TERHI KANKAANRANTA

Factors Influencing Physicians' and Nurses' Labour Supply Decisions

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ACADEMIC DISSERTATION
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This work is dedicated to Ida and Aleksi

CONTENTS

Abstract

The objective of this study was to analyse what the arguments are in individuals' utility functions in health care and analyse the consequences of these utility functions in the supply of health care labour. In the economics literature, the term 'labour supply decision' often refers to a decision to participate in the labour market or concerning the hours worked, conditional upon labour market entry. In this study, motivation to work was assumed to be influenced by wages but also extended to include factors possibly related to working conditions and workplace. Motivation to work can also derive from altruistic considerations. Altruistic employees are assumed to be committed to the 'good of the public', and different factors may motivate them in working as compared to more self-interested employees. Finally, the worker's personality, often referred to as identity, was assumed to play a role in labour supply decisions

The definition of physicians' labour supply decision in this study involved the choice of primary working sector (public or private). In addition, we analysed physicians' intentions of voluntary turnover: to remain in public health care or switch to the private health care sector. Nurses' labour supply was defined as a decision of labour market participation and on hours worked, as well as intentions to stay in health care or leave for non-health-care roles. Both pecuniary and non-pecuniary factors were hypothesised to influence decisions.

For the studies concerning physicians, we explored the national postal surveys of Finnish physicians, completed in 1988, 1993, 1998, and 2005. For the nurses, survey data were collected in November 2005. In addition to these survey data, statistical data were obtained via the Finnish Medical Association, the National Research and Development Centre for Welfare and Health (STAKES), and the Union of Health and Social Care Professionals (TEHY).

Both pecuniary and non-pecuniary factors were found to influence physicians' and nurses' labour supply decisions. When wages were important for physicians or they considered themselves entrepreneurial in approach, they more often chose the private sector as their main working sector. If the workplace was familiar before graduation, the physician tended to choose the public sector. Increased job satisfaction and decreased job dissatisfaction decreased physicians' intentions to change sector from public to private health care. Factors such as good income when compared to workload and a chance to apply one's own ideas in the work were associated with increased job satisfaction. Excessive duties and tight, inflexible timetables increased job dissatisfaction and therefore intentions for sector change.

Increased job satisfaction and decreased job dissatisfaction also decreased the intentions of registered nurses (RNs) to leave health care for non-health-care roles. Higher wages, the proportion of income earned from overtime work, and the num-

ber of nurses in one's current work unit increased intentions to remain in the health care field. Factors increasing job satisfaction included the possibility of specialisation, a satisfying ratio of income to workload, and a secure livelihood. Excessive duties, lack of possibilities to make decisions oneself, and large amounts of paperwork increased job dissatisfaction.

Pecuniary factors influenced the number of hours of work RNs supplied as well. Increasing RNs' wages by 10% might increase weekly hours supplied by 4.8%. However, also non-pecuniary factors related to job satisfaction, job dissatisfaction, work, and workplace influenced the number of hours worked. In general, longer hours were worked by nurses in outpatient departments, operating rooms, and home care, as compared to nurses working in wards.

In conclusion, not just economic factors influence the labour supply of physicians and nurses. This study showed that wages matter for labour supply decisions. Higher wages increased RNs' intentions to remain working in health care and therefore have long-term effects. Also short-term effects can be obtained, if more people are attracted to the nursing profession. However, on their own, higher wages are not sufficient to influence physicians' and nurses' labour supply decisions. Non-pecuniary factors are also important determinants of labour supply and should therefore be included in analysis. By influencing factors related to increased job satisfaction, decreased job dissatisfaction, working conditions, and workplace, it should be possible to keep nurses in the health care sector, keep physicians in public health care, and/or increase the number of hours supplied by nurses.

Abstract in Finnish

Tämän tutkimuksen tarkoituksena oli analysoida terveydenhuollossa toimivien henkilöiden, lääkärien ja sairaanhoitajien, hyötyyn vaikuttavia tekijöitä sekä mitä hyötyfunktioista seuraa työn tarjonnan näkökulmasta. Taloustieteessä työn tarjontapäätöksellä usein tarkoitetaan päätöstä osallistua työmarkkinoille, sekä tehtyjen työtuntien määrää, mikäli henkilö on jo työmarkkinoilla. Työn tarjontaan oletettiin vaikuttavan palkka, mutta lisäksi myös työolosuhteisiin ja työpaikkaan liittyvät tekijät. Työmotivaatioon voi vaikuttaa myös altruismi. Altruististen ihmisten hyöty kasvaa heidän saadessaan auttaa muita, toimia ”yhteisen hyvän” puolesta, verrattuna henkilöihin, jotka ajattelevat enemmän omaa etuaan. Lisäksi työntekijän persoonallisuus, josta usein käytetään nimitystä identiteetti, saattaa muokata työn tarjontapäätöksiä.

Tässä tutkimuksessa työn tarjontapäätös tarkoitti ensinnäkin päätöstä lääkärien pääasiallisen työskentelysektorin valinnasta (kunnallinen vai yksityinen terveydenhuollon sektori). Toiseksi analysoitiin lääkärin suunnitelmia joko jäädä kunnallisen terveydenhuollon palvelukseen, tai tulevaisuudessa vaihtaa yksityiselle terveydenhuoltosektorille. Sairaanhoitajien osalta analysoitiin sairaanhoitajien työmarkkinoille osallistumista ja heidän tekemiensä viikkotyötuntien määrää. Lisäksi analysoitiin sairaanhoitajan halukkuutta jäädä terveydenhuollon palvelukseen tai tulevaisuudessa mahdollisesti vaihtaa alaa, kokonaan pois terveydenhuollosta. Työntekijän hyötyfunktion oletettiin muodostuvan sekä rahallisista, että ei-rahallisista tekijöistä, joiden siten oletettiin vaikuttavan työn tarjontapäätöksiin.

Tutkimuksen aineistoina käytettiin vuosina 1988, 1993, 1998 ja 2003 tehtyjä kyselytutkimuksia lääkäreille. Sairaanhoitaja-aineisto kerättiin kyselytutkimuksella poikkileikkauksena marraskuussa 2005. Näiden aineistojen lisäksi tietoja kerättiin Lääkäriliiton, Sosiaali- ja terveysalan tutkimus- ja kehittämiskeskuksen (STAKES), sekä Terveyden ja Sosiaalialan ammattijärjestön (TEHY) rekistereistä.

Sekä rahalliset, että ei-rahalliset tekijät vaikuttivat lääkärien ja sairaanhoitajien työn tarjontapäätöksiin. Mikäli lääkärille palkka oli ollut tärkeä työpaikan valintaan vaikuttanut tekijä, hän valitsi useimmin työskentelysektorikseen yksityisen. Myös yrittäjiksi itsensä kokeneeet lääkärit valitsivat muita useammin yksityisen sektorin. Mikäli taas työpaikka oli ollut lääkärille tuttu jo opiskeluajoilta, se lisäsi kunnalliselle sektorille hakeutumista. Lisääntynyt työtyytyväisyys ja vähentynyt työtyytymättömyys lisäsivät lääkärin halukkuutta työskennellä tulevaisuudessakin kunnallisen sektorin palveluksessa. Työtyytyväisyyttä lisäsivät esimerkiksi hyvät tulot suhteessa työmäärään, sekä mahdollisuus soveltaa omia ideoita ja näkemyksiä työssä. Kohtuuton päivystysrasitus ja työn pakkotahtisuus sitä vastoin lisäsivät työtyytymättömyyttä ja siten halukkuutta vaihtaa yksityiselle terveydenhuollon sektorille.

Lisääntynyt työtyytyväisyys vähensi sairaanhoitajien halukkuutta vaihtaa pois terveydenhuollosta, kun taas työtyytymättömyyden kasvu lisäsi vaihtohalukkuutta.

Bruttopalkan ja vuorotyölisien kasvu, kuten myös sairaanhoitajien lukumäärän lisäys työyksikössä lisäsi halukkuutta jäädä terveydenhuoltoon. Työtyytyväisyyttä lisääviä tekijöitä olivat esimerkiksi mahdollisuus erikoistumiseen, kohtuulliset tulot suhteessa työmäärään sekä turvattu toimeentulo. Työtyytymättömyyttä aiheuttivat esimerkiksi kohtuuton vuorotyörasitus, itsenäisten päätöksentekomahdollisuuksien puuttuminen ja runsas paperityö.

Rahalliset tekijät vaikuttivat myös sairaanhoitajien tekemien viikkotyötuntien määrään. Tulostemme mukaan, nostamalla palkkaa 10 %, olisi mahdollista lisätä sairaanhoitajan tekemää viikkotuntimäärää 4.8 %:lla. Huomattava kuitenkin on, että myös ei-rahalliset tekijät vaikuttavat tehtyjen työtuntien määrään. Poliklinikoilla, leikkaus- ja toimenpideosastoilla, sekä kotihoidossa työskentelevät sairaanhoitajat tekemien viikkotyötuntien määrä oli korkeampi kuin vuodeosastolla työskentelevien sairaanhoitajien.

Yhteenvetona voidaan todeta, että pelkästään rahalliset tekijät eivät ohjaa lääkärien ja sairaanhoitajien työn tarjontapäätöksiä. Tämä tutkimus osoitti, että palkoilla voidaan vaikuttaa lääkärien ja sairaanhoitajien työn tarjontapäätöksiin. Tulosten mukaan palkkojen nosto lisäsi sairaanhoitajien halukkuutta jäädä terveydenhuollon palvelukseen, jolloin palkalla voidaan sanoa olevan pitkän aikavälin vaikutuksia. Lyhyellä aikavälillä korkeampi palkka saattaa lisätä alalle hakeutuvien lukumäärää. Korkeampi palkkataso ei yksin kuitenkaan vaikuta työn tarjontapäätöksiin vaan myös ei-rahallisilla tekijöillä on merkitystä ja ne tulisi ottaa tarkasteluihin mukaan. Kaiken kaikkiaan tulisi kiinnittää huomiota myös työskentelyolosuhteisiin ja työpaikkaan liittyviin tekijöihin. Lisäksi tulisi vaikuttaa tekijöihin, jotka tulostemme mukaan lisäävät työtyytyväisyyttä ja vähentävät työtyytymättömyyttä. Siten on mahdollista lisätä sairaanhoitajien halukkuuta jäädä terveydenhuollon palvelukseen, lääkäreiden halukkuutta jäädä julkiselle sektorille tai sairaanhoitajien tekemien työtuntien määrää.

Abbreviations

CFA	confirmatory factor analysis
FIML	full information maximum likelihood
GP	general practitioner
IMR	inverse Mill's ratio
LIML	limited information maximum likelihood
MLA	multilevel analysis
MQL	marginal quasi-likelihood
NHI	National Health Insurance
NHS	the National Health Service
OECD	Organisation for Economic Co-operation and Development
OLS	ordinary least squares
PQL	a second-order penalised quasi-likelihood procedure
RN	registered nurse
SEM	structural equation model
STAKES	National Research and Development Centre for Welfare and Health
TEHY	Union of Health and Social Care Professionals
WLS	weighted least squares

List of Original Publications

This thesis is based on the following original publications, which are referred to in the text by Roman numerals I–IV.

I T Kankaanranta, J Vainiomäki, V Autio, H Halila, H Hyppölä, M Isokoski, S Kujala, E Kumpusalo, K Mattila, I Virjo, J Vänskä, P Rissanen. Factors associated with Physicians' choice of working sector: a National longitudinal Survey in Finland. Applied Health Economics and Health Policy 2006, 5: 125-136.

II T Kankaanranta, T Nummi, J Vainiomäki, H Halila, H Hyppölä, M Isokoski, S Kujala, E Kumpusalo, K Mattila, I Virjo, J Vänskä, P Rissanen. The role of job satisfaction, job dissatisfaction and demographic factors on physicians' intentions to switch work sector from public to private. Health Policy 2007, 83: 50-64.

III T Kankaanranta, P Rissanen. Nurses' intentions to leave nursing in Finland. The European Journal of Health Economics, DOI 10.1007/s10198-007-0080-3.

IV T Kankaanranta, P Rissanen. The labour supply of registered nurses in Finland: the effect of wages and working conditions. The European Journal of Health Economics, DOI.10.1007/s10198-008-0116-3.

Introduction

In the literature many factors were found to influence numbers of health care workers. Generally, voluntary turnover decreases their number (Letvak, 2002), whereas it is possible to increase the size of the workforce through improving course enrolment in the medical field. Demographic factors were related to both the demand and supply side of the labour force. The average age of educators in health care as well as of workers in clinical roles is rising (Atencio et al. 2003). As a result, many retirements are expected in the coming years. Also the number of students who might apply for nursing training is decreasing (Buerhaus et al. 2000). The same holds for physicians.

The total number of physicians in Finland has steadily increased over the last decade. In 2000, there were 18,925 licensed physicians in Finland, whereas at the end of 2007 the number was 22,358. In recent years, more than 500 medical students have graduated each year, which has increased the number of physicians by about 2% annually (Finnish Medical Association, 2008). However, the number of physicians near or above retirement age has also increased. According to the Physician 2007 study, physicians aged 63 or over accounted for 7.6% of the total number of physicians in 1985. The figure was 13.3% in 2005 and in 2007 had increased to 15.1% (Vänskä et al. 2007). Therefore, the percentage of physicians of retirement age has increased by about 1% annually.

