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Abstract

Many registered nurses (RNs) in Norway work part-time, or in non-health jobs. The nurses' trade organizations claim that a wage increase will increase the short-term labor supply in health care. This paper is an attempt to identify the effects of job-type specific wage increases through policy simulations on micro data. 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 and other sector specific aspects of the jobs. The unique data set covers all RNs registered in Norway and their families. The spouses' incomes and age of the children are vital when estimating the labor supply of this profession. For married females the results indicate job type specific wage elasticities for hours of work of 0.17 in hospitals and 0.39 in primary care. The total hours worked in health and non-health jobs are actually predicted to be slightly reduced, but the change is not significantly different from zero. Single females are somewhat more responsive to wage changes than married ones.

1. Introduction

The excess demand for nursing labor in the national health services persists in many developed countries in spite of systematic increases in the education capacity in order to meet the demand. Finlayson, et.al. (2002) reports a nursing shortage in the UK of 10,000 to 22,000 depending on the way vacancies are calculated. In the US, the national supply of registered nurses was estimated at 1.89 million full-time equivalents in 2000 while the demand was estimated at 2 million, a shortage of 110,000 or 6 percent, by the U.S. Department of Health and Human Services (2002). In Norway, the Ministry of Labor and Government Administration estimated the number of vacancies at 3,300 full-time positions in 1998. The nurse shortage is a problem as it reduces the quality of the services provided. In a survey initiated by Nurseweek (2002), three-fourths responded that they in the past year, had witnessed a negative impact on the quality of patient care as a result of a greater number of patients per nurse and higher turnover among experienced RNs.

Many registered nurses (RNs) work part-time, in non-health jobs or are temporarily out of the workforce. Nurses' trade unions claim that a wage increase will increase not only recruitment into the nursing profession, but also the *short-term* labor supply of those already qualified. Higher wages are claimed to increase hours worked by personnel employed in the health sector, and attract nurses from non-health activities. When the tax schedule is nonlinear in income, estimation of labor supply parameters is difficult. This paper is an attempt to quantify these short-term effects through policy simulations in a discrete choice framework. I apply a structural labor supply model with nonlinear budget constraints. Structural methods, though controversial, are advantageous when the objective is to analyze the effects of a policy alternative that may change the budget sets in complicated ways.

The nurses choose the job package that maximizes their utility given a nonlinear budget set that incorporates taxes. These job packages are characterized by attributes such as hours of work, sector specific wages and other sector specific aspects of the jobs. The three sectors or job-types are in public hospitals, public primary care services and other "non-health" or "non-patient" jobs in public administration, private business and NGOs. The model is a static neo-classical structural labor supply model inspired by approaches like Aaberge, Dagsvik and Strøm (1995) and van Soest (1995).

I will not analyze the impact of wage increases as an instrument to mobilize those not working. One argument for not including this group is the differences in personal characteristics compared to those working, as discussed in the data section. Another is the small number of people not working in 1995; only 0.9 percent of the workforce, when subtracting the group with disability benefits or other social benefits as their main income.

As most registered nurses are women, the literature on female labor supply provides an important background to this discussion. Killingsworth and Heckman (1986) provide a comprehensive review of research indicating that women's workforce participation is responsive to changes in the wage rate, unearned income, spouse's wage and marital status, as well as having children, particularly of preschool age. The survey indicates that labor supply elasticities for females are positive, i.e. the positive substitution effect outweighs the negative income effect.

In relation to the nursing profession itself, a survey by Link (1992) summarizes the literature and finds that wage levels, and having children, influence labor force participation, although the responsiveness to wage changes has declined considerably over time. The latter finding reflects the fact that most RNs are now working.

In a recent review of the labor supply literature for nurses, Antonazzo et.al. (2003) confirms the increasing use of panel data models, limited dependent variable models, and treatment of sample selection issues. They find that results vary considerably depending on the methods used, particularly on the effect of wages. The impact of one's own wage on labor force participation is not significant in most of the studies on North American data, whereas there are some studies with elasticities greater than one. The impact on hours worked is estimated with elasticities from –0.94 to +2.8, depending on sample, time period and gender. The impact of an increase in household non-labor income is estimated with elasticities that are slightly negative in relation to the participation rate, and insignificant or negative for hours worked.

There are fewer British studies available. One example is Phillips (1995) which estimates labor market participation elasticities with respect to the wage rate, non-labor income, and costs incurred through work, reported for qualified and unqualified nurses. Participation is found to be highly responsive to wage changes, and some discontinuity is found in the supply function. The econometric model traditionally applied to nurses has been a logit model for the participation, and a selection-corrected hours-of-work regression.

A newly published study on Norwegian data by Askildsen et al. (2003) applies, however, a matched panel data set to estimate wage elasticities ranging from –0.06 to 0.46 depending on the setup of regression of hours against log wage. They find that individual and institutional features are statistically significant and important for working hours, and find their estimate of 0.21 most reliable. This paper has a different and larger sample of nurses, including those working in non-health jobs, and separates the analysis for single and married females as their behavioral response is expected to be different. Two important features of this study are firstly the inclusion of the spouse's income and other non-work income like capital income, transfers and savings. Omitting the non-work income is of extra concern when focusing on the married nurses, as it might lead to an upward bias of the wage elasticities.

In their agenda for research on nurses' labor supply Antonazzo et.al. (2003) advertised the need for econometric models that can handle nonlinearity in the labor supply function. I argue that the application of a discrete choice model, as presented in my study, is a feasible way to address this problem. A weakness in many of the existing studies is the small sample size and/or the exclusion of nurses not practicing in the health sector. An advantage of the matched registered data used in this study is the inclusion of all qualified nurses. Another benefit is the possibility to match family characteristics that are important for the nurses' labor supply, such as spouse's income and children's age.

In a policy perspective I find that there are reasons to have moderate expectations of what wages can achieve as a tool to reduce the overall shortage of nurses. The predictions of this paper are that wage changes have a minor impact on hours worked

by the personnel employed in the health sector. Wage rates probably have a minor impact on nurses' working hours compared to non-pecuniary factors. Furthermore, there are obvious weaknesses in focusing solely on the supply side of the labor market for health personnel, and the term 'nursing shortage' is slightly misleading. A higher wage level may both reduce the employers' demand for nursing hours, as well as affect the hours offered by the nurses.

For married women I find job type specific wage elasticities of 0.166 for the hospital jobs. The increase in hours is due to attracting nurses from primary care and non-health jobs, as the average amount of working hours in the hospital sector is reduced through the wage increase. The total hours produced by our sample of RNs in both health and non-health jobs, taking job changes into account, are predicted to be inelastic. The wage elasticity for the primary care jobs is predicted to be 0.390, attracting labor from hospitals and non-health jobs. A simultaneous wage increase for hospital and primary care personnel reduces the number of nurses preferring a non-health job. A simulated wage increase for health-jobs by 10% reduces the predicted share of nurses preferring a non-health job from 16.8% to 16.1%. The predicted wage elasticities of hours worked in this simulation are -0.002 for hospital jobs and 0.153 for primary care jobs. The elasticities are only significantly different from zero at a 10% level.

For single women the job specific wage elasticities are stronger, especially in the primary care sector. Part of this effect is probably due to the fact that there are relatively few single nurses in the primary care sector, as nurses often start their career with a hospital job.

After a presentation of the data and the context in Section 2, the model is presented in Section 3. In Section 4 the results are elaborated and Section 5 includes some calculations of the changes in the job-specific costs and total labor costs of a wage increase in one or more of the jobs. Section 6 concludes.

2. Data

According to Statistics Norway (2003) there were 77,819 registered nurses below retirement age in Norway in 2002, of whom 69,690 were employed. Those not employed were mainly on disability pensions, medical and vocational rehabilitation, early retirement or further education. Auxiliary nurses with a year of education after college are not included in these numbers. Norway is one of the countries with the highest density of nurses with 15.3 working nurses per 1,000 population in October 2002. Over 90% of the nurses are women. 91.4% of the employed nurses were public employees. Registered nurses receive a minimum of three years of education at college level. Personnel in administrative positions have often completed a year of administrative training. Nurse specialist training also adds one or two years.

The study presented here is, however, based on the 51,500 nurses below retirement age permanently living in Norway in 1995. The Norwegian health services are primarily run by national and local government authorities. 50% of the nurses in our sample work in public hospitals. Close to 26% work in primary health care run by the municipalities in nursing homes, home nursing or health clinics. Only 5% are employed by private health services working in a private medical clinic or in the

pharmaceutical industry. Some 15% work in non-health areas like public administration or in the service sector. Some of these teach at colleges or lower levels, work in occupational health in the industry or in public health administration. 6% earn their main income from different types of transfers like disability benefits. About 1% earn less than the minimum income required to qualify for public pensions, and do not receive transfers beyond the same limit of NOK 40,000.

Table 1. Registered nurses by job type in 1995

Category	*Share*
Hospitals	*49.9%*
Public primary care	*25.7%*
Private healthcare	*5.1%*
Non-health	*15.3%*
Non-work **Do not earn sufficient to qualify for national insurance:** **1G ≈ NOK 40 000 >Labor income>Social benefits.**	*0.9%*
Disability pensions and social security benefits	*6.1%*

The public health sector is responsible for most of the production of health care services and for their financing. Primary health care is the responsibility of municipalities, but a considerable share of general practitioners run private practices. Municipalities are also responsible for general public health services, home nursing and nursing homes. The demand side is dominated by a few large groups of buyers that may be considered monopsonists. 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).

One explanation for nursing shortages as reported in Hirsch and Schumacher (1995, 1998), is that hospitals face an upward sloping labor supply curve which results in a lower wage and employment level for nurses than if the market was competitive. "Monopsony would help explain reported shortages, since hospitals will list vacancies and desire to hire additional workers at the monopsonistic wage, but would decrease their profitability were they to raise wages to attract more applicants." There is a parallel in a public setting, where the health care institutions are equipped with a fixed budget and an increase in wages could reduce the staffing they can afford. The empirical evidence for monopsony power in nursing labor markets is, however, sparse.

