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Do Medical Doctors Respond to Economic Incentives?

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Do Medical Doctors Respond to Economic Incentives?

Abstract

A longitudinal analysis of married physicians labor supply is carried out on Norwegian data from 1997 to 1999. The model utilized for estimation implies that physicians can choose among 10 different job packages which are a combination of part time/full time, hospital/primary care, private/public sector, and not working. Their current choice is influenced by past available options due to a taste persistence parameter in the utility function. In the estimation we take into account the budget constraint, including all features of the tax system. Our results imply that an overall wage increase or a tax cut moves married physicians towards full time job packages, in particular to full time jobs in the private sector. But the overall and aggregate labor supply elasticities in the population of employed doctors are rather low compared to previous estimates.

JEL-Code: J220, I100, C350.

Keywords: physicians’ labor supply, multi-sector, panel data.

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1. Introduction

In this paper we study what determines the supplied working hours of employed medical doctors. In particular, we investigate the choice between working in public and private institutions, and between full time and part time contracts. As economists, we tend to think that wages are among the most relevant determinants of (physicians’) labor supply. But many other relevant features are often neglected by economists. Some have to do with contracts characteristics, with sectors, with hours. Some have to do with job satisfaction and motivation. In this paper, we model physicians’ labor supply choices taking into account also non-pecuniary characteristics of different job types. We focus on how changes in wages and taxation affect both the overall labour supply and the choice of job-type.

We estimate a structural labor supply model that allows for choices between types of jobs. The physicians are assumed to maximize utility given the budget constraints and given the availability of different types of jobs. The jobs differ with respect to the working loads. At each point in time physicians can choose between 10 different states which are a combination of working full time or part time, working in hospitals or primary care, working in the public or private sector and not working. Our model extends the basic multinomial logit model applied to panel data and it is based on an econometric model developed by Dagsvik (2002). In our model, the current choice depends on all the utility functions associated with each alternative in the past, not only the optimal ones. Thus, we allow for the random parts of the utility functions to be correlated across time and types of jobs (taste persistence). This behavioural assumption implies that individuals’ past options (and not only past optimal choices) matter for current choices. The model is estimated on transitions between jobs based on a panel of 6,564 married employed Norwegian physicians from 1997 to 1999. In our data we do not observe self-employed physicians.

Our paper differs from past literature on physicians’ labour supply because it is the first time that a dynamic labor supply model is estimated taking into account choices among job types and taste persistence over time. Past literature that has estimated physicians’ labour supply is rather different from our framework. Baltagi et al. (2005) estimates a labour supply

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5 See for instance Train (2003) or Cameron (2005)
of 1303 male physicians employed only in Norwegian hospitals who worked for the whole period 1993-1997 and they obtain labor supply elasticities around 0.3. Our paper differs from theirs in many respects. The most relevant difference is that we assume that doctors can choose between different job types with predetermined number of hours. The reason why we do not let physicians work a little more when economic incentives are improved is due to the working loads offered by the management in hospital and primary care. There are thus institutional constraints on hours worked that we have to consider when calculating the responses to economic incentives.

Saether (2005) utilize a model that is similar to ours but it is a static model estimated on data from one year. He finds that a wage increase causes a modest response in total hours and a reallocation of hours in favor of the sector with increased wages. Midtunn (2007) analyzes the Norwegian physicians’ choice to work only in the private sector. Gjerberg (2001) studies physicians’ choice of specialty among female and male Norwegian physicians. Godager et al. (2009) concentrate their analysis on choices of working hours of 435 Norwegian General Practitioners after the reform of 2001 where GP’s became self-employed. Also Grytten et al. (2008) study a particular aspect of the wage structure of Norwegian GP’s: the effect of General Practitioners fees’ changes on their income.

Labour supply of medical doctors has been studied also in other countries but none of the previous studies is similar to ours: Rizzo (1994) analyzes only self-employed physicians. Also Showalter and Thurston (1997) find elasticities for self-employed US physicians equal to 0.33 while the effect is small and insignificant for employed physicians. Their paper utilizes a labour supply model that is similar to the one of Baltagi et al (2005) and it is different from ours because they don’t take into account institutional constraints in terms of hours’ choices, choices among job types, and taste persistence over time. Ikenwilo (2007) estimates a labour supply model where they include job satisfaction. They use data from a Scottish survey of physicians. The uncompensated earnings elasticities vary between 0.09 (without job’s quality controls) and 0.12 when they control for job’s quality. Elasticities are lower for physicians working full time and they find the usual gender difference in the elasticities.

Our results imply that overall wage increases and tax reductions give the medical doctors an incentive to move to full time jobs, in particular in the private sector, at the expense of working in other jobs in the health care sector of economy. Because we allow other attributes
than pure economic incentives to matter in explaining behaviour, captured by random parts in the preference structure, and because availability of jobs and restrictions on hours work vary across jobs, the overall impact on labor supply among employed Norwegian medical doctors of changes in economic incentives is rather modest. Our estimates of labor supply elasticities are in line with the results for employed doctors reported in Showalter and Thurston (1997) and Ikenwilo (2007). It should be noted that the impact of a wage increase on labor supply is in part absorbed by taxation. Because all details of a step-wise linear progressive tax system is accounted for in our model, this absorption is explicitly accounted for.

The paper is organised as follows. In Section 2 the model is presented. Section 3 describes the data. Estimates are given in Section 4. Elasticities and the impact of changes in taxation are presented in Section 5. Section 6 concludes.

2. The model

2.1 The random utility labor supply model

We will assume that physicians make a choice of where to work according to what maximizes his or her utility. In what follows, we will estimate this behavior on panel data and we thus need a model that accounts for transition between states. The model we employ allows for correlation in utilities across time. Our econometric model builds on the econometric framework developed in Dagsvik (2002). Let $U_{jn}(t)$ be the utility of physician $n$ when working in job type $j$ at time $t$. The utility function is assumed to be random because there are job attributes that affect preferences that we do not observe. Let $v_{jn}(t)$ be the systematic part of the utility function and let $\epsilon_{jn}(t)$ be the random taste shifter, assumed to be independent and identical extreme value distributed. Following Dagsvik (2002), we assume that

$$U_{jn}(t) = \max \left[ U_{jn}(t-1) - \rho, v_{jn}(t) + \epsilon_{jn}(t) \right]$$

(1)
The coefficient \( \rho \) is a preference discount factor. If \( \rho = 0 \) there is a complete strong taste persistence, and if \( \rho = \infty \) there is no taste persistence at all and \( U_{jn}(t) = v_{jn}(t) + \varepsilon_{jn}(t) \). The inclusion of taste persistence is a behavioural assumption and it implies that individuals' past options (and not only past optimal choices) matter for current choices. This implies that the current choice depends on all the utility functions associated with each alternative in the past, not only the optimal one.

The expected value of \( U_{jn}(t) \) is given by

\[
E[U_{jn}(t)] = \ln \left( \sum_{r=t_0}^{t} \exp(v_{jn}(r) - (t - r)\rho) \right)
\]

or

\[
\exp \left( E[U_{jn}(t)] \right) = \sum_{r=t_0}^{t} \left[ \exp v_{jn}(r) - (t - r)\rho \right]
\]

To calculate correlation across utilities it is convenient to calculate correlation of a monotone transformation of the utilities:

\[
\text{corr} \left\{ \exp[-U_{jn}(s)], \exp[-U_{jn}(t)] \right\} = \frac{\exp \left\{ E[U_{jn}(s)] \right\} - \exp \left\{ E[U_{jn}(t)] \right\} \exp^{-\rho(t-s)}}{\exp \left\{ E[U_{jn}(s)] \right\} \exp \left\{ E[U_{jn}(t)] \right\}} \; \text{for} \; s \leq t
\]

We observe that if covariates are constant over time the correlation from \( t \) to \( t-1 \) is approximately equal to \( e^{-\rho} \).

As shown in Dagsvik (2002) the model can be employed to yield transition probabilities, which here will be estimated on panel data. We will assume that doctor \( n \) will choose the state that maximizes utility, given his or her choice set. Physicians can choose between 10 states, which vary with respect to type of institution (hospitals versus primary care), sector (public versus private) and hours offered by the institutions in the health care sector (part time versus full time). Part time is defined as a number of hours of work less than 30.

We will assume that the choice set is the same for all physicians. The choice set is related to availability of jobs, characterized by offered hours. Thus, in our model the physicians are not free to choose any hours they like to work. Hours are regulated, in part by
the institutions and in part by the unions. To this end, let the probability density of offered hours be given by

\[ g_{jnt}(h_{jnt}) = \exp(d_{j}z_{jnt}); \quad z_{jnt} = 1 \text{ if } h_{jnt} \geq 30; = 0 \text{ otherwise} \]

Note that the \( g(.) \) function captures the rationing of full time jobs and \( d_{j} \) are parameters to be estimated for each sector \( j \) at each time \( t \). They capture the availability of full time hours in the different jobs.\(^6\) In the estimation, the sum of \( d_{j} \) has an upper bound which ensures that that \( 0 \leq d_{j} < 1 \) for all \( j \).

Let \( Q_{jnt} \) denotes the probability that doctor \( n \) moves from state \( i \) in period \( t-1 \) to state \( j \) in period \( t \), and \( Q_{int} \) denotes the probability that doctor \( n \) stays in state \( i \) also in period \( t \).