According to these figures, the supply of physicians should meet the demand. However, the profession of physician has suffered for many years from recruitment problems (Hämäläinen, 2005), and, especially in primary public health care, there is a shortage of physicians. The increased number of physicians has quite modestly changed the structure of how physicians have chosen working sectors. However, the percentage of physicians working mainly in private health care increased by almost 50% after the 1990s. Occupational health services have also attracted physicians since the mid-1990s (Vänskä et al. 2006), especially from primary public health care. Part-time employment, such as extended maternity leave and partial retirement, has also become more popular in the last decade. In 2007, about 19% of female doctors and 12% of males had part-time employment, which generally refers to 23 or fewer work hours per week (Vänskä et al. 2007). In addition, physicians employed by private firms are paid on an hourly basis and usually work fewer hours than do salaried physicians, for example, at health centres and hospitals.

The shortage of physicians and nurses may vary between geographical areas. Doctors and nurses may be reluctant to relocate to rural areas because of poorer employment prospects for health professionals and any relocating family members, low salaries, poorer access to education opportunities for any children they may have, and less availability of certain lifestyle-related services (Zurn et al. 2004, Dussault and Franceschini, 2006). The educational system can also have an effect on practice

locations. Graduates from medical schools located outside the major urban areas were shown to practise more often in rural areas (Rosenblatt et al. 1992, Kristiansen and Førde, 1992).

If we take public health centres as an example, on 3 October 2007 there were, in total, 3,742 vacancies at health centres, and 3,586.5 of these were included in calculations of physician shortages (Parmanne, 2007). Since 2000, 309.5 new vacancies, in total, were established in Finland, measured in absolute terms; Table 1.

Table 1. Descriptive figures of MD vacancies in health centers in some hospital districts, in 2007.

Hospital district	Total number of vacancies in 2007	Change in new vacancies in 2000–2007	% change in number of vacancies	Shortage of physicians in 2007 (%)
Kainuu	63.0	-1.0	1.6	27.8
Etelä-Karjala	104.0	7.5	7.8	23.3
Kymenlaakso	77.0	-41.0	-34.7	22.1
Länsi-Pohja	46.0	2.0	4.5	21.7
Itä-Savo	42.0	-1.0	2.3	21.4
Helsinki and Uusimaa*	918.0	133.0	8.6	5.9
Päijät-Häme	94.5	-40.5	30.0	3.2
Totally	**3586.5**	**+309.5**	**9.4**	**10.0**

* = university hospital in hospital district
Source: Parmanne, 2007

There are many possible indicators of labour force shortages, such as the extent to which an organisation is unable to recruit staff to fill vacant posts or how many months a vacancy has remained unfilled. Table 1 presents the figures for the five hospital districts with the highest percentage of vacancies that were unfilled. We also report figures for the Helsinki and Uusimaa hospital district, which is often used as a base category in national statistics, as well as Päijät-Häme, which had the lowest level of shortage. On average, 10.0% of vacancies were completely unfilled in 2007, while in 2006 the figure was 8.9%. The shortage varied by hospital district, being greatest in Kainuu and Etelä-Karjala. Kainuu decreased one vacancy between 2000 and 2007. Even though Helsinki and Uusimaa had an increased number of new vacancies, the shortage level was below the overall average. The hospital district of Päijät-Häme had the lowest level of shortage, but it had also decreased the number of new vacancies by 40.5 in 2000–2007.

According to the report on numbers of physicians in public health centres in 2007 (Parmanne, 2007), the shortage also varied with the size of the health centre (i.e., the number of physician posts there). In those health centres where 1–5 physicians were working, the shortage was 13.8%, but it decreased to 8.6% if the number

of physicians was 15 or greater. If the health centre was located in a hospital district with a university hospital, the shortage was 6.7% on average, compared to 14.5% in hospital districts with no university hospital.

A shortage of physicians is or will be characteristic of many other countries, like the UK (Elliot, 2003) and the USA (Salsberg and Grover, 2006). In addition, a major issue for health care policymakers in most Western countries is shortage of registered nurses (RNs) (Shields, 2004, Buchan et al. 1997, Aiken, 2007, Chiha and Link, 2003). Despite the increased numbers of RNs in Finland, problems in recruiting RNs were reported (Hämäläinen, 2005), especially in larger cities and for short-term vacancies. In Finland, RNs account for the most positions in the public health care sector; the number of nurses has increased about 29% in the 2000s and came to 36,320 in absolute terms in 2005 (Ministry of Social Affairs and Health, 2007). Stated in an alternative manner, in 1995 the public health care sector had 43.6 full-time RNs per 10,000 inhabitants, and in 2004 the figure had increased to 66.9 (National Research and Development Centre for Welfare and Health, 2006). Nursing has been an attractive career option, and, for example, in 2005, the average number of applicants for a student place was five (Ailasmaa, 2007a). The number graduating has varied, for example, between 2,956 and 3,785 in 1993–2001 (Santamäki, 2004), being 2,734 in 2006 (Finnish Nurses Association, 2008). On the other hand, in 2003, 19.5% of RNs working in the public sector were 50–59 years old and 0.6% over age 60 (Commission for Local Authority Employers, 2005). As for their working sector, in 2004 about 80% of RNs were working in public health care (Ailasmaa, 2007a).

The consequences of large-scale shortages can be severe, affecting the delivery and quality of health care. For example, in the UK National Health Service (NHS), nurse shortages have led to increased waiting time for surgery, delays in emergency care, and even complete closures of hospital wards (Frijters et al. 2007). In Finland, as a consequence of the physician shortage in the public sector, emergency physician services now are often produced by private firms, which may be a more expensive way to arrange services. In addition, it may create problems in continuity of care (Häkkinen, 2005).

To prevent large-scale recruitment difficulties or even shortages of physicians and RNs, it is essential to analyse their labour supply decisions. The objective of the study reported on here was to analyse what the arguments are in physicians' and nurses' utility functions and analyse the consequences of these utility functions in the supply of health care labour. According to the traditional labour economic model, workers compare wages to the value of forgone leisure when making labour supply decisions. However, models of compensating wage differentials (Lazear, 1995) include in the utility function also non-pecuniary aspects related to, for example, workplace and working conditions. In this view, a worker compares the combination of wages and non-pecuniary aspects when making labour supply decisions. Motivation to work can also arise from workers' life values and their identity, as well as for altruistic reasons. Altruistic employees are committed to the public good and may have different factors motivating them to work than more self-interested persons do. We assumed that the utility function may be more complicated than the traditional model and allowed also non-pecuniary factors, such as aspects of the work, to be sources of utility. Thus we gain a picture of working life wherein non-

material elements, as well as non-individual objectives (the utility of others), may be important. In the empirical part of the study, these aspects were operationalised.

In the economics literature, the term ‘labour supply decision’ often refers to a decision to participate in the labour market or to hours worked, conditional upon labour market entry. In this study, labour supply decisions were defined in several ways. Physicians’ labour supply decision was defined as a choice of primary working sector (public or private). Physicians’ intentions to voluntarily change primary working sector from public to private health care were also analysed. For registered nurses (RNs), we defined the labour supply decision as a decision to participate in the labour market as well as a decision about how many hours to work. In addition, RNs’ intentions to remain in health care or leave for non-health-care roles were analysed. In the study, pecuniary factors as well as non-pecuniary elements related to job satisfaction, job dissatisfaction, working conditions, and workplace were included in the analysis. In addition, for physicians, factors related to identity were analysed as well. In Finland, there are no comparable studies, and internationally there are only a few studies, analysing factors related to the labour supply of physicians and nurses.

The study is presented in two parts. The first offers a general presentation of the dynamics of the labour market and the Finnish health care system. We also reviewed literature on the factors influencing labour supply decisions of physicians and nurses, along with methodological issues. The second part consists of four empirical studies. Two of them analysed physicians’ choice of main working sector, and one examined nurses’ intentions to stay in the health care sector or switch to non-health-care roles. Finally, for nurses, we developed a static labour supply model of labour force participation and hours worked.

Theoretical framework for labour supply

Labour market equilibrium and shortage of labour

Theoretically, in a competitive labour market, flexible wages equate to labour supply and demand in the long run. The impact of a real wage change on hours of work can be broken down into income and substitution effects. An increase in the real wage increases the relative return on working, increasing the supply of hours (substitution effect). On the other hand, the wage increase tends to make people work less and demand more leisure time. Which of these effects dominates is an empirical question. If higher real wages reduce the labour supply at some point, the supply curve relating real wages and hours supplied may even bend back. If the substitution effect dominates, rising wages will attract more employees to the profession, therefore increasing the supply of labour.

However, the health care labour market has some special features setting it apart from competitive labour markets. Firstly, there are few employers operating in the markets. For example, in Finland, the public sector has the most responsibility for arranging health care services for residents and is therefore the dominant employer. Secondly, there is usually substantial regulation on entry to the labour force. Physicians must be licensed and nurses registered before they can work in their respective professions. Municipalities and hospital districts apply similar principles when setting wages. Nonetheless, wage differences exist between employers. Most employees also are trade union members. More than 90% of physicians working in Finland belong to the Finnish Medical Association, and about 90% of nurses are in trade unions, such as the Union of Health and Social Care Professionals (TEHY). Finally, nursing is a female-dominated profession and lengthy career interruptions for child-rearing are common (Shields, 2004).

To better understand the economic framework of the dynamics of the health care labour market, we adapted the work of Wilson (1987) and Maynard and Walker (1997), who modelled the physicians' labour market. For studying the case of nurses, we adapted the model by Shields (2004).

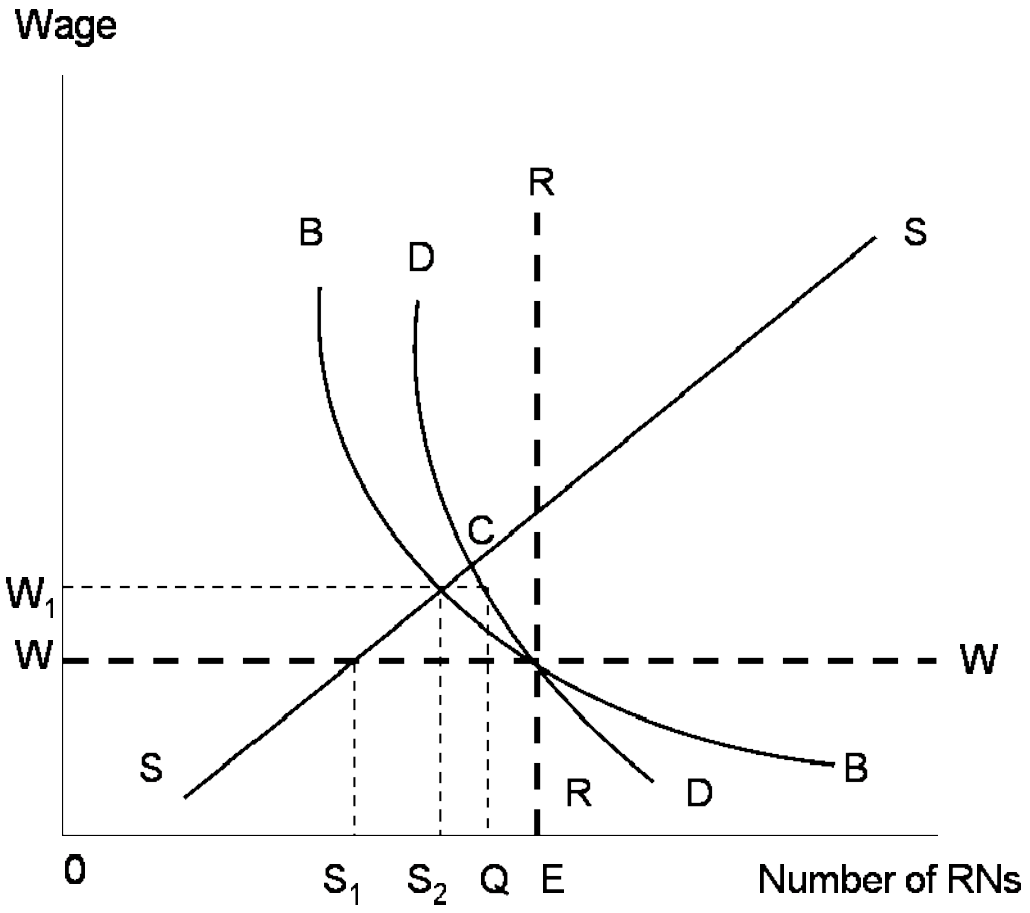

Figure 1. RNs labour market

The model illustrates RNs' labour market at a given point in time. Nurses' real hourly wage is presented on the y-axis and the number of working full-time-equivalent nurses on the x-axis. Line R represents the 'ideal' clinic requirements (according to nursing professionals) in number of nurses needed to provide a desirable level of health care. Line W represents the current hourly wage and B the budgeted share (fixed at least in the short run) of the total health care budget that is allocated to employing nurses. The demand for RNs is characterised by a downward-sloping curve, D, if health care is to be delivered efficiently: resources are used efficiently to achieve the maximum possible quantity of health services. The D curve is quite inelastic, reflecting a situation wherein little substitution for RNs by other workers is possible.

Line S shows the supply of RNs. In the work of Shields (2004), the supply was divided into supply of domestic nurses and those attracted from overseas. Because in Finland the number of RNs qualified abroad is quite modest, line S was depicted as a single line. At point E in Figure 1, the wage (W), budget (B), requirements (R),

and demand for nurses are consistent with each other. However, point E does not represent sustainable equilibrium, because it does not consider the supply of RNs, line S. At wage rate W, the nursing budget is under-spent and the supply of RNs is S_1. There is a shortage of RNs, measured by distance $E - S_1$ on the x-axis.