Askildsen et.al. (2003) claim that it is important to correct for shift work, as omitting such institutional features will bias the wage effect. "The reason is twofold. If shift hours are considered burdensome, a wage compensation is required (Moore and Viscusi, 1990). If this compensation is insufficient, lower labor supply is offered, and the estimated wage effect will be downwardly biased. It may also be the case that shift workers just consider it too demanding to work long hours, and respond less to wage changes than those working on ordinary daytime contracts." This paper uses a matched data set covering all registered nurses working in Norway. A drawback of using the complete sample of RNs is the lack of information about whether the nurses work shifts or regular hours. This study might therefore underestimate the true wage effect for some groups.

The data set is based on several of the administrative data registers delivered by Statistics Norway. Using the register of authorized health personnel as an identifier we can link information about demography, including children, income and employment relations. We also know the spouses' income and employment. It is assumed that this years saving for next years vacation is equal to the amount saved last year. Appendix 1 provides details about variable construction, trimming procedure and summary statistics for key individual level variables by job category.

Hourly wage is the applied earnings measure, and is calculated by dividing annual earnings by hours in a full-time position for those working full-time. These calculated wages are used when assigning predicted hourly wages for all nurses in all the three job alternatives in the model below. I exploit the richness of the register data in this procedure, including residency and observed experience from the past 20 years. I control for the selection effect by applying a Heckman two-step procedure, as there is reason to believe that there is a selection process driving the decision of where to work, or not work at all. See Appendix 2 for wages, and Appendix 3 for taxes.

I considered it likely that the decision process is affected by gender and family status. I have chosen to focus the analysis on the two subsamples of married and single females, as women dominate the nursing profession. I run two separate analyses, as I expect married nurses to be less sensitive than single ones to changes in wages. Many individuals registered as *single* will be cohabitants, but when cohabitants have a child together they are registered as married. Table A3 confirms the differences in characteristics; single nurses are younger and many of them prefer to live in central areas. Almost 30% live in greater Oslo. Two-thirds of the single nurses work at hospitals compared to 50% of the married females. 61% of the single nurses work full-time compared to 35% of the married ones.

In the following model the RNs choose between three job alternatives: *Hospitals*, *public primary care* and *non-health* jobs in the service sector and employment in public administration. These are the dominating categories of work covering almost 95 percent of those working. As reported in Table A2 those working in the private health care sector have other individual characteristics, including a higher spouse's income. Nurses not working and those with public transfers as their main source of income, are excluded from this analysis.

In our sample of married females 50% work at the hospitals, 33% in primary care and 17% with other non-health tasks. The working hours are not observable, but calculated by division of annual income by predicted hourly wage. The hours are then categorized into 9 groups as reported in the first column in Table 4. In the estimation of working hours each alternative is allocated the average amount of working hours in that category, implying that within each category hours offered are uniformly distributed. For those who actually work at hospitals we estimate the average weekly working hours to be 28.9, compared to 30 hours in the primary care jobs and 25.5 hours in the non-health jobs. For reasons of comparisons with later predictions we can construct an imaginary 'average nurse' by multiplying the shares for each hour category with the mean hours in the categories, and then multiplying by the job-type shares. We then get the following distribution of weekly hours by job type: 14.6 hospital hours, 9.9 primary care hours and 4.3 non-health hours.

3. Model

The model focuses on the supply side of the labor market and implicitly assumes that the nurses are employed in the jobs they prefer. This is of courses a strict assumption, but on the other hand it was not far from the actual situation in 1995 with plenty of job offers in all practice types. However, the model does take account for the fact that most jobs offered are full-time jobs and that hospital jobs are more available in central areas.

The nurses choose between job packages, each being defined by a job or practice type i, specific choice of hours h, and a wage rate per hour w. The three alternative job types or practice types are hospitals, primary care and non-health. There are unobserved job characteristics associated with practice type i, that may affect preferences and hence choices. As an example we may think of specific skills involved in the job, patient mix or shift work.

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

$$U_i = V_i + \varepsilon_i, \qquad (1)$$

where U_i is the utility when the nurse works h_i hours in job type i, V_i is the deterministic element in the utility function and ε_i 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_i also captures the unobserved job characteristics associated with practice type i.

The utility for job number i is given by

$$U(C,h,i) = V(C(h),h) + \varepsilon(C,h,i), \qquad (2)$$

where C is the disposable household income after tax per year, h is hours of work representing leisure time, and i the unobserved job characteristics.

The budget constraint, for given job number i, is

$$C = f(hw) + I;\ h = H_i,\ w = W_i, \qquad (3)$$

where H_i is the job i specific hours of work, and W_i the pre-tax hourly wage for job i. The nurses have a choice between nine categories of hours per week. The categories are constructed so that they represent the common work contracts. The categories are represented by the mean in each category, $h = \{18, 21, 25, 28, 30, 33, 35.5, 37.5, 40\}$ hours per week. I also exclude non-market opportunities (h=0), meaning that all nurses in the analysis have to participate in the workforce. This is not a strong limitation, as almost all nurses observed not to be participating in the workforce are categorized as unable to work and granted a disability benefit.

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 across jobs. For all individuals a pre-tax hourly

wage is estimated for each job applying a Heckman two-step selection correction procedure. See Appendix 2 for the estimation of wages.

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, spouse's income after tax, transfers). A non trivial assumption made is that the spouse's hours of work are 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 together.

In traditional labor supply offered wages are determined by human capital characteristics and hours offered are uniformly distributed. However, in real life wages may vary across job types for observationally identical workers, and jobs with a specific number of hours may be more available in the market than other jobs, e.g. "full-time" jobs. Thus, when the nurses make their choice with respect to labor supply, they choose between job-packages with different wage and hours profiles.

I assume that the nurses make their choices by maximizing utility, given the job-packages available in the market. As already mentioned, the analyst does not observe preferences neither does he observe all details of the job-packages available in the market. Let $B_i(h,l)$ denote the set of feasible jobs with hours of work H_i equal to h, when the individual lives in a geographic location categorized by a centrality dummy l. Let $g_i(h,l)$ be the frequency of jobs in $B_i(h,l)$, which is related to the institutional availability of full-time jobs and the geographical location, as hospital jobs are more available in central areas. The geographical location only influences the availability of hospital jobs. It follows from above that the utility function can be written as

$$\tilde{U}_i = U(f(H_i W_i)+I, H_i, i) = V(f(H_i W_i)+ I, H_i) + \tilde{\varepsilon}_i \qquad (4)$$

where

$$\tilde{\varepsilon}_i = \varepsilon(f(H_i W_i)+I, H_i, i). \qquad (5)$$

Since hours of work and consumption are given when the job is given, the agent's choice problem is a discrete one, namely to find the job that maximizes utility. Let $P(h,l)$ denote the probability that the agent chooses a job with hours of work h, when he/she lives in an area with centrality l. This is the same as choosing a job (any job) within $P(h,l)$. When the random error terms $\{\tilde{\varepsilon}_i\}$ are ii extreme value distributed, the probability $P(h,l)$ can be expressed as

$$P(h,l) = P(\text{choosing any job within } B(h,l))$$

$$= P(\tilde{U}_i = \max_k \tilde{U}_k \mid i,k \in B(h,l))$$

$$= \frac{\exp(\psi(h;w,I))g(h,l)}{\sum_{x,y\in D}\exp(\psi(x;w,I)g(x,y)}, \qquad (6)$$

where D is the set of feasible hours of work and

$$\psi(h;w,I) = v(f(hw)+I,h) = V/\sigma. \qquad (7)$$

Due to the assumption of extreme value distributed utilities, it follows readily that the choice probabilities are multinominal logits. By setting $g_i(h,l)=1$ in *(6)* we get the standard multinominal logit. The interpretation of the "opportunity density extended version of the standard multinominal logit" given in *(6),* 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

$$g_i(h,l) = \exp(\nu_1 k_i + \nu_2 l) \qquad (8)$$

where $k_i=1$ if the main job is full-time (35.5 hours per week or more), and $k_i=0$ otherwise. l=1 if the individual lives in a central area and the choice is the hospital job type, and $l=0$ otherwise. For more details about this methodology I refer to Aaberge, Colombino and Strøm (1999).

In an extended version of the model I also include a component in the opportunity index that corrects for the fact that the nurses have an education where the dominating pool of available jobs are found with the health care providers. There is however a possible endogeniety problem with this formulation, and that is why both alternatives are reported in the next section. The modified $g(.)$ function is then

$$g_i(h,l,m) = \exp(\nu_1 k_i + \nu_2 l + \nu_3 m_i) \qquad (9)$$

where $m_i=1$ if the job i is with a health care provider, and $m_i=0$ otherwise.

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

$$V_i = \alpha \frac{(10^{-6}C_i)^{\lambda}-1}{\lambda} + \beta(X)\frac{(8760-(8*365)-h_i)/8760)^{\gamma}-1}{\gamma} \qquad (10)$$

where

$$\beta(X) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \qquad (11)$$

The first element represents the stochastic utility from consumption and the second element the stochastic utility of leisure time. See Aaberge, Dagsvik and Strøm (1995) for an empirical analysis applying this specification. An advantage of this specification is that it is flexible enough to yield both negative (back-ward bending labor supply curve) and positive wage elasticities. 8,760 is the total number of annual hours, from which 8 hours per day are subtracted for sleep. α, λ, γ and the $\beta's$ are unknown parameters. For the utility function to be quasi-concave, we require $\lambda<1$ and $\gamma<1$. Note that if $\lambda \to 0$ and $\gamma \to 0$, the utility function converges to a log-linear function. The characteristics are: X_1= age of the nurse, X_2= number of children below six years of age, X_3= 1 if the person is born in Norway, 0 otherwise. 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. This approach will normally increase the fit, but is less rooted in economic theory.