With the assumed probability distribution for \( \epsilon_{jnt} \), we get (Dagsvik (2002):

\[
Q_{jnt} = \frac{V_{jnt}}{\sum_{r=t_0}^{1} \left\{ \exp(-\tau r) \sum_{k=0}^{9} V_{knt} \right\}}; \quad \forall \ i, j = 0,1,2,...,9
\]

\[
Q_{int} = 1 - \sum_{j=0}^{9} Q_{jnt}; \quad \forall \ i, j = 0,1,2,...,9
\]

where \( V_{jnt} \) is equal to:

\[
V_{jnt} = \psi_{jnt}(w_{jnt}, h_{jnt}, SI_{nt}, I_{nt})g_{jnt}(h_{jnt})
\]

and \( \psi_{jnt} \) is given by:

\[
(7) \quad \psi_{jnt}(w_{jnt}, h_{jnt}, SI_{nt}, I_{nt}) = \psi_{jnt}(f_{t}(w_{jnt}h_{jnt}+SI_{nt})+I_{nt}, L_{jnt})
\]

and \( f_{t} \) is equal to:

\[
f_{t}(w_{jnt}h_{jnt}+SI_{nt}) = w_{jnt}h_{jnt}+SI_{nt} - T_{t}(w_{jnt}h_{jnt}+SI_{nt})
\]

\( L_{jnt} \) is annual leisure. Let \( C_{jnt} \) be disposable annual income. Disposable income is given by

\[ L_{jnt} \text{ is annual leisure. Let } C_{jnt} \text{ be disposable annual income. Disposable income is given by} \]

\(^6\) See Dagsvik and Strøm (2006) for further details about rationing of jobs in labor supply models.
Here $w_{jnt}$ is the hourly wage rate, $h_{jnt}$ denotes annual hours of work, $S_{jnt}$ is the wage income from secondary jobs and $I_{jnt}$ is non-labor income, including the after-tax income of a spouse, child benefits and other benefits. The functional form of $f_t(\cdot)$ depends on the characteristics of the tax function, $T_t(\cdot)$, which is a step-wise linear tax function at time $t$, see tables A1-A3 in Appendix A.

The different job types that the employed doctor can choose between are:

0 = not working
1 = working part time in a hospital in the private sector;
2 = working full time in a hospital in the private sector;
3 = working part time in primary care in the private sector;
4 = working full time in primary care in the private sector;
5 = working part time in a hospital in the public sector;
6 = working full time in a hospital in the public sector;
7 = working part time in primary care in the public sector;
8 = working full time in primary care in the public sector;
9 = working in other sectors.

The states, 1-9, give all possible type of jobs that employed physicians can choose between, and hence should be part of a labor supply model that attempts at studying labor supply among the stock of employed physicians.

For instance, if we assume there are only 3 time periods, $t=0,1,2$, the probability of moving from sector 1 in period 0 to sector 2 in period 1 is equal to

$$Q_{12n1} = \frac{V_{2n1}}{\sum_{r=0}^{1} \left[ \exp \left( -(1-r)\rho \right) \right]^9 V_{knr}} = \frac{V_{2n1}}{\left[ \exp \left( -\rho \right) \right] \sum_{K=0}^{9} V_{k0} + \left[ \exp \left( -2\rho \right) \right] \sum_{K=0}^{9} V_{k1}}$$
This model therefore implies that the probability of moving from one state to another is influenced only by the past and not by the future. The higher $\rho$, the less important is the past; i.e. previous utility functions do not weight much.

2.2 The deterministic part of the utility function

We will assume that the systematic or deterministic part of the utility function is given by:

$$
\log \psi_{jn} = (A + \sum_{s=1}^{5} a_s X_{s_{jn}}) \frac{(C_{jn} 10^{-5})^{\lambda} - 1}{\lambda} + (B + \sum_{s=6}^{8} b_s X_{s_{jn}}) \frac{(L_{jn} - L_{0})^{\gamma} - 1}{\gamma}
$$

Here:

- $X_{1_{jn}}$ = age;
- $X_{2_{jn}}$ = age squared;
- $X_{3_{jn}}$ = 1 if married to a person in the health sector, =0 otherwise;
- $X_{4_{jn}}$ = 1 if more than one job, =0 otherwise;
- $X_{5_{jn}}$ = 1 working in turnus\(^7\), =0 otherwise;
- $X_{6_{jn}}$ = number of children $\leq 6$;
- $X_{7_{jn}}$ = number of children $\{>6, \leq 11\}$;
- $X_{8_{jn}}$ = 1 if female, =0 otherwise.

$$
L_{jn} = \frac{8760 - (12 \times 365) - 48h_{jn}}{8760}
$$

\(^7\) It is mandatory for all physicians to work their final year of studying medicine as an apprentice doctor in a given, often rural, location.
where $h_{jnt}$ is hours per week. We have assumed 12 hours a day for rest and sleep and 48 weeks of work a year. Therefore, leisure in this definition is equal to the total number of hours in a year (8760) minus sleeping time in a year minus hours of work. Leisure includes therefore hours in the week-ends and in vacation time.

$\rho_n$ may depend on the age and age squared of the doctor:

$$\rho_{nt} = \rho_0 + \rho_1 X_{1nt} + \rho_2 X_{2nt}$$

We expect that the older the doctor is, the lower is $\rho_{nt}$. This means that we expect that older physicians have stronger taste persistence than younger physicians and hence they are more reluctant to move when economic incentives changes, than the young.

Notice that the probability that an individual is observed in state $j$ at time $t$, given that state $i$ was left at time $t-1$, denoted $q_{jnt}$, is given by

$$q_{jnt} = \frac{Q_{jnt}}{1-Q_{jnt}} = \frac{V_{jnt}}{\sum_{k \neq j}^{16} V_{knt}}$$

And state probabilities, denoted $P_{jnt}$, are given by

$$P_{jnt} = \frac{\sum_{r=1}^{t} \exp(-t-r\rho_n) V_{jnt}}{\sum_{r=t_0}^{t} \sum_{k=1}^{16} \exp(-(t-r)\rho_n)) \sum_{k=1}^{16} V_{knr}}$$

### 2.3 The wage equations

In order to estimate the model we need estimates of the wage equations. Log wage is assumed to depend on observed covariates (the $Z$-vector to be defined below) and a random term. The random term consist of two parts; one that is distributed across job types, individuals and time and one that is distributed only across individuals. The coefficients related to the latter random
component accounts for correlation in wages across type of jobs at each point in time. The wage equations are the following:

\[
\begin{align*}
\log W_{nt} &= Z_{nt} \beta_n + \eta_{nt} \\
\eta_{nt} &= \tilde{\epsilon}_{nt} + \kappa_n \tau_n \\
\tau_n &\sim L(0,1) \\
\tilde{\epsilon}_{nt} &= \sigma_n \epsilon_{nt}, \text{ where } \epsilon_{nt} &\sim L(0,1)
\end{align*}
\]

L(0,1) is the standard logistic distribution

We then get

\[
\log W_{nt} = Z_{nt} \beta_n + \sigma_n \epsilon_{nt} + \kappa_n \tau_n; \quad i = 1, 2, \ldots, 9
\]

The correlations in wages across jobs are given by:

\[
\begin{align*}
\text{cov}(\eta_{nt}, \eta_{jt}) &= \mathbb{E}[\eta_{nt} \eta_{jt}] = \kappa_n \kappa_j \\
\text{corr}(\eta_{nt}, \eta_{jt}) &= \frac{\kappa_n \kappa_j}{\sqrt{\sigma_n^2 + \kappa_n^2} \sqrt{\sigma_j^2 + \kappa_j^2}}
\end{align*}
\]

The wage equations are estimated separately, but we account for selection in the following way. We estimate a set of coefficients for every year. Hence we are using 3 (1997-1999) cross-section datasets to estimate the coefficients. In the estimation of the wage equation we use a larger data set. Unmarried doctors are included and the justification is that there are no reason to expect wages to differ with respect to marital status. The coefficients vary across the 9 job types and over time. The vector of the explanatory variables is:

\[
Z_{nt} = (1, \text{age}, \text{gender}, \text{centrality index}^8, \text{education})
\]

Let $\phi$ be the density for the normalized (0,1) logistic density distribution. And let

\[8\text{ See table B2 for descriptive statistics of these variables.} \]
\[ L_t = \prod_{j=1}^{9} \frac{1}{\sigma_{jt} w_{jnt}} \varphi \left( \frac{\log w_{jnt} - Z_{nt} \beta_{jt} - \kappa_j t_n - \lambda_{jt} \log P_{jnt}}{\sigma_{jt}} \right) \]

and

\[ \hat{\phi}(.) = \frac{1}{S} \sum_{l=1}^{S} \varphi \left( \frac{\log w_{jnt} - Z_{nt} \beta_{jt} - \kappa_j t_n - \lambda_{jt} \log P_{jnt}}{\sigma_{jt}} \right) \]

and

\[ \log L_t = \sum_{n=1}^{N} \sum_{j=1}^{9} - \log \sigma_{jt} - \log w_{jnt} + \log \hat{\phi}(.) \]

The latter is used to estimate coefficients in the wage equations. Here \( s \) is a random draw for each individual from a standard logistic distribution, number of draws are \( S=20 \). \( P_{jnt} \) is a standard multinomial logit probability (for doctor \( n \), working in job type \( j \) at time \( t \)) used to capture selection effects, see Strøm and Wagenhals (1991) for an outline of selection effects in wage equations with logistic distributed error terms.

\[ P_{jnt} = \frac{v_{jnt}}{\sum_{k=0}^{9} v_{kat}} \quad ; \quad j = 0, 1, 2, \ldots, 9 \]

Here \( y_{nt} = (1, \text{age, education, number of children above and below 6 years of age, dummy for married or cohabiting, dummy for married to a person working in the health sector or not, spouse income}) \).