There are some possibilities for correcting the imbalance between demand and supply in the model of Figure 1. The supply curve, S, could be shifted outward in the long term by increasing the number of school-leavers entering nursing training. Also recruiting more RNs from overseas or attracting them back to health care from non-health-care roles would increase the supply in the short run. By increasing the wage rate from W to W_1, the shortfall could be reduced to $E - S_2$. If the use of nurses would be economised to an efficient level, curve D, the scale of the shortage at wage rate W_1 could be reduced to $Q - S_2$. To achieve an equilibrium of the D and S curves (point C in Figure 1), the wage rate should be higher than W_1. However, to reach that point, more resources must be allocated to employing RNs – that is, to shift the budget line, B, outward.

It has been hypothesised that the monopsony power in the labour market for nurses could be used to explain shortages of hospital RNs (Hirsch and Schumacher, 1995). If hospitals face an upward-sloping labour supply curve, a lower wage and employment level could result than would be seen if the market were competitive (Hirsch and Schumacher, 1995). (2006a) argues that monopsony power is possible also in the Finnish labour market for nurses, where there is one dominant employer or most employers (municipalities and hospital districts) at least apply the same wage-setting principles. To test for the presence of monopsonistic power as, for example, in Sullivan's work (1989), there should exist wage dispersion among nurses with similar characteristics.

Motivation and maximisation of the individual's utility

Motivation induces human behaviour by some means. In economics, motivation is usually studied by analysing factors affecting a person's utility. The basic neo-classical static model of labour supply (see, e.g., Killingsworth, 1983) assumes that labour supply decisions of a 'representative individual' are a result of utility maximisation, subject to constraints. Utility is viewed as a measure of an individual's happiness and overall well-being. However, that definition has conceptual problems, related to, for example, quantification of the amount of utility. Thus, nowadays 'utility' is used to refer to consumer preferences and is seen as a way to describe preferences. A rational individual attempts to maximise utility, which depends on his or her tastes concerning the amount of consumption and leisure time. The rationality is based on three axioms (McGuire et al. 1997). Firstly, the individual is able to order all available combinations of goods according to his or her preferences (the axiom of completeness). Secondly, if A is preferred to B and B is preferred to C, then A is preferred to C, with A, B, and C normally conceived of as

bundles of commodities (the axiom of transitivity). Finally, the individual aims for his or her most preferred state (the axiom of selection).

A utility function assigns a number to every possible consumption bundle such that less-preferred bundles are assigned lower numbers than more-preferred ones. Per Antonazzo et al. (2003), the utility function (U) can be formulated as

$$U = U(C_t, L_t, X_t) \quad (1)$$

where C_t denotes the composite consumer good (within-period consumption), L_t is leisure hours, and X_t individual attributes, all in period t. The individual tries to choose a combination of C, L, and X that maximises his or her utility. Many combinations make the person equally happy – i.e., yield an equal level of utility. It is also assumed that individuals prefer more of both consumption and leisure.

Constraints facing the individual are many. The price of goods limits the individual's possibilities to consume only the amount that equals his or her total income from work and other income, if borrowing and saving are not allowed. Also, the total amount of time allocated to work and leisure per period is finite. Because of the scarcity of time, the individual has to make a choice between leisure and labour. Utility is maximised subject to linear budget constraint, thus

$$C_t + W_t L_t = V_t + W_t T \quad (2)$$

where W is the hourly wage, V non-labour income, and T the total time available (i.e., 24 hours per day). Therefore, the right-hand side of the equation (also called full income) gives the potential income if the worker were to devote all available time, T, to the labour market. The left-hand side of the equation denotes how the full income is spent: on consumption of goods and leisure. Therefore, leisure also has a price, which is given by wage rate W. In addition, leisure (L) is assumed to be a normal good. Therefore increases in non-labour income, *ceteris paribus*, raise the demand for leisure.

In standard labour economics theory, utility is measured in terms of material incentives. However, models of compensating wage differentials assume that the motivation to work arises also from a variety of social and psychological elements, related to, for example, working conditions. Professional ambitions, such as possibilities to progress in one's career or prestigious position, could be non-pecuniary forms of compensation, increasing the worker's utility. According to the traditional labour economic analyses, workers compare wages to the value of forgone leisure when making labour supply decisions. Work itself is seen to reduce utility due to lost leisure time, but is a way to earn income for consumption. In this study, we adopted a more advanced position, from which we allowed individuals to have more complicated objective functions, allowing, for example, variation in the motivations for working. The motivation might be material, altruistic (that is, seeking 'the good

of the patient'), or professional ambitions. This gives us a model wherein not only the preferences of individuals concerning known states of the world (attitudes toward money and so on) vary but also the states of the world for which they have preferences may vary: some give greater weight to 'the good of the patient', while others accord more weight to professional performance or the social aspects of the work environment One assumption is that altruistic employees, such as teachers and police, would be committed to the good of the public, while self-interested persons, generally, favour only personal gain. Le Grand (2003) considered in his book whether government employees should be assumed to be altruistic or self-interested. It is not possible to create an exhaustive list of all elements that might be included as arguments in individual objective functions. We can hypothesise that these non-monetary arguments in individuals' utility function are things like social environment at work, the individual's own position in this social environment (e.g., hierarchical status), social relations, professional performance and status, attitudes toward the 'common good', and the attitudes towards patients. Focusing only on pecuniary incentives of utility, gives too narrow a presentation of employee's motivations to work.

According to the standard human capital theory, workers invest in human capital, which augments their productivity and makes them more attractive to firms. The production approach defines jobs as a collection of tasks, with individuals hired to perform them. In human capital theory, the job is defined as a particular investment opportunity for the workers. Some jobs offer greater opportunities for advancement than others, mostly because they are associated with more training. Employees' wages increase with investment in human capital, such as number of years of schooling completed and number of years of work experience (Lazear, 1995). However, in modelling of earnings functions, besides the human capital characteristics, also geographical controls, non-labour income, socio-demographic characteristics, and non-pecuniary job characteristics were assumed to influence the wage rate (Askildsen et al. 2003, Skåtun et al. 2005, Ikenwilo and Scott, 2007). Therefore, the wage rate (W) can be expressed as

$$W = f(E, V, T, G, X, S) \qquad (3)$$

where E refers to education, V to non-labour income, T to tenure in the job, G to geographical controls, X to non-pecuniary job characteristics (such as type of workplace and work position), and S to socio-demographic controls.

The model described here (in equations 1–3) is based on a single individual, but often labour supply decisions are affected also by others in one's family. However, there is no consensus as to how best to model family decision-making. Family utility and the family budget constraint model assume that the utility that is maximised is total family utility and depends on total family consumption and on the leisure time of each family member (Fallon and Verry, 1988). Another approach assumes that each family member maximises his or her own individual utility. That utility is subject to family budget constraints and is a function of the individual's own leisure time but also of family consumption. Regardless of the model being used, family

factors influence the individual's labour supply decisions and therefore should be included in the model, if possible (Fallon and Verry, 1988).

Decisions about labour market participation and hours worked

According to neoclassical economic theory, an individual's labour supply decisions can be expressed in the context of a work/leisure choice. On the basis of utility maximisation, an individual decides whether to participate in the labour market and also selects the number of hours to work, conditional upon labour market entry (e.g., Killingsworth, 1983, Birsch, 2005). Static labour supply functions can be specified in several ways. If an individual has decided to enter the labour market, he or she then decides how many hours to work. While the conventional static model of labour supply does not define what time period to apply – a day, a week, or some other unit – the different dimensions of labour supply cannot be seen as perfect substitutes: most people would not be indifferent between working 100 hours per week for 20 weeks of the year and working 40 hours a week for 50 weeks of the year (Killingsworth, 1983).

Given the variety of work opportunities available, for example, for nurses, it can be assumed that the hours worked are freely chosen (Antonazzo et al. 2003). Following Antonazzo et al. 2003, labour supply H (hours of work or labour market participation rate – i.e., the proportion who work) can be expressed as
$H = T - L$

$$H = (T - L) = f(W, V, Z, S) \qquad (4)$$

where T denotes the total time available (24 hours per day), L leisure hours, W the wage rate, V non-labour income (e.g., spouse's income), Z non-pecuniary job characteristics (such as work position), and S socio-demographic and individual worker characteristics. The specification can be derived assuming the utility function (Equation 1) and maximising it subject to budget constraint (Equation 2). The Lagrangian function (Equation 5) and first-order conditions are (Antonazzo et al. 2003)

$$\psi = U(C_t, L_t, X_t) - \lambda\left[(C_t - V_t - W_t(T - L_t)\right] \qquad (5)$$

$$U_C\left(C_t, L_t, X_t\right) = \lambda$$

$$U_L(C_t, L_t, X_t) \geq \lambda W_t \qquad \text{or} \quad \frac{U_L}{U_C} \geq W_t$$

When deciding whether to enter the labour market, the individual considers whether the increased consumption possibilities resulting from working are sufficiently attractive to compensate for the forgone leisure. Therefore, the individual compares his or her 'reservation wage' (see below) and the market wage (what the employer is willing to pay for an hour of work – i.e., the absolute value of the slope of the budget line).

Reservation wage is the wage rate leaving him or her indifferent between working the first hour and not working at all. It is the slope of the indifference curve at the endowment point (the amount an individual can consume if not entering the labour market). The indifference curve shows the bundles that the consumer perceives as being indifferent from each other. If the reservation wage is higher than the market wage, the individual ends up at a corner solution, consuming only leisure and not working (Borjas, 1996). In other words, a higher market wage makes it more likely that a person will enter the labour market.

The reservation wage is also influenced by non-labour income, such as spouse's wages or income from investments. When non-labour income increases, reservation wage increases also, because leisure was assumed to be a normal good. Therefore, the probability of the person entering the labour market will be reduced as non-labour income increases. If an individual decides to enter the labour market, he or she incurs costs. Commuting costs decrease the endowment point and therefore influence the reservation wage. Increased commuting costs increase the reservation wage also and therefore decrease the individual's probability of labour force participation.

At the optimal level of consumption and leisure, marginal utility of leisure divided by marginal utility of consumption equals the wage rate (Equation 5). Therefore, the rate at which a person is willing to give up leisure hours in exchange for additional consumption equals the wage rate. An individual will not end up working all possible hours either, because the corner solution would give him or her less utility than an interior solution. Thus, we have an interior solution and the individual participates in the labour market (Borjas, 1996.).

With utility held constant, the relationship between worker's wage rate and hours of work is ambiguous, depending on which effect dominates: substitution or income effect. If wage rate increases, the demand for leisure rises, if leisure is assumed to be a normal good. Therefore, because of income effect, a worker will reduce the hours of work. However, leisure has become more expensive and substitution effect creates incentive for a worker to increase consumption other than leisure. Therefore, he or she would increase the hours worked. If we hold the worker's wages constant but increase non-labour income, the slope of the budget line remains

the same but will be shifted outward in parallel. If leisure is again assumed to be a normal good, the worker will be better off and reduce the hours worked.

In the neoclassical labour–leisure model, the individual can allocate his or her time to either leisure activities or work in the labour market. However, people often spend leisure time on such things as child-rearing, cooking, and cleaning the house. Women are found to allocate more hours to the non-market sector than men (Borjas, 1996). In the Time Use Survey conducted by Statistics Finland in 1999–2000, wherein respondents (n = 5,300) were aged 10 or over, resident in Finland, it was found that women did 60% of all domestic work. However, men were found to be participating increasingly in cooking and cleaning, and women were doing more home maintenance than before. For food preparation, women used about 50 minutes a day and men about 20. The division of domestic work changed with the spouse's employment situation. If the spouse of a gainfully employed woman exited working life, became unemployed, or retired, the man participated more in domestic work than when he was employed. Therefore, in analysis of the factors affecting labour market participation or hours worked, socio-demographic aspects should be included also. Such variables include employee's age, number of children, marital status, and partner's wage.

Factors influencing the number of qualified workers

The elements influencing labour supply in health care were constructed in the form of Figure 2, according to, for example, the work of Antonazzo et al. (2003).

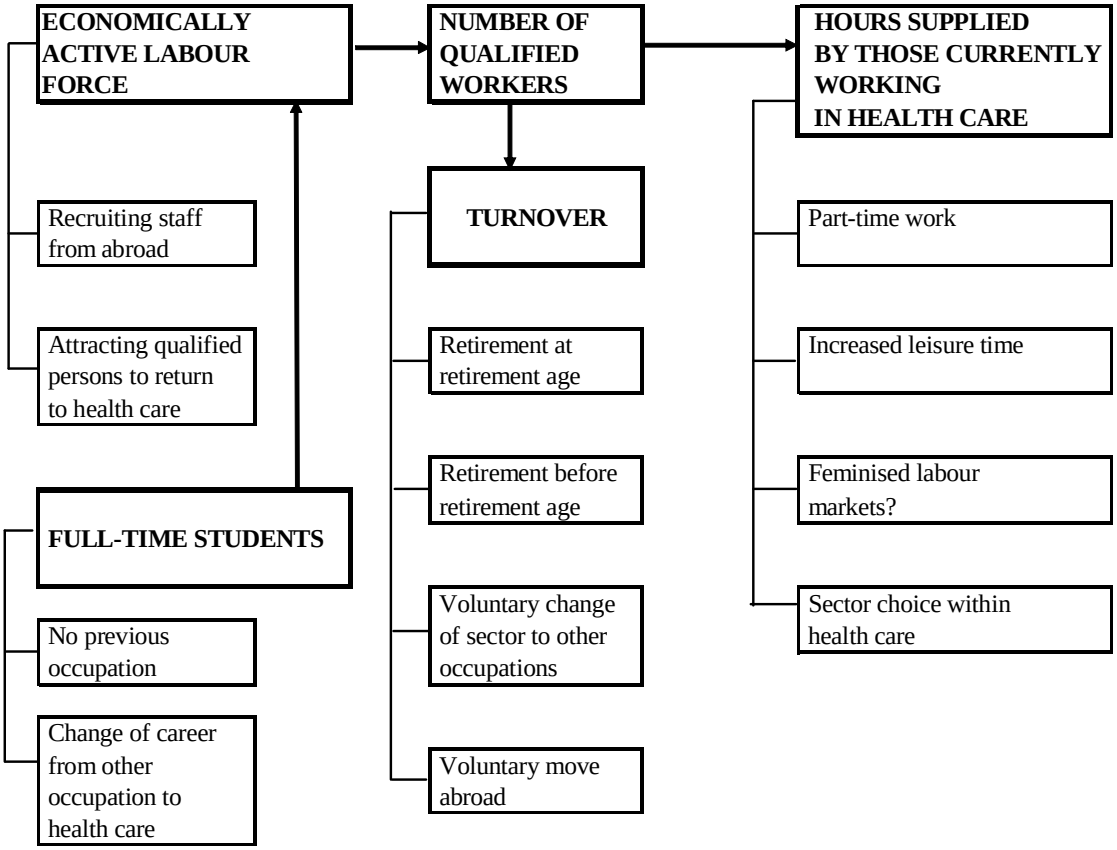

Figure 2. Different aspects of health care labour supply in Finland

The stock of health care professionals – i.e., the number of qualified workers – can be analysed from two perspectives. There are factors increasing the stock labelled Economically active labour force and are those decreasing the number of workers as Turnover. Economically active labour force includes those who were waiting to take up a job or were seeking work. In addition, those individuals who were temporarily ill but normally would be seeking work were defined as participating in the labour force. In economic statistics, full-time students are basically not seen as economically active labour until they have graduated.