The parameters $(\alpha, \lambda, \gamma, \beta_0, \beta_1, \beta_2, \nu_1, \nu_2, (\nu_3))$ are estimated in a maximum-likelihood procedure. Note that σ is not identified and is absorbed in α and β.

4. Results

The following analysis contains a discussion of the estimated parameters of the model, before the observed and predicted choices of working hours and job types are presented. For both married and single nurses, the procedures presented in Section 4.1-4.2 are undertaken twice, with and without an opportunity index that corrects for the fact that the RNs have an education where the dominating pool of available jobs are found with the health care providers (Model A and B, respectively). The predicted choices from Model A, with less accurate predictions, are presented in Appendix 4, as a backdrop to the predictions from Model B discussed in the following two sections. In Section 4.3 an analysis of the total wage cost of a job specific wage increase is presented.

Table 2.Two model specifications applied on two samples.

Sample	Sample size	Mean age	Estimated parameters	Predicted probabilities
Married females	25,242	43	Table 3	Model A: Appendix 4.1 Model B: Section 4.1
Single females	7,782	35	Table 6	Model A: Appendix 4.2 Model B: Section 4.2

4.1 Married females

From Table 3 we observe that all parameters except β_1 are sharply determined and that λ and γ are estimated to yield a quasi-concave utility function. The income term in the utility function (10) is estimated with a λ of –2.8 and an α, the constant in the consumption term, of 0.7, meaning that the nurses prefer the job that pays best if otherwise similar. The γ in the leisure component is estimated to –6.4. Like α, the constant β_0 in the leisure term is positive and significant, meaning that more hours of leisure increases the utility. Surprisingly β_1 is not significantly different from zero, as one might expect that the nurses would prefer jobs with less working hours when they get older. On the other hand they are responsible for their children earlier in their career and many choose to work part-time. This is confirmed by the positive, yet small, β_2 of 0.03, which I interpret as a higher preference for part-time jobs for mothers of children below six years of age, than for the average nurse. The parameters in the opportunity index are also significant with ν_1 of 0.8 and ν_2 of 0.5. It is worth noting that the McFadden's Rho is very low, especially for the married females. One interpretation is that wage and working hours are relatively less important than other factors not observed, such as shift work, patient load, travel distance from home etc.

when choosing a job. It is a similar situation for Model B, which takes into account that the dominating pool of jobs for the registered nurses is with the health care providers. The parameter ν_3 is positive and significantly different from zero. The signs of the other parameters are unchanged. Observe that McFadden's Rho is slightly higher in the extended model (B), but still worrying low.

Model performance
The basic model (A) performs poorly in the predictions of job type choices, as it seems that the multinominal model distributes the predictions almost evenly: 38% hospital, 30% primary care and 32% non-health (Column 2 in Table 4). The predicted choices of hour categories are generally in line with the observed ones with half-time and full-time preferred. The extended model (B) has much sharper predictions with 52% working at hospitals, 31% working in primary care and 17 % in non-health jobs (Column 3 in Table 4). The predicted distribution of weekly hours is 14.7 in hospitals, 8.4 in primary care and 4.6 in non-health work. The predicted hourly pre-tax wages used in the analysis were on average NOK 159 in the hospital sector, NOK 148 in the primary care sector and NOK 187 in non-health.

Out-of-sample predictions
In order to evaluate the model's prediction properties, I use the estimated parameters from 1995 and predict preferred working hours in 2000. I use the pre-tax hourly wages, the tax system and the personal characteristics applicable in 2000. This procedure is undertaken for all females in 2000 and for those who were married in 1995 and 2000. I compare the predictions with the observed choices. Only the predictions of the extended model (B) are presented in Table 5.

Looking at all observed married females, the mean price corrected pre-tax hourly wages increased by 26% in the hospital sector, 32% in the primary care sector and 14% in non-health. (N=25,242 in 1995 and 25,363 in 2000). The average age was 43.1 in 1995 and 44.3 in 2000. Part of the wage increase is due to the higher seniority of the 2000 sample, as seniority is an important determinant for the wage in the public sector.

The higher wage increase in the public sector, especially at primary care level, makes it natural to expect a reallocation of hours to this sector. Before I compare the observed and predicted choices in 2000, it is important to emphasize that the public health services were significantly strengthened from 1995 to 2000. The capacity boost took place at both care levels. Major structural changes in the health care sector make the comparison over time complicated.

There was a 14% increase from 1995 to 2000 in the number of employees at psychiatric and somatic institutions in the specialist health services. According to Statistics Norway (2001) the number of full-time nursing positions increased by 23% to 27,415 in 2000. The number of full-time positions for auxiliary nurses was reduced by 4% to 8,386 in 2000, continuing the trend that this personnel category is replaced by registered nurses in hospitals.

The number of full-time positions for physicians was increased by 23% to 8,288 in 2000. However, there was also a significant increase in the production capacity, partly fuelled by the transition to an activity based funding system. In the specialist services,

the number of discharges increased by 11% to 760,893 in 2000. Outpatient-consultations were increased by 13%. The number of full-time positions, for all professions, increased by 30% in the primary care sector to 89,670 in 2000, reducing the ratio of full-time positions per patients to 0.44.

The first column in Table 5 presents the observed and predicted choices for all married females working in 1995 who were also observed in 2000. The next column shows the same group's choices in 2000. 18,244 married females were observed both in 1995 and 2000. The average age was 41.3 years in 1995, and naturally 46.3 years in 2000. The third column presents all the married females with complete data in 2000.

The observed changes in the five-year period deserve a few comments. Looking at the sample observed in both 1995 and 2000, there is a striking increase in the number of nurses employed in the primary care sector. There are at least four factors causing this development. Firstly, the relative wage has increased in favor of the primary care sector. The sample observed in both years has a pre-tax hourly wage increase of 20% in the hospital sector, 26% in the primary care sector and 9% in the non-health jobs. Secondly, the nurses in the sample are five years older in 2000 and they are simply following the normal trend of switching to the primary care services with age. One reason is probably an interest in moving their family out of the cities. There are less hospital jobs available in the suburbs and rural areas. Thirdly, the significant structural changes in the public health sector have boosted the mobility of the workforce. And finally, there is also a possibility that some specialized institutions, still not hospitals, are categorized as hospitals in 1995 and primary care institutions in 2000, exaggerating the changes. The average number of hours worked is stable, however, with a reallocation between the sectors as described above.

The predictions respond to the wage changes as expected; an increased share is predicted to work in the primary care institutions, with reductions in the others. The average number of working hours is underpredicted, and as in 1995 it is the hours in the primary care sector that are incorrectly predicted by the model. A conclusion thus seems to be that the model predicts the correct directions of changes, but underpredicts the hours. However, it is not surprising that the predictions are biased when taking the huge structural changes into consideration.

What happens if the wage increases in the health care jobs?
A wage increase for hospital personnel might change the hours worked for those already working there, and attract nurses from non-health jobs. The introduction of a policy simulation, repeating the predictions above and keeping the parameters previously estimated, but now with a 10 percent wage increase in the hospital jobs, is a way to predict the net magnitude of these effects. The probability of choosing a hospital job increases from 52.4% to 53.5%, as presented in Table 6, and the predicted hospital working hours increase by 0.3 hours per week per nurse. With almost 48 weeks of work per year this adds up to 175 extra full-time positions. The gain in hospital hours must be weighted against the simulated reduction in primary care jobs pf 133 full-time positions, and the reduction in non-health jobs totalling 75 positions.

The impact on the total working hours produced by all nurses in the sample, in health and non-health jobs, is a small reduction of 0.1 hours per week per nurse, or 33 full-time positions. The wage elasticity in the hospital sector is predicted to be 0.166. This

pattern of changes in the probability of a job type being selected and hours worked repeats itself when undertaking similar policy simulations for the primary care jobs, for both health jobs and for non-health jobs as presented in Table 6.

In wage bargaining the hospital and primary care sectors normally follow the same pattern. When increasing the wage in both public health sectors, the model predicts a wage elasticity of 0.153 in the primary care sector, and zero (-0.002) in the hospital sector. The model predicts an increased probability of choosing a job in both the hospital and the primary care sector, but predicts fewer hours worked in average by those employed.

Finally two attempts are made to identify the income effect. First a lump-sum transfer of NOK 50.000 is introduced, an amount equivalent to about 27% percent of the average annual income. Somewhat surprisingly this slightly alters the predicted mix of job types, as fewer RNs are expected to work in hospitals and non-health jobs, matched by more people preferring home care and nursing homes. Adding up the working hours for all sectors, the model predicts a reduction in expected average hours of 1.6% or more than 300 full-time positions. The other attempt is to repeat the simulation with a 10% increase of the non-wage income. The income elasticity is found to be –0.063 for all hours, -0.138 for hospital hours and 0.075 for primary care hours. The elasticity for primary care hours is not significantly different from zero at a 10% level. Generally, many of the elasticities reported in this section are only weakly significant. It is important to keep in mind, however, that the standard deviation reported in the prediction contains both the uncertainty of the prediction for each individual, and information about the distribution of the predictions across individuals. The significance level is reported in Table 6, where * represents the 10% level, and ** the 5% level.

Table 3 Estimation of parameters of the utility function and opportunity densities. Married females.