The estimated probability \( P_{jnt} \) is included in the wage density in equation (18) when the wage equations are estimated.

Note that the coefficients, both in the wage equations and in the probabilities capturing selection effects vary across alternatives and over time. Not working is among the alternatives in the probabilities.

The estimates of the wage equations and the probabilities related to selection effects, as well as summary statistics, are given in Appendix B.

2.4 The estimation procedure
To proceed with the estimation of the utility function we first have to calculate the disposable income function, here called consumption, in each of the 10 states. For all states, irrespective of the fact that we have observed the wage in the job chosen by the agent, we use the wage equation, including all terms, also the error terms. For the working states we have done the following:

\[
\begin{align*}
C_{int} &= f_i(w_{int}h_{jnt} + I_{nst}) + I_{nt}, & i = 1, 2, ..., 9 \\
f_i(w_{int}h_{jnt} + I_{nst}) &= w_{int}h_{jnt} + I_{nst} - T(w_{int}h_{jnt} + I_{nst}) \\
\log W_{int} &= Z_{int}\beta_{it} + \sigma_{it}e_{int} + \kappa_{it}\tau_{it}, & i = 1, 2, ..., 9
\end{align*}
\]

(20)

The consumption that we will use in the estimation of the utility function is:

\[
\bar{C}_{int} = \frac{1}{SR} \sum_{s=1}^{S} \sum_{r=1}^{R} f_i \left[ \exp(Z_{int}\hat{\beta}_{it} + \sigma_{it}e^{\hat{e}_{int}} + \kappa_{it}\tau^{\hat{\tau}_{it}})h_{int} + I_{nst} \right], & i = 1, 2, ..., 9
\]

(21)

Here the coefficients in the wage equations are estimated from the previous step. \(s=1, 2, ..., S\) and \(r=1, 2, ..., R\) are draws from the standard logistic distribution. We have used \(S=R=20\). Instead of integrating the error terms in the wage equations in the disposable income function, we could have integrated them out in the final likelihood function. Due to the complexity of the model we have chosen to do the former.

The utility function is estimated on the following transition probabilities:
The initial year, $t_0$, is 1997, and the years where transitions can take place are 1998 and 1999. We observe that $\exp(z_{ijntd_j})$ is multiplied with the exp of the deterministic part of the utility function. This weightings of the exp of the deterministic part of the utility function extends the traditional conditional logit choice probability and is due to the fact that jobs are rationed, for more details we refer to Dagsvik and Strøm (2006).

Let the remaining coefficient to be estimated be $\pi_t = (A, a, \gamma, \lambda, B, b, \rho_n, d_j)$

Suppressing the observed variables, the transition probabilities can be written

$$Q_{ijt} = Q_{ijnt}(\pi)$$

The likelihood for our sample is:

$$L = \prod_{t=1997}^{1999} \prod_{n=1}^{N_t} \prod_{i=1}^{9} \prod_{j=1}^{9} Q_{ijnt}(\pi)^{Y_{i(t-1),j(t),n}}$$

$Y_{i(t-1),j(t),n} = 1$ if $n$ transit from state $i$ in year $t-1$ to state $j$ in year $t$

otherwise

$Y_{i(t-1),j(t),n} = 0$

The coefficients $\pi = (A, a, \gamma, \lambda, B, b, \rho_n, d_j)$ are estimated by maximizing the likelihood function. Notice that for each individual there are only two probabilities present in the likelihood, namely those related to the transitions chosen.
3. **Data**

The data used in this study are the result of merging register data from Statistics Norway with data on physicians collected by The Norwegian Association of Local and Regional Authorities (from the PAI\(^9\) register). The register data from Statistics Norway consists of demographic, educational, income and labor market data. The income data is taken from tax returns, while the labor market data consist of employee data merged with data on employers.

The resulting panel data set covers all physicians in Norway in the period 1996 – 2000. We consider an individual as a doctor either if the person’s educational attainment is as a doctor or if the person works as a doctor. In this way we include persons who might have several educations or an education abroad (in which cases the registered educational attainment might not be as a doctor). Some individuals become physicians during the period 1996 – 2000. In the year 2000 there were 12,376 physicians in Norway. We excluded the years 1996 and 2000 from our estimation because of problems with the capital income variables in 1996 (our income variables are taken from tax returns and therefore are vulnerable to changes in definitions of taxable income) and with the distribution over sectors in 2000 (the data for the last year seem to be preliminary).

Observations of individuals with missing values for gender or job affiliation were dropped. To simplify our analysis we chose to estimate the model for those who were physicians throughout the period 1997 – 1999 and who did not change civil status during this period. Individuals who were not a doctor in this period were thereby dropped as were those who became married or divorced. Table 1 gives an overview of the relationship between our original data set and the data set for which we have estimated our model: 6,564 married physicians.

TABLE 1 APPROXIMATELY HERE

\(^9\) The PAI register consists of data on workers in public enterprises, including physicians and nurses working in hospitals and health care.
We coded the data so that we ended up with 10 different sectors of work (including not working) divided according to whether a doctor worked in a hospital or in general health care, whether in a public or private institution and whether it was part-time and full time\textsuperscript{10}. Our data only included hours worked per year, so weekly hours are calculated by dividing hours worked in a year by 48 (weeks in a year minus vacation). For physicians not working in a hospital or health care, we do not differentiate between part-time and full-time work. Doctors choose between the different sectors under the assumption that in each sector they will receive a wage generated by the wage equations and work the average observed hours in the sector. Table 2 shows the number of hours worked in the different sectors. Working hours are longer in the private sector compared to in the public sector.

\begin{table}[h]
\begin{center}
\caption{Approximately Here}
\end{center}
\end{table}

Table 3 gives the distribution of married physicians by gender and across sectors. Women constitute around 27 per cent of doctors. Most doctors work in public hospital followed by the sector called other, and then followed by public health care.

\begin{table}[h]
\begin{center}
\caption{Approximately Here}
\end{center}
\end{table}

Table 4 provides the age distribution of married doctors in the three years considered in the analysis.

Our model is based on the assumption that we can simulate the different levels of consumption and leisure which could be achieved by each individual in each sector if they chose to work there. Our calculations are based on estimated wage equations done independently for the three years 1997, 1998 and 1999. These estimates are commented on in Appendix B. The resulting levels of possible consumption and leisure are reported in Table 5. For the states which are observed chosen by an individual we use observed leisure, while for

\textsuperscript{10} The part-time category includes physicians who work less than 30 hours a week.
other potential, but not chosen states, we use average leisure among those observed in the state.

TABLE 5 APPROXIMATELY HERE

Consumption is determined by wage income, capital income, transfer income and the income of the spouse. All income variables were deflated by the consumer price index. Leisure is expressed as a percentage of available time. Available time includes time over the week-ends and vacation time but excludes 12 hours per day of sleeping and personal care time. Table 5 shows that leisure is slightly increasing over time except for physicians working in private and public health care full time.

Table 6 shows the mean of the variable, $z_{jnt}$, (i.e the dummy for observed full time) indicating whether a doctor is observed working full time in a sector or not. The percentage of physicians working full time in the “other” sector has been falling, while it has been increasing in the “private hospital” and “private health care” sectors.

TABLE 6 APPROXIMATELY HERE

Summary statistics for the remaining explanatory variables are given in Table 7. We use dummy variables for whether the spouse works in the health sector, whether the doctor has a side job in addition to the main job and whether the doctor is working “turnus”\textsuperscript{11}.

TABLE 7 APPROXIMATELY HERE

4. Estimates.

In table 8 we give the estimates of the utility function and of the density function for offered hours in full time jobs.

TABLE 8 APPROXIMATELY HERE

\textsuperscript{11} All physicians have to work their final university year as an apprentice doctor in a given, often rural, location. This year is called turnus.
The estimates of $\lambda$ and $\gamma$ imply that the deterministic part of the utility function is strictly concave.

Marginal utility of consumption is estimated to increase with age until till the age of 44\textsuperscript{12}. Thus younger physicians are estimated to be more willing work more than the older ones. With a spouse working in the health sector the incentives to go for higher working loads is strengthen. For physicians who are doing their internship (“turnus”) the impact is the opposite.

Marginal utility of leisure is estimated to increase with the number of older children, which imply lesser incentives to go for high working loads. Young children has no impact and may be due to the fact that day care centers are available at the working place and/or that flexible working hours makes it easier to combine work and having small children. Gender has no impact on the marginal utility of leisure. This result could be related to the fact that our sample contains only highly educated individuals and also to the relatively egalitarian division of unpaid labor within the household in the Norwegian society.