One way to increase the number of individuals in the active labour force is by attracting qualified persons to return to health care from non-health-care roles. Another possibility is to recruit staff from abroad. The latter refers to workers who were trained in Finland but then emigrated to other countries, as well as those who are foreign-educated. In the USA, about 8% of US-registered nurses were estimated to be foreign-educated (Aiken, 2007). In the UK, around 45% of all new entrants to the UK register in recent years were from non-UK sources (Buchan and Seccombe, 2005). Also in Finland, RNs who were qualified abroad are seen as an increasingly important resource in the health care of the future (Ministry of Labour, 2003), but the number of RNs qualified abroad was still quite modest (Nieminen, 2006). Recruiting

staff from abroad can also have drawbacks, such as problems related to language and differences in training and work experience.

Full-time students were defined as persons who either had no previous occupation at all or had careers outside health care but were seeking education because of intention to switch career to health care. After completing their education, they will be included in the economically active labour force.

The turnover, or quit rate, is conventionally defined as the proportion of a given workforce who voluntarily quit their jobs over a given period, usually 12 months. Also the definition annual drop-out / average staff on post is widely used (Gray and Phillips, 1996). Labour turnover is a necessary part of an efficient labour market: employees move to jobs where their productivity (represented by their wages or employment package) is greatest (Gray et al. 1996). At the same time, turnover can cause problems. One aspect of turnover is retirement at or before retirement age, which will decrease the stock of health care professionals. In addition, if workers voluntarily change to non-health-care roles or emigrate, the number of qualified workers in health care will be decreased.

We can also analyse factors related to hours supplied by those currently working in health care, if the stock of health care professionals is assumed to be fixed. Part-time work may decrease the hours supplied, as can workers' changing preferences toward more leisure time. Also the changing gender balance can affect the hours supplied. It has been argued that feminised labour markets can decrease hours supplied if females, for example, take maternity leave. Finally, health care workers may switch sector within health care, such as from the public to the private sector. In this case, the stock of workers remains unchanged within health care but the sector the worker leaves experiences decreasing hours supplied as well as fewer workers. We can also argue that sector change causes a 'brain drain' and changes in the quality of health professionals, if the same kinds of workers persistently choose to change sector.

Methodological issues

Three major methodological issues were identified in labour supply research (Killingsworth, 1983). The first is possible sample selection bias. In short-run models, problems may arise in estimation of labour supply elasticities because of the exclusion of non-working individuals from the sample. The potential hours of work of non-working individuals cannot be observed. Unobservable worker characteristics, such as tastes or preferences for work, induce the working sample to value work more and to offer more hours of work than the overall population does. In analysis of, for example, wages, application of ordinary least square (OLS) to the working sample implies that coefficients will be biased downward and inconsistent: the reservation wage will be lower, and therefore the regression line will be flatter than the true one (Antonazzo et al. 2003).

Measurement error was the second potential problem in estimating labour supply functions. It is related to the situation where the variable being explained cannot be measured accurately, because of either data collection difficulties or immeasurability of the relevant variable. Typically in labour supply studies, wage rates are subject to measurement error. Tax regimes were found to affect the labour supply of married women (Smith et al. 2003) and if not included in analysis may introduce a bias in the wage estimates. Through incorporation of the disturbance term into models or using instrumental variables, the existence of measurement error for the dependent variable can be rectified (Kennedy, 1992). However, measurement error can also be related to independent variables. In these cases, an instrumental variables approach was often used to overcome the problem.

Finally, the functional form of the estimation model may cause problems in labour supply estimations. In estimation of labour supply functions, the results typically are very sensitive to the specification of the labour supply function and the data used. The two dimensions of labour supply, participation and hours supplied, should be analysed via separate models. When one estimates hours of work, a sample-selection-corrected regression is required, whereas logit and probit models are preferred for analysing the participation decision. Logit and probit models are efficient and robust against non-normality and heteroskedasticity. (Antonazzo et al. 2003)

Very little empirical research has been conducted in the UK on the labour market behaviour of nurses, while more examples of relevant work are available from North America (Antonazzo et al. 2003). Following Antonazzo et al. 2003, nursing labour supply studies conducted in North America can be divided into three different categories according to the study year: the first-generation studies (conducted in the 1970s), the second-generation studies (1980s), and work from present empirical evidence (starting in the late 1980s). These categories differ in their way of handling the above-mentioned problems of estimation. The functional forms of labour supply models have developed over the years. The first-generation studies were based on models derived explicitly from utility or indirect utility functions. In addition, the data were often old and non-working nurses were not included in the studies. Also, the number of explanatory variables was quite low. The second-generation studies showed considerable development, and their supply equations were more complete and derived explicitly from utility functions. Also sample selection problems began to be addressed by means of Heckman's procedure (Antonazzo et al. 2003).

Recent studies have used more advanced estimation techniques and larger sample sizes. Also, non-working nurses often are included in analysis, as are fixed costs of work and the possibility of intra-family bargaining (Shields, 2004). An instrumental variables approach was used to alleviate measurement errors. In measurement of abstract concepts, such as people's behaviour, there may be variables that are associated with dependent constructs but not included in the models. However – for example, in structural equation models – it is possible to reduce measurement error by including in the model multiple indicators per latent variable. In summary, significant advances in both the theoretical and econometric modelling of labour supply have been made. However, some problems remain to be solved. The lack of longitudinal data is one major challenge in development of labour supply models.

The labour supply studies are also US-dominated, which is reflective of the availability of data (Shields, 2004). For studies of physician behaviour, physician-induced demand for services and the practice patterns have been rather widely studied, but relatively few papers have addressed the supply side (Baltagi et al. 2005).

Review of the literature

Factors influencing labour supply decisions of health care professionals

In the literature review we included empirical studies of physicians' and nurses' labour supply that were published in English in scientific journals in the field of health economics. However, traditional economics literature mostly excludes non-pecuniary aspects, which have been included in our analyses. Therefore, to gain a better overview of non-pecuniary aspects, we referred to some studies outside the field of health economics.

Pecuniary factors

One's own wage

According to Adam Smith's classic work from 1776, *The Wealth of Nations*, the attractiveness of different jobs, and therefore the long-run labour supply for a profession, is related to factors such as the level of pay and the education needed to perform the job. The traditional empirical economic literature of labour supply has focused on the role of wages and other financial elements on labour force participation and hours supplied. The theoretical response of hours worked to changes in one's wages is ambiguous, depending on the relative income and substitution effects. This result has been confirmed in empirical labour supply studies. Sloan and Richupan (1975) reported a large, positive, and significant association of married nurses' wages to their hours supplied (elasticity: 2.81). However, the wage elasticity (the larger the elasticity, the stronger the response) for single nurses was far less responsive. Brewer (1996) also reported positive, significant wage elasticities for female nurses, as did Bognanno et al. (1974) and Skåtun et al. (2005) for female, married nurses. A statistically insignificant, or a significant but weak, association with hours worked was found in studies by Link and Settle (1979) (elasticity: 0.38), Ault and Rutman (1994), Chiha and Link (2003), and Phillips (1995). Depending on the estimator chosen, significant but quite small wage elasticities for nurses were also found in the panel-data analysis of Askildsen et al. (2003). These studies indicate that fairly large increases in nurses' wages would be needed to induce even small increases in hours of work. Also the type of contract under which a nurse is

engaged is important for deriving labour supply effects, because the work contracts specify working conditions and payment, including standard hours of work and monetary compensation for work outside normal hours (Askildsen et al. 2003). Shift work (the proportion of monthly income due to bonuses for working shift patterns) was found to have a statistically significant, negative impact on hours supplied (Askildsen et al. 2003) as well as on the voluntary quitting decision of nurses working in public hospitals (Holmås, 2002).

For physicians, Sloan (1975) and Thornton (1998) found a positive but small association of the individual's wage to hours supplied. Baltagi et al. (2005) reported a significant positive effect on hours, the magnitude depending on the estimation method chosen. The influence of expected earnings on physicians' speciality choice has been reported to be mixed. Sloan (1970) reported wages to affect decisions concerning choice of speciality, but the effect was small, and no positive effect on speciality choice was found in a more recent study by Thornton (2000). For example, weekly hours worked were found to be more important for speciality choice than wages also in the study of Thornton and Esposto (2003).

One of the first econometric studies of the labour supply of registered nurses was that of Benham (1971). Despite the considerable instability of results between study years, he found that rising per capita income increased nurses' labour force participation. Phillips (1995) found that wages were likely to be a powerful tool for managing the supply of nurses, at least where participation rates are not particularly high. A positive association between one's own wage and the participation decision was found in studies by Skåtun et al. (2005). However, many studies report the nurse's wage not to be significantly related to labour force participation (Bognanno et al., 1974, Chiha and Link, 2003).

The relationship between nurses' wages and voluntary turnover was found to be negative in studies by Parker and Rickman (1995), Gray and Phillips (1996), and Holmås (2002). Ahlburg and Mahoney (1996) and Frijters et al. (2007) reported the nurse's wage as having only a modest effect quantitatively on the decision to remain a nurse. The labour supply of nurses can also be measured as the number of full-time-equivalent RNs employed in hospitals, as in the study of Staiger et al. (1999), who found RN labour supply to be inelastic with respect to wage changes. The nurse's wage has also been reported to have a positive impact on his or her job satisfaction (Seo et al. 2004) and therefore to reduce voluntary quitting (Clark, 2001). A positive association between physicians' income and job satisfaction was found by Leigh et al. (2002) and Grembowski et al. (2003).

Spouse's wage and non-labour income

Other financial elements, spouse's wages, and household non-labour income have been reported to be negatively associated with nurses' hours supplied. The studies of Benham (1971), Bognanno et al. (1974), and Skåtun et al. (2005) found that spouses' wages were negatively related to RN participation. Spouse's earnings were negatively and significantly associated also with RNs' hours supplied (Bognanno et

al. 1974, Link and Settle, 1979, Sloan and Richupan, 1975) but had little influence on labour force withdrawal (Parker and Rickman, 1995).

Non-labour income has been found to reduce time spent in the paid labour force (Brewer, 1996, Link and Settle, 1979, Sloan and Richupan, 1975, Phillips, 1995). Higher levels of non-labour household income also decrease participation in the labour market (Phillips, 1995, Skåtun et al. 2005). However, Skåtun et al. (2005) found non-significant effects on hours worked with respect to partner's wage and non-labour income. Holmås (2002) analysed nurses' voluntary quitting and found spouses' income and capital income to increase exit rates, even though the effect was rather small in magnitude. For physicians, savings or other income was not significantly related to hours supplied (Thornton, 1998, Baltagi et al. 2005).

Non-pecuniary elements

The role of job satisfaction / dissatisfaction

In addition to pecuniary factors, also non-pecuniary elements, such as working conditions, work security, and overall job satisfaction have been reported to affect employees' absenteeism, productivity, or intentions to quit. Workers currently facing adverse working conditions or who are dissatisfied with their jobs have greater intentions to switch job or even stop working completely (Böckerman and Ilmakunnas, 2004, Clark, 2001). Non-pecuniary factors can influence labour supply directly but can also be elements of job satisfaction or dissatisfaction. Non-monetary elements and their association with, for example, labour turnover are subject to much study in the psychology literature (Tett and Meyer, 1993, Hellman, 1997, Lu et al. 2005), but most of these studies suffer from not including monetary factors in their analyses. The role of non-pecuniary job characteristics influencing workers' utility from work is neglected in the traditional theory of labour economics and therefore also in most empirical studies. However, models of compensating wage differentials (Lazear, 1995) broadened the model by allowing non-pecuniary aspects of factors such as working conditions to influence employees' utility from work. In these models, the worker was assumed to compare utility from wages and non-pecuniary factors when making labour supply decisions. Difficulties in measuring 'psychological' phenomena and the lack of data sources that contain information about these variables are further reasons for non-pecuniary aspects often being excluded from labour supply models (Scott, 2001).

