well documented. As far back as in 1713, Bernardino Ramazzini (Costa, 1996) pointed out the harmfulness of shift work, in particular night work. He wrote of the bakers, who 'work at night, so when the others sleep they stay awake, while trying to sleep during the day like animals who escape the light: hence, in the same town there are men living in antithetic life in comparison with the others'. The medical interest for such a problem started between the two world wars and has increased over the past decades.

A broad overview of concerns related to shift work is presented by Costa (1996). Shift work, particularly night work, can have a negative impact on the health and well-being of workers, particularly in four spheres: a) biological: due to the disturbance of normal circadian rhythms of psychophysiological functions, beginning with the sleep/wake cycle; b) working: coming from fluctuations in work performance and efficiency over the 24 hour span, with consequent errors and accidents; c) social: dealing with difficulties in maintaining the usual relationships both at family and social level, with consequent negative influences on marital relations, care of children and social contacts; d) medical: deterioration of health, which can manifest itself in disturbances of sleeping and eating habits and, in the long run, in more severe disorders that deal prevalently with the gastrointestinal, neuropsychical and, probably, cardiovascular functions. Costa especially stresses that shift and night work may have specific adverse effects on women's health in relation to the hormonal and reproductive function." In a study on young female nurses, Ohida et al. (2001) find a significant association between working night shifts and the use of alcoholic beverages to help induce sleep, as well as daytime drowsiness.

Lanfranchi et al. (2002) report a significant shift premium. The wage rate for shift workers is 16% higher than for daytime workers. This premium compensates workers who do not self-select into shift work. They find that the shift premium is significant for shift work choice, and conclude that for their sample the shift choice is a result of wage differentials rather than shift preferences.

One study focusing on RNs is Schumacher and Hirsch (1997). They find that on US data the shift premium to evening shift RNs is close to 4 percent, while for night shift RNs it is almost 12 percent. They find a small insignificant premium for working rotating or split shifts over day shifts. Even though shift premiums are significant wage determinants, they account for just under 10 percent of the cross-sectional wage differential between hospitals and health practitioners' offices, and little of the differential between hospitals and nursing homes.

Lehrer et al. (1991) refer to the differences in job attributes between hospital and non-hospital settings. If hospital jobs involve relatively unpleasant characteristics such as a high degree of stress and job hazards, then in order to attract nurses of a given quality, hospitals must pay a compensating differential. In this paper I do not, however, compare hospital RNs with colleagues working in a practitioner's office, but with nurses working shifts at nursing homes and in home nursing. They may have an equal need for compensation to care for a less prestigious patient group often with less qualified colleagues and poorer staffing than is the case at the hospitals.

An understanding of the hospital premium is important, especially given what is expected to be a large shift of medical care delivery away from hospitals towards outpatient settings. Schumacher and Hirsch (1997) argue that a plausible explanation for the hospital premium is that "hospitals demand, attract, and retain higher quality nurses than do employers in the non-hospital sector, and these skills are not reflected fully in measured variables". They report a hospital RN advantage of roughly 20 percent based on a cross-sectional analysis. When they extend their analysis to a longitudinal analysis they find that one third to half of the advantage is due to unmeasured worker ability. The remainder is likely to reflect compensating differentials for hospital disamenities. Older studies include Link (1988) who finds that there was a hospital premium of around 13 percent in 1984 (but does not find a premium with 1977 data). Booton and Lane (1985) use data from a 1981 survey of Utah RNs and find that the hospital premium is largest for associate degree RNs (21 percent) and smallest for diploma RNs (15 percent). Lehrer et al. (1991), using a sample of Illinois RNs, note the large difference in earnings between hospital and non-hospital RNs. Although it is not the focus of their paper, they suggest that the premium may reflect a compensating differential.

While there seems to be a hospital premium in the US health care sector, the setting is quite different in a National health sector in a Scandinavian country with a tradition for centralized wage bargaining and a monopsonistic buyer. The nurses union and NALRA bargain the wage nationally[1]. However, there is some room for local adaptations of the wage policy. Hospitals and municipalities that have severe staff shortages or a high rate of turnover, offer higher wages than nationally agreed upon as well as other benefits in order to become a more attractive workplace.

Shift hours in Norway are compensated with both an hourly wage premium and shorter mandated working hours for a full-time position. Health workers may choose shift work because of compensating wage differentials, but it is also possible that they have preferences for shift work. Compared to other studies of compensating variation, my study has the advantage of focusing on differentials within a single occupation, so that preferences and abilities are more homogeneous than for broader groups of workers. I find a positive shift premium, but no positive hospital premium. Actually, the hospital premium for the sample of daytime working RNs is slightly negative. The shift premium influences the shift choice for the hospital RNs. I also identify some selection effects.

[1] In many European countries, compensating wage differentials are set by industry-wide collective bargaining and are adopted by non-unionized firms in the same industry. Hamermesh (1999) points to the fact that these bargained differentials are wider than the mostly market-generated premia that exist in the United States.

As there is no hospital premium, I focus on the shift dimension in the application of the random utility model. I find that for most RNs the offered combination of a shift wage premium, shorter working hours and the flexibility of hours, overcompensates the negative effects of shift work.

This paper is organized as follows: In section 2 the data and setting is presented. In section 3 a switching regression model with endogenous switching is established and the results presented. In section 4 a strategy for estimating compensated variation in a random utility model is presented. Section 5 discusses the results from the two approaches and concludes.

2. Data

The public health care providers are the dominant employers of Norwegian registered nurses. In 2002, 91.4 percent of those working within health and social services were public employees. The Norwegian Association of Local and Regional Authorities (NALRA), organize employers in municipalities and counties who own the public institutions, . with the exception of some national hospitals. There were 77,819 registered nurses in 2002, of whom 90% participated in the labor market. Those not participating were undertaking further education or enrolled in one of the social security programs, such as disability pension, medical or vocational rehabilitation or early retirement. For a general overview of the Norwegian health care system, see van den Noord et al. (1998) and European Observatory on Health Care Systems (2000).

This study uses a sample of 11,542 female registered nurses employed by NALRA institutions in 2000. Being prior to the national hospital ownership reform, the counties demanded RNs for their hospitals, and the municipalities needed personnel for their health centers, nursing homes and home nursing. The attraction of limiting the analysis to NALRA employees is the information on hours of work and shift type. The data is only reported for one month by October 1st. The NALRA register data is matched with annual labor income and other administrative data registers delivered by Statistics Norway. The set includes information about work experience and various sociodemographic variables, like the age of children and spouse's income. I exclude nurses with other jobs than the NALRA job, and those not employed during the whole year.

I focus on the occupational sub-category specified as “Registered Nurses” in the NALRA register, which is a group that normally has not undertaken any postgraduate training. I thus exclude midwifes and registered nurses working as nursing specialists or ward administrators. By restricting the analysis to the “ordinary” RNs I avoid the comparisons of groups with different formal qualifications and different management tasks. Daytime work, however, is strongly related to management tasks, and by omitting this personnel category from the analysis the sample of daytime RNs becomes relatively small compared to the shift worker sample. This may bias the results in that RNs incorporate a specialization and/or a management premium when choosing daytime work. The decision to exclude specialized nurses and health administrators allows me to focus on the hospital premium and the shift premium, but the alternative of including the other personnel categories is highly relevant in further research.

Registered nurses dominate the hospital nursing services whereas auxiliary nurses play a more important role in nursing homes and in home nursing. At the local health centers and municipal casualty clinics the nursing staff consists mostly of RNs. Hospital nurses are generally confronted with more complicated and acute cases than nurses at the primary care level. However they normally work in teams with other RNs, and the patients are younger and with better prospects than those in nursing homes. In the nursing homes the RNs lead teams of auxiliary nurses and nurse assistants. Nurse assistants are personnel without any health qualification. In home nursing you work more independently but deal with more trivial health problems related to aging.

Shift work is regulated by law and through agreements between NALRA and the nursing union. A registered nurse works 37.5 hours per week in a full-time position with daytime hours. Selecting a job that includes shift work will reduce this to 35.5 hours per week. Part-time work is common and expressed as a percentage of full-time. The character of the shift work varies, from a combination of daytime and evenings to a combination of days, evenings and nights. Weekend work every third or fourth week is also common. Due to aggregation of the different compensation payments, I am unable to separate between the different shift forms. Kostiuk (1990) and Lanfranchi et al. (2002) apply a similar shift measure.

The alternatives available for NALRA nurses are hospital jobs with shift work, hospital jobs with daytime hours, primary care jobs with shift work and primary care jobs with daytime hours. The sample is almost equally divided between hospital and primary care jobs. Shift work is far more common than daytime work. See Table 1 for an overview of observed choices and hourly wages. Appendix 1 provides summary statistics for key individual level variables.

Table 1 Observed job alternative and hourly wage.

	Number of workers	Hourly wages Mean	St.dev.	Min.	Max.
Hospital daytime	803	146.5	12.9	121.2	184.3
Hospital shift work	5,154	172.2	20.1	126.3	225.2
Primary care daytime	589	146.8	13.5	120.2	188.8
Primary care shift work	4,996	172.7	19.4	128.7	225.5
Total sample	11,542				

Hourly wage is the applied earnings measure, calculated by dividing annual earnings reported to the tax authorities by the reported hours from the NALRA register. The reason why I do not apply the reported NALRA hourly wage, but instead construct the wages from annual income reports, is that only a small share of the NALRA institutions reports the wage completely. Shift compensation and other benefits are often unreported. From the RNs with complete data I can, however, observe that none of the RNs has a wage outside the wage interval NOK 120 – NOK 230. I thus omit the constructed wages outside this interval, a total of 1,404. These observations probably represent wrongly reported full-year participation or RNs who have changed their workload during the year, making the hours reported by October 1 misleading.

The observed mean wage is higher in shift work (NOK 172) than daytime work (NOK 147), but there seems to be almost no difference between the mean in hospital and primary care jobs. Remember that these wages are not yet corrected for individual characteristics. Hospital nurses are generally younger than primary care nurses, they work in more urban areas and have fewer children. Similarly, shift workers are younger than daytime workers. Corrections for these observed variables will be addressed below.

3. A switching regression model

3.1 The model

Lanfranchi et al. (2002) demonstrate how the estimation of a shift premium and shift choice fits well into the framework of switching regression models with endogenous switching. I follow their strategy but extend the focus to four types of job premiums for registered nurses in the public sector:

a) *the shift premium for hospital nurses,*
b) *the shift premium for primary care nurses,*
c) *the hospital premium for shift working nurses, and*
d) *the hospital premium for nurses working regular daytime.*

I undertake four separate rounds of analysis, but I introduce the model with a notation suitable for the estimation of a shift premium. The estimation of a hospital premium is parallel. By categorizing the sample into different sub-categories I am able to apply the relatively simple set-up from Lanfranchi et al. but still use the richness of the data. I also avoid the pooling of samples as it seems reasonable to expect that the shift premium is different from hospital to primary care nurses, and similarly that the hospital premium is different for nurses working shifts and those working regular daytime. See i.a. Lanfranchi et al. (2002) for a discussion of the problems that arise with pooling of the data.

The starting point is:

shift wages: $$w_s = \beta_s X + u_s \qquad (1a)$$

day wages: $$w_d = \beta_d X + u_d \qquad (1b)$$

shift choice: $$S^* = \eta Z + \delta\left(w_s - w_d\right) + v \qquad (1c)$$

where w_s and w_d are log hourly wages, the vector *X* includes standard wage equation variables, while u_s and u_d are error terms in the wage equations. The subscript *s* and *d* refer to shift work and regular daytime work.

There may be selectivity into shift work. Let S^* be a latent variable for shift work with the corresponding binary variable S. S = 1 if $S^* \geq 0$ and S = 0 if $S^* < 0$. Z is a vector of variables influencing shift choice (including potential instruments), and *v* an error term. The term $w_s - w_d$ captures the shift premium.

The error terms may be correlated giving rise to selectivity bias. Following Lanfranchi et al. (2001), let $\sigma_{u_s v}$ and $\sigma_{u_d v}$ represent the covariances between the error term in the choice equation, *v,* and the error terms in the wage equations, u_s and u_d The covariance $\sigma_{u_s v}$ can be expected to be positive while $\sigma_{u_d v}$ can be expected to be negative. Suppose that we study a worker with abilities not captured by the exogenous variables in the shift work wage equation. These abilities are reflected in a higher wage. This in turn will give rise to a positive error term u_s. In addition, suppose that because of this higher wage the person becomes more likely to choose shift work than what is captured by the explanatory variables in the shift choice equation. We will then have a positive error term *v.* Moreover, the covariance $\sigma_{u_s v}$ will be positive. There will, in other words, be a positive selection into shift work. On the other hand, a positive selection into daytime work would imply that $\sigma_{u_d v}$ is negative.

The reduced form of the choice equation is:

$$S^* = \eta Z + \delta\left(\beta_s - \beta_d\right) X + \delta(u_s - u_d) + v \qquad (2)$$

which can be reparametrized to $S^* = \tilde{\eta}\tilde{Z} + \tilde{v}$. Following Maddala (1983), we can compute the conditional expected wages:

$$E\left(w_s \mid S=1\right)=\beta_s X+\sigma_{u_s v}\frac{\phi\left(\tilde{\eta}\tilde{Z}\right)}{1-\Phi\left(\tilde{\eta}\tilde{Z}\right)} \quad (3a)$$

$$E\left(w_s \mid S=0\right)=\beta_d X+\sigma_{u_d v}\frac{\phi\left(\tilde{\eta}\tilde{Z}\right)}{1-\Phi\left(\tilde{\eta}\tilde{Z}\right)} \quad (3b)$$

where including $+\sigma_{u_s v}\left(\phi/\Phi\right)$ and $-\sigma_{u_d v}\left(\phi/\Phi\right)$ in the respective wage equation will control for selectivity. ϕ and Φ are the density and distribution functions of the standard normal evaluated at $\tilde{\eta}\tilde{Z}$. If we estimate the wage equation (1a) and (1b) without controlling for selectivity we will get biased estimates if the covariances are nonzero. Most likely, we will tend to underestimate the shift premium.