The estimate of the discounting of utilities (the $\rho$-function) implies that it decreases with age up to the age of 53\textsuperscript{13}. The decline with age means that the younger the doctor is the more he or she can be willing to move between jobs. After the age of 53, the estimated discounting indicate that physicians above this age again become more mobile ($\rho$ becomes higher again), which may be due to the fact that older physicians leave the more strenuous full time job in hospitals and move to lower working loads or to jobs outside hospitals. The estimates of the density of offered hours imply that full time jobs are more available in public hospitals and public primary care relative to in the private sector. However, it should be kept in mind that a full time job in the private sector has more hours than in the public sector (see Table 2).

\textsuperscript{12} Our calculation based on the estimated coefficients.
\textsuperscript{13} Our calculation based on the estimated coefficients; remember that $\rho$ is a preference discount factor. If $\rho = 0$ there is a complete strong taste persistence, and if $\rho = \infty$ there is no taste persistence at all. The inclusion of taste persistence is a behavioural assumption and it implies that individuals’ past options (and not only past optimal choices) matter for current choices. This implies that the current choice depends on all the utility functions associated with each alternative in the past, not only the optimal one.
5. Labor supply elasticities and the impact of less progressive taxes on labor supply.

Given the estimates of the model we can calculate uncompensated labor supply elasticities in two ways. We can either calculate the elasticity for each individual in the sample using the deterministic part of the utility function. Or we can use the whole model to calculate elasticities, with random preferences, densities of offered hours, random parts in wage equations, correlation of wages across job types and the step-wise linear tax function according to tax rules. The latter elasticities, denoted aggregate elasticities, means that we have to account for the possibility that physicians working in some state increases at the expense of a reduction in other states. Thus, we should expect that these aggregate elasticities are lower than the individual, job-specific labor supply elasticities. We would also argue that it is these aggregate elasticities that are of interest for the health authorities. The reason is that they account for the impact of wage increases, or tax rate changes, on the total hours supplied by all employed physicians in the population.

If we use only the deterministic part of the utility function, we find that the individual job-specific labor supply elasticities for physicians working in public and private hospitals, calculated at mean values, in 1999, are around 0.5. These individual job specific elasticities are comparable with the ones reported in Baltagi et al (2005), although ours are somewhat higher (0.5) than theirs (0.3).

To find the aggregate labor supply elasticities we have calculated the impact of an overall increase in wages in 1997, 1998 and 1999 on total labor supply for employed physicians. Wages are increased in all 10 states. In calculating these elasticities, we have employed the whole model including the random terms in the utility function and the wage equations.

An important aspect of our model is that an overall wage increase, or job-specific wage increase, may move the physicians between the different job types. Given that he or she works in a hospital, an increase in labor supply may imply a move from part-time jobs to full time jobs. Or he or she can move to jobs with higher working loads outside hospitals. The reason why we do not let physicians work a little more, given the job, when economic incentives are improved, is due to the working loads offered by the management in hospital and primary
care. There are thus institutional constraints on hours worked that we have to consider when calculating the responses to economic incentives.

Table 9 reports the impact of changes in wages and taxes on the mobility of physicians. In column 1, we report how the mobility of physicians between states in 1999 is affected by a 1 per cent increase in wages in 1997, 1998 and 1999. These numbers can be interpreted as aggregate labor supply elasticities.

TABLE 9 APPROXIMATELY HERE

We find that an overall wage increase move physicians’ labor supply away from the public sector to the private sector, in particular to private hospitals working full time. The weighted overall aggregate labor supply elasticity, with total hours in the ten states as weights\(^{14}\), is rather modest, 0.04. The overall wage increase also reduces the probability of not working. The elasticity of not working with respect to an overall wage increase is about -0.3.

The overall weighted elasticity of only 0.04 shadows for higher elasticity in specific jobs. A one per cent wage increase in the period 1997-1999 increases the number of physicians in full time jobs in private hospitals by 0.26 percent (table 9 col.1). This elasticity is not directly comparable with the job-specific elasticity reported above (around 0.5). There are two reasons for this. In the first place, the 0.26 elasticity is derived from a model where the random parts of the utility functions and wage equations are accounted for when the elasticity is calculated. These random parts of the utility function capture other attributes than the pure economic incentives related to working in different types of jobs in the health sector. If these random parts of preferences are ignored, after the model is estimated, one puts too much weight on economic incentives in explaining behaviour. Second, it is embedded in a framework where the physicians are allowed to move between different types of jobs. An overall wage increase may move the physicians that work the shortest hours (part time) towards job types with higher working loads (full time). If one fails to take into account that a wage increase shifts physicians around, one risk to overestimate the labor supply elasticities among physicians.

\(^{14}\) See section 2.1, and in particular equation (5).
If only wages in the public and private hospitals are increased, the move towards jobs, in particular to private hospitals is increased at the expense of working in jobs outside hospitals and working in primary care (col. 4 in table 9). The number of physicians working full time and part time in the private sector increases by respectively 0.41 percent and 0.22 percent. The equivalent increases in the public hospitals are more modest, 0.06 and 0.15, respectively. Because there are far more physicians working in the public sector the weighted average elasticities over the four possible states in private and public hospitals (full time and part time) in 1999 is 0.08, while the weighted aggregate elasticity for the whole stock of physicians is 0.03, which is due to the fact that physicians move from jobs outside hospitals to jobs in hospitals. The job type that has the strongest reduction is part time jobs in private primary care, -0.18 percent. The wage increase also increases the number of employed physicians (not working goes down by -0.16 percent).

We have also calculated the impact on the transition between states of replacing the current progressive tax structure in the relevant years (1997, 1998 and 1999) by a flat tax of 0.28 (see table 9 col. 2), which is a considerable change in marginal tax rates\textsuperscript{15}. This tax change move physicians away from part time jobs towards full time jobs in both public and private sector, but the transition to private hospitals is by far the strongest. The number of physicians working in private hospitals increases by as much as 11.43 percent, mostly at the expense of physicians working part time jobs in hospitals and primary care. The impact on total hours in the population of medical doctors is rather modest; an increase of only 0.76 percent.

In 2006 the Norwegian tax structure was reformed with a rather strong cut in top marginal taxes\textsuperscript{16}. When the tax function in 1999 is replaced by the tax function for 2006, we find results similar to the ones we found with a flat tax of 28\% (see table 9 col. 3). The responses, however, are weaker. Medical doctors get an incentive to move to private hospital (an increase of 4.74\% in full time jobs). The overall impact on supplied hours among employed physicians is only 0.43\%.

\textsuperscript{16} The highest marginal rate in 2006 is equal to 44.8\%, while in 1999 it is equal to 49.3\%. Note that to be taxed at the highest tax rate in 2006 (44.8 \%) the income in real terms has to be considerably higher than the income taxed on the margin by 49.8 \% in 1999. The reform in 2006 thus implied a considerable swing away from progressive taxation. See tables A.3 and A.4 in appendix A.
In table 10 we report how consumption changes according to the different simulations reported above. From table 10 column 1, we observe that a one per cent wage increase implies a change in consumption ranging from 0.3 to 0.5 per cent in 1999. The highest change in consumption occurs for individuals working full time in private hospitals (0.51 percent). The introduction of a 28% flat tax (table 10 col. 2) raises consumption for physicians working full time. The reason for reduction in consumption for doctors working part time is that their average tax in the observed tax regimes is less than 28%.

TABLE 10 APPROXIMATELY HERE

From Table 10 column 3, we observe that the less progressive tax structure of 2006 increases disposable income among medical doctors by 6-8%. Physicians working full time in private hospitals get the highest increase.

6. Conclusion

We have estimated a structural labor supply model that allows for choices between types of jobs. At each point in time, physicians can choose between 10 different states which are a combination of working full time or part time, working in hospitals or primary care, working in the public or private sector and not working. In our model, the current choice depends on all the utility functions associated with each alternative in the past, not only the optimal ones. Thus, we allow for the random parts of the utility functions to be correlated across time and types of jobs (taste persistence). This behavioural assumption implies that individuals' past options (and not only past optimal choices) matter for current choices. The model is estimated on a panel of 6,564 married Norwegian physicians from 1997 to 1999.

Our study implies that overall wage increases and tax reductions give the medical doctors an incentive to move to full time jobs, in particular in the private sector, at the expense of working in other jobs in the health care sector of the economy. Because we allow other attributes than pure economic incentives to matter in explaining behaviour, captured by random parts in the preference structure, and because availability of jobs and restrictions on hours work vary across jobs, the overall impact on labor supply among Norwegian medical doctors of changes in economic incentives is rather modest.
Bibliography


Table 1. Sample selection

<table>
<thead>
<tr>
<th>Description</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norwegians who were physicians in 2000, original data set</td>
<td>12,376</td>
</tr>
<tr>
<td>Dropped due to missing sector or missing gender</td>
<td>688</td>
</tr>
<tr>
<td>Dropped if not a doctor in 1997, 1998 or 1999</td>
<td>2,172</td>
</tr>
<tr>
<td>Dropped if a change of civil status occurred 1997 - 1999</td>
<td>1,175</td>
</tr>
<tr>
<td>Dropped if occupation not relevant</td>
<td>18</td>
</tr>
<tr>
<td><strong>Total retained</strong></td>
<td>8,323</td>
</tr>
</tbody>
</table>

Married and a doctor throughout 1997 - 1999: 6,564
Unmarried and a doctor throughout 1997 - 1999: 1,759

Sum 8,323

Table 2. Average weekly hours across sectors.