		Model A			Model B		
		Estimate	**Std.error**	**P-value**	**Estimate**	**Std.error**	**P-value**
	Utility function						
β_0	Constant 'leisure element'	0.052	0.010	[.000]	0.371	0.039	[.000]
β_1	Age				0.000		
		0.000	0.000	[.585]		0.001	[.558]
β_2	Number of children below 6 years of age	0.027	0.005	[.000]	0.095	0.011	[.000]
γ	Exponent 'leisure element'						[.000]
		-6.415	0.237	[.000]	-4.050	0.134	
α	Constant 'consumption element'						[.000]
		0.690	0.107	[.000]	2.007	0.109	
λ	Exponent 'consumption element'	-2.806	0.268	[.000]	-1.508	0.128	[.000]
	Opportunity density*						
v_1	1 if living in a central area, 0 otherwise						[.000]
		0.821	0.015	[.000]	0.530	0.017	
v_2	1 if the job is full-time, 0 otherwise						
		0.533	0.034	[.000]	0.546	0.032	[.000]
v_3	1 if the job is with a health care provider, 0 otherwise				0.739	0.020	[.000]
Number of observations		25,242			25,242		
Log likelihood		-80,642			-79,878.5		
McFadden's Rho		0.03			0.04		

** For the wage equation see Appendix 2.*

Table 4 Observed and predicted hours for married females

Observed and predicted hours Married females N=25242	Observed shares		Model A Main model* Predicted probability		Model B Extended model Predicted probability	
	Mean	**St.dev.**	**Mean**	**St.dev.**	**Mean**	**St.dev.**
Job type choice						
Hospital	0.505		0.378	*0.020*	0.524	*0.052*
Primary care	0.328		0.304	*0.014*	0.308	*0.037*
Non-health	0.168		0.317	*0.010*	0.168	*0.017*
	1.000		1.000		1.000	
	*Share (Job type) * Mean hours in job type*		*Pr (Job type) * Mean hours in job type*		*Pr (Job type) * Mean hours in job type*	
Hospital	14.6	*15.2*	10.9	*0.7*	14.7	*1.6*
Primary care	9.9	*14.7*	8.3	*0.5*	8.4	*1.0*
Non-health	4.3	*10.0*	8.6	*0.5*	4.6	*0.5*
All	28.7	*7.1*	27.8	*0.7*	27.7	*0.9*
Categories of hours						
Hours Cat.1 (Mean=18h/w)	0.139		0.168	*0.022*	0.172	*0.030*
Hours Cat.2 (Mean=21h/w)	0.132		0.154	*0.014*	0.157	*0.019*
Hours Cat.3 (Mean=25h/w)	0.118		0.130	*0.004*	0.131	*0.009*
Hours Cat.4 (Mean=28h/w)	0.138		0.109	*0.003*	0.109	*0.005*
Hours Cat.5 (Mean=30h/w)	0.085		0.094	*0.005*	0.094	*0.005*
Hours Cat.6 (Mean=33h/w)	0.091		0.071	*0.008*	0.071	*0.007*
Hours Cat.7 (Mean=35.5h/w)	0.138		0.161	*0.023*	0.146	*0.053*
Hours Cat.8 (Mean=37.5h/w)	0.086		0.068	*0.014*	0.071	*0.011*
Hours Cat.9 (Mean=40h/w)	0.074		0.044	*0.012*	0.049	*0.010*
	1.000		1.000		1.000	

*Standard deviation in italics. * See wage elasticities in Appendix 4.*

Table 5 Observed and predicted hours for married females 2000 (Model B only)

	1995 (If observed in 2000)				2000 (If observed in 1995)				All married females in 2000			
Married females	**Observed shares**		**Predicted probability**		**Observed shares**		**Predicted probability**		**Observed shares**		**Predicted probability**	
	Mean	**St.dev.**	**Mean**	**St.dev.**	**Mean**	**St.dev.**	**Mean**	**St.dev.**	**Mean**	**St.dev.**	**Mean**	**St.dev.**
Sector choice												
Hospital	0.518	*0.500*	0.523	*0.052*	0.441	*0.497*	0.508	*0.051*	0.432	*0.495*	0.508	*0.051*
Primary care	0.324	*0.468*	0.309	*0.037*	0.434	*0.496*	0.330	*0.035*	0.452	*0.498*	0.329	*0.035*
Other	0.157	*0.364*	0.168	*0.017*	0.125	*0.330*	0.163	*0.016*	0.116	*0.320*	0.163	*0.017*
	1.000		1.000		1.000		1.000		1.000		1.000	
	*Share (Job type) * Mean hours in job type*		*Pr (Job type) * Mean hours in job type*		*Share (Job type) * Mean hours in job type*		*Pr (Job type) * Mean hours in job type*		*Share (Job type) * Mean hours in job type*		*Pr (Job type) * Mean hours in job type*	
Hospital	15.1	*15.3*	14.7	*1.6*	13.0	*15.2*	13.9	*1.4*	12.5	*15.0*	14.0	*1.4*
Primary care	9.9	*14.7*	8.4	*1.0*	12.5	*14.8*	8.9	*1.0*	12.8	*14.8*	8.9	*1.0*
Other	4.1	*9.9*	4.6	*0.5*	3.7	*10.1*	4.4	*0.5*	3.3	*9.5*	4.4	*0.5*
All	29.1	*6.9*	27.7	*0.9*	29.1	*6.6*	27.3	*0.6*	28.7	*6.6*	27.3	*0.7*
Categories of hours												
Hours Cat.1 (Mean=18h/w)	0.113	*0.317*	0.172	*0.028*	0.104	*0.305*	0.184	*0.021*	0.117	*0.322*	0.185	*0.023*
Hours Cat.2 (Mean=21h/w)	0.130	*0.337*	0.157	*0.018*	0.116	*0.321*	0.165	*0.013*	0.121	*0.327*	0.165	*0.014*
Hours Cat.3 (Mean=25h/w)	0.121	*0.326*	0.131	*0.008*	0.136	*0.342*	0.135	*0.005*	0.138	*0.345*	0.135	*0.005*
Hours Cat.4 (Mean=28h/w)	0.143	*0.350*	0.109	*0.005*	0.136	*0.343*	0.112	*0.002*	0.140	*0.347*	0.111	*0.003*
Hours Cat.5 (Mean=30h/w)	0.089	*0.285*	0.094	*0.005*	0.107	*0.308*	0.095	*0.003*	0.108	*0.310*	0.095	*0.003*
Hours Cat.6 (Mean=33h/w)	0.096	*0.295*	0.071	*0.007*	0.125	*0.331*	0.072	*0.004*	0.119	*0.324*	0.072	*0.005*
Hours Cat.7 (Mean=35.5h/w)	0.143	*0.351*	0.145	*0.050*	0.140	*0.347*	0.115	*0.030*	0.131	*0.337*	0.116	*0.031*
Hours Cat.8 (Mean=37.5h/w)	0.089	*0.285*	0.072	*0.012*	0.070	*0.254*	0.072	*0.007*	0.064	*0.245*	0.071	*0.008*
Hours Cat.9 (Mean=40h/w)	0.074	*0.262*	0.049	*0.010*	0.067	*0.250*	0.049	*0.006*	0.061	*0.239*	0.049	*0.007*
	1.000		1.000		1.000		1.000		1.000		1.000	
Age	41.3	*7.5*			46.3	*7.5*			44.3	*8.5*		
Sample size	18,244				18,244				25,363			

Table 6 Predictions of a policy experiment for married females

	Predicted		Predictions with 10% increase in hospital wages		Predictions with 10% increase in prim. care wages		Predictions with 10% increase in both wages		Predictions with 10% increase in non-health wages		Predictions with 10% increase in all wages		Predictions with 10% increase in non-work income		Predictions with NOK 50,000 added to non-work income	
	Mean	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*			*Mean*	*St.dev.*
Prob (Job type choice)																
Hospital	0.524	*0.052*	0.535	*0.053*	0.515	*0.050*	0.526	*0.052*	0.520	*0.051*	0.522	*0.051*	0.521	0.052	0.516	*0.050*
Primary care	0.308	*0.037*	0.301	*0.038*	0.320	*0.035*	0.313	*0.036*	0.305	*0.037*	0.310	*0.036*	0.312	0.037	0.318	*0.035*
Non-health	0.168	*0.017*	0.164	*0.017*	0.165	*0.016*	0.161	*0.016*	0.175	*0.019*	0.168	*0.017*	0.167	0.017	0.166	*0.017*
	1.000		*1.000*		*1.000*		*1.000*		*1.000*		1.000		*1.000*		*1.000*	
*Pr (Job type) * Mean hours in job type*																
Hospital	14.7	*1.6*	15.0	*1.7*	14.5	*1.5*	14.7	*1.6*	14.6	*1.6*	14.6	*1.5*	14.5	1.6	14.2	*1.3*
Primary care	8.4	*1.0*	8.2	*1.0*	8.7	*1.0*	8.5	*1.0*	8.3	*1.0*	8.4	*1.0*	8.5	1.0	8.6	*1.0*
Non-health	4.6	*0.5*	4.5	*0.5*	4.5	*0.5*	4.4	*0.5*	4.8	*0.6*	4.6	*0.5*	4.5	0.5	4.5	*0.5*
Total	27.7	*0.9*	27.6	*0.9*	27.7	*0.9*	27.6	*0.9*	27.7	*0.9*	27.6	*0.9*	27.5	0.9	27.3	*0.6*
Wage elasticities	*(New pred. hours-Old pred. hours)/Old pred. hours*10*															
All hours			-0.016	*0.014*	-0.007	*0.008*	-0.022	*0.02*	-0.004	*0.006*	-0.026	*0.025*	-0.063**	0.020		
Hospital hours			0.166**	*0.059*	-0.169**	*0.085*	-0.002	*0.043*	-0.090*	*0.052*	-0.087	*0.084*	-0.138**	0.058		
Primary care hours			-0.230**	*0.117*	0.39	*0.283*	0.153	*0.17*	-0.090*	*0.052*	0.065	*0.126*	0.075	0.047		
Non-health hours			-0.230**	*0.117*	-0.169**	*0.085*	-0.390**	*0.186*	0.431*	*0.244*	0.024	*0.067*	-0.076**	0.037		

Standard deviation in italics. * Significantly different from zero at a 10% level. ** Significantly different from zero at a 5% level.