The wage equations (1a) and (1b) and the choice equation (1c) is a switching regression model with endogenous switching. We can use it to estimate whether there are shift premiums and whether the shift premiums affect shift choice.

The next steps are firstly, to estimate the reduced form (2) using a probit to get $\hat{\tilde{\eta}}$. I then compute $\phi\left(\hat{\tilde{\eta}}\hat{\tilde{Z}}\right)$ and $\Phi\left(\hat{\tilde{\eta}}\hat{\tilde{Z}}\right)$. Secondly, I estimate the wage (3a) and (3b), including selection terms, to get $\hat{\beta}_s$ and $\hat{\beta}_d$, $\hat{\sigma}_{u_s v}$, $\hat{\sigma}_{u_d v}$, and compute the estimated expected wage premium $\left(\hat{w}_s-\hat{w}_d\right)=\left(\hat{\beta}_s-\hat{\beta}_d\right)X$. I then estimate the structural form (1c) using probit to get $\hat{\delta}$. If $\hat{\sigma}_{u_s v}$ and $\hat{\sigma}_{u_d v}$ are significant in the wage equations, the correction for sample selection is needed. The above procedure is then repeated for case *b) – d).* The results are presented in Tables 2 and 3 in Appendix 2 where they are presented in pairs by shift choice (*a* and *b*) and hospital choice (*c* and *d*).

3.2 Wages, shift premiums, and shift choice.

I will first present the results for the model of shift choice and the shift premium. The results are reported separately for the two samples; the hospital RNs (*a*) and the primary care RNs (*b*).

Reduced form choice. I start by estimating the reduced form probit for shift choice (2) for the subset of hospital workers. Table A2.i column 1 in Appendix 2.1 reports marginal effects of the reduced form, whereas the next columns report standard errors and t-values. I will later discuss the parameters in the shift choice function to the structural form choice equation.

While Kostiuk (1990) and Lanfranchi et al. (2002) had access to data from different sectors with variations in contract terms, shift bonuses and shift rates for the different industries, I do not have any similar variation in data as all RNs get the same public sector contract. I must relate the shift choice to family life like marital status and children. Shift work gives less leisure time with your spouse and we should therefore expect that married nurses are less likely to choose shift work. On the other hand, shift work means increased flexibility to be there for your children and their activities in daytime. It is thus likely that parents of small children are more likely to choose shift work.

None of the family characteristics are likely to have any direct influence on the wage. There is a possible indirect effect as having smaller children leads many nurses to reduce their workload or withdraw from the labor market temporarily thereby getting lower job tenure, which influences their salary. In many empirical studies the labor market experience is proxied by *potential* experience, i.e. age-education-7[2]. This is a problematic upper bound for experience that is more upwardly biased for women, who tend to be more loosely connected to the labor market, at least in connection with maternity leave. In this study I have, however, controlled for the number of years with an income qualifying for pension entitlement during the last 23 years as a measure of experience. The measure is constructed on earnings histories available from the Norwegian National Insurance Scheme, which was established in 1967. Individual 'pension entitlements' in this scheme are linked to their income histories.

Wage equations. The results from the reduced form probit can be used to control for sample selection when estimating wage equations for shift workers and daytime workers. The wage equations are presented in Table A3.i in Appendix 2.1. The first two sets of results (column 1-3 and 4-6) are for the sample of hospital RNs. For the shift workers neither age nor experience

[2] The RNs in this sample started in the primary school when aged 7. Today the children start school the year they get 6.

is significant. The only dummy for country origin that is significant is the one for non-OECD countries. The county dummies are significant and with one exception they are negative compared to the reference of the capital Oslo. This is as expected as the reference group working for Oslo municipality has a separate wage contract with a somewhat higher wage. The dummies for municipal centrality are not significant, with the exception of one that is weakly significant for an intermediary centrality. For the daytime workers in the sample of hospital RNs there is a significant age effect where the wage is reduced by age. According to the agreed contract with the labor union, experience is one of the strongest criteria for increased wage. It is thus surprising that age has a negative sign in the wage equation. One possible explanation is that younger nurses are more willing to work overtime, somewhat increasing their average salary. Most dummies for county of residency are significant and negative.

Although weakly significant, the selection term coefficients suggest a positive selection into shift work and no significant selection into daytime work. The RNs select themselves into shift work because of preferences or comparative advantages. This differs from the findings of Kostiuk (1990) who finds no effect of self-selection of workers into shift work, and Lanfranchie et al. (2002) who find that shift workers seem to prefer to avoid shift work. The shift wage premium, which is (weakly) significant for the choice of shift work in the structural probit results (Table A2.i column 4), increases the preference for shift work. I find no selection into daytime work, in contrast to the findings of Kostiuk and Lanfranchie et al.

The estimated wage equations are somewhat different for the sample of primary care nurses. Experience, county dummies and one centrality dummy for the second highest centrality level are significant for the shift working primary care nurses. None of the explanatory variables are significant for the daytime workers. This accentuates the homogeneity of the sample with little variation in wages. For the shift working primary care RNs there is a negative selection into shift work, as opposed to the shift-selection term for the hospital RNs. There is no significant selection into daytime jobs. In the structural probit model (in Table A2.i column 10) there is no significant effect of the shift wage premium on shift choice for the sample of primary care RNs.

Structural form choice equations. Table A2.i column 4 and 10 presents the marginal effects in the structural form (1c) for the sample of hospital and primary care nurses respectively. The corresponding standard errors and t-values are also reported. As already mentioned, the shift premium is weakly significant for the shift choice for the hospital RNs and not significant for the primary care RNs. The top rows of Table A2.i report the results for variables only appearing in the choice equation. Both the dummy for marital status and the number of children below 6 years of age are significant, and the signs are as expected for the sample of hospital RNs. The number of children from 6 to 11 years of age is only weakly significant. None of the three selection variables are significant for the sample of primary care RNs. The lack of variable significance for the latter group is not easily interpreted but hospital RNs are generally younger than primary care RNs and a smaller percentage is married.

The bottom rows report the results for variables also appearing in the wage equations. For the hospital RNs, age becomes weakly significant, as well as experience. The probability of selecting a shift job is estimated to decrease by age and experience.

Whereas it is less likely for a RN from one of the other Nordic countries to choose a shift job, it is more likely for RNs from other countries. For the hospital sample, the county dummies are mostly positive and significant for the shift choice, but not for the primary care sample. The centrality dummies are not significant.

The two wage equations for shift and daytime workers can be used to compute the shift premium for each person in the sample. The average shift premium for the sample of hospital nurses is 19.3%, while the shift premium for the sample of primary care nurses is 18.1%. The shift premiums are sharply determined with t-values of 293.3 and 330.0.

3.3 Wages, hospital premiums, and hospital choice.

I now shift the focus to the analysis of hospital versus primary care choice and the hospital premium. Tables A2.ii and A3.ii in Appendix 2.2 presents the results for two samples; the RNs working shifts (*c*), and the RNs working regular daytime hours (*d*).

Reduced form choice. I start by estimating the reduced form probit for hospital choice (2) in the subset of shift working RNs. Table A2.ii column 1 reports marginal effects of the reduced form. Marital status and children may be correlated with hospital choice in several ways. Given the stress and demanding environment at a hospital many RNs prefer to switch to a primary care job that is easier to combine with family life when they get children. There is also an indirect geographical effect as many RNs move out of the city centers to the suburbs and rural areas when they become parents. With most hospitals centrally located, they are able to reduce their travel time if they take a job in a nursing home or in home nursing.

Wage equations. The wage equations for the sample selection models with hospital choice are presented in Table A3.ii in Appendix 2.2. The first two sets of results (column 1-3 and 4-6) are for the sample of shift RNs. In contrast to the primary care workers, age, experience or country background is not significant in the wage equation for the hospital workers. Most geographical dummies are strongly significant and negative, meaning that they earn less than the RNs working in Oslo, the capital. There is a positive and significant selection into both hospital and primary care jobs for the sample of shift working RNs.

Few of the variables are significant in the two wage equations for the sample of daytime working RNs. Age and experience and some of the county dummies are significant for the hospital workers. There is no selection effect for the hospital workers. For the primary care workers there is a weakly significant positive selection effect.

Structural form choice equations. Table A2.ii column 4 and 10 presents the marginal effects in the structural form (1c) for hospital choice for the samples of shift and daytime RNs respectively. The hospital premiums are not significant for the hospital choice for any of the two samples. For the sample of shift working RNs, marital status and the number of children from 6 to 11 years of age is significant for the choice of a hospital job. For the sample of RNs working regular daytime only the number of children from 6 to 11 years of age is (weakly) significant.

The results for the explanatory variables also used in the wage equations are as follows. For the sample of shift working RNs, age is a negative and significant variable in the structural form equation of hospital choice, whereas experience is not. The opposite is the case for the daytime working RNs. Of the shift working nurses, those with a non-OECD background are less likely to choose a hospital job. Of the day-working nurses, those from the other Nordic countries are more likely to choose a hospital job, but this effect is only weakly significant. Most of the geographical dummies are strongly significant and negative for both samples meaning that they are less likely to work in a hospital job than the reference group in the capital.

The average hospital premium for the sample of shift working nurses is -0.04%, while the hospital premium for the sample of daytime working nurses is –1.7%. The hospital premium for the nurses working shifts are, however, not significantly different from zero with a t-value of 1.37. The t-value is 18.73 for the nurses working daytime.

A summary of results so far

Before I present the random utility model, I will summarize the results so far. The first finding is that there is a highly significant shift premium of 19.3% for the sample of hospital RNs and 18.1% for the primary care RNs. However, the shift premium is only weakly significant for the shift work choice for the sample of hospital RNs, and not for the primary care RNs. There seems to be a positive selection into shift work for the nurses working in hospitals, but a negative selection into shift work for the nurses in primary care jobs. There is no selection effect into the daytime jobs.

I find no hospital premium for the shift RNs, and a slightly negative hospital premium of –1.7% for the daytime working RNs, but it is not significant for the hospital job choice. There is a positive selection into hospital and primary care jobs for the sample of shift RNs. There is no selection into hospital jobs and a positive selection into primary care jobs for the day-working RNs.

The selection equation *(1c)* may be looked upon as a simplified choice model where the individual wage rate determines the selection of job type. The random utility model presented in the next section takes choices one step further to integrate choice and a richer specification of preferences in the modeling. I will restrict the analysis to the shift choice and shift compensation as the hospital premium seems to be of minimum significance in the Norwegian public health sector.

4. Compensating variation in random utility models

4.1 A random utility model

In order to calculate the compensating differentials in utility terms, I present a static neo-classical structural labor supply model with single decision makers. The individual's utility depends on income, leisure and other characteristics of the jobs. The utility maximization problem is solved by discretizing the budget set and choosing the optimal shift type, leisure and income combination from a finite set of alternatives. Conditioning on their participation in the public health care sector, the nurses are facing a choice between a shift job or a day job (i = s,d). As explained above I omit the analysis of the hospital premium in this part of the paper.

Because the analyst does not know the nurses' preferences, I will assume a random utility model

$$U(C,h,i) = V(C(h),h) + e(C,h,i), \qquad (4)$$

where U is the utility when the nurse works h hours with shift type i (shift job or a day job). C is disposable income. V is the deterministic element in the utility function and ε is a stochastic term with an iid extreme value distribution with an expected mean of 0 and a variance of $\sigma_*^2\pi^2/6$. The random term ε also captures the unobserved job characteristics associated with the workload and shift type.

The budget constraint, for a job with shift type *i,* is

$$C=f(hw)+I;\ h=H_{ik},\ w=W_i(H_{ik}), \tag{5}$$

where H_{ik} ($i=d,s,\ \ k=1,\ldots,9$) are the specific hours of work for the alternative with shift type i and hours of work k, and $W_i(H_{ik})$ the pre-tax hourly wage for the job-package with shift type i when the individual is working H_{ik} hours. The wage is a piecewise linear relation capturing the agreed terms of overtime compensation. Note that for the same job, wage rates may differ across nurses by personal characteristics like experience, residency and country background. In addition, for the same nurse, wage rates may differ with shift type. For all individuals a pre-tax hourly wage is estimated for each shift type applying a Heckman two-step selection correction procedure. The $f(.)$ function represents the net-of-tax labor income while I is the family income other than the nurse's own earnings (capital income after tax, spouses income after tax, and transfers)[3].

Each category of hours is centered on a common choice of working hours, e.g. 50%, 75% and 100% of a full-time position. There are also categories for extended full-time, covering nurses in full-time positions working overtime, or people with jobs at more than one hospital where the workload totals more than 100%. As the nurses working shifts face different contractual arrangements than those working daytime, the hours are shorter for this group[4].

I assume that the nurses make their choices by maximizing utility, given the job-packages available in the market. Let $B(i,h)$ denote the set of feasible jobs with hours of work H_{ik} equal to h, with shift type i. Let $g_i(h)$ be the frequency of jobs in $B(i,h)$, which is related to the institutional availability of full-time jobs. It follows from above that the utility function can be written as

[3] A non-trivial assumption made is that the spouse's hours of work is exogenous, as there is reason to believe that the spouse's choice of working hours will correlate, either negatively, e.g. if one of the parents must look after the children, or positively as they have preferences for spending their leisure time together.