Also, the lack of large longitudinal datasets has been a reason for economics literature examining the relationship between job satisfaction and quitting behaviour being scant (Elliot et al. 2003, Shields and Ward, 2001). Nylenna et al. (2005a) studied Norwegian doctors' overall job satisfaction by using panel data. They found doctors to have a high level of general satisfaction, but the implications of the satisfaction for labour supply were not analysed. Castle et al. (2006) studied the determi-

nants of staff job satisfaction (all nursing home staff included), but, again, the implications were excluded.

However, non-pecuniary aspects of jobs are relevant in many public-sector labour markets, where wages are nationally negotiated and cannot be altered by local public employers, while non-pecuniary aspects perhaps can (Scott et al. 2006). The labour supply can therefore be analysed also through analysis of job satisfaction or dissatisfaction, which can influence labour supply in many ways. Freeman (1978) showed that job satisfaction influences employees' voluntary quitting intentions and quantitatively may be even more important than wages. In general, the non-pecuniary aspects of the job seem important in determining nurses' attachment to it (Pudney and Shields, 2000a and 2000b). Nurses who reported a higher level of job satisfaction were more likely to remain in their current organisation (Davidson et al. 1997, Irvine and Evans, 1995). General practitioners' higher job satisfaction was associated with reduced likelihood of quitting, in studies by Sibbald et al. (2003) and Scott et al. (2006). Job satisfaction can also be related to work motivation or the number of hours supplied. Ikenwilo and Scott (2007) found that increased job satisfaction reduced hours worked by hospital consultants.

Workplace-related factors

Type of workplace (hospital, health service, nursing home, etc.) was included in the analysis in the study of Askildsen et al. (2003). They found nurses' working hours related to type of workplace. Nurses in, for example, home nursing were found to work shorter hours than those in the base category, somatic hospitals. In that study, also the workplace's geographical area was found to affect the labour supply: working hours were highest in less densely populated areas. Baltagi et al. (2005) found that doctors employed at large hospitals (measured by number of beds) worked more than others, even though the effect was partly offset by the negative effect of working at a regional hospital.

Workplace-related factors can be another aspect of job satisfaction or dissatisfaction and therefore influence labour supply. Dissatisfaction with workplace relations was reported to cause voluntary turnover among nurses (e.g. Larrabee et al. 2003, Shields and Ward, 2001), while satisfaction with relations with co-workers had a positive impact on job satisfaction of caregivers in nursing homes and thereby reduced turnover rates (Castle et al. 2006). Nylenna et al. (2005b) reported that co-operation with colleagues and fellow workers increased Norwegian doctors' job satisfaction. Nurse–physician relationships and collaboration are also reported to strongly influence nurses' job satisfaction and therefore increase retention if the relationship is not satisfactory (Manderino and Berkey, 1997, Pfifferling, 1999, Rosenstein, 2002, Larrabee et al. 2003).

Changes in physicians' job satisfaction and determinants thereof were investigated by Sibbald et al. (2000). Factors causing increased stress included others' unrealistically high expectation of the role and the work environment. Also dealing with problem patients and worrying about patient complaints were sources of stress.

Nurses' working position (staff nurse, nursing specialist, ward nurse, enrolled nurse, etc.) was found to influence working hours supplied and intentions to quit (Askildsen et al. 2003, Shields and Ward 2001). Nurses in half-time positions were reported to have higher exit rates than those in full-time positions (Holmås, 2002, Parker and Rickman, 1995). Practice setting had a significant, positive effect on work hours in the study of Ferrall et al. (1998). Working under the fee-for-service system added an average of 5.9 hours per week in direct patient care but reduced by 5.5 the total weekly hours worked.

When labour supply was analysed through job satisfaction or dissatisfaction, factors related to work conditions, such as work overload, poor career advancement opportunities, and routinisation, were found to significantly reduce nurses' satisfaction in the studies of Seo et al. (2004), and Shields and Ward, (2001). Supervisory support increased nurses' job satisfaction (Seo et al. 2004). In analysis of physicians' choice of a practice in which to work, very much the same kinds of variables as for nurses were associated with job satisfaction; for example, workload and daytime hours at work were significantly related to the choice (Scott, 2001).

Demographics

Nurses' age was found to have only a modest effect on the participation decision or hours supplied, in the studies of Link and Settle (1979), and Sloan and Richupan, (1975). However, Ault and Rutman (1994) with their single-equation approach found that age negatively affects hours worked, but hours were affected positively when sample heterogeneity was controlled for. Also, Askildsen et al. (2003) reported nurses working shorter hours as they become older, but to a diminishing extent. Gray and Phillips (1996) reported that the relationship between turnover and age was negative and statistically significant for full-time registered and enrolled nurses. Shields and Ward (2001) found that the relationship between age and intention to quit was U-shaped, with older workers being significantly less likely to report an intention to quit than those under 24 years of age. For physicians, Thornton (1998) found that age does not have a significant effect on solo-practice physicians' hours worked. However, intention to quit was found to increase with age (Sibbald et al. 2003, Scott et al. 2006).

Years of experience and tenure are mostly found to negatively influence voluntary quitting. Longer-tenured employees have firmer specific human capital invested in the organisation and thus are more reluctant to leave the organisation than those with less tenure (Holmås, 2002). Years of experience have been found to be inversely related to the probability of quitting voluntarily (Holmås, 2002).

Marital status has been reported to affect nurses' labour supply. Being single has been reported as positively and significantly associated with hours of work in studies by Askildsen et al. (2003), and positively but not significantly with participation

in the study of Phillips (2005). Married nurses were found to have a lower exit rate from nursing than unmarried nurses (Holmås, 2002), or there was no significant effect seen (Shields and Ward, 2001). However, the labour supply decision of single nurses is likely to be influenced by a different set of factors from those affecting married nurses (Skåtun et al. 2005). Therefore, in some nursing studies only married nurses are included in the analysis.

Increase in the number of young children is expected to raise a woman's reservation wage and therefore reduce likelihood of participation in the labour force. Also, given participation, mothers seem to work fewer hours than women with no children (Smith et al. 2003). Many previous economic studies have confirmed that these hypotheses are valid for nurses and physicians. The definition of 'young children' varies among the studies. Often the variable was broken down to cover the various stages of childhood – e.g., nursery-age, pre-school, and school-age children. Young children were found to have a negative but not significant association with female nurses' labour force participation (Benham, 1971) or a negative and statistically significant association (Chiha and Link 2003, Phillips, 1995, Skåtun et al. 2005). It has also been reported that young children statistically significantly reduce hours supplied (Chiha and Link, 2003, Link and Settle, 1979, Sloan and Richupan, 1975, Brewer, 1996, Ault and Rutman, 1994, Askildsen et al. 2003). Ahlburg and Mahoney (1996) reported that young children affect nurses' decision to leave the profession, but the effect was small quantitatively. Also, Holmås (2002) reported children younger than seven years not to have a significant effect on the hazard rate from nursing in the public health care sector. However, young children can reduce the labour supply of nurses also by increasing the likelihood of working part-time rather than full-time (Ault and Rutman, 1994).

Physicians with small children (including male physicians) were reported to work less than those with no children (Baltagi et al. 2005), but having children younger than 18 years was associated with reduced likelihood of quitting (Sibbald et al. 2003. Female physicians without children were reported as more likely to work full-time than their female colleagues with children. In addition, children influenced female physicians' choice of speciality. Female physicians without children were more likely to be in surgical specialities and less likely to be in primary care (Potee et al. 1999).

Ault and Rutman (1994) reported education to have either a significant, negative or an insignificant association with nurses' labour force participation but not to be significantly associated with hours supplied. Education level was found to be positively related to nurses' intentions to quit, reflecting a situation wherein the more highly educated were likely to have greater occupational mobility than the less educated (Shields and Ward, 2001).

An ethnic background other than Caucasian was reported to have a positive effect on the hours of work supplied, while it had no statistically significant association with the participation decision (Skåtun et al. 2005). Shields and Ward (2001) found that the probability of quitting was higher for ethnic-minority nurses. Racial harassment can influence job satisfaction and therefore increase nurses' intentions to quit the job (Shields and Price, 2002). For physicians, Sibbald et al. (2003) reported

that doctors from ethnic minorities were more likely than white doctors to intend to quit.

Table 2 presents a summary of the studies from the 2000s. We report on health economics studies of physicians and registered nurses in which labour supply was analysed as being a decision on participation, hours worked, or voluntary turnover. Non-pecuniary variables referred to job satisfaction or dissatisfaction as well as factors related to workplace (region, number of employees, etc.) or work conditions (position, work schedule, etc.). Factors related to workplace and work conditions were modelled as aspects of job satisfaction and job dissatisfaction in some studies.

Table 2. Summary of literature research of physicians and RNs in 2000's

	Independent variables					Dependent variable(s)
Study	**Wage**	**Spouce's wage**	**Non-labour income**	**Non-pecuniary variables**	**P/N**	
Skåtun et al. 2005	+	+	+	+	N	* Participation * Hours supplied
Chiha, Link, 2003	+	+	+		N	* Participation * Hours supplied
Askildsen et al. 2003	+	+	+	+	N	Hours supplied
Holmås, 2002	+	+	+	+	N	Voluntary turnover
Baltagi, Bratberg, Holmås, 2005	+	+	+	+	P	Hours supplied
Thornton, 2000	+		+	+	P	Speciality choice
Thornton, Esposto, 2003	+			+	P	Speciality choice
Frijters, Shields, Price, 2007	+			+	N	Voluntary turnover
Clark, 2001	+			+	N	Voluntary turnover
Sibbald, Bojke, Gravelle, 2003	+[1]			+	P	Voluntary turnover
Scott et al. 2006	+[1]	+	+	+	P	Voluntary turnover
Shields, Ward, 2001	+			+	N	* Voluntary turnover * Hours supplied
Scott, 2001	+			+	P	Choice of a practice
Ikenwilo, Scott, 2007	+	+	+	+	P	Hours supplied
Shields, Price, 2002				+	N	Voluntary turnover

P = study of physicians
N = study of nurses
+ = variable included in analysis
[1] = direct measurement of general practitioners' income from work unavailable

The Finnish health care system

The public and private sector

In Finland, public and private health care are separate in terms of funding. Most services are produced by public authorities. There were 416 municipalities on 1 January 2007, responsible for providing primary and specialist public health care services, which are mainly financed through general taxation. Municipalities can provide services themselves, form federations to run health centres together, or buy services from the private sector (Järvelin, 2002). The federations encompass particular hospital districts, and, by law, every municipality must belong to a hospital district (Linna et al. 1998), of which there are 20 in Finland (if the autonomous archipelago of Åland, which is regulated by separate legislation, is excluded). The entire population, regardless of ability to pay or place of residence, has an equal right to access public health care services. Most primary public health care (e.g., outpatient medical care, inpatient care, care for the elderly, and services for specific patient groups such as clinics for diabetes) is provided by health centres, which are owned and financed by one municipality or jointly by several municipalities (Häkkinen, 2005). Specialised medical services are provided by central or university hospitals, with the hospitals mostly owned by hospital districts. There are only a few small private hospitals.

Private health care in Finland includes mainly specialised outpatient care and is available mainly in larger cities (Järvelin, 2002). The private health care sector also offers primary and specialised health care but has an incentive to provide only those services that yield the largest revenues.

A peculiar characteristic of the Finnish health care system is the National Health Insurance (NHI) scheme, which covers all residents and is funded through taxes by the state, municipalities, employers, and the insured population. The NHI provides reimbursement for some of the same services as the tax-funded system but also services provided by the private sector (Häkkinen, 2005, Häkkinen and Lehto, 2005, Järvelin, 2002). As the NHI usually covers a certain percentage (50–75%) of the costs exceeding a fixed sum, the patient's share of the expenses is higher for private-sector services (Rissanen and Häkkinen, 1999).

Physicians' and nurses' employment

In the last few years, the total number of physicians and nurses has steadily increased (see Figure 3).

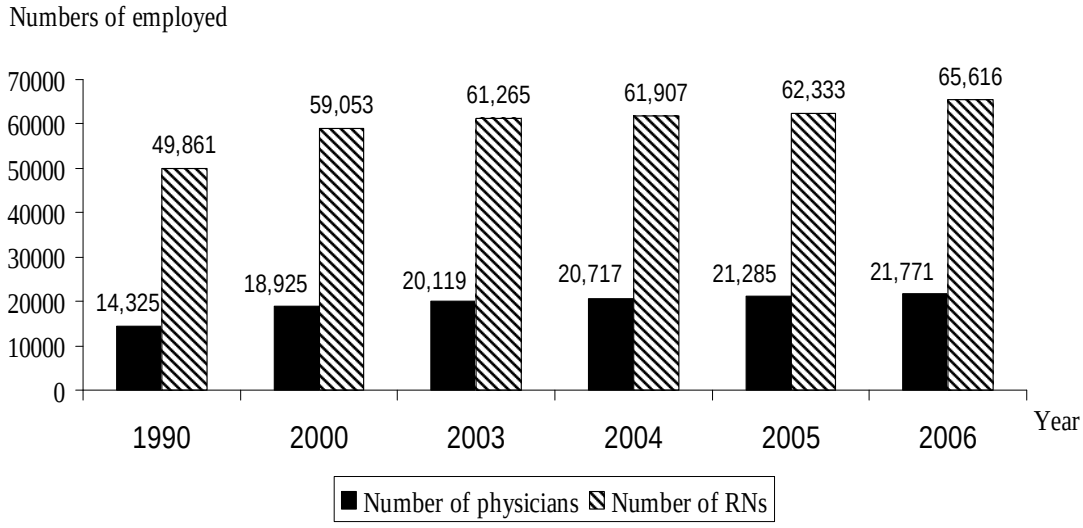

Figure 3. Numbers of licensed physicians and working-age RNs (<63 years) working in Finland. Source: Finnish Medical Association, 2007 and Statistics of Finland

Given the current number of physicians, the real supply of physicians is lower than the number in Figure 3. In 2006 (measured on 1 January 2007), the number of licensed physicians in Finland was 21,771. However, only 17,163 of them were of working age and living in Finland. It is also worth noting that many physicians from other EU countries get licensed in Finland but do not practice medicine here (Finnish Medical Association, 2007).