4.2 Are single females more responsive to wage?
It seems reasonable to expect that single females are more flexible in their choices and more able to choose jobs with higher working hours and overtime work. On the other hand most of them already work full-time, so the potential for increased hours of work is less than for married females. The average number of observed hours prior to categorization is 1,541 for the single females, compared to 1,353 for married ones. The non-work income is naturally much lower for the single females at NOK 43,567, compared to NOK 229,537 for the married ones. The average age is 35 years, 8 years younger than the married females.

A complicating factor is the choices of the single mothers who are likely to be highly restricted by their parenting obligations and depending on childcare, which often is difficult to combine with shift work. This group, however, is small. The sample of single nurses also includes cohabitants without joint children.

Most of the single nurses are young and work in central areas, often at hospitals. As they get older many of the single nurses too move to less central areas and work in the primary care sector. However, they do not reduce their hours of work like the married ones do in their late twenties and thirties, except for the single mothers. There is a selection out of the single status by age. It is thus somewhat problematic that my out-of-sample prediction is based on those observed as single in both 1995 and 2000. The average nurse marries during the first five years after graduation.

The parameters estimated for the single females follow a similar pattern to those of the married ones. The estimates are reported in Table 6. For the single nurses, the extension of the opportunity index (Model B) has a somewhat different effect on the parameter changes in the leisure component in the utility function, when comparing to the married nurses. Both β_0 and γ are reduced with this extension. As seen in Table 8, the extension of the opportunity index improves the accuracy of the predicted sector choices. A higher share of the single nurses prefer hospital jobs and full-time jobs. The predicted shares, with the observed in parenthesis, are 68.0% (65.8%) for hospitals, 21.2% (21.9%) for primary care and 10.8% (12.3%) for non-health. The single nurses work more hours than the married ones, 32.1 hours per week predicted, 32.3 hours per week observed.

Looking at the whole sample available in 1995 and 2000, hospital wages increased on average by 9%, the primary care wages by 14% and the non-health wages by 3%. The pre-tax hourly wages were on average NOK 154 at hospitals, NOK 146 in primary care and NOK 184 in non-health jobs. Limiting the sample to those observed in both years, the seniority effect is more important. The hospital wages increased by 23% during the five-year period, while wages in primary care and non-health jobs increased by 28% and 11% respectively.

The observed changes from 1995 to 2000 indicate almost a doubling of the share working in primary care to 0.390 as found in Table 9. The shares of both hospitals and non-health jobs are reduced. The average number of working hours, is reduced by 5.5%, mainly due to the reduced share at hospitals. Looking at the whole sample of 11,091 single nurses in 2000 confirms this significant change in the share preferring a

primary care job. But the reduction in hours is smaller when looking at the whole sample.

The out-of-sample predictions presented in Table 9 are subject to the same complications due to structural changes in the health care sector as discussed for the married females. The predictions respond to the relative wage changes in the right direction, but underpredict the strength of the effects.

Wage elasticities

The wage elasticities are higher for the single nurses as presented in Table 10. The job specific wage elasticity for nurses working in hospitals is 0.196, while the elasticity for primary care jobs is 1.743. Part of this effect is probably due to the fact that there are relatively few single nurses in the primary care sector compared to married ones, as nurses often start their career with a hospital job. This predicted elasticity should thus be interpreted with care. When simulating an increase in both health jobs, the probability for choosing a non-health job is reduced to 0.094 from the previous 0.108. The predicted wage elasticity is found to be -0.235 for hospital jobs and 0.724 for primary care jobs. The predicted elasticity in the primary care sector is only significantly different from zero at a 10% significance level. The income elasticities are not significantly different from zero. The non-wage income of single nurses is quite low compared to the married ones. It may thus be unrealistic to expect that a 10% increase in this component will have any identifiable effect.

To conclude we find that the single nurses seem to be more responsive to wage changes than the married ones. The predicted effect is small however, and some of the elasticities are only significantly different from zero at a 10% level. Generally the effect of a job-specific wage rise is an increase in the number of people and the total hours worked in that job type, but with a corresponding reduction in hours in other job types. It also seems to be the case that those already working in the job where the wage is increased, reduce their expected average working hours slightly.

Table 7. Estimation of parameters of the utility function and opportunity densities. Single females.

		Model A			Model B		
		Estimate	Std.error	P-value	Estimate	Std.error	P-value
	Utility function						
β_0	Constant 'leisure element'	1.470	*0.309*	*[.000]*	0.894	*0.179*	*[.000]*
β_1	Age	-0.002	*0.003*	*[.570]*	0.001	*0.001*	*[.642]*
γ	Exponent 'leisure element'	-1.424	*0.431*	*[.001]*	-2.741	*0.358*	*[.000]*
α	Constant 'consumption element'	0.283	*0.051*	*[.000]*	0.832	*0.096*	*[.000]*
λ	Exponent 'consumption element'	-3.592	*0.214*	*[.000]*	-2.502	*0.146*	*[.000]*
	Opportunity density*						
v_1	1 if living in a central area, 0 otherwise	1.428	*0.030*	*[.000]*	0.977	*0.033*	*[.000]*
v_2	1 if the job is full-time, 0 otherwise	0.487	*0.053*	*[.000]*	0.538	*0.056*	*[.000]*
v_3	1 if the job is with a health care provider, 0 otherwise				1.137	*0.043*	*[.000]*
Number of observations			7,782		7,782		
Log likelihood			-22,762		-22,342.6		
McFadden's Rho			0.11		0.13		

** For the wage equation see Appendix 2.*

Table 8 Observed and predicted hours for single females

Observed and predicted hours			**Main model**		**Extended model**	
Single females	**Observed**		**Predicted**		**Predicted**	
N=7782	**shares**		**probability**		**probability**	
	Mean	**St.dev.**	**Mean**	**St.dev.**	**Mean**	**St.dev.**
Job type choice						
Hospital	0.658	*0.474*	0.579	*0.114*	0.680	*0.071*
Primary care	0.219	*0.413*	0.182	*0.056*	0.212	*0.061*
Non-health	0.123	*0.329*	0.239	*0.062*	0.108	*0.018*
	1.000		*1.000*		*1.000*	
	*Share(Job type) * Mean hours in job type*		*Pr (Job type) * Mean hours in job type*		*Pr (Job type) * Mean hours in job type*	
Hospital	21.8	*16.4*	19.1	*3.8*	22.1	*3.2*
Primary care	7.2	*13.9*	6.0	*1.7*	6.7	*1.5*
Non-health	3.3	*9.2*	7.7	*2.0*	3.3	*0.6*
	*Sum over [Share(Job type) * Mean hours in job type]*		*Sum over [Pr (Job type) * Mean hours in job type]*		*Sum over [Pr (Job type) * Mean hours in job type]*	
All	32.3	*6.4*	32.7	*1.6*	32.1	*2.3*
Categories of hours						
Hours Cat.1 (Mean=18h/w)	0.064	*0.245*	0.039	*0.042*	0.049	*0.064*
Hours Cat.2 (Mean=21h/w)	0.057	*0.233*	0.056	*0.034*	0.062	*0.050*
Hours Cat.3 (Mean=25h/w)	0.067	*0.250*	0.082	*0.018*	0.082	*0.028*
Hours Cat.4 (Mean=28h/w)	0.092	*0.289*	0.096	*0.008*	0.092	*0.014*
Hours Cat.5 (Mean=30h/w)	0.082	*0.274*	0.103	*0.008*	0.094	*0.010*
Hours Cat.6 (Mean=33h/w)	0.121	*0.326*	0.108	*0.012*	0.089	*0.012*
Hours Cat.7 (Mean=35.5h/w)	0.225	*0.418*	0.176	*0.062*	0.316	*0.111*
Hours Cat.8 (Mean=37.5h/w)	0.159	*0.366*	0.173	*0.028*	0.120	*0.025*
Hours Cat.9 (Mean=40h/w)	0.132	*0.339*	0.166	*0.030*	0.097	*0.024*
	1.000		*1.000*		*1.000*	

Table 9. Out-of-sample predictions. Single females, 2000.