[4] The hours per week in the categories, based on the observed means, are Hi ={11.5, 17.9, 21.6, 26.3, 28.2, 30.6, 35.4, 36.6, 40.7} if the nurse work shifts and Hi ={12.2, 18.9, 22.8, 27.8, 29.8, 32.3, 37.4, 38.6, 42.9} if the nurse does not work shifts.

$$\tilde{U}_{ik} = U\left(f\left(H_{ik}W_i\left(H_{ik}\right)\right) + I, H_{ik}, i, k\right) = V\left(f\left(H_{ik}W_i\left(H_{ik}\right)\right) + I, H_{ik}\right) + \tilde{\varepsilon}_{ik} \tag{6}$$

where

$$\tilde{\varepsilon}_{ik} = \varepsilon\left(f\left(\left(H_{ik}W_i\left(H_{ik}\right)\right) + I, H_{ik}, i, k\right)\right) \tag{7}$$

Since hours of work and consumption are given when the job-package is given, the agent's choice problem is a discrete one, namely to find the job-package that maximizes utility. Let $P(i,h)$ denote the probability of the agent choosing a job-package with shift type *i* and hours of work *h*. This is the same as choosing a job-package (any job-package) within *B(i,h).* When the random error terms $\{\tilde{\varepsilon}_{ik}\}$ are iid extreme value distributed, the probability $P(i,h)$ can be expressed as

$$P(i,h) = P(\textit{choosing any job-package within } B(i,h))$$

$$= P(\tilde{U}_{ik} = \max_{i,k} \tilde{U}_{ik} \mid i,k \in B(i,h))$$

$$= \frac{\exp(\psi(i,h;w,I))g_i(h)}{\sum_{x,y \in B} \exp(\psi(x,y;w,I)g_i(x)}, \tag{8}$$

where *B* is the set of feasible combinations of shift type and hours of work, and

$$\psi(i,h;w,I) = v_{ik}\left(f\left(H_{ik}W_i\left(H_{ik}\right)\right) + I, H_{ik}\right) = V_{ik}/\sigma.$$

(9)

Due to the assumption of extreme value distributed utilities it follows that the choice probabilities are multinomial logits. By setting $g_i(h) = 1$ in *(8)* we get the standard multinomial logit. The interpretation of the "opportunity density extended" version of the standard multinomial logit, given in *(8),* is that the attractiveness of a choice measured by $\exp(\psi)$ is weighted by a function saying how available this choice is in the market. The weight is determined by

$$g_i(h) = \exp(\varsigma k_i) \qquad (10)$$

where k_i = 1 if the main job is full-time with shift type *i* (35.5 hours per week if shift, 37.5 hours per week if daytime), and k_i = 0 otherwise. For more details about this methodology I refer to Aaberge, Colombino and Strøm (1999).

The deterministic part of the preferences is represented by the following "Box-Cox" type utility function:

$$v_{ik} = \kappa \frac{(C_{ik} - C_0)^{\lambda} - 1}{\lambda} + \rho(X)\frac{(L_{ik} - L_0)^{\gamma} - 1}{\gamma} \qquad (11)$$

where

$$C_{ik} - C_0 = 10^{-6}\left(C_{ik} - 50000\right)$$

$$L_{ik} - L_0 = \left(8760 - (12 * 365) - H_{ik}\right)/8760. \qquad (12)$$

$$\rho(X) = \rho_0 + \sum_{q=1}^{5} \rho_q X_q$$

The first element represents the utility from consumption and the second element the utility of leisure time. See Aaberge, Dagsvik and Strøm (1995) and Aaberge, Colombino and Strøm (1999) for an empirical analysis applying this specification. One advantage of this specification is that it is flexible enough to yield both negative (backward bending labor supply curve) and positive wage elasticities.

A minimum consumption of NOK 50,000 is introduced in the consumption element. 8,760 is the total number of annual hours, from which 12 hours per day for sleep and rest is subtracted in the leisure element. κ , λ , γ and the $\rho's$ are unknown parameters. For the utility function to be quasi-concave, we require λ<1 and γ<1. Note that if $\lambda \to 0$ and $\gamma \to 0$, the utility function converges to a log-linear function.

An alternative specification is to use a semi-parametric approach like van Soest (1995), where the deterministic part of the preferences is represented by a polynomial.
Due to the calculation of the compensating variation (CV) below I stay with the Box-Cox formulation.

The characteristics are: X_1 = Age of the nurse/10. X_2 = Number of children below six years of age. X_3 = Number of children between 6 and 11 years of age. X_4 = 1 if the person is born in Norway, 0 otherwise. X_5 = 1 if the person is married, 0 otherwise.
The parameters (κ, λ, γ, ρ_0 , ρ_q , ς) are estimated in a maximum-likelihood procedure. Note that σ is not identified and is absorbed in κ and ρ's.

Compensating variation
We are interested in the value in utility terms of a change of shift type from daytime job *d* to the shift job *s,* for a specific workload. We measure the utility with the expected value of the compensating variation z_h .

First we define z_h in

$$U(C(w_{dh}), L_{dh}) = U(C(w_{sh}) - z_h, L_{sh}) \tag{13}$$

or

$$v(C(w_{dh}), L_{dh}) + \varepsilon_{dh} = v(C(w_{sh}) - z_h, L_{sh}) + \varepsilon_{sh} \tag{14}$$

If the shift alternative is more attractive than the day job for a given workload measured in percentage of a full-time position, z_h is a measure of the over-compensation of the shift job.

Given the choice of a Box-Cox function from (11), we can insert it into (14). For a specific category of hours (*k=1,…,9*) we have

$$\kappa\frac{\left(C_{dk}-C_0\right)^{\lambda}-1}{\lambda}+\rho(X)\frac{\left(L_{dk}-L_0\right)^{\gamma}-1}{\gamma}+\varepsilon_{dk}=$$
$$\kappa\frac{\left(C_{sk}-z_k-C_0\right)^{\lambda}-1}{\lambda}+\rho(X)\frac{\left(L_{sk}-L_0\right)^{\gamma}-1}{\gamma}+\varepsilon_{sk} \qquad (15)$$

I will try to identify the size of z_k using a Monte Carlo simulation. However, to simplify this process I first rearrange *(15)* to the following expression

$$\tilde{\kappa}\left[C\left(w_{sk}\right)-z_k-C_0\right]^{\lambda}=$$
$$\tilde{\kappa}\left[C\left(w_{dk}\right)-C_0\right]^{\lambda}+\tilde{\rho}\left(x\right)\left[\frac{L_{dk}-L_0}{\gamma}-\frac{L_{sk}-L_0}{\gamma}\right]+\left(\varepsilon_{dk}-\varepsilon_{sk}\right)$$

(16)

where $\tilde{\kappa}=\frac{\kappa}{\lambda},\ \tilde{\rho}\left(x\right)=\frac{\rho\left(x\right)}{\lambda}$

I also introduce the denotation K_k to simplify the presentation of *(16):*

$$K_k=\tilde{\kappa}\left[C\left(w_{dk}\right)-C_0\right]^{\lambda}+\tilde{\rho}\left(x\right)\left[\frac{L_{dk}-L_0}{\gamma}-\frac{L_{sk}-L_0}{\gamma}\right]$$

(17)

K_k is deterministic and can be calculated for each individual when we have estimated the parameters of the model. (16) may now be represented as

$$\tilde{\kappa}\left[C\left(w_{sk}\right)-z_k-C_0\right]^{\lambda}=K_k+\left(\varepsilon_{dk}-\varepsilon_{sk}\right) \qquad (18)$$

We know that the difference between two extreme value variables is logistic distributed. Thus, if ε_{dk} and ε_{sk} are iid extreme values, then $\varepsilon^*_{dsk} = \varepsilon_{dk} - \varepsilon_{sk}$ follows the logistic distribution. The next step is to simulate z_k using a Monte Carlo simulation where I take 50 draws from the logistic distribution for each category of hours for each individual. For each draw of ε^*_{dsk}, I calculate $\hat{z}_k$. I have to apply the following rule in the calculation:

$$\tilde{\kappa}\left[C\left(w_{sk}\right) - \hat{z}_k - C_0\right]^{\lambda} = \max\left(0, K_k + \hat{\varepsilon}^*_{dsk}\right) \tag{19}$$

This is to avoid that the consumption you give up as measured by $\hat{z}_k$ gives you a lower consumption than the minimum level of C_0. The result is two formulas to calculate $\hat{z}_k$:

If $K_k + \hat{\varepsilon}^*_{dsk} \leq 0$ then $\hat{z}_k = C(w_{sk}) - C_0$ *(20)*

If $K_k + \hat{\varepsilon}^*_{dsk} > 0$ then

$$\hat{z}_k = \left[C\left(w_{sk}\right) - C_0\right] - \left\{\left[C\left(w_{dk}\right) - C_0\right]^{\lambda} + \frac{\tilde{\rho}\left(x\right)}{\tilde{\kappa}}\left[\frac{L_{dk} - L_0}{\gamma} - \frac{L_{sk} - L_0}{\gamma}\right] + \frac{1}{\tilde{\kappa}}\hat{\varepsilon}^*_{dsk}\right\}^{\frac{1}{\lambda}} \tag{21}$$

The next step is to find the average for each category of hours for each individual. I calculate

$$CV_{kn} = \sum_{t=1}^{50} \hat{z}_{knt} \tag{22}$$

for each individual *n*, and each category of hours *k.* The last step is to calculate the mean per category of hours over the individuals.

$$\overline{CV_k} = \frac{1}{N}\sum_{n=1}^{N} CV_{kn} \qquad (23)$$

Given that the utility function can be given a cardinal interpretation I may present the mean and the standard deviation of CV_k and plot the distribution for each category of hours. If I restrict the utility function to be cardinal, I can only report the number of nurses who have a $CV_{kn} > 0$ and $CV_{kn} \leq 0$.

4.2 Estimation and results

Job-specific wages and disposable income

The first step in the estimation procedure is to derive predicted hourly wages not only for the shift type and care level they actually work in, but also for the other alternatives. The wages are individual specific depending on personal characteristics like age, experience, country background and residency, and are estimated by a Heckman selection correction procedure. Overtime hours are compensated in accordance with the agreed terms. As the wages were discussed in detail in Section 3, I will only refer to Table A4 in Appendix 3. Above, I used a two-step Heckman procedure with a Probit model for covering the probabilistic structure of choice. Here, the latter is logistic, but the outcome on the wages of a Logit instead of a Probit is minimal (Dagsvik et al. (1987)).

A disposable income is calculated for each job package, defined by care level, shift type and categories of hours. I use the predicted hourly wages, and actual non-linear tax rates to calculate labor income after tax, and add the actual capital income, social security benefits and spouse's income. The first column in Table A8 presents the difference in disposable income for a shift job versus a day job for the nine categories of hours. The mean shift premium is positive and higher in hospitals as shown in Section 3.2, but for all alternative hours there are some individuals who have a negative shift premium. The mean difference is NOK 19,000 for a full-time position in the hospital sector or approximately 4% of the disposable income for the day alternative. This is illustrated for the case of full-time jobs by the histogram of the difference in disposable income in favor of the shift jobs in Figure A1, Quadrant 1.

Estimation of structural parameters

Based on the knowledge of disposable income and leisure measured by hours of work for all alternative job packages for each individual, I estimate the structural model. The parameters are estimated separately for the samples of hospital and primary care nurses. Remember that for the same percentage of a full-time job the nurses work shorter hours if they work in a shift job. I have restricted the sample to those with a non-work income between NOK 100,000 and NOK 500,000 in order to limit the impact of outliers in the analysis.

From Table A5 we observe that almost all parameters are sharply determined and that λ and γ are estimated to yield a quasi-concave utility function. For the hospital nurses the income term in the utility function (11) is estimated with λ to be 0.285, and α to 2.828 such that increased income increases the deterministic utility.

The γ in the leisure component is estimated to -0.320. β_0 is positive with a value of 6.567, meaning that the average individual has an increased utility of jobs with shorter working hours. The other βs are, however, negative. This means that the RNs tend to choose jobs with less part-time work the older they are, and that the same goes for nurses with children aged between 6 and 11 and married nurses. The number of children below 6 years of age is not significant. The *g*-function in (8) with a dummy representing a full-time position is represented with the significant parameter ς of 1.064.

The parameters estimated for the primary care nurses follows the same pattern as for the hospital RNs with the exception of some of the βs. Age is not significant, but age squared is significant and has a negative sign. Surprisingly β_3, the parameter for the number of children below 6 years of age is negative, as well as the parameters for the number of children between 6 and 11 years, marital status, and whether you are born in Norway.

Deterministic utility

The second group of columns in Table A6 presents the difference in deterministic utility between the shift job and the daytime job. It is worth noting that the mean difference is positive in favor of the shift jobs for all categories of hours. This is illustrated for the case of full-time jobs by the histogram of the difference in deterministic utility in favor of the shift jobs in Figure A1, Quadrant 2.