<table>
<thead>
<tr>
<th>Sector</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Public hospital, part-time</td>
<td>20.0</td>
<td>19.1</td>
<td>18.7</td>
</tr>
<tr>
<td>2. &quot; &quot; full time</td>
<td>40.0</td>
<td>39.9</td>
<td>39.3</td>
</tr>
<tr>
<td>3. Private hospital, part-time</td>
<td>19.1</td>
<td>20.2</td>
<td>18.5</td>
</tr>
<tr>
<td>4. &quot; &quot; full time</td>
<td>42.2</td>
<td>41.9</td>
<td>42.1</td>
</tr>
<tr>
<td>5. Public health care, part-time</td>
<td>16.7</td>
<td>15.7</td>
<td>15.6</td>
</tr>
<tr>
<td>6. &quot; &quot; full time</td>
<td>40.5</td>
<td>40.6</td>
<td>40.6</td>
</tr>
<tr>
<td>7. Private health care, part-time</td>
<td>14.6</td>
<td>13.2</td>
<td>13.9</td>
</tr>
<tr>
<td>8. &quot; &quot; full time</td>
<td>42.3</td>
<td>42.6</td>
<td>42.8</td>
</tr>
<tr>
<td>9. other</td>
<td>29.3</td>
<td>26.7</td>
<td>26.2</td>
</tr>
</tbody>
</table>
Table 3. Distribution of married physicians by gender and across sectors.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians married throughout 1997 - 1999</td>
<td>4,765</td>
<td>1,799</td>
<td>4,765</td>
<td>1,799</td>
<td>4,765</td>
<td>1,799</td>
</tr>
<tr>
<td>Per cent working in sector:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0. Not working</td>
<td>4.6%</td>
<td>6.5%</td>
<td>5.3%</td>
<td>6.9%</td>
<td>5.9%</td>
<td>6.3%</td>
</tr>
<tr>
<td>1. Public hospital, part-time</td>
<td>11.5%</td>
<td>17.1%</td>
<td>10.1%</td>
<td>17.2%</td>
<td>11.6%</td>
<td>17.2%</td>
</tr>
<tr>
<td>2. “ “ full time</td>
<td>44.2%</td>
<td>35.7%</td>
<td>45.6%</td>
<td>36.4%</td>
<td>44.7%</td>
<td>36.6%</td>
</tr>
<tr>
<td>3. Private hospital, part-time</td>
<td>0.4%</td>
<td>1.0%</td>
<td>0.5%</td>
<td>0.6%</td>
<td>0.5%</td>
<td>0.8%</td>
</tr>
<tr>
<td>4. “ “ full time</td>
<td>1.2%</td>
<td>1.2%</td>
<td>1.4%</td>
<td>1.2%</td>
<td>1.4%</td>
<td>1.4%</td>
</tr>
<tr>
<td>5. Public health care, part-time</td>
<td>11.3%</td>
<td>13.7%</td>
<td>11.6%</td>
<td>15.5%</td>
<td>12.9%</td>
<td>16.6%</td>
</tr>
<tr>
<td>6. “ “ full time</td>
<td>6.0%</td>
<td>6.4%</td>
<td>5.4%</td>
<td>5.6%</td>
<td>4.6%</td>
<td>5.4%</td>
</tr>
<tr>
<td>7. Private health care, part-time</td>
<td>2.0%</td>
<td>1.3%</td>
<td>2.2%</td>
<td>1.6%</td>
<td>2.2%</td>
<td>1.6%</td>
</tr>
<tr>
<td>8. “ “ “ full time</td>
<td>1.6%</td>
<td>1.2%</td>
<td>1.9%</td>
<td>1.1%</td>
<td>2.2%</td>
<td>0.9%</td>
</tr>
<tr>
<td>9. Other</td>
<td>17.2%</td>
<td>16.0%</td>
<td>16.0%</td>
<td>14.1%</td>
<td>14.1%</td>
<td>13.1%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

Table 4. Age distribution of married physicians

<table>
<thead>
<tr>
<th>Married</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>221</td>
<td>120</td>
<td>48</td>
</tr>
<tr>
<td>20-24</td>
<td>698</td>
<td>620</td>
<td>547</td>
</tr>
<tr>
<td>25-29</td>
<td>1,084</td>
<td>1,023</td>
<td>953</td>
</tr>
<tr>
<td>30-34</td>
<td>1,340</td>
<td>1,287</td>
<td>1,248</td>
</tr>
<tr>
<td>35-39</td>
<td>1,169</td>
<td>1,257</td>
<td>1,280</td>
</tr>
<tr>
<td>40-44</td>
<td>973</td>
<td>1,021</td>
<td>1,041</td>
</tr>
<tr>
<td>45-49</td>
<td>568</td>
<td>627</td>
<td>732</td>
</tr>
<tr>
<td>50-54</td>
<td>378</td>
<td>403</td>
<td>449</td>
</tr>
<tr>
<td>55-59</td>
<td>133</td>
<td>206</td>
<td>266</td>
</tr>
<tr>
<td><strong>Sum</strong></td>
<td>6,564</td>
<td>6,564</td>
<td>6,564</td>
</tr>
</tbody>
</table>
Table 5. Mean consumption and leisure for married physicians by sector. Norwegian kroner and per cent.

<table>
<thead>
<tr>
<th></th>
<th>Mean consumption (NOK)</th>
<th></th>
<th>Mean leisure (as % of available time)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0. Not working</td>
<td>234,008 208,758 230,922</td>
<td>100.0% 100.0% 100.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Public hospital, part-time</td>
<td>376,104 347,365 366,002</td>
<td>78.1% 79.1% 79.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. “ “ full time</td>
<td>457,517 444,162 467,571</td>
<td>56.2% 56.2% 56.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Private hospital, part-time</td>
<td>375,572 370,105 370,429</td>
<td>79.1% 77.9% 79.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. “ “ full time</td>
<td>514,895 497,835 556,823</td>
<td>53.7% 54.1% 53.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Public health care, part-time</td>
<td>334,460 308,563 332,590</td>
<td>81.7% 82.9% 82.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. “ “ “ full time</td>
<td>448,288 439,211 467,161</td>
<td>55.6% 55.5% 55.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Private health care, part-time</td>
<td>325,550 304,015 330,991</td>
<td>84.0% 85.6% 84.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. “ “ “ full time</td>
<td>446,135 446,595 497,167</td>
<td>53.7% 53.3% 53.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Other</td>
<td>399,800 368,367 394,853</td>
<td>68.0% 70.7% 71.3%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 6. Mean of dummy for observed full time, $z_{jnt}$, by sector.

<table>
<thead>
<tr>
<th></th>
<th>Married</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1997</td>
<td>1998</td>
<td>1999</td>
</tr>
<tr>
<td>1. Public hospital, full time</td>
<td>0.419</td>
<td>0.431</td>
<td>0.424</td>
</tr>
<tr>
<td>3. Private hospital, full time</td>
<td>0.012</td>
<td>0.013</td>
<td>0.014</td>
</tr>
<tr>
<td>5. Public health care, full time</td>
<td>0.061</td>
<td>0.054</td>
<td>0.048</td>
</tr>
<tr>
<td>7. Private health care, full time</td>
<td>0.015</td>
<td>0.017</td>
<td>0.018</td>
</tr>
<tr>
<td>9. Other</td>
<td>0.094</td>
<td>0.073</td>
<td>0.063</td>
</tr>
<tr>
<td>Full time in total</td>
<td>0.601</td>
<td>0.588</td>
<td>0.569</td>
</tr>
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</table>

Table 7. Mean of the explanatory variables.