According to the Organisation for Economic Co-operation and Development (OECD)'s 'Health Data 2004', the density of both doctors and nurses in Finland was in line with the OECD average. In the last decade, the percentage of female physicians increased by about 10%, and it came to roughly 52% in 2007. In 2003, female physicians' mean age was 42.8 years (males: 47.0 years), and the corresponding figures for 2007 were 44.3 and 49.0, respectively (Viitamäki and Vänskä, 2003, Vänskä et al. 2007). Nursing is a female-dominated profession, and, in 2003, 92% of working-age nurses were female (National Research and Development Centre for Welfare and Health Care, 2003). In a similar manner to that of physicians, the mean age of working nurses increased: in 2003 in the public sector, the mean age was 40.2 years, and it was 40.8 years in 2007 (Commission for Local Authority Employers, 2007).

The work sectors of physicians are explored on a yearly basis by the Finnish Medical Association. In mid-March, they send a questionnaire to every Finnish phy-

sician who is not retired and whose mailing address is known. About 95% of doctors are members of the Finnish Medical Association, but the questionnaire is sent also to non-members. The response rate has been high, roughly between 80% and 90%. In 2007, the response rate was 75.8%. There has been some variation in response rates with physicians' main work sectors (see Table 3).

Table3. The main work sectors of physicians, as absolute figures and percentages.

	1993	2000	2003	2004	2005	2006	2007
Working sector	**% (number)**	**% (number)**	**% (number)**	**% (number)**	**% (number)**	**% (number)**	**% (number)**
Hospitals	46.7	48.2	47.4	47.1	46.9	47.0	47.5
	(5,816)	*(7,130)*	*(7,240)*	*(7,285)*	*(7,373)*	*(7,514)*	*(7,633)*
Public health centers	24.6	23.8	22.1	22.3	22.7	22.7	21.8
	(3,057)	*(3,529)*	*(3,372)*	*(3,443)*	*(3,564)*	*(3,623)*	*(3,510)*
Teaching and research	8.6	8.1	6.9	6.7	6.5	6.1	5.9
	(1,070)	*(1,200)*	*(1,052)*	*(1,043)*	*(1,028)*	*(978)*	*(951)*
Outpatient clinics	3.0	2.5	2.8	2.6	2.4	2.4	2.3
	(369)	*(373)*	*(420)*	*(401)*	*(384)*	*(378)*	*(372)*
Occupational health care	4.6	4.6	5.4	5.4	5.6	5.8	6.0
	(573)	*(685)*	*(826)*	*(840)*	*(886)*	*(927)*	*(957)*
Private practice	8.6	8.2	9.9	10.2	10.2	10.5	10.9
	(1,076)	*(1,219)*	*(1,507)*	*(1,574)*	*(1,611)*	*(1,682)*	*(1,748)*
Other duties	3.9	4.5	5.6	5.7	5.6	5.4	5.6
	(487)	*(671)*	*(854)*	*(883)*	*(885)*	*(869)*	*(908)*
Total	100	100	100	100	100	100	100
	(12,448)	*(14,807)*	*(15,271)*	*(15,469)*	*(15,731)*	*(15,971)*	*(16,079)*

Source: Viitamäki, Vänskä: Physician 2003, statistics and Vänskä, Kajantie, Viitamäki: Physician 2007, statistics

In 1993, 24.6% of physicians were working at public health centres, while in 2006 the percentage was 22.7%. In 1993, 46.7% of physicians worked in public hospitals, and in 2007 the figure was 47.5%. However, the absolute number of physicians working primarily in the private sector has increased considerably, over 60%, since the mid-1990s (in 1993, there were 1,076 private practitioners, and the figure had already risen to 1,748 in 2007). Physicians' other work options were teaching and research, in which 8.6% of physicians worked in 1993 and 5.9% in 2007. In 2007, 13.9% of physicians were working in other duties (in occupational health care, the pharmaceutical industry, or administrative work), whereas in 1993 the percentage was 11.5%. Physicians at public hospitals and health centres are also allowed to run a part-time private practice. About a third of the physicians with a full-time post in the public sector run a private practice as part-time physicians (Finnish Medical Association, 2007).

When we turn to RNs' work sector, we find that about 80% of RNs worked in the public health care sector in 2004, if those of retirement age were excluded. Around 8% were working in other occupations, and about 3% in administrative duties and education in the public sector. The unemployed accounted for 3%, and 7% were outside the labour force (Ailasmaa, 2007b). The percentage in health care has shown little movement since then: about 80% of RNs worked in health care in 2007 (Ailasmaa, 2007a). In 2006, 33% of the total workforce in public-sector employment worked on a rotating-shift basis (that is, 114.45 hours in three weeks), 26% had standard working hours of 38.15 hours a week, and 15% worked less than office hours (36.15 hours/week). The same work schedules were common in nursing (Commission for Local Authority Employers, 2007).

Wage-setting

There are different means of remuneration. Variable pay means tying a worker's compensation to some output-based measure of performance. In fixed payment, the worker's compensation is independent of output, often because output is difficult to measure or define, or because variations in output are affected primarily by factors over which the worker has no control (Lazear, 1995). In health care, the measurement of performance is complicated, because a major part of performance involves patients' health status improvement, which may be difficult to measure or define satisfactorily.

In the public sector in Finland, the Commission for Local Authority Employers, on one side, and trade unions of physicians and nurses, on the other, draw up national collective agreements on contractual employment of physicians and nurses. The local government sector can also make local agreements, which are concluded between local or joint authorities and a sub-organisation of the principal negotiating organisation for the employees. In recent years, the power of the local sector in decision-making has increased (Vänskä and Juutinen, 2005). The collective agree-

ments related to pay, working hours, and annual leave are usually made for a one- or two-year period (Commission for Local Authority Employers). Hospital physicians are salaried workers, and basic monthly salary depends on post and length of career. Various bonuses can be paid (e.g., for increased responsibility), but in practice they are not often used (Järvelin, 2002).

Also physicians at health centres are mostly employed as salaried workers, and they have the same payment conditions as hospital physicians for extra remuneration. Most health centres are moving toward the principle of capitation responsibility, under which a multi-profession team including, for example, a doctor and a nurse, is responsible for the care of a geographically delimited area covering 1,500–5,000 persons. In this system, a person or family is always assigned to the same health centre team and the physician will provide consultations as soon as possible, always within three days (Järvelin, 2002.).

Physicians at public hospitals and health centres who also run a part-time private practice are paid for the services rendered on a fee-for-service basis in most cases (Rissanen and Häkkinen, 1999). Wages are generally higher in the private sector than the public sector. In 2005, the average monthly income of physicians working full-time in the private sector, based on regular work hours, was about 17% higher than the corresponding figure for the public sector (Vänskä, 2006).

Figure 4 shows the development of full-time employee salaries (in euros per year, not adjusted for 2008 currency values) of physicians working at public health centres and of RNs in the public sector, as well as the mean wage of all public-sector workers. The mean wage for physicians at public health centres is based on normal working hours and extra bonuses for responsibility, tenure, medical actions, etc.

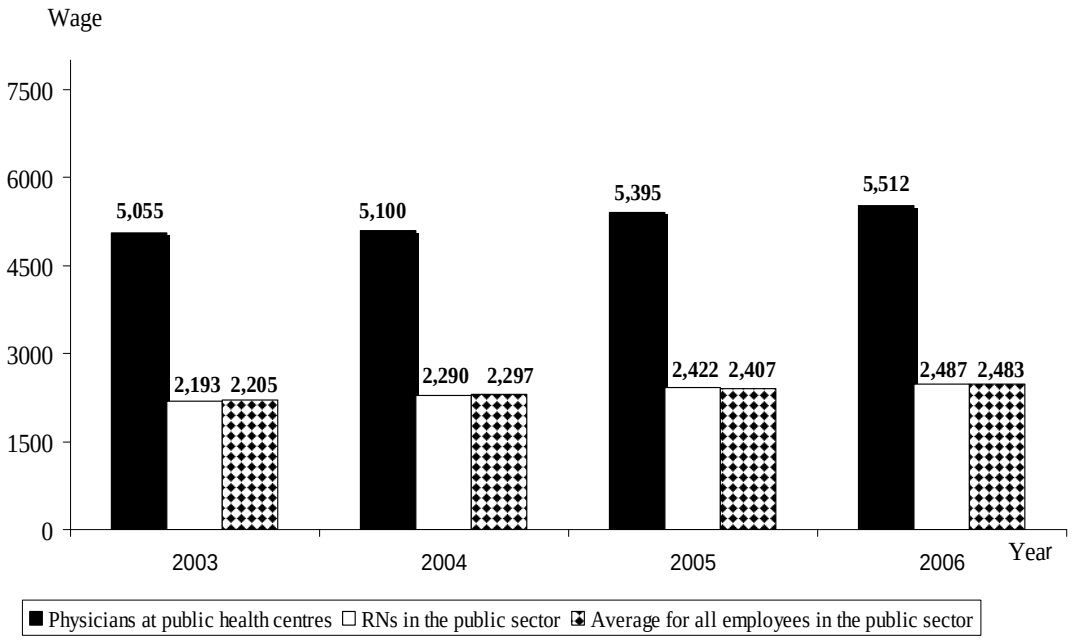

Figure 4. Mean monthly wages in euros for RNs in public health care, physicians working at public health centres, and all workers in the public sector.
Source: http://www.kuntatyonantajat.fi/

The monthly wage for nurses consists of the job-based pay (base salary), 'person-based pay', compensation for extra hours worked, and incentive pay under a goal-sharing plan. The job-based pay is determined by the collective agreement and based on an assessment of the demands of the work. In 2006, the base salary (€1,889) comprised 76% of RNs' total average salary of €2,487, and 24% was accounted for by various bonuses (€598), such as compensation for work outside normal hours. Person-based pay is determined by work experience, individual competence, and work performance (Commission for Local Authority Employers, 2005, 2006, and 2008).

Aims of the study

The main aim of the study was to determine the arguments influencing physicians' and nurses' utility as well as the association of these arguments with the supply decisions of labour in health care.

The labour supply decisions were defined as

a) a decision to participate in labour market or
b) a decision about the number of hours worked

and was also extended to

c) a decision to choose main working sector or
d) intention to voluntarily change main working sector.

The more specific aims of this study were:

1) To test the hypothesis that also non-pecuniary factors are associated with physicians' choice of main working sector as well as intention to change working sector.

2) To test the hypothesis that both pecuniary and non-pecuniary factors are associated with nurses' intentions to stay in the health care sector or to switch from health care to non-health-care roles.

3) To test the hypothesis that both pecuniary and non-pecuniary factors are associated with RNs labour market participation and hours worked.

Data and methods

Data

For the studies involving physicians (studies I and II), we analysed the data from the national postal surveys of Finnish physicians, completed at five-year intervals from 1988 to 2003 (Table 4).

Table 4. Data for studies I and II

	1988	**1993**	**1993**	**1998**	**1998**	**2003**	**2003**
Survey name	Junior Physician	Junior Physician	Senior Physician	Junior Physician	Senior Physician	Junior Physician	Senior Physician
Qualification year	1977−1986	1982−1991	1977−1981	1987−1996	1977−1986	1992−2001	1977−1991
Sample size	2,632	2,332	1,430	2,492	2,865	2,415	4,114
Number of responses	1,745	1,818	1,118	1,822	2,117	1,554	2,735
Response rate (%)	66.3	78.0	78.2	73.1	73.9	64.6	66.4

These surveys were co-ordinated by the universities of Kuopio and Tampere in collaboration with the Finnish Medical Association. A postal questionnaire was sent each year to a random sample of physicians who were registered in Finland in the years specified as 'Qualification year' in Table 4. According to their qualification year, physicians were included in either the 'Senior Physician' survey or the 'Junior Physician' survey. In attempting to minimise bias related to question misinterpretation, a highly structured questionnaire was used. There were no identification codes in the questionnaire itself, but the envelopes were numbered in order to monitor the mailing process. The researcher received only the completed questionnaires and, thus, could not identify individual respondents. (Hyppölä, 2001, Hyppölä et al. 2002).

For studies III and IV, survey data were collected in November 2005. In the previous spring, the questionnaire was piloted twice. A random sample of nurses was drawn from the registry of the Union of Health and Social Care Professionals. The Finnish questionnaire was posted to 5,000 Finnish nurses registered as having completed a nursing qualification. After two reminders, the response rate was 68.14% (n = 3,407). Some 0.01% of responses were blank or indicated unwillingness to participate in the survey. Only one response had to be excluded on account of incomplete data, and one questionnaire was sent to a deceased person. In the end, we had 3,352 completed questionnaires (Figure 5).

In addition to these survey data, statistical data for the entire population of Finnish physicians and nurses were obtained via the Finnish Medical Association, the National Research and Development Centre for Welfare and Health (STAKES), and the Union of Health and Social Care Professionals.