Compensating variation

The results from the Monte Carlo simulations are presented in the third group of columns in Table A6. The compensating variation is presented for the variable $\overline{CV_k}$ for the nine alternative categories of hours. For all alternatives the mean is positive, with the exception of the jobs with shortest working hours, the category of 32.5% of a full-time position, which has a negative mean. However, a positive $\overline{CV_k}$ means that the RNs on average are so satisfied with their shift jobs, being rewarded with higher wages, shorter working hours and increased flexibility, that they actually would accept a lower wage than they are offered today and still be better or equally well off with a shift job. For a full-time job the $\overline{CV_k}$ equals NOK 26,000 or 5.7% of the annual disposable income for the household. The minimum value for the simulated $\overline{CV_k}$ is -63,680 NOK and the maximum is NOK 96,500. For the full-time alternative 90 % has $\overline{CV_7} > 0$ meaning that the majority gains from having a shift job, or in other words that the RNs could accept a reduction in the shift compensation and still prefer the shift alternative. For half-time jobs the percentage with $\overline{CV_4} > 0$ is 62% of the RNs, while for those working in a one third of a full-time position, we have that $\overline{CV_1} > 0$ for 29% for the hospital RNs and 27% for the primary care RNs.

Generally the differences between shift jobs and daytime jobs are smaller in primary care both when focusing on the shift premium measured in disposable income, and compensating variation expressed by $\overline{CV_k}$. For all categories of hours a histogram for $\overline{CV_k}$ and the share with a positive $\overline{CV_k}$ are presented in Figure A2 and A3. In Figure A4 and A5 the $\overline{CV_k}$ is plotted by age for 50%, 75% and 100% positions for hospital and primary care jobs. The compensation needed seems to be rather stable across age groups.

I have not conditioned on the RNs' actual choices in the calculation of the $\overline{CV_k}$. I still consider the calculations as a relevant approximation of the compensation necessary. The statistical derivation of a more correct expression, contingent on their actual choices is technically more complex and an obvious topic for further research.

5. Conclusions

In the first part of this paper I applied a switching regression model to identify the compensating differentials for registered nurses. The first finding was that there is a significant shift premium of 19.3% for the sample of hospital RNs and 18.1% for the primary care RNs. However, the shift premium is only weakly significant for the shift work choice for the sample of hospital RNs, and not significant for the primary care RNs. There seems to be a positive selection into shift work for the nurses working in hospitals, but a negative selection into shift work for the nurses in primary care jobs. There is no selection effect into the daytime jobs.

In contrast to the previous published results I found no hospital premium for the shift RNs, and a slightly negative hospital premium of –1.7% for the daytime working RNs. The negative hospital premium is not significant for the hospital job choice. There is a positive selection into hospital and primary care jobs for the sample of shift RNs. There is no selection into hospital jobs and a positive selection into primary care jobs for the dayworking RNs.

In the second part of the paper I focused on the shift premium and shift choice as the hospital premium seems to be of minimum significance in the Norwegian public health sector. I presented a structural labor supply model with a random utility function to identify the expected compensation necessary for the nurses to remain on the same utility level when they are "forced" from a day job to a shift job. The expected compensating variations were derived by Monte Carlo simulations and the distribution presented for different categories of hours. I found that on average the offered combination of higher wages, shorter working hours and increased flexibility overcompensated for the health and social strain related to shift work. The simulations indicated that the average nurse would choose a shift job even if the shift compensation was reduced by 5% of the disposable income.

It is widely known that a focusing only on wage differentials may be misleading when evaluating compensating mechanisms, as the other attributes of a nursing job, such as job flexibility and working hours, also compensate the negative effects of shift work. A structural labor supply model with a random utility function makes it possible to better include the nonpecuniary characteristics of jobs in the analysis, and thus to better inform the policy makers who are trying to find an optimal compensation package in a public health sector with a strained budget.

6. References

Aaberge, R., Colombino, U., Strøm, S., 1999, Labour Supply in Italy: An Empirical Analysis of Joint Household Decisions, with Taxes and Quantity Constraints. Journal of Applied Econometrics 14: 403-422.

Aaberge, R., Dagsvik, J. K., Strøm, S., 1995, Labor Supply Responses and Welfare Effects of Tax Reforms. Scandinavian Journal of Economics 97: 635-59.

Booton, L.A., Lane, J.I., 1985, Hospital Market Structure and the Return to Nursing Education. Vol. 96, No. 1 (January), pp. 61, 64.

Costa, G., 1996, The Impact of Shift and Night Work on Health. Applied Ergonomics 27: 9-16.

Dagsvik, J. K., 1987, A Modification of Heckman's Two Stage Estimation Procedure that is Applicable when the Budget Set is Convex. Discussion paper No. 28. Statistics Norway.

Dagsvik, J. K, Laisney, F., Strøm, S., Østervold, J., 1988, Female Labor Supply in France, Annales d'Economic et de Statistique, Vol. 11, 5-40.

European Observatory on Health Care Systems, 2000, Health Care Systems in Transition, Norway. Copenhagen: WHO Regional office for Europe.

Hamermesh, D., 1999, The Timing of Work over Time, The Economic Journal, 109 (January), 37-66.

Hwang, H., Reed, W.R., Hubbard, C., 1992, Compensating Wage Differentials and Unobserved Productivity. Journal of Political Economy, Vol. 100, No. 4 (August), pp. 835-58.

The International Council of Nurses (ICN), 2000, Nurses and Shift work, Position Statements.

Kostiuk, P. F., 1990, Compensating Differentials for Shift Work. Journal of Political Economy, Vol. 98, No. 5, pt. 1 (October), pp. 1054-75.

Lanfranchi, J., Ohlsson, H., Skalli, A., 2001, Compensating Wage Differentials and Shift Work Preferences: Evidence from France, ERMES (2001). Working paper No 55, Department of Economics, Göteborg University.

Lanfranchi, J., Ohlsson, H., Skalli, A., 2002, Compensating Wage Differentials and Shift Work Preferences. Economics letters 74, 393-398.

Lehrer, E. L., White, W.D., Young, W.B., 1991, The Three Avenues to a Registered Nurse License: A Comparative Analysis. Journal of Human Resources, Vol. 26, No. 2 (Spring), pp. 262-79.

Link, C. R.,1988, Returns to Nursing Education: 1970-84. Journal of Human Resources, Vol. 23, No.3 (Summer), pp. 372-87.

Maddala, G., 1983, Limited Dependent and Qualitative Variables in Econometrics. Cambridge University Press, Cambridge.

Ohida, T., 2001, Night-Shift Work Related Problems of Young Female Nurses in Japan. Journal of Occupational Health, 43, 150-156.

Rosen, S., 1986, The Theory of Equalizing Differences. In: O. Ashenfelter and R. Layard, Editors, Handbook of Labor Economics Vol. 1, North-Holland, Amsterdam (1986), pp. 641–692 Chapter 12.

Schumacher, E. J., Hirsch, B.T., 1997, Compensating Differentials and Unmeasured Ability in the Labour Market for Nurses: Why do Hospitals Pay More? Industrial and Labor Relations Review, Vol. 50, No.4, July 1997, pp 557-79.

Train, K., 2003, Discrete Choice Methods with Simulation. Cambridge University Press, Cambridge.

van den Noord, P., Hagen, T.P., Iversen, T., 1998, The Norwegian Health Care System. Economics Department Working Papers no. 198. Paris: OECD.

van Soest, A., 1995, Discrete Choice Models of Family Labor Supply. Journal of Human Resources 30, 63-88.

Appendix 1 Key variables

Table A1 Key variables

Female registered nurses in 2000	**Mean**	**Std Dev**
N	11,542	
Age	40.2	10.2
Born in Norway=1	0.92	0.27
Single	0.29	0.45
Married	0.60	0.49
Number of children	2.0	1.0
Lives in a central area (Cat. 6&7 out of 7)	0.70	0.46
Years since graduation	13.3	11.0
Number of years employed (income >1G) since 1967	10.9	7.6
Hours per year	1,363	347
Work shifts	0.88	0.33
% Position	0.81	0.21
Income from work, NOK	237,914	56,953
Social security benefits, NOK	21,037	28,229
Total income, NOK	264,990	68,815
Income after tax	196,376	50,422
Age of spouse (N=7,753)	45.7	9.6
Total annual income, spouse	403,774	416,579
Annual income after tax, spouse	277,146	328,507

Appendix 2.1. A switching regression model to identify the shift premium

Table A2.i Shift choice, probit models, marginal effects. (Case a and b)

	Case a) Shift work choice if hospital RNs						**Case b) Shift work choice if primary care RNs**					
	Reduced form			**Structural form**			**Reduced form**			**Structural form**		
Variable	**dF/dx**	***Std. E.***	***t-values***	**dF/dx**	***Std. E.***	***t-values***	**dF/dx**	***Std. E.***	***t-values***	**dF/dx**	***Std. E.***	***t-values***
Shift premium				3.555	*1.951*	*1.78*				1.917	*2.762*	*0.7*
Married	-0.020	*0.009*	*-2.24*	-0.036	*0.012*	*-2.82*	0.002	*0.009*	*0.2*	-0.001	*0.010*	*-0.08*
No. of children <6 years of age	0.027	*0.010*	*2.75*	0.048	*0.015*	*3.09*	0.024	*0.009*	*2.52*	-0.014	*0.056*	*-0.26*
No. of children aged 6-11	0.008	*0.007*	*1.16*	0.015	*0.008*	*1.86*	0.005	*0.007*	*0.77*	-0.003	*0.014*	*-0.24*
Age	-0.047	*0.112*	*-0.42*	-0.893	*0.477*	*-1.83*	0.202	*0.116*	*1.75*	-0.013	*0.331*	*-0.04*
Age^2/100	0.168	*0.399*	*0.42*	2.992	*1.599*	*1.83*	-0.736	*0.408*	*-1.8*	0.093	*1.263*	*0.07*
Age^3/1000	-0.259	*0.616*	*-0.42*	-4.338	*2.319*	*-1.83*	1.166	*0.625*	*1.86*	-0.224	*2.098*	*-0.11*
Age^4/10000	0.144	*0.349*	*0.41*	2.288	*1.226*	*1.82*	-0.672	*0.351*	*-1.91*	0.168	*1.260*	*0.13*
Experience	-0.027	*0.017*	*-1.59*	-0.079	*0.033*	*-2.31*	-0.054	*0.017*	*-3.07*	-0.092	*0.057*	*-1.62*
Experience^2/100	0.062	*0.258*	*0.24*	0.746	*0.453*	*1.61*	0.465	*0.266*	*1.74*	0.778	*0.524*	*1.49*
Experience^3/1000	0.156	*1.524*	*0.1*	-3.875	*2.671*	*-1.43*	-1.610	*1.569*	*-1.02*	-2.444	*1.980*	*-1.24*
Experience^4/10000	-0.598	*3.032*	*-0.2*	8.017	*5.584*	*1.41*	1.655	*3.117*	*0.53*	2.107	*3.188*	*0.66*
Born in a Nordic country excl. Norway	-0.051	*0.023*	*-2.5*	-0.095	*0.038*	*-3.03*	-0.018	*0.025*	*-0.75*	-0.051	*0.060*	*-0.98*
Born in an OECD country excl. Nordic	0.033	*0.020*	*1.44*	0.083	*0.014*	*2.19*	-0.042	*0.033*	*-1.45*	0.031	*0.079*	*0.33*
Born in a non-OECD country	0.040	*0.020*	*1.64*	0.074	*0.015*	*2.39*	0.047	*0.020*	*1.79*	0.056	*0.021*	*1.88*
Place of residency (C3=Oslo)												
County 1 Østfold	0.076	*0.009*	*5.3*	0.091	*0.008*	*4.44*	0.059	*0.029*	*1.44*	0.089	*0.032*	*1.25*
County 2 Akershus	0.038	*0.013*	*2.49*	0.050	*0.012*	*3.07*	0.028	*0.042*	*0.59*	0.091	*0.047*	*0.83*
County 4 Hedmark	0.075	*0.010*	*4.23*	0.046	*0.026*	*1.36*	0.057	*0.029*	*1.37*	0.091	*0.030*	*1.12*
County 5 Oppland	0.089	*0.007*	*5.81*	0.101	*0.006*	*3.95*	0.075	*0.020*	*2.12*	0.091	*0.020*	*1.77*
County 6 Buskerud	0.079	*0.008*	*5.71*	-0.351	*0.424*	*-1.09*	0.023	*0.045*	*0.46*	0.018	*0.048*	*0.34*
County 7 Vestfold	0.071	*0.010*	*4.3*	0.077	*0.009*	*4.62*	0.042	*0.037*	*0.91*	0.090	*0.036*	*0.94*
County 8 Telemark	0.075	*0.010*	*4.34*	0.042	*0.029*	*1.19*	0.038	*0.038*	*0.8*	0.078	*0.041*	*0.97*
County 9 Aust-Agder	0.068	*0.011*	*3.75*	-0.027	*0.088*	*-0.34*	0.027	*0.043*	*0.56*	0.078	*0.045*	*0.85*
County 10 Vest-Agder	0.082	*0.007*	*6.93*	0.049	*0.026*	*1.48*	0.059	*0.028*	*1.46*	0.073	*0.027*	*1.57*
County 11 Rogaland	0.071	*0.008*	*5.65*	0.051	*0.016*	*2.48*	0.045	*0.036*	*1.01*	0.082	*0.046*	*1.09*
County 12 Hordaland	0.051	*0.010*	*4.18*	-0.023	*0.055*	*-0.44*	0.056	*0.032*	*1.33*	0.101	*0.043*	*1.07*
County 13 Sogn og Fjordane	0.053	*0.018*	*2.12*	-0.295	*0.316*	*-1.25*	0.061	*0.027*	*1.5*	0.075	*0.025*	*1.58*
County 14 Møre og Romsdal	0.056	*0.015*	*2.8*	0.027	*0.027*	*0.89*	0.065	*0.029*	*1.58*	0.083	*0.031*	*1.61*
County 15 Sør-Trøndelag	0.081	*0.007*	*7.41*	0.103	*0.009*	*4.23*	0.022	*0.045*	*0.45*	0.087	*0.047*	*0.79*
County 16 Nord-Trøndelag	0.085	*0.007*	*6.15*	0.059	*0.021*	*1.96*	0.070	*0.023*	*1.89*	0.082	*0.022*	*1.88*
County 17 Nordland	0.063	*0.013*	*3.29*	0.055	*0.015*	*2.66*	0.051	*0.033*	*1.16*	0.093	*0.038*	*1.05*
County 18 Troms	0.052	*0.021*	*1.76*	0.085	*0.011*	*2.45*	0.028	*0.042*	*0.59*	0.089	*0.049*	*0.84*
County 19 Finnmark	0.056	*0.023*	*1.67*	0.091	*0.007*	*2.34*	0.031	*0.043*	*0.62*	0.037	*0.042*	*0.73*
Municipal Centrality (7=Most central)												
Municipal Centrality 1	0.038	*0.018*	*1.77*	-0.001	*0.036*	*-0.04*	-0.027	*0.016*	*-1.78*	0.010	*0.050*	*0.2*
Municipal Centrality 2	-0.013	*0.025*	*-0.55*	0.000	*0.024*	*0*	0.012	*0.021*	*0.54*	-0.031	*0.075*	*-0.45*
Municipal Centrality 3	-0.003	*0.023*	*-0.15*	0.038	*0.025*	*1.28*	-0.001	*0.019*	*-0.06*	0.047	*0.059*	*0.66*
Municipal Centrality 4	-0.003	*0.043*	*-0.08*	-0.803	*0.274*	*-1.77*	0.021	*0.017*	*1.15*	0.013	*0.022*	*0.55*
Municipal Centrality 5	0.026	*0.017*	*1.4*	-0.069	*0.075*	*-1.09*	-0.041	*0.023*	*-1.99*	-0.003	*0.052*	*-0.06*
Municipal Centrality 6	0.000	*0.016*	*0.02*	-0.015	*0.019*	*-0.8*	-0.002	*0.015*	*-0.15*	0.040	*0.055*	*0.65*
Log likelihood	-2,007.2			-2,005.6			-1,774.6			-1,774.3		
chi squared	696.53			699.78			214.24			214.72		
Significance level	0.000			0.000			0.000			0.000		
pseudo R2	0.1479			0.1485			0.0569			0.0571		
Number of observations	5,957			5,957			5,585			5,585		