<table>
<thead>
<tr>
<th></th>
<th>Married</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1997</td>
<td>1998</td>
<td>1999</td>
</tr>
<tr>
<td>Female</td>
<td>0.27</td>
<td>0.27</td>
<td>0.27</td>
</tr>
<tr>
<td>Age</td>
<td>45</td>
<td>46</td>
<td>47</td>
</tr>
<tr>
<td>Age squared</td>
<td>2108</td>
<td>2199</td>
<td>2292</td>
</tr>
<tr>
<td>No. children younger than 7 years</td>
<td>0.68</td>
<td>0.58</td>
<td>0.49</td>
</tr>
<tr>
<td>No. children 7 to 18 years of age</td>
<td>1.01</td>
<td>1.03</td>
<td>1.04</td>
</tr>
<tr>
<td>Spouse working in health sector</td>
<td>0.43</td>
<td>0.43</td>
<td>0.43</td>
</tr>
<tr>
<td>Has a side job</td>
<td>0.10</td>
<td>0.09</td>
<td>0.08</td>
</tr>
<tr>
<td>Works &quot;turnus&quot; (internship)</td>
<td>0.03</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>Number observations</td>
<td>6564</td>
<td>6564</td>
<td>6564</td>
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### Table 8. Estimates of the utility function and offered hours density.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Estimates</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Consumption</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>A</td>
<td>-2.28</td>
<td>0.8230</td>
</tr>
<tr>
<td>Age</td>
<td>$a_1$</td>
<td>0.14</td>
<td>0.0355</td>
</tr>
<tr>
<td>Age squared</td>
<td>$a_2$</td>
<td>-0.0016</td>
<td>0.000367</td>
</tr>
<tr>
<td>Married to a person in the health sector</td>
<td>$a_3$</td>
<td>0.15</td>
<td>0.0541</td>
</tr>
<tr>
<td>More than one job</td>
<td>$a_4$</td>
<td>0.22</td>
<td>0.0526</td>
</tr>
<tr>
<td>Working during last year of university</td>
<td>$a_5$</td>
<td>-0.71</td>
<td>0.1933</td>
</tr>
<tr>
<td>Exponent</td>
<td>$\lambda$</td>
<td>0.31</td>
<td>0.0651</td>
</tr>
<tr>
<td><strong>Leisure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>B</td>
<td>5.07</td>
<td>0.3906</td>
</tr>
<tr>
<td>Number of children ≤6</td>
<td>$b_1$</td>
<td>0.09</td>
<td>0.0960</td>
</tr>
<tr>
<td>Number of children {&gt;6,≤18}</td>
<td>$b_2$</td>
<td>0.24</td>
<td>0.0729</td>
</tr>
<tr>
<td>Female</td>
<td>$b_3$</td>
<td>0.10</td>
<td>0.1626</td>
</tr>
<tr>
<td>Exponent</td>
<td>$\gamma$</td>
<td>0.42</td>
<td>0.1799</td>
</tr>
<tr>
<td><strong>Taste correlation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>$\rho_0$</td>
<td>13.76</td>
<td>1.4822</td>
</tr>
<tr>
<td>Age</td>
<td>$\rho_1$</td>
<td>-0.49</td>
<td>0.0593</td>
</tr>
<tr>
<td>Age squared</td>
<td>$\rho_3$</td>
<td>0.0046</td>
<td>0.0006</td>
</tr>
<tr>
<td><strong>Density, offered hours, full time</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public hospitals</td>
<td>$d_2$</td>
<td>0.25</td>
<td>0.0024</td>
</tr>
<tr>
<td>Private hospitals</td>
<td>$d_4$</td>
<td>0.13</td>
<td>0.0078</td>
</tr>
<tr>
<td>Public prim.care</td>
<td>$d_6$</td>
<td>0.21</td>
<td>0.0038</td>
</tr>
<tr>
<td>Private prim.care</td>
<td>$d_8$</td>
<td>0.17</td>
<td>0.0060</td>
</tr>
<tr>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Log likelihood</td>
<td></td>
<td>-10993</td>
<td></td>
</tr>
<tr>
<td>McFaddens rho</td>
<td></td>
<td>0.27</td>
<td></td>
</tr>
</tbody>
</table>

*** statistically significant parameter at 1% confidence level
Table 9. The impact of changes in wages and taxes on the mobility of physicians in 1997-1999. 6564 married physicians. Percentage change in number of physicians and hours.

<table>
<thead>
<tr>
<th>Job types</th>
<th>(1) 1% wage increase in 1997, 1998 and 1999</th>
<th>(2) 28% flat tax in 1997, 1998 and 1999</th>
<th>(3) 2006 tax schedule used in 1999</th>
<th>(4) 1% wage increase hospital doctors in 1997, 1998 and 1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number physicians</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0. Not working</td>
<td>-0.30</td>
<td>-1.53</td>
<td>-4.19</td>
<td>-0.16</td>
</tr>
<tr>
<td>1. Public hospitals, part time</td>
<td>0.02</td>
<td>-1.73</td>
<td>0.16</td>
<td>0.15</td>
</tr>
<tr>
<td>2. Public hospitals, full time</td>
<td>0.03</td>
<td>0.79</td>
<td>0.09</td>
<td>0.06</td>
</tr>
<tr>
<td>3. Private hospitals, part time</td>
<td>0.04</td>
<td>-2.84</td>
<td>2.37</td>
<td>0.22</td>
</tr>
<tr>
<td>4. Private hospitals, full time</td>
<td>0.26</td>
<td>11.43</td>
<td>4.74</td>
<td>0.41</td>
</tr>
<tr>
<td>5. Public primary care, part time</td>
<td>-0.03</td>
<td>-2.17</td>
<td>-0.54</td>
<td>-0.13</td>
</tr>
<tr>
<td>6. Public primary care, full time</td>
<td>0.06</td>
<td>1.98</td>
<td>0.91</td>
<td>-0.08</td>
</tr>
<tr>
<td>7. Private primary care, part time</td>
<td>-0.03</td>
<td>-3.49</td>
<td>1.6</td>
<td>-0.18</td>
</tr>
<tr>
<td>8. Private primary care, full time</td>
<td>0.14</td>
<td>5.05</td>
<td>2.73</td>
<td>-0.13</td>
</tr>
<tr>
<td>9. Other</td>
<td>0.04</td>
<td>-0.54</td>
<td>-0.33</td>
<td>-0.08</td>
</tr>
<tr>
<td>Weighted average of total hours</td>
<td>0.04</td>
<td>0.76</td>
<td>0.43</td>
<td>0.03</td>
</tr>
</tbody>
</table>
Table 10. Per cent change in consumption when wages increase by 1 % or a 28 % flat tax is introduced and when 1999 tax schedule is replaced by 2006 tax schedule. 6564 married physicians.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0. Not working</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>1. Public hospitals, part time</td>
<td>0.35</td>
<td>0.39</td>
<td>0.37</td>
<td>0.41</td>
<td>-0.22</td>
<td>-0.88</td>
<td>6.27</td>
</tr>
<tr>
<td>2. Public hospitals, full time</td>
<td>0.40</td>
<td>0.44</td>
<td>0.42</td>
<td>6.28</td>
<td>5.02</td>
<td>7.25</td>
<td></td>
</tr>
<tr>
<td>3. Private hospitals, part time</td>
<td>0.35</td>
<td>0.41</td>
<td>0.38</td>
<td>0.67</td>
<td>1.20</td>
<td>-0.72</td>
<td>6.23</td>
</tr>
<tr>
<td>4. Private hospitals, full time</td>
<td>0.46</td>
<td>0.50</td>
<td>0.51</td>
<td>10.45</td>
<td>5.00</td>
<td>7.25</td>
<td></td>
</tr>
<tr>
<td>5. Public primary care, part time</td>
<td>0.30</td>
<td>0.34</td>
<td>0.33</td>
<td>-1.04</td>
<td>-1.45</td>
<td>-1.73</td>
<td>6.46</td>
</tr>
<tr>
<td>6. Public primary care, full time</td>
<td>0.39</td>
<td>0.43</td>
<td>0.42</td>
<td>5.52</td>
<td>6.14</td>
<td>7.23</td>
<td>7.71</td>
</tr>
<tr>
<td>7. Private primary care, part time</td>
<td>0.28</td>
<td>0.33</td>
<td>0.33</td>
<td>-1.24</td>
<td>-1.55</td>
<td>-1.76</td>
<td>6.47</td>
</tr>
<tr>
<td>8. Private primary care, full time</td>
<td>0.39</td>
<td>0.44</td>
<td>0.45</td>
<td>5.35</td>
<td>6.70</td>
<td>7.23</td>
<td>7.71</td>
</tr>
<tr>
<td>9. Other</td>
<td>0.36</td>
<td>0.42</td>
<td>0.41</td>
<td>1.53</td>
<td>0.64</td>
<td>0.20</td>
<td>5.94</td>
</tr>
</tbody>
</table>
Appendix A. Tax functions.

In this appendix, we only show tax functions for married when the spouse has an income. The tax function for married with a spouse without income is slightly different. In the empirical application we utilize all the appropriate tax functions.

Table A.1 Tax function, 1997.

<table>
<thead>
<tr>
<th>Nominal income (NOK) Y</th>
<th>Tax T (NOK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-18 198</td>
<td>0</td>
</tr>
<tr>
<td>18 198 - 24 709</td>
<td>0.25Y-4 250</td>
</tr>
<tr>
<td>24 709 – 30 125</td>
<td>0.078Y</td>
</tr>
<tr>
<td>30 125 – 156 500</td>
<td>0.302Y- 6 748</td>
</tr>
<tr>
<td>156 500 – 233 000</td>
<td>0.358Y - 15 512</td>
</tr>
<tr>
<td>233 000-262 500</td>
<td>0.453Y – 37 647</td>
</tr>
<tr>
<td>262 500-</td>
<td>0.495Y – 48 672</td>
</tr>
</tbody>
</table>

Table A.2 Tax function, 1998.

<table>
<thead>
<tr>
<th>Nominal income (NOK) Y</th>
<th>Tax T (NOK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-18 198</td>
<td>0</td>
</tr>
<tr>
<td>18 198 - 24 709</td>
<td>0.25Y-4 250</td>
</tr>
<tr>
<td>24 709 – 31 250</td>
<td>0.078Y</td>
</tr>
<tr>
<td>31 250 – 163 000</td>
<td>0.302Y - 7 000</td>
</tr>
<tr>
<td>163 000 – 248 000</td>
<td>0.358Y - 16 128</td>
</tr>
<tr>
<td>248 000-272 000</td>
<td>0.453Y – 39 688</td>
</tr>
<tr>
<td>272 000-</td>
<td>0.495Y – 51 112</td>
</tr>
</tbody>
</table>

Table A.3 Tax function, 1999.