	1995 (If observed in 2000)				2000 (If observed in 1995)				All married females in 2000			
Single females	**Observed shares**		**Predicted probability**		**Observed shares**		**Predicted probability**		**Observed shares**		**Predicted probability**	
	Mean	**St.dev.**	**Mean**	**St.dev.**	**Mean**	**St.dev.**	**Mean**	**St.dev.**	**Mean**	**St.dev.**	**Mean**	**St.dev.**
Sector choice												
Hospital	0.664	*0.472*	0.678	*0.074*	0.517	*0.500*	0.611	*0.066*	0.529	*0.499*	0.612	*0.058*
Primary care	0.220	*0.414*	0.214	*0.063*	0.390	*0.488*	0.248	*0.050*	0.394	*0.489*	0.236	*0.047*
Other	0.116	*0.321*	0.108	*0.018*	0.094	*0.291*	0.141	*0.021*	0.077	*0.266*	0.152	*0.025*
	1.000		1.000		1.000		1.000		1.000		1.000	
	*Share (Job type) * Mean hours in job type*		*Pr (Job type) * Mean hours in job type*		*Share (Job type) * Mean hours in job type*		*Pr (Job type) * Mean hours in job type*		*Share (Job type) * Mean hours in job type*		*Pr (Job type) * Mean hours in job type*	
Hospital	22.1	*16.4*	22.0	*3.3*	16.3	*16.4*	19.6	*3.1*	16.9	*16.5*	20.0	*2.7*
Primary care	7.3	*14.0*	6.7	*1.5*	11.8	*15.2*	7.5	*1.2*	12.1	*15.5*	7.2	*1.1*
Other	3.2	*9.2*	3.3	*0.6*	2.8	*9.0*	4.2	*0.6*	2.2	*7.9*	4.6	*0.8*
All	32.6	*6.1*	32.1	*2.3*	30.8	*6.4*	31.3	*2.0*	31.2	*6.3*	31.9	*1.8*
Categories of hours												
Hours Cat.1 (Mean=18h/w)	0.050	*0.217*	0.050	*0.065*	0.073	*0.260*	0.065	*0.056*	0.067	*0.249*	0.051	*0.048*
Hours Cat.2 (Mean=21h/w)	0.053	*0.224*	0.063	*0.051*	0.082	*0.274*	0.080	*0.043*	0.071	*0.257*	0.068	*0.039*
Hours Cat.3 (Mean=25h/w)	0.070	*0.255*	0.083	*0.028*	0.094	*0.292*	0.094	*0.023*	0.085	*0.279*	0.086	*0.023*
Hours Cat.4 (Mean=28h/w)	0.095	*0.293*	0.092	*0.014*	0.120	*0.325*	0.096	*0.012*	0.120	*0.325*	0.091	*0.014*
Hours Cat.5 (Mean=30h/w)	0.079	*0.270*	0.094	*0.009*	0.112	*0.316*	0.092	*0.008*	0.114	*0.317*	0.090	*0.009*
Hours Cat.6 (Mean=33h/w)	0.123	*0.329*	0.089	*0.012*	0.147	*0.354*	0.079	*0.008*	0.152	*0.359*	0.079	*0.007*
Hours Cat.7 (Mean=35.5h/w)	0.230	*0.421*	0.313	*0.111*	0.174	*0.379*	0.337	*0.121*	0.189	*0.391*	0.370	*0.115*
Hours Cat.8 (Mean=37.5h/w)	0.167	*0.373*	0.120	*0.025*	0.098	*0.297*	0.091	*0.016*	0.108	*0.310*	0.095	*0.014*
Hours Cat.9 (Mean=40h/w)	0.133	*0.340*	0.097	*0.024*	0.100	*0.301*	0.066	*0.014*	0.094	*0.292*	0.070	*0.013*
	1.000		1.000		1.000		1.000		1.000		1.000	
Age	5,677				5,677				11,091			
Sample size	34.3	*7.3*			39.3	*7.3*			34.8	*8.1*		

* Significantly different from zero at a 10% level. ** Significantly different from zero at a 5% level.

Table 10. Predictions of a policy experiment for single females

	Predicted		Predictions with a 10% increase in hospital wages		Predictions with a 10% increase in prim. care wages		Predictions with a 10% increase in both wages		Predictions with a 10% increase in non-health wages		Predictions with a 10% increase in all wages		Predictions with a 10% increase in non-wage income		Predictions with NOK 50,000 in transfers	
	Mean	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*			*Mean*	*St.dev.*
Prob (Sector choice)																
Hospital	0.680	*0.071*	0.706	*0.078*	0.648	*0.066*	0.676	*0.073*	0.667	*0.068*	0.664	*0.071*	0.679	0.072	0.640	*0.077*
Primary care	0.212	*0.061*	0.196	*0.066*	0.249	*0.053*	0.230	*0.059*	0.208	*0.061*	0.226	*0.059*	0.213	0.061	0.256	*0.059*
Non-health	0.108	*0.018*	0.099	*0.018*	0.103	*0.016*	0.094	*0.017*	0.125	*0.022*	0.109	*0.019*	0.108	0.018	0.104	*0.020*
	1.000		*1.000*		*1.000*		*1.000*		*1.000*		1.000		1.000		*1.000*	
*Pr (Sector) * Mean hours in sector*																
Hospital	22.1	*3.2*	22.6	*3.3*	21.1	*2.8*	21.6	*3*	21.7	*3*	21.2	*2.9*	22.1	3.2	19.1	*2.3*
Primary care	6.7	*1.5*	6.1	*1.6*	7.8	*1.4*	7.2	*1.5*	6.6	*1.5*	7	*1.5*	6.7	1.5	7.5	*1.6*
Non-health	3.3	*0.6*	3	*0.6*	3.2	*0.5*	2.9	*0.5*	3.8	*0.8*	3.3	*0.6*	3.3	0.6	3	*0.6*
*Sum over [Pr (Sector) *Mean hours in sector]*																
Total	32.2	*2.3*	31.8	*2.2*	32	*2.3*	31.6	*2.1*	32.1	*2.3*	31.6	*2.1*	32.1	2.4	29.6	*1.2*
Wage elasticities	*(New pred. hours-Old pred. hours)/Old pred. hours*10*															
All hours			-0.118**	*0.057*	-0.044**	*0.021*	-0.152**	*0.066*	-0.030*	*0.016*	-0.175**	*0.076*	-0.022	0.027		
Hospital hours			0.196**	*0.075*	-0.466**	*0.208*	-0.235*	*0.135*	-0.192**	*0.094*	-0.394*	*0.207*	-0.039	0.046		
Primary care hours			-0.883**	*0.426*	1.743**	*0.854*	0.724*	*0.429*	-0.192**	*0.094*	0.545	*0.342*	0.026	0.030		
Non-health hours			-0.883**	*0.426*	-0.466**	*0.208*	-1.263**	*0.537*	1.373**	*0.647*	-0.068	*0.196*	-0.033	0.050		

Standard deviation in italics. * Significantly different from zero at a 10% level. ** Significantly different from zero at a 5% level.

5. The costs of an active wage policy

The total cost of a policy reform is of course strongly correlated to the change in hours worked in the different job types. As shown in the previous sections a job-specific wage increase will have an impact on the choice of job types and hours worked, although to a modest degree. The analysis so far has focused on the average effect on hours of a change in wages. It is, however, not unlikely that the nurses are heterogeneous in their response to a wage reform, e.g. according to their position on the wage scale. Using individual specific hourly wages in combination with our predicted changes in job type and hours for each individual, we capture the total expected changes in wage costs. Focusing on wage increases in the public health sector defends disregarding the employers' taxes, e.g. the proportional tax on labor costs. The additional tax paid by the public hospitals and nursing homes return as increased tax income in the state budget.

A 10% simulated increase in hospital wages will increase the wage costs for the hospital jobs for the married females by 1.7 percent (Table A8 in Appendix 5). The average cost per hour is calculated to NOK 158.6 both *prior to* and *after* the simulated wage increase, due to a matching increase in hours. The new individuals attracted to the hospital sector must have a lower mean hourly salary than those already working there, cancelling out the 10% hourly wage increase. The average hourly wage in the primary care sector is predicted to be reduced by 9.1% to NOK 135.0, as those changing jobs from primary care to hospitals have a higher than average wage in the primary care sector. The primary care hours are predicted to be reduced by 2.2%, while the costs are reduced by 11.1%. Due to reductions in the two other job types, the total costs of all employed married nurses will be reduced by 2.7%.

Looking at both hospitals and primary care jobs, a 10% wage increase will reduce the non-health hours and wage costs by 4.0%. Of the 166 RNs predicted to leave their non-health jobs, 45 find a hospital job and 141 a primary care job. However, the hospital hours and costs are unchanged, while the primary care hours and costs are increased by 1.5%. I interpret this as a reduction of hours for those already in the sector, reducing costs in spite of the hourly wage increase. Those entering the hospital and primary care jobs have a lower average wage canceling out added costs from the wage increases. The predicted changes in the costs for the single nurses mirror those of the married nurses (Table A9 in Appendix 5).

6. Conclusions

The purpose of this study has been to identify the short-term effect of increases in hourly wages on hours worked in the health sector, both hoping to boost the hours worked by RNs already employed in the health sector and attract personnel from non-health jobs. Wage is probably increasingly important to attract people to the nursing profession as is becomes less of a calling and more of a regular job. But this study indicates that once qualified, wage seems to have a modest impact on hours worked for the nurses, especially for married women. Wage also has a modest impact on the choice of job-type, but a simulated wage increase by 10% in health-jobs merely reduces the share of nurses preferring a non-health job from 16.8% to 16.1% for those married, and from 10.8% to 9.4% for the single females.

For married women I find job type specific wage elasticities of 0.17 for the hospital jobs. The increase in hours is partly due to the attraction of nurses from primary care and non-health jobs and partly due to an increase in the hours worked by those already working at the hospitals. The wage elasticity is predicted to be 0.39 for primary care jobs, and 0.43 for non-health jobs, but these elasticities are only significant at lower levels (80% and 90% respectively). For all hours worked by married female nurses, health and non-health, the income effect dominates the substitution effect with a wage elasticity of -0.026. This elasticity however is not significantly different from zero.

For the single women the job specific wage elasticities are stronger, especially in the primary care sector. The wage elasticity for hospital hours is 0.20. The elasticity is much higher for primary care (1.7), but part of this effect is probably due to the fact that there are relatively few single nurses in the primary care sector compared to married ones, as nurses often start their career with a hospital job. For all hours worked by single female nurses, in health and non-health jobs, the wage elasticity is –0.18. The elasticities for this group are more uncertain, with higher standard deviations. But they are all significantly different from zero.

The conclusion is that wage has the effect of increasing hours worked in the health sector. But there is a loss incurred as the average nurse's working hours are predicted to be slightly reduced by such a policy. As expected, single nurses are more responsive to wage than those who are married. The complexity of the nurses' choices and the many other characteristics that are important with regard to the choice of job type and hours worked, reduces the sharpness of the predicted elasticities.

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Appendix 1. Variable construction and trimming procedure.
The data used is based on several of the administrative data registers delivered by Statistics Norway, with the register of authorized health personnel as an identifier. Our trimming procedure excludes personnel above 66 years of age, as many retire at 67. Some personnel categories have access to early retirement, but it was not common practice for registered nurses in 1995.

Authorized foreign RNs are excluded when they do not have a permanent residency in Norway (only temporarily residency code/social security number, F-number), or if they have a permanent residency code, but no income or address in Norway. The data includes information about annual earnings prior to and after taxation, employment status, and demographic variables. All employers are coded by the NACE Standard Industrial Classification, which gives us detailed information on their sector and type of activity.