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

Table A3.i Wage equations, sample selection models. Shift RNs and daytime RNs (Case a and b).

	Case a) Wage equations if hospital RNs						**Case b) Wage equations if primary care RNs**					
	Shift workers			**Daytime workers**			**Shift workers**			**Daytime workers**		
	Coef.	***Std. E.***	***t-values***	**Coef.**	***Std. E.***	***t-values***	**Coef.**	***Std. E.***	***t-values***	**Coef.**	***Std. E.***	***t-values***
Age	0.015	*0.039*	*0.37*	-0.215	*0.107*	*-2.02*	0.026	*0.048*	*0.54*	0.082	*0.167*	*0.49*
Age^2/100	0.013	*0.147*	*0.09*	0.779	*0.368*	*2.11*	-0.058	*0.175*	*-0.33*	-0.238	*0.593*	*-0.4*
Age^3/1000	-0.102	*0.238*	*-0.43*	-1.204	*0.554*	*-2.17*	0.039	*0.275*	*0.14*	0.289	*0.913*	*0.32*
Age^4/10000	0.095	*0.140*	*0.68*	0.673	*0.305*	*2.2*	0.002	*0.158*	*0.01*	-0.123	*0.513*	*-0.24*
Experience	0.004	*0.005*	*0.73*	-0.007	*0.021*	*-0.35*	0.018	*0.006*	*2.94*	-0.043	*0.030*	*-1.42*
Experience^2/100	0.037	*0.087*	*0.43*	0.238	*0.272*	*0.88*	-0.100	*0.092*	*-1.1*	0.402	*0.349*	*1.15*
Experience^3/1000	-0.469	*0.555*	*-0.84*	-1.733	*1.502*	*-1.15*	0.177	*0.566*	*0.31*	-1.350	*1.792*	*-0.75*
Experience^4/10000	1.139	*1.171*	*0.97*	3.848	*2.860*	*1.35*	0.095	*1.176*	*0.08*	1.255	*3.299*	*0.38*
Born in a Nordic country excl. Norway	0.005	*0.008*	*0.6*	0.006	*0.016*	*0.35*	0.015	*0.009*	*1.63*	-0.012	*0.023*	*-0.54*
Born in an OECD country excl. Nordic	0.017	*0.011*	*1.54*	0.040	*0.026*	*1.58*	-0.005	*0.012*	*-0.41*	0.001	*0.028*	*0.05*
Born in a non-OECD country	0.022	*0.011*	*2.1*	0.032	*0.027*	*1.21*	0.006	*0.012*	*0.48*	0.062	*0.047*	*1.33*
Place of residency (C3=Oslo)												
County 1 Østfold	-0.040	*0.010*	*-4.13*	-0.051	*0.031*	*-1.65*	-0.125	*0.055*	*-2.29*	-0.017	*0.095*	*-0.18*
County 2 Akershus	-0.032	*0.008*	*-3.98*	-0.036	*0.016*	*-2.3*	-0.100	*0.054*	*-1.85*	-0.002	*0.090*	*-0.03*
County 4 Hedmark	-0.026	*0.012*	*-2.14*	-0.069	*0.035*	*-1.98*	-0.132	*0.055*	*-2.42*	-0.013	*0.095*	*-0.14*
County 5 Oppland	-0.041	*0.013*	*-3.22*	-0.046	*0.044*	*-1.04*	-0.141	*0.055*	*-2.55*	-0.012	*0.102*	*-0.11*
County 6 Buskerud	0.023	*0.011*	*2.15*	-0.098	*0.031*	*-3.12*	-0.069	*0.054*	*-1.28*	-0.052	*0.090*	*-0.57*
County 7 Vestfold	-0.045	*0.011*	*-4.15*	-0.063	*0.030*	*-2.07*	-0.116	*0.055*	*-2.12*	-0.008	*0.092*	*-0.09*
County 8 Telemark	-0.019	*0.011*	*-1.64*	-0.062	*0.033*	*-1.86*	-0.104	*0.054*	*-1.91*	-0.022	*0.092*	*-0.24*
County 9 Aust-Agder	-0.026	*0.012*	*-2.19*	-0.084	*0.031*	*-2.7*	-0.122	*0.055*	*-2.23*	-0.043	*0.091*	*-0.48*
County 10 Vest-Agder	-0.018	*0.010*	*-1.7*	-0.067	*0.031*	*-2.12*	-0.113	*0.055*	*-2.07*	-0.029	*0.095*	*-0.31*
County 11 Rogaland	-0.010	*0.008*	*-1.21*	-0.042	*0.025*	*-1.66*	-0.092	*0.054*	*-1.7*	-0.010	*0.091*	*-0.11*
County 12 Hordaland	-0.034	*0.007*	*-4.74*	-0.071	*0.017*	*-4.08*	-0.123	*0.054*	*-2.27*	-0.003	*0.092*	*-0.03*
County 13 Sogn og Fjordane	-0.018	*0.014*	*-1.28*	-0.102	*0.029*	*-3.47*	-0.114	*0.055*	*-2.07*	-0.023	*0.096*	*-0.24*
County 14 Møre og Romsdal	-0.018	*0.010*	*-1.7*	-0.045	*0.026*	*-1.73*	-0.124	*0.055*	*-2.26*	-0.030	*0.096*	*-0.31*
County 15 Sør-Trøndelag	-0.027	*0.009*	*-3.04*	-0.033	*0.029*	*-1.16*	-0.137	*0.054*	*-2.52*	-0.045	*0.090*	*-0.51*
County 16 Nord-Trøndelag	-0.015	*0.012*	*-1.27*	-0.066	*0.036*	*-1.83*	-0.134	*0.055*	*-2.44*	-0.028	*0.099*	*-0.29*
County 17 Nordland	-0.053	*0.011*	*-4.97*	-0.076	*0.028*	*-2.67*	-0.118	*0.054*	*-2.17*	-0.008	*0.094*	*-0.09*
County 18 Troms	-0.057	*0.015*	*-3.69*	-0.043	*0.034*	*-1.27*	-0.125	*0.054*	*-2.31*	-0.032	*0.090*	*-0.35*
County 19 Finnmark	-0.089	*0.017*	*-5.26*	-0.062	*0.046*	*-1.36*	-0.104	*0.055*	*-1.88*	-0.069	*0.093*	*-0.74*
Municipal Centrality (7=Most central)												
Municipal Centrality 1	-0.006	*0.008*	*-0.73*	-0.029	*0.030*	*-0.96*	-0.006	*0.007*	*-0.9*	-0.008	*0.017*	*-0.48*
Municipal Centrality 2	0.002	*0.009*	*0.24*	0.008	*0.021*	*0.39*	-0.007	*0.009*	*-0.87*	-0.018	*0.027*	*-0.67*
Municipal Centrality 3	-0.007	*0.008*	*-0.85*	0.007	*0.021*	*0.33*	-0.008	*0.007*	*-1.05*	0.021	*0.022*	*0.98*
Municipal Centrality 4	-0.014	*0.014*	*-1.02*	-0.133	*0.053*	*-2.5*	0.002	*0.009*	*0.19*	0.017	*0.023*	*0.74*
Municipal Centrality 5	0.013	*0.008*	*1.67*	-0.018	*0.019*	*-0.92*	0.014	*0.009*	*1.56*	0.001	*0.025*	*0.02*
Municipal Centrality 6	0.004	*0.006*	*0.72*	0.000	*0.015*	*-0.03*	-0.012	*0.006*	*-1.96*	0.011	*0.015*	*0.74*
Selection term	0.057	*0.032*	*1.76*	0.022	*0.048*	*0.45*	-0.136	*0.066*	*-2.04*	-0.118	*0.087*	*-1.36*
Constant	4.755	*0.381*	*12.48*	7.107	*1.116*	*6.37*	4.840	*0.486*	*9.97*	4.366	*1.568*	*2.78*
sigma ui												
R2	0.1429			0.1369			0.0716			0.0816		
RSS												
Number of observations	4,863			758			4,652			550		

Appendix 2.2. A switching regression model to identify the hospital premium

Table A2.ii Hospital choice, probit models, marginal effects (Case c and d).