<table>
<thead>
<tr>
<th>Nominal income (NOK) Y</th>
<th>Tax T (NOK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-21 800</td>
<td>0</td>
</tr>
<tr>
<td>21 800 - 31 105</td>
<td>0.25Y-5 350</td>
</tr>
<tr>
<td>31 105 – 33 291</td>
<td>0.078Y</td>
</tr>
<tr>
<td>33 291 – 166 190</td>
<td>0.2992Y- 7 364</td>
</tr>
<tr>
<td>166 190– 269 100</td>
<td>0.358Y- 17 136</td>
</tr>
<tr>
<td>269 100-</td>
<td>0.493Y – 53 465</td>
</tr>
</tbody>
</table>
Table A.4 Tax function, 2006.

<table>
<thead>
<tr>
<th>Nominal income (NOK) Y</th>
<th>Tax T (NOK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-29 600</td>
<td>0</td>
</tr>
<tr>
<td>29 600 - 43 023</td>
<td>0.25Y - 7 400</td>
</tr>
<tr>
<td>43 023– 67 200</td>
<td>0.078Y</td>
</tr>
<tr>
<td>67 200 – 93 529</td>
<td>0.358Y - 18 816</td>
</tr>
<tr>
<td>93 529– 179 706</td>
<td>0.262Y - 9 912</td>
</tr>
<tr>
<td>179 706– 394 000</td>
<td>0.358Y – 27 020</td>
</tr>
<tr>
<td>394 000 – 750 000</td>
<td>0.448Y–62 480</td>
</tr>
<tr>
<td>750 000-</td>
<td>0.478Y - 84 980</td>
</tr>
</tbody>
</table>
Appendix B. Wage equations and selection effects.

As mentioned earlier, estimation of our model requires data for consumption in all possible states (nine working states). To be able to compute such counterfactual incomes we estimated wage equations for all individuals for the three years 1997, 1998 and 1999. It is usual in such estimations to take into account sample selection problems (the Heckman procedure is the most common procedure). We take sample selection into account by including the predicted choice probabilities, \( \Pr_1 - \Pr_9 \), as explanatory variables in the wage equations. These probabilities were the predictions resulting from a simple multinomial logit estimation of sector choice. We show the mean of the explanatory variables used for estimating the logit and the wage equations in Tables B.1 and B.2. The estimates are given in Table B.3 and the resulting average predicted probabilities are given in Tables B.4.

Table B.1. Mean of the explanatory variables for the logit estimation.

<table>
<thead>
<tr>
<th></th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>0.32</td>
<td>0.32</td>
<td>0.33</td>
</tr>
<tr>
<td>Birthyear</td>
<td>1943</td>
<td>1943</td>
<td>1944</td>
</tr>
<tr>
<td>Married</td>
<td>0.76</td>
<td>0.71</td>
<td>0.69</td>
</tr>
<tr>
<td>No. children younger than 7 years</td>
<td>0.64</td>
<td>0.56</td>
<td>0.48</td>
</tr>
<tr>
<td>No. children 7 to 18 years of age</td>
<td>0.80</td>
<td>0.78</td>
<td>0.76</td>
</tr>
<tr>
<td>Less than 20 years of education</td>
<td>0.73</td>
<td>0.73</td>
<td>0.71</td>
</tr>
<tr>
<td>20 or more years of education</td>
<td>0.08</td>
<td>0.08</td>
<td>0.09</td>
</tr>
<tr>
<td>Missing education</td>
<td>0.09</td>
<td>0.09</td>
<td>0.10</td>
</tr>
<tr>
<td>Spouse working in health sector</td>
<td>0.33</td>
<td>0.32</td>
<td>0.32</td>
</tr>
<tr>
<td>Income of spouse, NOK</td>
<td>151,423</td>
<td>83,766</td>
<td>86,592</td>
</tr>
</tbody>
</table>

Number observations 9,516 10,206 11,114
Table B.2. Mean of the explanatory variables for the wage equations.

<table>
<thead>
<tr>
<th></th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>0.31</td>
<td>0.32</td>
<td>0.33</td>
</tr>
<tr>
<td>Birthyear</td>
<td>1943</td>
<td>1943</td>
<td>1943</td>
</tr>
<tr>
<td>Less than 20 years of education</td>
<td>0.74</td>
<td>0.73</td>
<td>0.71</td>
</tr>
<tr>
<td>20 or more years of education</td>
<td>0.08</td>
<td>0.09</td>
<td>0.10</td>
</tr>
<tr>
<td>Missing education</td>
<td>0.08</td>
<td>0.08</td>
<td>0.09</td>
</tr>
<tr>
<td>Least central municipalities (kommuner)</td>
<td>0.09</td>
<td>0.08</td>
<td>0.08</td>
</tr>
<tr>
<td>Less central and central municipalities</td>
<td>0.32</td>
<td>0.32</td>
<td>0.32</td>
</tr>
<tr>
<td>Especially central municipalities</td>
<td>0.59</td>
<td>0.60</td>
<td>0.60</td>
</tr>
<tr>
<td>Probability of working at job type 1</td>
<td>0.14</td>
<td>0.14</td>
<td>0.16</td>
</tr>
<tr>
<td>Probability of working at job type 2</td>
<td>0.39</td>
<td>0.40</td>
<td>0.38</td>
</tr>
<tr>
<td>Probability of working at job type 3</td>
<td>0.002</td>
<td>0.004</td>
<td>0.006</td>
</tr>
<tr>
<td>Probability of working at job type 4</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Probability of working at job type 5</td>
<td>0.09</td>
<td>0.11</td>
<td>0.12</td>
</tr>
<tr>
<td>Probability of working at job type 6</td>
<td>0.05</td>
<td>0.05</td>
<td>0.04</td>
</tr>
<tr>
<td>Probability of working at job type 7</td>
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<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Probability of working at job type 8</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Probability of working at job type 9</td>
<td>0.16</td>
<td>0.15</td>
<td>0.13</td>
</tr>
<tr>
<td>Number observations</td>
<td>8,965</td>
<td>9,547</td>
<td>10,349</td>
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</table>