Table A1 Sample trimming

	N
RNs registered in 1995 (permanent residence code only)	63,527
Subtracting	
Foreigners with no income in Norway	3,934
RNs with higher education (Not nursing related)	658
67 years or older	2,387
Registered during 1995	2,722
Temporary licenses	40
Missing in some variables	2,335
	51,451

Table A2 Key variables by sector

Variable	Hospital		Primary care		Private health care		Non-health		Non-work		Transfers	
1995	Mean	*St.d.*	Mean	*St.d.*	Mean	*St.d.*	Mean	*St.d.*	Mean	*St.d.*	Mean	*St.d.*
Sector share	49.9%		25.7%		5.1%		15.3%		0.9%		6.1%	
N	24,144		13,208		2,617		7,876		479		3,127	
Age	40.0	*9.8*	42.0	*10.1*	43.9	*9.2*	43.1	*9.4*	50.4	*11.3*	50.8	*11.8*
Female=1	92.4%		93.2%		90.9%		86.8%		97.7%		97.2%	
Single=1	23.9%		14.3%		10.4%		14.6%		9.4%		12.0%	
Married=1	64.6%		73.2%		78.6%		69.7%		85.2%		68.0%	
Divorced=1	7.8%		8.2%		7.3%		10.4%		2.5%		10.5%	
Born in Norway=1	91.5%		92.2%		91.9%		92.5%		85.6%		91.1%	
Gave birth in 1994 or 1995 =1	13.4%		12.7%		8.5%		9.4%		3.3%		1.7%	
# of children if parent	2.2	*0.9*	2.4	*1.0*	2.4	*0.9*	2.4	*1.0*	2.5	*1.2*	2.6	*1.1*
Years since authorization	14.3	*10.4*	16.2	*11.0*	18.7	*10.1*	17.5	*10.3*	24.4	*12.0*	24.9	*11.9*
Number of years worked last 20 years	13.7	*5.3*	13.9	*5.2*	14.9	*4.7*	14.9	*4.8*	9.7	*5.8*	13.0	*5.5*
Income from work	199 810	*54 731*	193 071	*54 028*	201 416	*87 267*	205 423	*122 333*	12 768	*14 566*	5 402	*9 599*
Total Income	219 410	*57 530*	215 255	*57 450*	223 549	*93 865*	238 877	*147 162*	26 326	*54 621*	122 104	*69 940*
Transfers	16 482	*22 057*	19 245	*22 790*	16 491	*21 743*	6 207	*13 763*	6 207	*13 763*	109 689	*60 705*
Wage per hour	136	*7*	128	*4*	114	*7*	163	*10*				
Hours per year	1 470	*390*	1 510	*410*	1 770	*750*	1 260	*720*				
Hours Cat.1	20.7%		21.6%		22.2%		33.4%					
Hours Cat.2	29.1%		33.0%		26.1%		29.5%					
Hours Cat.3	50.1%		45.4%		51.7%		37.2%					
Spouse's total income	315 907	*319 714*	288 086	*204 982*	395 412	*589 663*	324 689	*293 860*	371 194	*420 800*	355 575	*417 588*
Spouse's income after tax	214 552	*224 655*	199 661	*142 419*	260 930	*383 139*	222 007	*215 751*	257 360	*324 146*	246 959	*325 082*
Spouse does not work =1	8.8%		12.8%		10.3%		12.6%		29.2%		27.8%	

Table A3 Samples used in the analysis, 1995

Variable	Married females		Single females		All nurses with data	
N	25,242		7,782		45,228	
Age	43.1	9.2	35.0	8.9	41.17	9.89
Female=1	1		1		0.92	
Single=1	0		1		0.19	
Married=1	1		0		0.68	
Divorced=1	0		0		0.08	
Born in Norway=1	0.93		0.91		0.92	
Gave birth in 1994 or 1995	0.12		0.15		0.13	
Number of children in 1995	2.5	0.9	1.3	0.6	2.1	1.0
# of children if mother	2.5	0.9	1.5	0.7	2.3	1.0
Years since authorization	17.7	10.2	9.3	9.0	15.4	10.6
Number of years worked last 20 years	14.8	4.6	11.2	5.6	13.9	5.2
Income from work	185 797	72 916	206 582	52 403	198 810	71 208
Total income	208 383	71 269	222 907	49 959	221 576	81 017
Transfers	19 658	20 193	13 665	24 579	19 136	26 646
Non-work	229 537	86 597	43 567	80 790	169 530	200 345
Wage per hour, ca	138	13	135	13	138	14
Hours per year, ca	1,353	485	1,541	379	1,445	477
Hours Cat.1 Half time and less	0.30		0.14		0.23	
Hours Cat.2 Part-time	0.35		0.25		0.30	
Hours Cat.3 Full-time	0.35		0.61		0.46	
Hospital	0.50		0.66		0.53	
Primary care	0.33		0.22		0.29	
Non-health	0.17		0.12		0.17	
Centrality Index 1 (Least Central)	0.08		0.08		0.07	
Centrality Index 2	0.04		0.05		0.04	
Centrality Index 3	0.09		0.09		0.09	
Centrality Index 4	0.02		0.01		0.02	
Centrality Index 5	0.04		0.03		0.03	
Centrality Index 6	0.20		0.14		0.19	
Centrality Index 7	0.52		0.61		0.55	
Work Region A Oslo/Akershus	0.19		0.30		0.22	
Work Region East excl.Oslo/Ak.	0.25		0.17		0.24	
Work Region South Agder/Rogaland	0.16		0.09		0.14	
Work Region West	0.18		0.15		0.16	
Work Region North	0.18		0.24		0.19	

Appendix 2. Wages

Annual income by sector

I have constructed sector-specific hourly wages for all nurses, including sectors where they not are participating. The first step in this process is to sort the jobs by the NACE standard industrial classification and aggregate into sectors or practice types. As described in table A3 I have chosen to use seven 'sectors' when I construct hourly wages: a) hospitals, b) public primary care, c) private health practice and d) other non-health work. Those who earned less than the minimum amount to qualify for pension entitlements (1G=NOK 39,340), are categorized as e) not working. Self-employment is allocated to the non-health sector.

Hourly wages

The earnings measure used is hourly wage. I calculated hourly wages for the subsample with a full-time job for the whole year by dividing the annual income by the normal working hours for the job type concerned. Intuitively there is reason to believe that there is a selection into the different job types, driven by unobserved factors like preferences and productivity. When I predict hourly wages for each individual, also in the job categories where they do not work, I take this selection into consideration. I apply a Heckman two-step procedure when estimating the wage equations as presented in Table A4, and find a significant selection effect. I repeat this procedure for each job category. Table A4 only reports the wage equation for the hospital sector. I exclude the equations for the other sectors, as they are parallel. The hours 'observed' are calculated by dividing the annual income by the hourly wage for the job category chosen by the individual.

Experience

In many empirical studies a labor market experience is proxied by *potential* experience, i.e. age-education-7. This is a problematic upper bound for experience which is more upwardly biased for women, who tend to be more loosely connected to the labor market, at least in connection with maternity leave. This is highly relevant for the nurse profession. I have therefore used the number of years with an income qualifying for pension entitlement during the last 20 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. I have also tested the traditional experience measure but found the measure based on 'pension entitlements' to be more suitable.

Table A4 Wage equation from a Heckman selection model

	Dependent variable: Wage per hour in the hospital sector	Coef.	Std. Err	z
Female	**Female=1**	-0.033	0.006	-5.84
Regiona	**Oslo/Akershus**	0.043	0.010	4.53
Regionc	**West**	-0.015	0.005	-3.11
Regiond	**Middle**	-0.006	0.006	-1.03
Regione	**North**	-0.013	0.005	-2.35
Age	**Age**	0.122	0.047	2.62
age2	**Age^2/10**	-0.353	0.164	-2.16
age3	**Age^3/1000**	0.435	0.249	1.75
age4	**Age^4/100000**	-0.194	0.139	-1.39
erf95	**Years of work experience last 20 years**	-0.018	0.011	-1.61
erf952	**Experience^2/10**	0.408	0.176	2.32
erf953	**Experience^3/1000**	-2.519	1.118	-2.25
erf954	**Experience^4/100000**	5.081	2.434	2.09
Cnordic	**From Nordic country except Norway=1**	0.039	0.008	4.82
coecd_no	**From OECD area except the Nordic countries=1**	0.006	0.010	0.56
Cglobal	**Non-OECD background=1**	0.019	0.012	1.61
kommsen1	**Centrality index 1 =1**	0.019	0.007	2.58
kommsen2	**Centrality index 2 =1**	0.013	0.006	2.11
kommsen3	**Centrality index 3 =1**	0.013	0.005	2.65
kommsen4	**Centrality index 4 =1**	0.061	0.019	3.19
kommsen5	**Centrality index 5 =1**	0.021	0.009	2.39
kommsen6	**Centrality index 6 =1**	-0.012	0.005	-2.4
Constant		3.442	0.475	7.24

Table A4 continued- Selection into the hospital sector

Select				
Female	Female=1	-0.657	0.033	-19.96
Regiona	Oslo/Akershus	-0.889	0.037	-24.02
Regionc	West	0.062	0.032	1.9
Regiond	Middle	-0.057	0.036	-1.58
Regione	North	0.219	0.034	6.42
Cnordic	From Nordic country except Norway=1	0.014	0.050	0.29
coecd_no	From OECD area except the Nordic countries=1	-0.008	0.065	-0.13
Cglobal	Non-OECD background=1	0.188	0.077	2.42
Age	Age	-0.684	0.288	-2.38
age2	Age^2/10	1.817	1.022	1.78
age3	Age^3/1000	-1.948	1.569	-1.24
age4	Age^4/100000	0.652	0.882	0.74
erf95	Years of work experience last 20 years	0.094	0.064	1.47
erf952	Experience^2/10	0.117	1.048	0.11
erf953	Experience^3/1000	-6.147	6.783	-0.91
erf954	Experience^4/100000	23.834	14.933	1.6
Married	Married=1	-0.494	0.020	-24.2
b950_5	No. of children Aged 0-5	-0.293	0.018	-16.35
kommsen1	Centrality index 1 =1	0.059	0.051	1.17
kommsen2	Centrality index 2 =1	0.161	0.044	3.62
kommsen3	Centrality index 3 =1	0.096	0.033	2.87
kommsen4	Centrality index 4 =1	-0.234	0.115	-2.04
kommsen5	Centrality index 5 =1	-0.021	0.057	-0.36
kommsen6	Centrality index 6 =1	0.045	0.031	1.45
Constant		8.723	2.922	2.99
/athrho		-0.574	0.093	-6.18
/lnsigma		-2.113	0.030	-69.86
Rho		-0.518	0.068	
Sigma		0.121	0.004	
Lambda		-0.063	0.010	

Number of obs	24,171	Log likelihood	-6,934.4
Censored obs	17,827	Wald chi2(22) =	996.11
Uncensored obs	6,344	Prob >chi2 =	0

Appendix 3. Taxes

Income tax

Table A5 Tax rules applied

Income = Y	Tax
0 – 20 954	0
20 954 – 143 500	0.302Y – 6 328
143 500 – 212 000	0.358Y – 14 364
212 000 – 239 000	0.453Y – 34 504
239 000 -	0.495Y – 44 542

Capital tax

Capital income is taxed at 28 percent.