	Case c) Hospital choice if shift RNs						**Case d) Hospital choice if daytime RNs**					
	Reduced form			**Structural form**			**Reduced form**			**Structural form**		
Variable	**dF/dx**	***Std. E.***	***t-values***	**dF/dx**	***Std. E.***	***t-values***	**dF/dx**	***Std. E.***	***t-values***	**dF/dx**	***Std. E.***	***t-values***
Hospital premium				-0.915	*0.756*	*-1.21*				-4.368	*4.305*	*-1.02*
Married	-0.049	*0.012*	*-4.02*	-0.056	*0.013*	*-4.17*	0.017	*0.035*	*0.48*	0.027	*0.037*	*0.74*
No. of children <6 years of age	0.000	*0.013*	*-0.03*	0.000	*0.013*	*-0.02*	0.017	*0.039*	*0.42*	0.027	*0.041*	*0.67*
No. of children aged 6-11	-0.046	*0.010*	*-4.72*	-0.052	*0.011*	*-4.8*	-0.054	*0.028*	*-1.95*	-0.088	*0.044*	*-2.02*
Age	-0.815	*0.139*	*-5.85*	-0.858	*0.144*	*-5.97*	-0.293	*0.490*	*-0.6*	-0.905	*0.780*	*-1.16*
Age^2/100	2.857	*0.511*	*5.59*	3.052	*0.536*	*5.7*	1.027	*1.706*	*0.6*	3.025	*2.616*	*1.16*
Age^3/1000	-4.361	*0.810*	*-5.39*	-4.707	*0.859*	*-5.48*	-1.578	*2.578*	*-0.61*	-4.348	*3.770*	*-1.16*
Age^4/10000	2.422	*0.469*	*5.16*	2.637	*0.502*	*5.25*	0.888	*1.430*	*0.62*	2.272	*1.985*	*1.15*
Experience	-0.004	*0.018*	*-0.24*	-0.013	*0.020*	*-0.68*	-0.167	*0.083*	*-2.01*	-0.179	*0.085*	*-2.11*
Experience^2/100	0.309	*0.310*	*1*	0.461	*0.334*	*1.38*	2.808	*1.188*	*2.36*	3.718	*1.505*	*2.48*
Experience^3/1000	-2.823	*1.952*	*-1.45*	-3.743	*2.096*	*-1.79*	-15.701	*6.715*	*-2.34*	-24.005	*10.674*	*-2.26*
Experience^4/10000	7.120	*4.055*	*1.76*	8.929	*4.324*	*2.07*	28.749	*12.928*	*2.22*	49.125	*24.043*	*2.05*
Born in a Nordic country excl. Norway	0.029	*0.030*	*0.97*	0.025	*0.031*	*0.82*	0.117	*0.070*	*1.55*	0.151	*0.074*	*1.85*
Born in an OECD country excl. Nordic	0.016	*0.037*	*0.43*	0.039	*0.041*	*0.95*	-0.160	*0.109*	*-1.48*	-0.080	*0.135*	*-0.6*
Born in a non-OECD country	-0.136	*0.036*	*-3.69*	-0.132	*0.036*	*-3.56*	-0.013	*0.151*	*-0.09*	0.022	*0.152*	*0.15*
Place of residency (C3=Oslo)												
County 1 Østfold	-0.534	*0.014*	*-17.3*	-0.518	*0.021*	*-11.93*	-0.612	*0.036*	*-7.44*	-0.573	*0.064*	*-4.65*
County 2 Akershus	-0.530	*0.014*	*-17.64*	-0.514	*0.021*	*-11.8*	-0.611	*0.039*	*-8.2*	-0.626	*0.036*	*-7.58*
County 4 Hedmark	-0.535	*0.011*	*-17.59*	-0.520	*0.019*	*-10.59*	-0.614	*0.031*	*-7.43*	-0.611	*0.031*	*-7.44*
County 5 Oppland	-0.532	*0.012*	*-17.22*	-0.518	*0.019*	*-11.75*	-0.616	*0.028*	*-7.23*	-0.555	*0.100*	*-2.72*
County 6 Buskerud	-0.518	*0.014*	*-16.6*	-0.496	*0.025*	*-9.38*	-0.634	*0.028*	*-8.94*	-0.646	*0.025*	*-7.17*
County 7 Vestfold	-0.509	*0.016*	*-15.1*	-0.493	*0.022*	*-11.29*	-0.616	*0.036*	*-7.29*	-0.628	*0.032*	*-6.75*
County 8 Telemark	-0.507	*0.015*	*-15*	-0.488	*0.025*	*-9.72*	-0.627	*0.027*	*-7.85*	-0.625	*0.027*	*-7.9*
County 9 Aust-Agder	-0.506	*0.015*	*-14.68*	-0.484	*0.027*	*-8.51*	-0.623	*0.029*	*-7.88*	-0.630	*0.025*	*-7.2*
County 10 Vest-Agder	-0.494	*0.018*	*-14.97*	-0.469	*0.030*	*-9.11*	-0.562	*0.049*	*-6.5*	-0.513	*0.080*	*-4.17*
County 11 Rogaland	-0.558	*0.014*	*-19.12*	-0.540	*0.023*	*-11.98*	-0.654	*0.031*	*-9.51*	-0.644	*0.034*	*-8.92*
County 12 Hordaland	-0.531	*0.018*	*-16.95*	-0.504	*0.031*	*-9.74*	-0.548	*0.056*	*-6.68*	-0.590	*0.060*	*-5.57*
County 13 Sogn og Fjordane	-0.521	*0.012*	*-15.03*	-0.506	*0.020*	*-9.82*	-0.593	*0.042*	*-5.91*	-0.609	*0.035*	*-5.54*
County 14 Møre og Romsdal	-0.584	*0.011*	*-20.12*	-0.569	*0.018*	*-11.81*	-0.659	*0.030*	*-8.25*	-0.617	*0.066*	*-4.18*
County 15 Sør-Trøndelag	-0.435	*0.025*	*-12.02*	-0.380	*0.057*	*-5.09*	-0.577	*0.048*	*-7.1*	-0.485	*0.124*	*-2.85*
County 16 Nord-Trøndelag	-0.526	*0.014*	*-16.78*	-0.504	*0.027*	*-9.01*	-0.584	*0.044*	*-6.4*	-0.501	*0.122*	*-2.68*
County 17 Nordland	-0.545	*0.013*	*-17.69*	-0.536	*0.016*	*-14.28*	-0.628	*0.034*	*-7.52*	-0.644	*0.030*	*-6.3*
County 18 Troms	-0.567	*0.007*	*-22.63*	-0.563	*0.008*	*-18.06*	-0.654	*0.020*	*-9.63*	-0.650	*0.021*	*-9.48*
County 19 Finnmark	-0.514	*0.012*	*-13.21*	-0.513	*0.012*	*-13.26*	-0.502	*0.085*	*-3.69*	-0.403	*0.164*	*-1.97*
Municipal Centrality (7=Most central)												
Municipal Centrality 1	-0.217	*0.021*	*-9.62*	-0.216	*0.021*	*-9.5*	-0.462	*0.054*	*-6.65*	-0.563	*0.089*	*-3.66*
Municipal Centrality 2	0.042	*0.028*	*1.48*	0.049	*0.029*	*1.69*	0.152	*0.072*	*1.9*	0.240	*0.096*	*1.96*
Municipal Centrality 3	0.088	*0.025*	*3.45*	0.090	*0.025*	*3.5*	0.193	*0.060*	*2.8*	0.143	*0.083*	*1.58*
Municipal Centrality 4	-0.336	*0.026*	*-10.19*	-0.352	*0.028*	*-9.48*	-0.493	*0.073*	*-4.32*	-0.633	*0.029*	*-1.86*
Municipal Centrality 5	-0.035	*0.026*	*-1.34*	-0.030	*0.026*	*-1.13*	-0.214	*0.072*	*-2.96*	-0.386	*0.160*	*-2.02*
Municipal Centrality 6	0.016	*0.020*	*0.82*	0.031	*0.023*	*1.33*	0.069	*0.056*	*1.21*	-0.002	*0.092*	*-0.02*
Log likelihood	-5,992.8			-5,992.1			-747.42			-746.88		
chi squared	2,082.8			2,084.2			401.9			402.9		
significance level	0.000			0.000			0.000			0.000		
pseudo R2	0.148			0.1482			0.2119			0.2124		
Number of observations	10,150			10,150			1,392			1,392		

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

Table A3.ii Wage equations, sample selection models. Hospital RNs and primary care RNs. (Case c and d)

	Case c) Wage equations if shift RNs						**Case d) Wage equations if daytime RNs**					
	Hospital workers			**Primary care workers**			**Hospital workers**			**Primary care workers**		
	Coef.	***Std.E.***	***t-values***	**Coef.**	***Std.E.***	***t-values***	**Coef.**	***Std.E.***	***t-values***	**Coef.**	***Std.E.***	***t-values***
Age	-0.058	*0.043*	*-1.34*	-0.135	*0.052*	*-2.58*	-0.214	*0.107*	*-2*	-0.118	*0.127*	*-0.93*
Age^2/100	0.262	*0.160*	*1.64*	0.481	*0.186*	*2.59*	0.773	*0.370*	*2.09*	0.470	*0.441*	*1.07*
Age^3/1000	-0.474	*0.255*	*-1.86*	-0.745	*0.286*	*-2.61*	-1.196	*0.555*	*-2.15*	-0.799	*0.666*	*-1.2*
Age^4/10000	0.297	*0.149*	*1.99*	0.421	*0.161*	*2.61*	0.669	*0.306*	*2.18*	0.485	*0.370*	*1.31*
Experience	0.006	*0.005*	*1.17*	0.015	*0.005*	*2.79*	-0.010	*0.021*	*-0.5*	-0.032	*0.023*	*-1.4*
Experience^2/100	0.041	*0.086*	*0.47*	-0.083	*0.090*	*-0.92*	0.256	*0.294*	*0.87*	0.453	*0.340*	*1.33*
Experience^3/1000	-0.589	*0.553*	*-1.07*	0.040	*0.564*	*0.07*	-1.793	*1.627*	*-1.1*	-2.162	*1.930*	*-1.12*
Experience^4/10000	1.532	*1.170*	*1.31*	0.489	*1.168*	*0.42*	3.946	*3.070*	*1.29*	3.436	*3.698*	*0.93*
Born in a Nordic country excl. Norway	0.011	*0.008*	*1.38*	0.020	*0.009*	*2.14*	0.002	*0.015*	*0.12*	0.011	*0.023*	*0.48*
Born in an OECD country excl. Nordic	0.015	*0.011*	*1.39*	-0.009	*0.011*	*-0.75*	0.044	*0.025*	*1.77*	0.004	*0.026*	*0.16*
Born in a non-OECD country	0.008	*0.011*	*0.79*	-0.015	*0.012*	*-1.24*	0.036	*0.025*	*1.47*	0.026	*0.037*	*0.69*
Place of residency (C3=Oslo)												
County 1 Østfold	-0.099	*0.015*	*-6.46*	-0.335	*0.064*	*-5.25*	-0.040	*0.035*	*-1.16*	-0.210	*0.127*	*-1.65*
County 2 Akershus	-0.084	*0.015*	*-5.63*	-0.323	*0.064*	*-5.05*	-0.033	*0.031*	*-1.08*	-0.161	*0.124*	*-1.29*
County 4 Hedmark	-0.095	*0.019*	*-5.09*	-0.359	*0.065*	*-5.5*	-0.058	*0.043*	*-1.35*	-0.209	*0.130*	*-1.61*
County 5 Oppland	-0.108	*0.017*	*-6.32*	-0.352	*0.065*	*-5.45*	-0.031	*0.044*	*-0.69*	-0.239	*0.132*	*-1.81*
County 6 Buskerud	-0.035	*0.015*	*-2.29*	-0.290	*0.064*	*-4.55*	-0.087	*0.040*	*-2.16*	-0.225	*0.132*	*-1.71*
County 7 Vestfold	-0.097	*0.015*	*-6.5*	-0.319	*0.063*	*-5.06*	-0.053	*0.037*	*-1.45*	-0.184	*0.128*	*-1.43*
County 8 Telemark	-0.072	*0.015*	*-4.72*	-0.311	*0.063*	*-4.92*	-0.052	*0.045*	*-1.16*	-0.210	*0.133*	*-1.58*
County 9 Aust-Agder	-0.081	*0.016*	*-4.89*	-0.337	*0.064*	*-5.29*	-0.074	*0.041*	*-1.82*	-0.216	*0.131*	*-1.64*
County 10 Vest-Agder	-0.068	*0.013*	*-5.33*	-0.298	*0.062*	*-4.81*	-0.055	*0.026*	*-2.08*	-0.201	*0.119*	*-1.69*
County 11 Rogaland	-0.071	*0.015*	*-4.61*	-0.317	*0.065*	*-4.92*	-0.033	*0.038*	*-0.87*	-0.198	*0.131*	*-1.51*
County 12 Hordaland	-0.081	*0.013*	*-6.39*	-0.321	*0.063*	*-5.13*	-0.066	*0.022*	*-2.96*	-0.162	*0.116*	*-1.4*
County 13 Sogn og Fjordane	-0.077	*0.019*	*-3.93*	-0.333	*0.065*	*-5.12*	-0.096	*0.039*	*-2.44*	-0.216	*0.127*	*-1.7*
County 14 Møre og Romsdal	-0.092	*0.021*	*-4.46*	-0.368	*0.067*	*-5.5*	-0.040	*0.045*	*-0.87*	-0.238	*0.133*	*-1.79*
County 15 Sør-Trøndelag	-0.062	*0.009*	*-6.72*	-0.300	*0.060*	*-5.05*	-0.022	*0.026*	*-0.85*	-0.186	*0.119*	*-1.56*
County 16 Nord-Trøndelag	-0.078	*0.016*	*-4.85*	-0.341	*0.064*	*-5.33*	-0.053	*0.033*	*-1.6*	-0.228	*0.124*	*-1.84*
County 17 Nordland	-0.116	*0.018*	*-6.55*	-0.343	*0.065*	*-5.29*	-0.069	*0.042*	*-1.64*	-0.195	*0.129*	*-1.51*
County 18 Troms	-0.156	*0.029*	*-5.4*	-0.414	*0.070*	*-5.91*	-0.038	*0.060*	*-0.64*	-0.228	*0.141*	*-1.62*
County 19 Finnmark	-0.150	*0.022*	*-6.9*	-0.334	*0.066*	*-5.1*	-0.057	*0.046*	*-1.22*	-0.206	*0.119*	*-1.74*
Municipal Centrality (7=Most central)												
Municipal Centrality 1	-0.033	*0.010*	*-3.34*	-0.058	*0.009*	*-6.28*	-0.024	*0.042*	*-0.58*	-0.048	*0.034*	*-1.42*
Municipal Centrality 2	0.007	*0.009*	*0.79*	0.004	*0.009*	*0.49*	0.007	*0.023*	*0.3*	0.003	*0.031*	*0.09*
Municipal Centrality 3	0.000	*0.008*	*0.05*	0.009	*0.008*	*1.15*	0.007	*0.025*	*0.28*	0.049	*0.026*	*1.87*
Municipal Centrality 4	-0.054	*0.017*	*-3.15*	-0.068	*0.014*	*-4.85*	-0.132	*0.063*	*-2.11*	-0.058	*0.041*	*-1.43*
Municipal Centrality 5	0.007	*0.008*	*0.84*	-0.004	*0.008*	*-0.5*	-0.015	*0.022*	*-0.71*	-0.005	*0.024*	*-0.19*
Municipal Centrality 6	0.004	*0.006*	*0.69*	-0.010	*0.006*	*-1.73*	-0.001	*0.016*	*-0.05*	0.024	*0.016*	*1.54*
Selection term	0.071	*0.019*	*3.79*	-0.159	*0.024*	*-6.58*	0.000	*0.040*	*0.01*	-0.090	*0.051*	*-1.76*
Constant	5.533	*0.428*	*12.94*	6.964	*0.579*	*12.03*	7.145	*1.121*	*6.38*	6.368	*1.363*	*4.67*

Notes. The dependent variable is the log hourly wage rate.