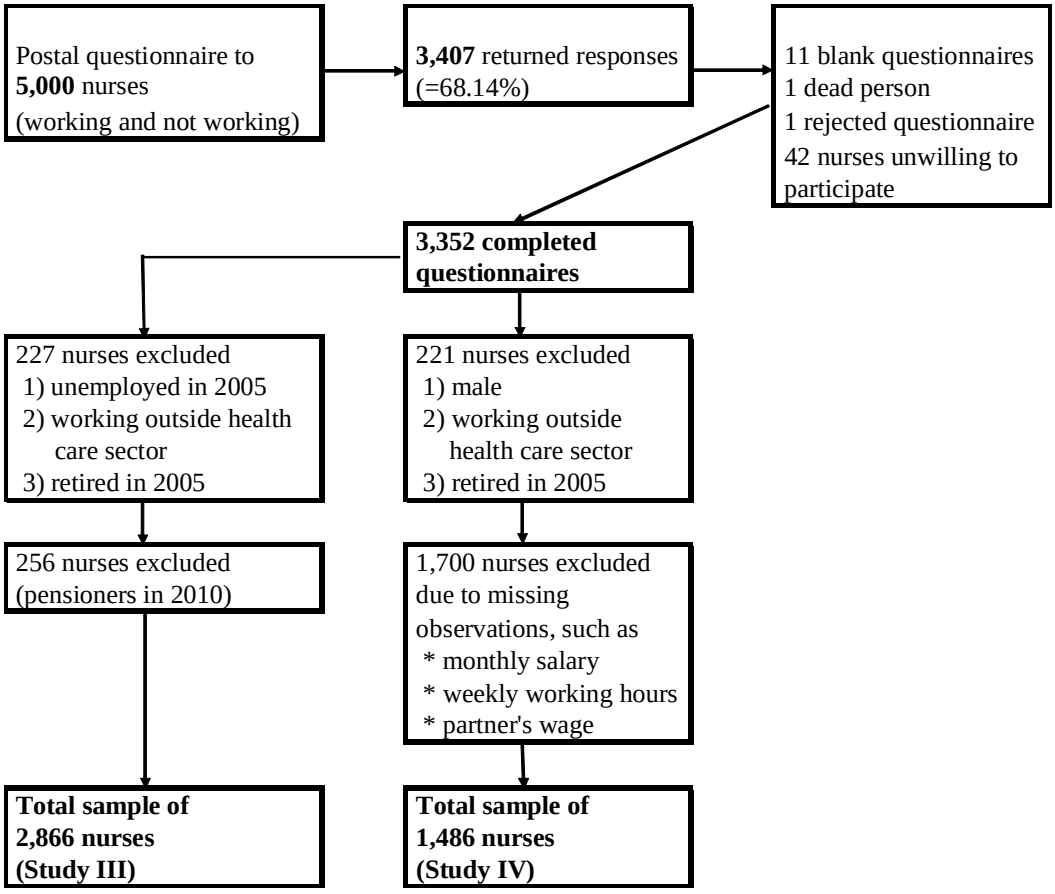

Figure 5. Flowchart of the creation of nursing study samples (Study III and IV).

Variables

In Study I, the working sector in which the physician was primarily working (dependent variable) was either the public or private health care sector. In studies II and III, possible working sectors were defined as the sector where physicians and nurses intended to work in the next five years. For physicians, the possible choices were to stay in public health care and to switch to the private sector. Nurses' possible choices were to stay in health care and move to non-health-care roles.

Economists have typically been quite sceptical about using data based on intentions. The information available to the respondent at the time of the survey can be more limited than the information he or she will possess when the relevant behaviour is determined (Manski, 1989). In addition, intention to leave the present working sector does not necessarily mean actual turnover. However, intention of turnover was found to have a medium or strong association with actual turnover behaviour

(Mobley, 1977, Rusbult and Farrel, 1983, Steel and Ovalle 1984, van der Klaauw, 2000, Sousa-Poza and Henneberger, 2004, Kivimäki et al. 2007) and can therefore be used as a proxy for actual turnover. In Study IV, the dependent variables used were monthly wage before taxes and weekly working hours. We also analysed factors influencing the decision of labour force participation.

Both pecuniary and non-pecuniary variables were used as independent variables. Importance of wage in sector choice and good income compared to workload were used as proxies for the real wage for physicians. Factors related to the choice of present workplace were assessed via this question: 'How much did the following factors affect your choice of present workplace?' The potential factors listed included wage and were assessed on a five-point scale. In the final analysis, answers were reclassified into two categories: 1) not important and 2) quite or very important.

Factors related to physicians' job satisfaction were assessed via this question: 'How well are the following aspects of job satisfaction realised in your present work?' Possible answers included good income compared to workload and were again assessed by five-point ranking: 'very poorly', 'quite poorly', 'difficult to say', 'quite well', and 'very well'. For nurses, gross taxable wage per month was used. For prediction of the wage rate if unemployed nurses were to enter nursing, a nurse's average monthly wage without extra bonuses for shift work was used and obtained from database records, including a variety of information at municipality level (from http://www.kunnat.net/). Other pecuniary variables were the proportion of total monthly income that a nurse received as compensation for shift work and spouse's gross monthly wage in euros, in the year 2005.

Non-pecuniary variables in this study included elements related to employees' work and workplace. Also job satisfaction and dissatisfaction were reported to influence employees' labour supply and therefore were included also in this study, assessed by five-point ranking. Working conditions were captured by including control variables for factors such as job status and contract type. Among factors related to workplace were main work unit and number of associates. Job satisfaction was assessed via factors related to appreciation, opportunities to progress in one's career, and workload. Job dissatisfaction included factors such as poor workplace relations, work schedule, and excessive duties.

Previous empirical labour economic literature found several demographic variables to affect individuals' labour supply decisions. Those variables, among them age, gender, marital status, number of children, and years of experience, were included in this analysis. In Study IV, only female nurses were included.

Demand-side variables were also included in the analysis, in order to assess the influence of local labour market conditions on choice of work sector. Regional dummies representing hospital districts were used as level-two variables in Study I. Hospital districts may differ in their demand for and supply of physicians. Who and how many persons are to be employed is determined at local level. Therefore, Study I incorporated control variables for number of inhabitants in the hospital district per physician. We also had a variable capturing whether there was a university hospital available, associated with densely populated areas. Finally, the age and gender distribution of the population in each hospital district were captured in the models. The

percentage of inhabitants aged ≥ 75 years and the percentage of females in each hospital district were included as demand-side variables. Also studies by Askildsen et al. (2003) and Shields and Ward (2001) included demand-side variables such as regional dummies and municipality size. In conclusion, the variables analysed in studies I–IV are presented in Table 5. In Study IV, we also analysed factors influencing RNs' monthly wage as well as labour force participation. The number of RNs outside the labour force was only 11. Therefore, the main analysis includes factors influencing hours worked, which are reported on here. In Table 5, we also show how the independent variables were assumed to influence the dependent variables. For example, variables marked with '+' were assumed in Study I to increase physicians' willingness to choose the public sector and in Study II to increase their intentions to stay in the public sector. Correspondingly, variables with '-' were assumed in Study III to decrease RNs' intentions to stay in health care and in Study IV decrease the number of hours worked.

Table 5. Variables included in studies I–IV and their assumed direction of effect on the dependent variables (- or +)

	Dependent variables			
Study I	**Study II**	**Study III**	**Study IV**	
Choice of primary working sector: public/private	Intention to change primary working sector from public to private	Intention to stay or to leave health care for non-health-care roles	Hours worked (labour force participation)	
			Studies	
Independent variables	**I**	**II**	**III**	**IV**
PECUNIARY VARIABLES				
Importance of wage	-			
Good income compared to workload		+		
Wage (monthly)			+	+
Share of income from shift work			+	
Partner's wage				-
Satisfying income compared to workload			+	
SOCIO-DEMOGRAPHIC FACTORS				
Number of children	-	-		
Number of children < 18 years of age				-
Children 3–7 (dummy representing whether the nurse has children aged 3–7)				-
Child < 3 (Dummy representing if the nurse is married/cohabiting with children)				-
Age	-		+	-
Years of experience	-	-		

continued

continued

	Studies			
Independent variables	**I**	**II**	**III**	**IV**
SOCIO-DEMOGRAPHIC FACTORS				
Marital status				
Single	+	+	-	
Married	-	-	+	
Divorced/Widowed	-	-	+	
Women * number of children (interaction term)	+			
Gender (0=male, 1=female)	+	+	+	
NON-PECUNIARY VARIABLES				
Intention to specialize	+			
Possibility for Specialisation			+	
Possibility of progressing in career	-		+	
Possibility of further education		+		
Secure living			+	
Family physician	-			
Listener	-			
Entrepreneur	-			
Appreciation by				
Colleagues in the same field	+			
Colleagues with other specialities	+			
Local decision makers	+			
Governmental health policy decision makers	+			
Generally held to be a prestigious position		+		
Generally prestigious career			+	
Workplace known prior to education	+			
Good workplace	+			
Good work community			+	
The chance to apply one's own ideas in the work		+		
Interesting work		+		
Monotonous work		-	-	
Poor employee/supervisor relations		-		
Physicians do not respect nurses equals			-	
Tense atmosphere in workplace		-		
Ungrateful patients		-		
Much paperwork			-	
Not possible to make own decisions			-	

continued

continued

Independent variables	Studies I	II	III	IV
NON-PECUNIARY VARIABLES				
Hospital district	a		a	
Availability of university hospital	-			
Percentage of inhabitants aged ≥ 75 years	-			
Position				
Nurse			+	
Midwife/nurse			+	
Immediate superior			+	
Manager in highest position/assistant manager			+	
Other			+	
Leading position		+		
Independent position		+		
Working schedule				
Day-work				+
Night work				-
Two-shift work				-
Three-shift work				-
Other schedule				-
Possibility to leisure time	-			
Excessive duties		-	-	
Tight, inflexible timetable		-		
Inconvenient work schedule		-		
Number of nurses in working unit			+	
Work unit				
Hospital/Health centre ward			+	+[2]
Outpatient department			+	+
Intensive care unit			+	+
Operating ward			+	+
Home care unit			+	+
Other			+	+
Working place				
Hospital				+
Health centre or mental health clinic				+
Long-term care of the elderly				+
Nursing home				+
Other				+

a = used as level two variable in Study I and control for local labour market conditions in Study III

[2] = defined as Ward in Study IV.

Statistical methods

Specification of utility

Nursing is a female-dominated profession; as a consequence, the majority of nurses are second-earners in the household (Shields, 2004). Therefore nurses' labour supply decisions were assumed to be based on the utility of the family, not only of the nurse him- or herself. In all studies, I–IV, we were modelling the individual's utility but it was assumed to be affected by family utility. This was done by including in the models family-related variables, such as number of children, marital status, and in studies III and IV also spouses' income.

Firstly, it was assumed that physicians and nurses will try to maximise the utility that they get from commodities, services, and leisure (Borjas, 1996). Additional purchases of consumption goods or more hours devoted to leisure activities were assumed to increase the individual's and also the family's utility. The utility function was assumed to be more complicated than in the standard labour economic analysis. In addition to the pecuniary factors, also non-monetary aspects, related e.g. to work conditions and workplace, were hypothesised to be sources of utility and thus influence labour supply decisions.

Formally, utility (U) was expressed as:

$$U_i = f(d_i Z) + u_i \qquad (6)$$

where i is an index of sector, Z is a set of explanatory variables, d is a vector of coefficients associated with Z, and u is a random error term. A worker was assumed to choose a sector i if the expected utility he or she was to gain in that sector was greater than in another sector j; i.e., $U_i > U_j$.

Our studies compared different work sectors in health care as well as non-health-care roles in nursing (Study III). Therefore we assumed that an individual will choose the sector that maximises his or her utility from monetary as well as non-pecuniary elements of the utility function. The choice was assumed to vary with the tastes and preferences of the individual making the choice. As a person's utility was assumed to affect labour supply decisions at a given point in time, our models were static.

Multilevel modelling (Study I)

Study I analysed factors influencing physicians' decisions to choose the public or private sector as their primary working sector. Preliminary analysis in the study was performed with the SPSS 11.5 program to establish the factors that could be associated with choice of working sector at the individual level. The structure of our data was hierarchical. We found some evidence of an ecological fallacy in our single-level analysis, due to the variable 'Hospital district'. If clustering is ignored in hierarchical data analysis, the variances of the estimated coefficients tend to be underestimated, leading to false rejection of H_1 hypotheses (Rodriguez and Goldman, 2001). Therefore, to get statistically robust estimate values, final analyses were performed by using the statistical technique called multilevel analysis (MLA) in the MLwiN 1.0 software package. Multilevel models are generally used for analysing data that fall naturally into hierarchical structures, consisting of multiple macro units and, within each macro unit, multiple micro units (Rice and Jones, 1997). We utilised a two-level random intercept model (Hox, 1995) where the intercept was allowed to vary across hospital districts. Level-one units (physicians) were nested in level-two units (hospital districts). We estimated the logistic multilevel model to be

$$y_{ij} = \pi_{ij} + e_{ij} = (1 + \exp(-\Sigma_p \beta_p x_{pij} + u_j))^{-1} + e_{ij} \qquad (7)$$

The probability of the i^{th} physician in the j^{th} hospital district choosing the public sector was π_{ij}. The binary outcome variable Y had value 1 if the physician chose the public sector and 0 if the choice was the private sector. Y had binomial distribution $y_{ij} \sim B(1, \pi_{ij})$. π_{ij} was the probability that $y_{ij} = 1$, and i (i = 1,…, n_i) represented individuals and (j = 1,… 20) hospital districts. The fixed part of the model was $\Sigma_p \beta_p x_{pij}$. β_o was the average intercept for the model as a whole (i.e., across all individuals and hospital districts). β_p is interpreted as the increase in the log odds of success associated with a unit increase in covariate $x_{pij.}$ The i^{th} physician in the j^{th} hospital district departs from his or her hospital district's summary line in the amount of e_{ij}. The term for hospital-district-level error was u_j, indicating that each district's summary line departs from the average by $u_{j.}$ The random effects and their variances were referred to as the random part of the model. The random errors e_{ij} and u_j were assumed to have the following properties:

$$\text{var}(u_j) = \sigma_u^2, \text{ var}(e_{ij}) = \sigma_e^2 \text{ and cov}(u_{j,} e_{ij}) = 0 \text{ for all ij.}$$

Because of our binary outcome variable, at level one a random coefficient e_{ij} was defined with a zero mean and a variance of $\sigma_e^2 = 1$. That implies that we used a binomial distribution. The intercept was allowed to vary randomly only at level two (hospital district). The data were not cross-classified, because each physician's main vacancy could be only in one hospital district. Multilevel logit models were separately estimated at each cross-sectional point (in years 1988, 1993, 1998, and 2003). As an approximation procedure, we first used a marginal quasi-likelihood procedure (MQL), and final results were obtained through a second-order penalised quasi-likelihood procedure (PQL). Both rely on the Taylor expansion to achieve the approximation (Guo and Zhao, 2000). Particularly in logistic hierarchical models, there is a scarcity of procedures testing model fit (Sturdivant, 2004). The Wald test was used for parameter testing.