Appendix 4. Predicted choices of the discrete choice model without the health care provider indicator in the opportunity index.

Table A6. Extended model - Married females. Predicted changes in sector choices and working hours in policy simulations. (Without v_3).

	Predicted		**Predictions with a 10% increase in hospital wages**		**Predictions with a 10% increase in prim. care wages**		**Predictions with a 10% increase in both wages**		**Predictions with a 10% increase in non-health wages**		**Predictions with a 10% increase in all wages**		**Predictions with NOK 50,000 in transfers**	
	Mean	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*
Prob (Sector choice)														
Hospital	0.378	*0.020*	0.381	*0.021*	0.376	0.019	0.379	*0.020*	0.376	*0.019*	0.377	*0.019*	0.376	*0.017*
Primary care	0.304	*0.014*	0.303	*0.015*	0.308	0.011	0.307	*0.012*	0.303	*0.015*	0.305	*0.013*	0.308	*0.010*
Non-health	0.317	*0.010*	0.316	*0.009*	0.316	0.009	0.314	*0.009*	0.321	*0.012*	0.317	*0.010*	0.316	*0.009*
			1.000		*1.000*		*1.000*		*1.000*		*1.000*		*1.000*	
*Pr (Sector) * Mean hours in sector*														
Hospital hours	10.9	*0.7*	10.9	*0.7*	10.8	0.6	10.9	*0.7*	10.8	*0.6*	10.8	*0.6*	10.7	*0.5*
Primary care hours	8.3	*0.5*	8.2	*0.5*	8.4	0.5	8.3	*0.5*	8.2	*0.5*	8.3	*0.5*	8.3	*0.5*
Non-health hours	8.6	*0.5*	8.6	*0.5*	8.6	0.5	8.5	*0.5*	8.7	*0.6*	8.6	*0.5*	8.5	*0.5*
*Sum over [Pr (Sector) *Mean hours in sector]*														
Total	27.8	*0.7*	27.8	*0.6*	27.8	0.6	27.7	*0.6*	27.8	*0.6*	27.7	*0.6*	27.6	*0.5*
Wage elasticities	*(New pred. hours-Old pred. hours)/Old pred. hours*10*													
All hours			-0.006	*0.008*	-0.004	0.007	-0.010	*0.014*	-0.005	*0.009*	-0.014	*0.022*	-0.064	*0.083*
Hospital hours			0.062	*0.053*	-0.056	0.058	0.006	*0.014*	-0.050	*0.056*	-0.042	*0.061*	-0.144	*0.180*
Primary care hours			-0.050	*0.053*	0.124	0.164	0.073	*0.109*	-0.050	*0.056*	0.024	*0.055*	0.083	*0.161*
Non-health hours			-0.050	*0.053*	-0.056	0.058	-0.105	*0.107*	0.095	*0.095*	-0.011	*0.022*	-0.089	*0.112*

Standard deviation in italics. * Significantly different from zero at a 10% level. ** Significantly different from zero at a 5% level.

Table A7. Single nurses. Predicted changes in sector choices and working hours in policy simulations. (Without v_3).

	Predicted		Predictions with a 10% increase in hospital wages		Predictions with a 10% increase in prim. care wages		Predictions with a 10% increase in both wages		Predictions with a 10% increase in non-health wages		Predictions with a 10% increase in all wages		Predictions with NOK 50,000 in transfers	
	Mean	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*
Prob (Job type choice)														
Hospital	0.579	*0.114*	0.603	*0.119*	0.565	*0.114*	0.590	*0.118*	0.567	*0.114*	0.578	*0.117*	0.582	*0.124*
Primary care	0.182	*0.056*	0.172	*0.059*	0.202	*0.057*	0.191	*0.059*	0.177	*0.055*	0.187	*0.057*	0.198	*0.061*
Non-health	0.239	*0.062*	0.225	*0.063*	0.233	*0.059*	0.219	*0.060*	0.256	*0.066*	0.235	*0.063*	0.220	*0.064*
	1.000		1.000		1.000		1.000		*1.000*		1.000		1.000	
*Pr (Job type) * Mean hours in job type*														
Hospital	19.1	*3.8*	19.5	*3.9*	18.6	*3.7*	19.1	*3.8*	18.6	*3.7*	18.7	*3.8*	17.9	*3.7*
Primary care	6.0	*1.7*	5.6	*1.8*	6.6	*1.8*	6.2	*1.8*	5.8	*1.7*	6.1	*1.8*	6.1	*1.9*
Non-health	7.7	*2.0*	7.2	*2.0*	7.5	*1.9*	7.0	*1.9*	8.1	*2.2*	7.4	*2.0*	6.7	*2.0*
*Sum over [Pr (Job type) *Mean hours in job type]*														
Total	32.7	*1.6*	32.4	*1.4*	32.6	*1.5*	32.3	*1.4*	32.6	*1.5*	32.2	*1.3*	30.8	*0.6*
Wage elasticities	*(New pred. hours-Old pred. hours)/Old pred. hours*10*													
All			-0.094*	*0.053*	-0.027*	*0.015*	-0.116**	*0.059*	-0.040	*0.025*	-0.149**	*0.073*		
Hospital			0.258*	*0.142*	-0.248*	*0.140*	0.020	*0.037*	-0.223	*0.137*	-0.182	*0.129*		
Primary care			-0.629*	*0.372*	1.034*	*0.558*	0.339	*0.236*	-0.223	*0.137*	0.129	*0.108*		
Non-health			-0.629*	*0.372*	-0.248*	*0.140*	-0.843*	*0.437*	0.551*	*0.304*	-0.330*	*0.190*		

Standard deviation in italics. * Significantly different from zero at a 10% level. ** Significantly different from zero at a 5% level.

Appendix 5. The predicted costs of a simulated wage increase.

Table A8. Extended model - Married females with basic model (A). Predicted cost changes in policy simulations.

N=25242	Predicted		Predictions with a 10% increase in hospital wages		Predictions with a 10% increase in prim. care wages		Predictions with a 10% increase in both wages		Predictions with a 10% increase in non-health wages		Predictions with a 10% increase in all wages		Predictions with NOK 50,000 in transfers	
	Mean	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*
Predicted total net wage cost per sector. In million NOK per year: 48 weeks, 7,782 individuals														
Hospital	2 831	*313*	2 879	*323*	2 529	*268*	2 830	*305*	2 550	*273*	2 805	*295*	2 484	*240*
Primary care	1 511	*190*	1 343	*176*	1 568	*187*	1 533	*189*	1 361	*172*	1 520	*187*	1 400	*167*
Non-health	940	*116*	919	*113*	924	*111*	903	*109*	1 080	*141*	1 037	*128*	924	*111*
All sectors	5 282	*259*	5 140	*253*	5 021	*243*	5 266	*250*	4 991	*254*	5 362	*258*	4 807	*209*
Difference in net wage costs in million NOK between predictions before and after the wage increase.														
Hospital			47		-302		-1		-281		-26		-348	
Primary care			-168		57		22		-150		9		-111	
Non-health			-22		-16		-37		139		96		-17	
All sectors			-142		-261		-16		-292		79		-475	

Table A9. Single nurses with basic model (A). Predicted cost changes in policy simulations.

N=7782 Predicted			Predictions with a 10% increase in hospital wages		Predictions with a 10% increase in prim. care wages		Predictions with a 10% increase in both wages		Predictions with a 10% increase in non-health wages		Predictions with a 10% increase in all wages		Predictions with NOK 50,000 in transfers	
	Mean	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*	*Mean*	*St.dev.*
Predicted total net wage cost per sector. In million NOK per year: 48 weeks, 7,782 individuals														
Hospital	1 279	*189*	1 304	*196*	1 107	*156*	1 248	*180*	1 139	*164*	1 227	*173*	1 005	*134*
Primary care	331	*74*	304	*82*	424	*76*	390	*83*	325	*74*	383	*82*	371	*80*
Non-health	207	*38*	188	*35*	197	*34*	180	*32*	259	*52*	226	*42*	185	*35*
All sectors	1 817	*149*	1 797	*140*	1 727	*128*	1 817	*132*	1 724	*137*	1 836	*133*	1 561	*86*
Difference in net wage costs in million NOK between predictions before and after wage increase.														
Hospital			26		-172		-31		-139		-52		-273	
Primary care			-27		92		58		-6		52		40	
Non-health			-18		-10		-27		53		19		-22	
All sectors			-20		-90		1		-93		19		-256	