Appendix 3 A random utility model

Table A4 Predicted hourly wages

Heckman selection model two-step estimates Hourly wage	**Hospital RNs Shift**			**Day**			**Primary care RNs Shift**			**Day**		
	Coef.	**Std. E.**	***t-values***	**Coef.**	**Std. E.**	***t-values***	**Coef.**	**Std. E.**	***t-values***	**Coef.**	**Std. E.**	***t-values***
Age	-0.039	0.091	-0.440	-0.261	0.127	-2.060	0.140	0.081	1.720	-0.070	0.120	-0.580
Age^2/100	0.198	0.337	0.590	0.926	0.439	2.110	-0.476	0.293	-1.630	0.311	0.419	0.740
Age^3/1000	-0.376	0.541	-0.690	-1.410	0.658	-2.140	0.707	0.460	1.540	-0.571	0.635	-0.900
Age^4/10000	0.246	0.318	0.770	0.778	0.363	2.140	-0.385	0.264	-1.460	0.366	0.353	1.040
Experience	0.012	0.012	0.990	-0.006	0.022	-0.260	0.004	0.011	0.400	-0.010	0.019	-0.530
Experience^2/100	-0.083	0.201	-0.410	0.260	0.311	0.840	0.058	0.175	0.330	0.109	0.281	0.390
Experience^3/1000	0.321	1.292	0.250	-2.053	1.743	-1.180	-0.617	1.090	-0.570	-0.270	1.616	-0.170
Experience^4/10000	-0.606	2.733	-0.220	4.750	3.354	1.420	1.484	2.254	0.660	-0.013	3.163	0.000
Born in a Nordic country excl. Norway	-0.005	0.019	-0.250	0.001	0.016	0.040	0.003	0.018	0.170	-0.003	0.021	-0.120
Born in an OECD country excl. Nordic	-0.009	0.025	-0.360	0.035	0.029	1.210	-0.018	0.021	-0.830	0.022	0.023	0.940
Born in a non-OECD country	0.009	0.023	0.390	0.053	0.031	1.690	-0.001	0.021	-0.070	0.022	0.037	0.600
County 1 Østfold	-0.021	0.022	-0.940	-0.033	0.023	-1.450	0.138	0.119	1.160	-0.073	0.109	-0.670
County 2 Akershus	-0.026	0.018	-1.420	-0.026	0.016	-1.560	0.171	0.125	1.370	-0.029	0.109	-0.260
County 4 Hedmark	-0.014	0.026	-0.560	-0.041	0.029	-1.410	0.151	0.126	1.200	-0.065	0.107	-0.610
County 5 Oppland	-0.028	0.025	-1.110	-0.015	0.032	-0.480	0.158	0.128	1.230	-0.091	0.109	-0.830
County 6 Buskerud	0.017	0.019	0.890	-0.097	0.022	-4.380	0.192	0.123	1.560	-0.076	0.111	-0.690
County 7 Vestfold	-0.043	0.022	-1.980	-0.046	0.025	-1.840	0.142	0.120	1.190	-0.045	0.109	-0.410
County 8 Telemark	-0.010	0.024	-0.420	-0.048	0.028	-1.700	0.166	0.124	1.330	-0.056	0.103	-0.540
County 9 Aust-Agder	-0.035	0.025	-1.420	-0.071	0.026	-2.700	0.140	0.123	1.140	-0.070	0.113	-0.620
County 10 Vest-Agder	-0.028	0.017	-1.660	-0.051	0.018	-2.750	0.167	0.124	1.340	-0.086	0.113	-0.770
County 11 Rogaland	0.002	0.018	0.130	-0.023	0.018	-1.320	0.179	0.123	1.460	-0.048	0.107	-0.450
County 12 Hordaland	-0.025	0.016	-1.570	-0.066	0.014	-4.840	0.155	0.124	1.250	-0.051	0.108	-0.480
County 13 Sogn og Fjordane	0.001	0.032	0.020	-0.073	0.034	-2.120	0.169	0.125	1.350	-0.084	0.115	-0.730
County 14 Møre og Romsdal	-0.019	0.022	-0.860	-0.036	0.026	-1.360	0.159	0.124	1.280	-0.091	0.115	-0.790
County 15 Sør-Trøndelag	-0.033	0.015	-2.250	-0.011	0.017	-0.660	0.146	0.130	1.120	-0.069	0.113	-0.610
County 16 Nord-Trøndelag	-0.023	0.020	-1.110	-0.037	0.026	-1.430	0.159	0.127	1.250	-0.100	0.110	-0.910
County 17 Nordland	-0.042	0.023	-1.820	-0.063	0.028	-2.250	0.164	0.126	1.300	-0.055	0.112	-0.500
County 18 Troms	-0.022	0.039	-0.570	-0.027	0.038	-0.730	0.156	0.128	1.220	-0.058	0.111	-0.530
County 19 Finnmark	-0.076	0.038	-2.000	-0.037	0.054	-0.700	0.181	0.131	1.380	-0.099	0.116	-0.850
Municipal Centrality 1	-0.006	0.017	-0.370	-0.028	0.033	-0.850	-0.011	0.011	-1.010	0.007	0.013	0.530
Municipal Centrality 2	0.017	0.020	0.830	-0.002	0.025	-0.090	0.004	0.016	0.250	-0.022	0.026	-0.830
Municipal Centrality 3	-0.009	0.018	-0.520	0.008	0.024	0.350	-0.005	0.014	-0.330	0.023	0.021	1.110
Municipal Centrality 4	0.004	0.032	0.130	-0.145	0.059	-2.460	-0.002	0.015	-0.110	0.002	0.020	0.110
Municipal Centrality 5	0.011	0.018	0.640	-0.015	0.022	-0.700	0.013	0.015	0.850	0.024	0.017	1.450
Municipal Centrality 6	0.004	0.013	0.340	-0.001	0.018	-0.080	-0.002	0.012	-0.170	0.015	0.014	1.020
Constant	5.288	0.877	6.030	7.630	1.325	5.760	3.419	0.857	3.990	5.598	1.250	4.480

Table 4 continued. Selection term.

Selection term	Hospital RNs Shift			Day			Primary care RNs Shift			Day		
	Coef.	Std. E.	*t-values*	Coef.	Std. E.	*t-values*	Coef.	Std. E.	*t-values*	Coef.	Std. E.	*t-values*
Married	-0.038	0.069	-0.550	-0.127	0.204	-0.620	-0.130	0.068	-1.930	-0.130	0.244	-0.530
No. Of children <6 years of age	-0.268	0.070	-3.830	-0.512	0.191	-2.680	-0.295	0.061	-4.810	-0.242	0.215	-1.120
No. of children aged 6-11	-0.204	0.055	-3.720	-0.049	0.157	-0.310	-0.092	0.048	-1.920	-0.215	0.168	-1.280
Age	-0.953	0.816	-1.170	-0.620	2.434	-0.250	2.080	0.726	2.870	-6.314	6.847	-0.920
Age^2/100	3.489	3.052	1.140	1.325	8.658	0.150	-7.587	2.639	-2.880	25.187	25.276	1.000
Age^3/1000	-5.656	4.936	-1.150	-0.947	13.353	-0.070	11.892	4.148	2.870	-43.515	40.831	-1.070
Age^4/10000	3.397	2.919	1.160	0.012	7.549	0.000	-6.783	2.385	-2.840	27.510	24.367	1.130
Experience	0.097	0.099	0.980	0.036	0.401	0.090	-0.172	0.101	-1.690	-0.662	0.647	-1.020
Experience^2/100	-1.297	1.703	-0.760	3.682	6.056	0.610	3.411	1.679	2.030	9.495	8.939	1.060
Experience^3/1000	7.982	10.889	0.730	-36.004	35.556	-1.010	-23.131	10.498	-2.200	-56.503	49.691	-1.140
Experience^4/10000	-18.205	22.889	-0.800	90.620	70.561	1.280	50.235	21.744	2.310	116.649	95.175	1.230
Born in a Nordic country excl. Norway	-0.231	0.131	-1.770	0.100	0.326	0.310	-0.154	0.148	-1.040	-0.161	0.536	-0.300
Born in an OECD country excl. Nordic	-0.369	0.160	-2.300	-0.600	0.492	-1.220	-0.069	0.192	-0.360	4.964	.	.
Born in a non-OECD country	-0.144	0.173	-0.830	5.439	.	.	-0.278	0.153	-1.820	5.306	.	.
County 1 Østfold	0.705	0.196	3.590	0.452	0.609	0.740	2.008	0.332	6.040	1.931	0.816	2.370
County 2 Akershus	0.185	0.140	1.330	0.356	0.358	0.990	2.396	0.334	7.160	1.895	0.751	2.520
County 4 Hedmark	0.502	0.228	2.210	5.853	.	.	2.465	0.351	7.030	1.546	0.796	1.940
County 5 Oppland	0.644	0.230	2.800	5.297	.	.	2.679	0.355	7.550	1.877	0.852	2.200
County 6 Buskerud	0.081	0.148	0.550	-0.660	0.382	-1.730	2.246	0.337	6.670	2.557	0.825	3.100
County 7 Vestfold	0.211	0.179	1.180	0.407	0.600	0.680	2.044	0.342	5.970	1.775	0.830	2.140
County 8 Telemark	0.390	0.202	1.940	0.171	0.635	0.270	2.300	0.351	6.540	1.484	0.778	1.910
County 9 Aust-Agder	0.008	0.189	0.040	0.315	0.651	0.480	2.239	0.354	6.320	7.280	.	.
County 10 Vest-Agder	0.042	0.129	0.330	0.211	0.400	0.530	2.362	0.337	7.000	7.178	.	.
County 11 Rogaland	0.466	0.139	3.370	0.674	0.516	1.310	2.324	0.326	7.140	1.757	0.740	2.370
County 12 Hordaland	0.303	0.119	2.540	-0.108	0.256	-0.420	2.372	0.327	7.260	1.805	0.747	2.420
County 13 Sogn og Fjordane	0.697	0.414	1.680	5.841	.	.	2.404	0.359	6.690	7.453	.	.
County 14 Møre og Romsdal	0.123	0.184	0.670	0.310	0.587	0.530	2.378	0.338	7.040	7.450	.	.
County 15 Sør-Trøndelag	0.076	0.111	0.680	0.694	0.530	1.310	2.789	0.358	7.780	7.075	.	.
County 16 Nord-Trøndelag	0.066	0.161	0.410	5.765	.	.	2.557	0.350	7.320	2.199	0.843	2.610
County 17 Nordland	0.389	0.196	1.990	0.309	0.633	0.490	2.482	0.343	7.230	2.517	0.848	2.970
County 18 Troms	5.177	.	.	4.938	.	.	2.593	0.337	7.700	2.382	0.845	2.820
County 19 Finnmark	0.492	0.427	1.150	5.320	.	.	2.794	0.448	6.240	7.363	.	.
Municipal Centrality 1	0.052	0.157	0.330	-0.103	0.705	-0.150	-0.010	0.108	-0.090	-0.288	0.323	-0.890
Municipal Centrality 2	0.341	0.193	1.770	-0.683	0.581	-1.180	0.237	0.175	1.360	-0.622	0.589	-1.060
Municipal Centrality 3	-0.070	0.156	-0.450	0.018	0.555	0.030	0.069	0.135	0.510	-0.422	0.571	-0.740
Municipal Centrality 4	0.623	0.421	1.480	-0.343	0.788	-0.430	-0.170	0.134	-1.270	5.272	.	.
Municipal Centrality 5	0.028	0.150	0.180	-0.031	0.595	-0.050	0.180	0.160	1.130	-0.304	0.407	-0.750
Municipal Centrality 6	0.011	0.124	0.090	-0.115	0.447	-0.260	0.216	0.103	2.110	0.012	0.335	0.030
_cons	11.210	7.910	1.420	10.180	24.799	0.410	-21.034	7.223	-2.910	59.179	67.985	0.870
Mills lambda	0.244	0.111	2.200	0.099	0.058	1.690	0.203	0.079	2.560	-0.015	0.049	-0.290
rho	1*			1*			1*			-0.170		
Number of observations	5,154			803			4,996			589		
Wald chi2	216.16			115.45			226.10			68.35		
Prob >chi2	0.000			0.000			0.000			0.242		

Note: two-step estimate of rho = rho is being truncated to 1

** For the hours above 100%, which means 35.5 hours per week for shift workers and 37.5 hours per week for daytime workers, the hourly wage is increased by 50%.*

*** Marital status and number of children are used as selection variables to correct for the selection into the respective job-types. Mills lambda is the selection correction.*

Table A5 Estimated parameters in the RUM model

		Shift vs. daytime work for hospital nurses			**Shift vs. daytime work for primary care nurses workers**		
		Est.	***St. E.***	***t-values***	***Est.***	***St. E.***	***t-values***
	Utility function						
β_0	Constant 'leisure element'	6.567	0.884	7.427	3.688	0.788	4.681
β_1	Age/10	-0.325	0.062	-5.243	0.371	0.267	1.389
β_2	Age/10 squared				-0.068	0.030	-2.282
$\beta 3$	No. of children < 6 years of age	-0.098	0.087	-1.123	-0.175	0.068	-2.575
$\beta 4$	No. of children 5< years of age<12	-0.269	0.074	-3.656	-0.252	0.054	-4.688
$\beta 5$	Born in Norway				-0.240	0.100	-2.408
$\beta 5$	Married	-0.601	0.114	-5.289	-0.225	0.076	-2.976
γ	Exponent 'leisure element'	-0.320	0.148	-2.161	-0.677	0.139	-4.887
α	Constant 'consumption element'	2.828	0.489	5.787	2.236	0.384	5.825
λ	Exponent 'consumption element'	0.285	0.148	1.922	0.405	0.149	2.725
	Opportunity density*						
ς	1 if the job is full-time, 0 otherwise	1.064	0.082	12.976	0.758	0.091	8.311
	Number of observations	3,354			3,928		
	Log likelihood	-8,835.5			-10,136.5		
	McFadden's Rho	0.089			0.107		

Table A6 Differences in consumption, deterministic utility and compensating variation in the RUM-model