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th>1998</th>
<th></th>
<th>1999</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Public hospital, part time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>-0.06</td>
<td>0.1166</td>
<td>0.03</td>
<td>0.1027</td>
<td>0.09</td>
<td>0.0953</td>
</tr>
<tr>
<td>Age</td>
<td>-0.09 ***</td>
<td>0.0063</td>
<td>-0.08 ***</td>
<td>0.0057</td>
<td>-0.09 ***</td>
<td>0.0050</td>
</tr>
<tr>
<td>Married</td>
<td>0.50 ***</td>
<td>0.1741</td>
<td>-0.05</td>
<td>0.1371</td>
<td>0.19</td>
<td>0.1249</td>
</tr>
<tr>
<td>No. children younger than 7 years</td>
<td>-0.21 ***</td>
<td>-3.3500</td>
<td>-0.08 **</td>
<td>-1.2400</td>
<td>-0.22 ***</td>
<td>-3.5300</td>
</tr>
<tr>
<td>No. children 7 to 18 years of age</td>
<td>-0.22 ***</td>
<td>-3.7600</td>
<td>-0.16 ***</td>
<td>-3.1000</td>
<td>-0.08 **</td>
<td>-1.5100</td>
</tr>
<tr>
<td>20 or more years of education</td>
<td>1.66 ***</td>
<td>5.3200</td>
<td>1.24 ***</td>
<td>5.2600</td>
<td>1.19 ***</td>
<td>5.4200</td>
</tr>
<tr>
<td>Missing education</td>
<td>-0.54 ***</td>
<td>-3.6200</td>
<td>-0.74 ***</td>
<td>-5.3900</td>
<td>-0.67 ***</td>
<td>-5.6800</td>
</tr>
<tr>
<td>Spouse working in health sector</td>
<td>0.51 ***</td>
<td>3.7900</td>
<td>0.43 ***</td>
<td>3.6700</td>
<td>0.53 ***</td>
<td>4.7800</td>
</tr>
<tr>
<td>Income of spouse (1/1,000,000)</td>
<td>-1.49 ***</td>
<td>0.5640</td>
<td>-0.31</td>
<td>0.5550</td>
<td>0.25</td>
<td>0.4690</td>
</tr>
<tr>
<td>Constant</td>
<td>167.03 ***</td>
<td>12.2757</td>
<td>151.11 ***</td>
<td>11.1482</td>
<td>173.53 ***</td>
<td>9.7735</td>
</tr>
<tr>
<td>2. Public hospital, fulltime</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>-0.16</td>
<td>0.1079</td>
<td>-0.22 **</td>
<td>0.0945</td>
<td>-0.08</td>
<td>0.0897</td>
</tr>
<tr>
<td>Age</td>
<td>-0.03 ***</td>
<td>0.0055</td>
<td>-0.02 ***</td>
<td>0.0050</td>
<td>-0.03 ***</td>
<td>0.0044</td>
</tr>
<tr>
<td>Married</td>
<td>0.60 ***</td>
<td>0.1578</td>
<td>0.08</td>
<td>0.1234</td>
<td>0.29</td>
<td>0.1137</td>
</tr>
<tr>
<td>No. children younger than 7 years</td>
<td>-0.24 ***</td>
<td>-4.0900</td>
<td>-0.04 **</td>
<td>-0.7400</td>
<td>-0.13 **</td>
<td>-2.2800</td>
</tr>
<tr>
<td>No. children 7 to 18 years of age</td>
<td>-0.13 ***</td>
<td>-2.6000</td>
<td>-0.02 **</td>
<td>-0.3800</td>
<td>0.07 **</td>
<td>1.6000</td>
</tr>
<tr>
<td>20 or more years of education</td>
<td>1.68 ***</td>
<td>5.6200</td>
<td>1.17 ***</td>
<td>5.3000</td>
<td>1.34 ***</td>
<td>6.4800</td>
</tr>
<tr>
<td>Missing education</td>
<td>-0.85 ***</td>
<td>-6.2300</td>
<td>-0.83 ***</td>
<td>-6.7400</td>
<td>-0.96 ***</td>
<td>-8.8400</td>
</tr>
<tr>
<td>Spouse working in health sector</td>
<td>0.85 ***</td>
<td>6.9600</td>
<td>0.62 ***</td>
<td>6.0100</td>
<td>0.72 ***</td>
<td>7.1400</td>
</tr>
<tr>
<td>Income of spouse (1/1,000,000)</td>
<td>-1.58 ***</td>
<td>0.5000</td>
<td>-0.44</td>
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<tr>
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<td>-0.51 **</td>
<td>-1.1200</td>
<td>-0.50 **</td>
<td>-1.1000</td>
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<tr>
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<td>0.62 **</td>
<td>1.7800</td>
<td>0.20 **</td>
<td>0.5900</td>
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</tr>
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<td>151.03 ***</td>
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<td>112.53 ***</td>
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<td>0.2000</td>
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<td>-0.03 **</td>
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<td>-0.03 **</td>
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<td>0.3700</td>
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<td>2.5000</td>
<td>0.69 **</td>
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<td>25.9985</td>
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<tr>
<td>Female</td>
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<tr>
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<td>4.4500</td>
<td>0.25 **</td>
<td>5.2400</td>
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<th></th>
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<td>6. Public health care, fulltime</td>
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<tr>
<td>Female</td>
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<td>0.1433</td>
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<td>No. children 7 to 18 years of age</td>
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<td>0.5300</td>
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<td>-0.69 **</td>
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</tr>
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<td>Income of spouse (1/1,000,000)</td>
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<td>No. children 7 to 18 years of age</td>
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<td>2.1000</td>
<td>0.20 **</td>
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<td>-1.2000</td>
<td>-0.32 **</td>
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<td>-0.62 **</td>
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<td>1.02 ***</td>
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<td>26.8294</td>
<td>55.79 **</td>
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<tr>
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<td>-0.50 **</td>
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<td>-0.02 **</td>
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<tr>
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<td>0.75 *</td>
<td>0.3862</td>
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</tr>
<tr>
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<td>0.3000</td>
<td>0.13 **</td>
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<td>0.2800</td>
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<td>-0.77 **</td>
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<td>1.13 ***</td>
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<td>Income of spouse (1/1,000,000)</td>
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<td>0.1168</td>
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<td>1.1800</td>
<td>0.12 **</td>
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<td>4.4300</td>
<td>1.28 ***</td>
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<tr>
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<td>-3.6200</td>
<td>-0.64 **</td>
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<tr>
<td>Spouse working in health sector</td>
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<td>0.7900</td>
<td>0.12 **</td>
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<td>48.13 ***</td>
<td>11.6302</td>
<td>47.87 ***</td>
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</tbody>
</table>

| Number observations | 9516          | 10206         | 11114         |
| Log liklihood        | -15800.67     | -17092.76     | -18748.45     |
| LR chi2(81)          | 1379.73       | 1271.35       | 1545.97       |
| Pseudo R2            | 0.04          | 0.04          | 0.04          |

*** statistically significant parameter at 1% confidence interval  ** statistically significant parameter at 5% confidence interval  * statistically significant parameter at 10% confidence interval

The base outcome is not working. The base category is male, unmarried physicians with a registered education of less than 20 years and no children under 19 years of age (and, since they are unmarried, no spouse working in the health sector).

<table>
<thead>
<tr>
<th></th>
<th>1997</th>
<th></th>
<th>1998</th>
<th></th>
<th>1999</th>
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<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Min</td>
<td>Max</td>
<td>Mean</td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>Pr₁: Public hospital, part time</td>
<td>0.157</td>
<td>0.023</td>
<td>0.428</td>
<td>0.160</td>
<td>0.016</td>
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<tr>
<td>Pr₂: Public hospital, fulltime</td>
<td>0.403</td>
<td>0.182</td>
<td>0.780</td>
<td>0.407</td>
<td>0.240</td>
<td>0.699</td>
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<tr>
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<td>0.006</td>
<td>0.000</td>
<td>0.020</td>
<td>0.005</td>
<td>0.000</td>
<td>0.078</td>
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<tr>
<td>Pr₄: Private hospital, fulltime</td>
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<td>0.002</td>
<td>0.018</td>
<td>0.013</td>
<td>0.002</td>
<td>0.033</td>
</tr>
<tr>
<td>Pr₅: Public health care, part time</td>
<td>0.113</td>
<td>0.003</td>
<td>0.317</td>
<td>0.119</td>
<td>0.010</td>
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<td>0.002</td>
<td>0.435</td>
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<td>0.005</td>
<td>0.115</td>
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<tr>
<td>Pr₇: Private health care, part time</td>
<td>0.015</td>
<td>0.000</td>
<td>0.067</td>
<td>0.017</td>
<td>0.001</td>
<td>0.062</td>
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<tr>
<td>Pr₈: Private health care, fulltime</td>
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<td>0.002</td>
<td>0.035</td>
<td>0.015</td>
<td>0.002</td>
<td>0.046</td>
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<td>Pr₉: Other sectors, both part time and fulltime</td>
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<td>0.035</td>
<td>0.377</td>
<td>0.152</td>
<td>0.081</td>
<td>0.369</td>
</tr>
<tr>
<td>Residual, not working</td>
<td>0.058</td>
<td></td>
<td>0.064</td>
<td>0.069</td>
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</tr>
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</table>

Table B.5. Sample selection for logit estimation and estimation of wage equations.

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<th>1998</th>
<th>1999</th>
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<tbody>
<tr>
<td>Physicians, used in logit estimation</td>
<td>9,516</td>
<td>10,206</td>
<td>11,114</td>
</tr>
<tr>
<td>Not working</td>
<td>-550</td>
<td>-656</td>
<td>-763</td>
</tr>
<tr>
<td>Missing wage income</td>
<td>-1</td>
<td>-3</td>
<td>-2</td>
</tr>
<tr>
<td>Working physicians, used in wage eq</td>
<td>8,965</td>
<td>9,547</td>
<td>10,349</td>
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</table>

The estimates of the wage equations are given in Table B.6. The wage equations for all nine work sectors have been estimated simultaneously using maximum likelihood, allowing for correlation between the different wages. The parameters σ₁ to σ₉ are the variance parameters mentioned in the main paper, and the parameters κ₁ to κ₉ are the parameters allowing for correlation between sectors. As can be seen from Table B.6, only κ₄ in 1997 is found significant at level of 95% or better, indicating that there is not much residual correlation between the different wages after correcting for the other explanatory variables.

As expected, one finds the most significant results in the largest sector, full time work in a public hospital. In this sector, being a woman reduces wages, while wages increase with age.

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<tbody>
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<td>Female</td>
<td>-0.03</td>
<td>0.04 **</td>
<td>0.0169</td>
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<tr>
<td>Age</td>
<td>0.00</td>
<td>0.00</td>
<td>0.0024</td>
</tr>
<tr>
<td>20 or more years of education</td>
<td>0.13 ***</td>
<td>0.16 ***</td>
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<td>0.01</td>
<td>0.0248</td>
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<td>Least central municipalities (kommuner)</td>
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<td>0.08 ***</td>
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<tr>
<td>Less central and central municipalities</td>
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<td>-0.03 **</td>
<td>0.0164</td>
</tr>
<tr>
<td>Pr1</td>
<td>-0.16 ***</td>
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<td>-0.16 ***</td>
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<tr>
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<tr>
<td>σ1</td>
<td>0.20 ***</td>
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<table>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Female</td>
<td>-0.03 ***</td>
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** *** statistically significant parameter at 1% confidence interval ** statistically significant parameter at 5% confidence interval
* statistically significant parameter at 10% confidence interval
- not possible to estimate either because of multicolinearity or lack of observations with the relevant characteristic
The base category with regard to the dummy variables is male physicians with a registered education of less than 20 years and living in an especially centralized region.

Table B.7 shows the mean and predicted hourly wages for physicians derived from predictions for all physicians using the estimated wage equations. As expected, the predicted wages have less variation than the observed (any type of estimation/prediction will result in a smoothing of the data).

Table B.7. Mean and median predicted hourly wages for physicians. Norwegian kroner.

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