Hospital

Categories *of hours* % of full-time	Difference in disposable income, NOK Shift job - Daytime job				Difference in deterministic utility Shift job - Daytime job				CV_k per year, NOK Compensating variation				Share with positive CV_k
	Mean	Std D	Min	Max	Mean	Std D	Min	Max	Mean	Std D	Min	Max	Mean
32.5 %	7 329	*2 400*	-2 125	17 264	0.148	*0.040*	0.025	0.405	-12 278	*21 294*	-101 625	66 453	0.29
50 %	11 404	*3 735*	-3 306	26 868	0.226	*0.055*	0.052	0.563	4 023	*17 774*	-69 672	79 375	0.62
60 %	13 175	*4 345*	-3 984	32 008	0.265	*0.060*	0.073	0.632	7 412	*18 613*	-61 594	85 266	0.68
75 %	15 294	*5 015*	-4 433	36 784	0.319	*0.064*	0.111	0.697	12 671	*19 585*	-68 375	75 203	0.76
80 %	16 392	*5 368*	-4 752	38 688	0.344	*0.067*	0.127	0.733	15 240	*19 655*	-80 141	88 516	0.80
86 %	17 771	*5 819*	-5 152	41 864	0.378	*0.071*	0.150	0.782	18 764	*20 181*	-76 563	100 922	0.83
100 %	19 063	*6 283*	-5 968	48 024	0.439	*0.073*	0.206	0.874	26 317	*20 907*	-63 680	96 500	0.90
103 %	18 480	*6 362*	-6 195	48 496	0.446	*0.073*	0.221	0.888	26 610	*21 198*	-48 797	114 828	0.90
115 %	20 525	*6 524*	-5 066	51 024	0.518	*0.071*	0.303	0.951	34 841	*21 802*	-47 164	116 922	0.94

N=3354

Primary care

Categories *of hours* % of full-time	Difference in disposable income, NOK Shift job - Daytime job				Difference in deterministic utility Shift job - Daytime job				CV_k per year, NOK Compensating variation				Share with positive CV_k
	Mean	Std D	Min	Max	Mean	Std D	Min	Max	Mean	Std D	Min	Max	Mean
32.5 %	5 767	*2 286*	-6 419	13 354	0.121	*0.033*	-0.033	0.258	-13 896	*22 184*	-105 078	57 000	0.27
50 %	8 974	*3 557*	-9 988	20 780	0.191	*0.045*	-0.028	0.377	2 276	*18 612*	-87 266	65 797	0.57
60 %	10 315	*4 114*	-12 036	24 264	0.229	*0.050*	-0.017	0.438	6 006	*19 273*	-96 641	95 391	0.64
75 %	12 033	*4 769*	-13 394	27 864	0.286	*0.054*	0.019	0.505	11 925	*20 035*	-74 188	76 328	0.74
80 %	12 898	*5 112*	-14 358	29 868	0.313	*0.057*	0.032	0.542	14 524	*19 753*	-66 953	86 563	0.78
86 %	13 983	*5 542*	-15 566	32 384	0.350	*0.060*	0.051	0.591	18 478	*20 571*	-70 406	90 484	0.82
100 %	14 937	*5 907*	-18 028	35 304	0.424	*0.061*	0.105	0.689	27 414	*21 188*	-56 922	116 031	0.90
103 %	14 188	*5 906*	-18 772	35 232	0.434	*0.060*	0.128	0.701	28 128	*21 427*	-47 672	95 000	0.90
115 %	16 299	*6 174*	-16 672	36 768	0.530	*0.061*	0.223	0.776	39 192	*21 920*	-42 875	134 313	0.96

N=3928

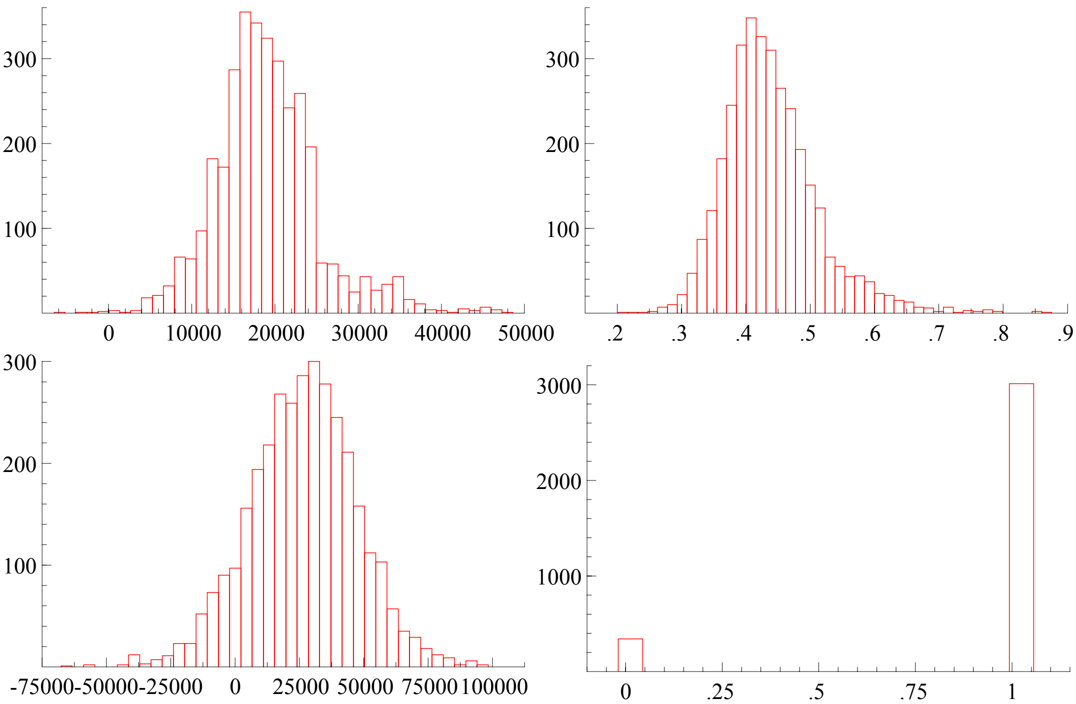

Figure A1 Hospital nurses – Full-time

Clockwise:

Quadrant 1: The difference in disposable income for full-time jobs (shift job – daytime job).

Quadrant 2: The difference in deterministic utility for full-time jobs (shift job – daytime job).

Quadrant 3: Compensating variation (CV_7) for full-time jobs (shift job – daytime job).

Quadrant 4: Share with positive and negative CV_7, for a for full-time job.

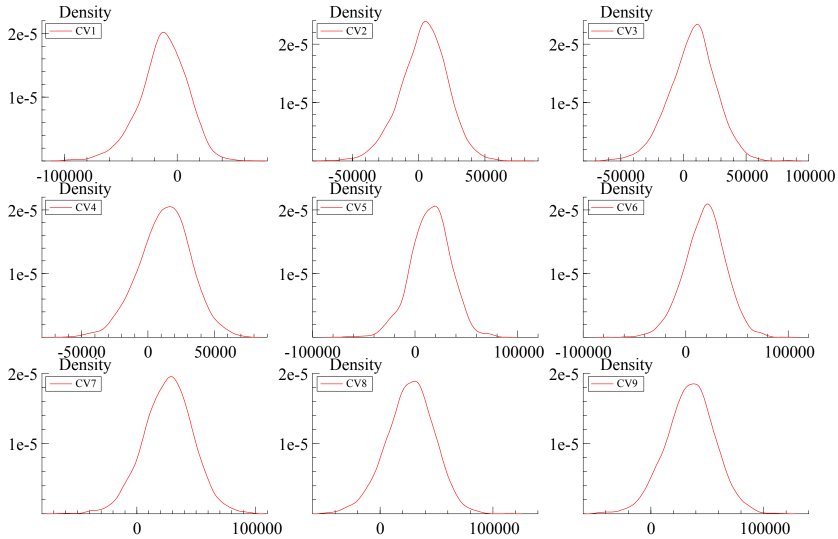

Figure A2. Shift compensation for hospital nurses

The mean of the compensating variation, CV_k*, by categories of hours.*

(2: 50%, 4: 75% and 7: 100% position).

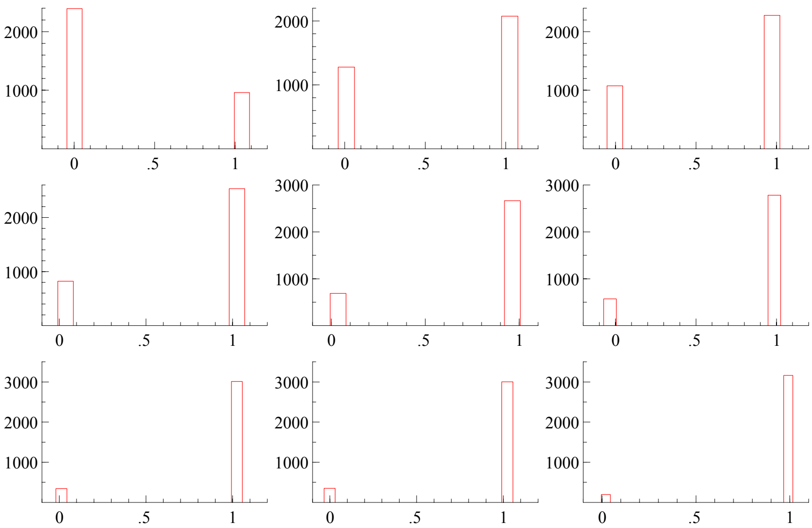

Figure A3. Shift compensation for hospital nurses

The share of the nurses with $CV_k > 0$*, by category of hours.*

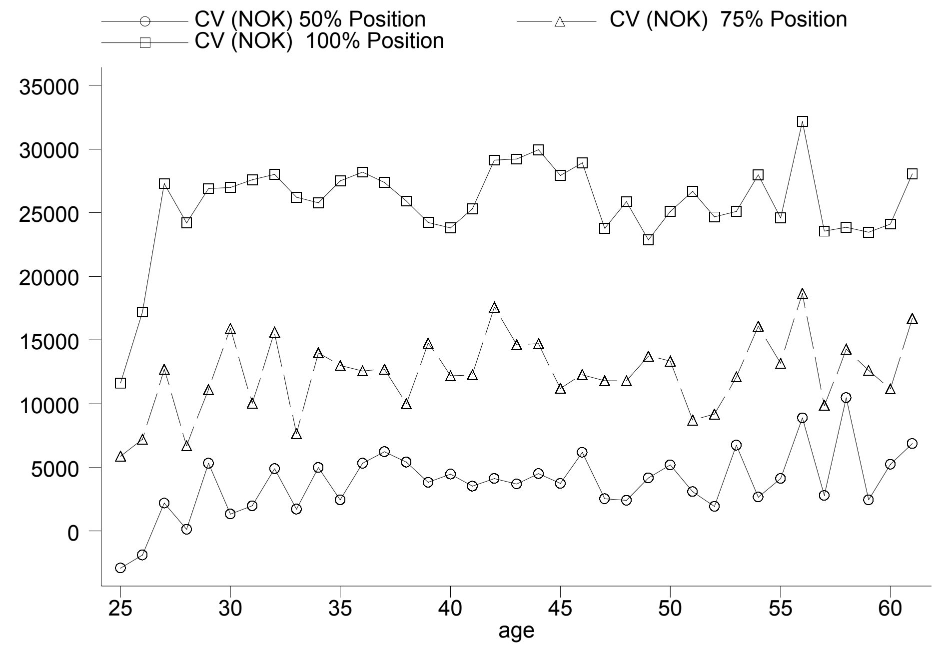

Figure A4. Shift compensation for hospital nurses.

The mean of the compensating variation, CV_k*, by age. 50%, 75% and 100% position.*

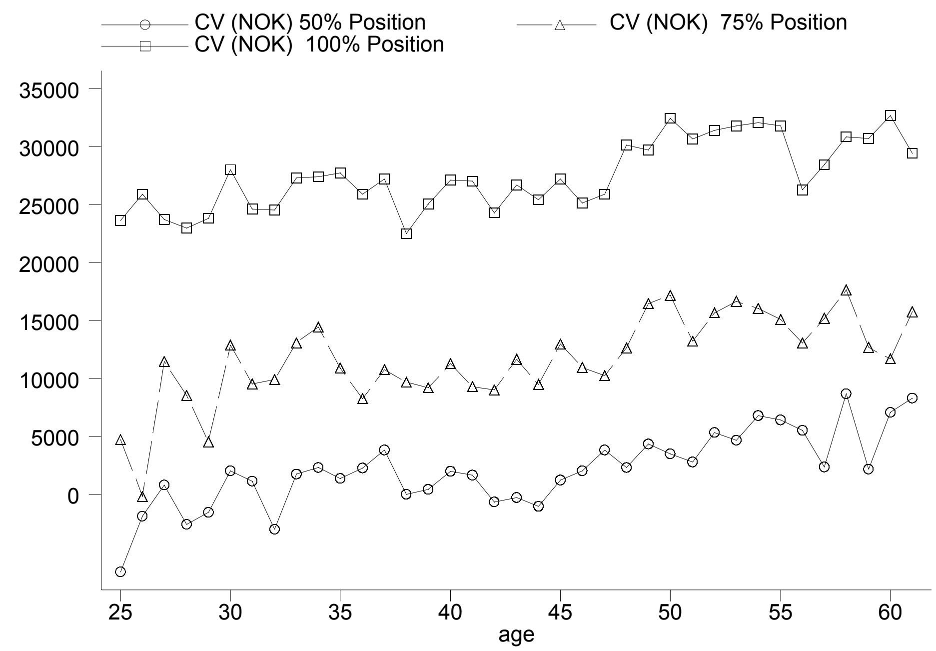

Figure A5. Shift compensation for primary care nurses

The mean of the compensating variation, CV_k*, by age. 50%, 75% and 100% position.*