Structural equation modelling (Studies II and III)

The structural equation modelling (SEM) technique was used to formulate turnover intentions in, for example, a study by Lambert et al. (2001) and was used here to formulate physicians' intentions to switch work sector from public to private, as well as nurses' intentions to stay or to leave the health care sector. The variables that in preliminary analysis with SPSS were found to be related to intentions included some that were latent in nature, such as job satisfaction and dissatisfaction. Job satisfaction is more complex than standard economic variables and requires more sophisticated analysis (Freeman, 1978). However, while regression analysis cannot define latent variables unambiguously, SEM covers a variety of modelling techniques – such as both factor and regression analysis – thus serving as a powerful analytical tool that takes into account elements such as non-linearities and correlated independents as well as measurement errors. One advantage of the SEM approach is the possibility to also test models rather than individual coefficients. Especially when one tries to measure such abstract elements as people's behaviour, measurement models are important; therefore, they were used in these studies.

We analysed the difference between the population (sample) covariances and the covariances predicted by the model. Formally formulated (Bollen, 1989) as:

$$\Sigma = \Sigma(\theta) \qquad (8)$$

where Σ denotes the matrix of observed covariances in the sample and θ is a vector of model parameters. The purpose of the modelling is to minimise the difference between the sample covariance matrix and the model covariance matrix so that Equation 8 holds with some acceptable statistical precision. Structural equation models include two components: a measurement and a structural model. The measurement model relates observed responses or indicators to latent variables. The structural model specifies relationships among latent variables and regressions of latent

variables on observed variables (Skrondal and Rabe-Hesketh, 2005). The measurement models (equations 9 and 10) and a structural equation model (Equation 11) can be formulated thus:

$$x = \Lambda_x \xi + \delta \quad (9)$$

$$y = \Lambda_y \eta + \varepsilon \quad (10)$$

$$\eta = B\eta + \Gamma\xi + \zeta \quad (11)$$

In these three matrix equations, Λ_x and Λ_y are factor loadings and δ, ε, and ζ are measurement error terms. The SEM calculation includes two types of latent variables: exogenous (ξ) and endogenous (η). Exogenous variables are independent variables in all equations in which they appear, while endogenous variables are dependent variables in at least one equation. Observed variables that are associated with exogenous variables are labelled with '*x*', while those associated with endogenous variables are labelled with '*y*'. Matrix B includes estimates related to η, and matrix Γ represents relationships between ξ and η. A confirmatory factor analysis (CFA) was conducted via LISREL 8.7 (Jöreskog and Sörbom, 1993a and 1993b). To obtain parameter estimates, we used the generally weighted least squares (WLS) estimation technique. In SEM models, standardised structural coefficients are used to judge the relative importance of independent variables. If the coefficient is, let us say, 0.60, the latent dependent variable increases by 0.60 standard units for each unit of increase in the latent independent.

Heckman selection, ordinary least squares, and tobit models (Study IV)

One major methodological issue in labour supply models is sample selection bias, which can occur when hours of work supplied are observed only for those employees who have made the decision to work. Therefore, the sample of workers on which the analysis is based may not be a random sample of all individuals (working and non-working). Heckman's sample selection models are widely used in labour economics and take into account sample selection bias.

Following Dow and Norton (2003), certain criteria influence the choice between Heckman sample selection and other methods. Firstly, the outcome variable can be defined to measure a potential or actual outcome. The actual outcome is fully observed. An example of actual outcome could be health expenditure, where values of zero indicate that zero euros was spent. If many observations have zero values, the econometric challenge is to model these corner solutions. As long as the zero values are true zeroes, not missing data, there is no selection problem to address.

By contrast, a potential outcome is a latent variable, only partially observed. The non-zero values are assumed to be true observations of the potential outcome, but zero values indicate observations for which the potential outcome is missing (la-

tent). Thus, the zeroes do not represent zero values for the potential outcome. Labour economists, who developed the Heckit model, are generally interested in the potential wage. Observations without positive wage outcomes do not imply that an individual worked for zero wages. Instead they indicate that the potential wage is unobserved.

We estimated a static labour supply model for registered nurses that includes both pecuniary and non-pecuniary factors affecting nurses' decisions on labour force participation as well as hours supplied. It was assumed that the error terms of the two equations came from a bivariate normal distribution, which allowed for a correlation between the two error terms and therefore the possibility of sample selection bias.

The Heckman models consisted of two equations. The first was a probit-type equation predicting whether or not somebody was working. The following, second equation was a linear regression equation conditional on the individual working (Jones, 2005), predicting, for example, monthly wage or hours supplied. Heckman procedure suggests that, before running OLS estimation on the working sample of individuals, we add λ_i (λ_i = IMR, inverse Mill's ratio) as a regressor to the hours equation. λ_i is a monotone decreasing function of the probability that an observation is selected into the sample (Heckman, 1979). In the case of the selection model, in order to distinguish the decision regarding participation in the labour market from the decision on hours worked, it is necessary to have variables that enter the participation decision but not the hours decision. If such variables cannot be found, separate identification depends on the non-linearity of the extra term (IMR), which appears in the participation decision equation (Madden, 2008). The probability that a nurse *i* works was expressed as

$$\Pr(\text{i works}) = \Pr(W_m > W_r) \qquad (12)$$

where W_m equals real market wage and W_r the real reservation wage. The market wage (in Equation 13) and reservation wage (in Equation 14) were expressed as:

$$W_m = \beta_0 + \beta_1 S_i + v_i \qquad \text{regression equation} \qquad (13)$$

$$W_r = \beta_0 + \beta_1 Z_i + \beta_2 I_i + e_i \qquad \text{selection equation} \qquad (14)$$

where S_i and v_i represent vectors of observable and unobservable human capital characteristics affecting the market wage, such as higher degree qualifications, experience as a nurse, and factors related to the nurse's work and workplace. Z_i represents a vector of individual characteristics (e.g., number of children and marital status), and I_i represents non-labour income such as spouse's wage. If a nurse chose

to work, supply of hours, H_i, was determined by the equality of the market wage and the marginal rate of substitution between consumption and leisure. If the market wage exceeded the reservation wage, hours of work could be presented via the same terms as in Equation 14 as well as characteristics related to nurses' work and workplace:

$$H_i = \beta_0 + \beta_1 Z_i + \beta_2 I_i + \beta_3 J_i + \beta_4 C_i + e \quad \text{if } W_m \geq W_r \quad (15)$$

where J_i represents a vector of work-related characteristics, such as nurses' position or working schedule, whereas C_i includes factors like workplace and work unit. If the market wage was below the reservation wage, hours of work came to zero. The participation decision was assumed to be influenced by factors related to household composition, the geographic region in which the nurse was living or working, and personal variables for the nurse.

We adopted the full information maximum likelihood (FIML) estimation procedure. The FIML estimator is recommended because it is usually more efficient than the limited information maximum likelihood (LIML) estimator (Puhani, 2000). However, problems with FIML estimation can arise with, for example, inconsistent standard errors (Nawata, 2004). FIML recognises that hours of work supplied were observed for only nurses who had already made the decision to work.

If collinearity problems prevail in estimation of a Heckman sample selection model, OLS (or the two-part model) is the most robust of the simple-to-calculate estimators (Puhani, 2000). In our analysis, also a single-equation model, linear OLS, was applied. The advantage of OLS is that it allows direct computation of the primary effect of interest, the marginal effect of one covariate on a dependent variable (Dow and Norton, 2003). However, there is evidence that OLS analysis of censored data leads to downward-biased estimates, the reason being that the analysis is based only on a sample that is unrepresentative of the population of interest. As in the work of Madden (2008), the extent of collinearity was examined by regressors' value of variance inflation factor (VIF). A sufficient condition for the presence of collinearity is a high VIF value (> 30). The VIF for any regressor is given by VIF = $1/(1-R_i^2)$, where R_i^2 is the multiple correlation coefficient of X_i regressed on the remaining explanatory variables (Madden, 2008). Finally, the hours equation was analysed via a tobit model.

In summary, because of advantages and disadvantages related to different methods of analysis, several techniques were applied, for obtaining a robust range of estimate values.

Results

Descriptive variables

Samples of physicians were representative of the basic physician population in their age and gender in 1988–1998 (Hyppölä, 2001) and 2003 (Vänskä et al. 2005). According to the Union of Health and Social Care Professionals, 93.5% of the members were female in 2004. The mean age of RNs was 41.7 years (Markkanen et al. 2005). Thus, the nursing sample was also representative of the nurse population in that registry, in terms of age and gender. Table 6 represents descriptives of those physicians mainly working in the public sector (Study I) as well as of physicians in primary public health care (Study II). Figures for registered nurses represent those working in health care (Study III).

In 1988, 93.5% of physicians in the sample were working in the public sector. In 2003, the percentage had decreased to 79% (according to Study I). Study II indicates that the percentage of physicians in primary public health care also decreased. In 1988, 39.1% of doctors were employed in primary public health care, whereas in 2003 the percentage was 29.0%. Table 6 shows that the percentage of female physicians in the public sector increased from about 50% to more than 60% in 1988–2003. The same holds for the mean number of years of experience, which increased from seven to around 14. Most of the physicians (each year over 80%) were married. The usual number of children in a family was two or ≥3. The figures for physicians in the private sector differed slightly from those for physicians in the public sector (Study I). Physicians in the private sector were more experienced than those in the public sector. In 2003, the mean number of years of experience in the public sector was 14 and in the private sector was 18. In public health care, the percentage of female doctors was about 5% higher than in the private sector. There were no remarkable differences in marital status between the sectors. In 2003, in the public sector the percentage of physicians with no children was almost twice as high as in the private sector.

Table 6. Descriptive statistics of physicians and RNs.

	1988 physician study		1993 physician study		1998 physician study		2003 physician study		2005 nurse study
	I[1]	II[2]	I[1]	II[2]	I[1]	II[2]	I[1]	II[2]	III
Sample size	1,392	838	2,261	1,479	3,228	1,817	3,474	1,950	2,866
Proportion of all physicians in sample	93.5	39.1	93.5	42.7	85.3	35.0	79.0	29.0	
Females (%)	49.9	53.0	53.1	57.5	58.5	64.3	60.4	66.5	93.9
Mean number of years of experience	7.0	7.0	10.0	9.7	12.0	12.4	14.0	14.2	12.69
Marital status (%)									
Single	12.1	9.7	12.6	10.2	11.2	7.2	9.0	5.4	10.7
Married	84.8	88.1	83.6	85.0	83.5	86.9	83.5	86.0	78.7
Divorced	3.6	2.2	3.8	4.4	5.3	5.2	7.5	7.9	10.6
Widow/ Widower				0.5		0.7		0.7	
Number of children (%)									mean 2.22
0	24.1	15.6	11.1	8.0	3.3	2.7	15.7	10.3	
1	20.2	20.5	19.5	15.5	18.3	14.3	13.5	13.6	
2	35.2	37.8	38.2	38.5	41.2	42.3	36.3	36.9	
≥3	20.5	26.1	31.2	38.0	37.2	40.7	34.5	39.2	

[1] = figures for physicians working in the public sector
[2] = figures for physicians working in primary public health care

For nurses currently working in health care, the mean number of years of experience was 12.69 in 2005 (Study III), slightly lower than that of physicians in the public sector. Most nurses (78.7%) were married. and their mean number of children was 2.22.

We also analysed factors influencing working hours of those nurses currently working in health care (Study IV); only female nurses (n = 1,486) were included in that analysis. Their mean age was 42 years (std. dev.: 9.47) and mean experience in the nursing profession 13.8 years (std. dev.: 9.33). In Study IV, 38% of nurses were 46 years of age or over, and 28% were ≤ 53 years old. About 80% of RNs were married or cohabiting and had children. The mean number of children < 18 years of age was 1.08 (std. dev.: 1.14).

Voluntary turnover in our study was defined as nurses' intentions to voluntarily leave the health care sector in the next five years. About 5.3% of nurses intended to leave health care within the next five years (Study III). In international comparison, this percentage is quite low, but in the Finnish context it is high, because of already existing recruitment problems.

For physicians, the time period was the same, but their intentions concerned willingness to change their present work sector from public health care to private (defined with the subgroup 'Quitter' in figures 6 and 7). In 2003, 20.5% of physicians (in primary and secondary public health care) were planning to change sector from public to private, whereas in 1988 the figure was 6%. We also were interested in seeing whether there were differences in intentions to change sector between physicians working in primary and secondary public health care; see figures 6 and 7.

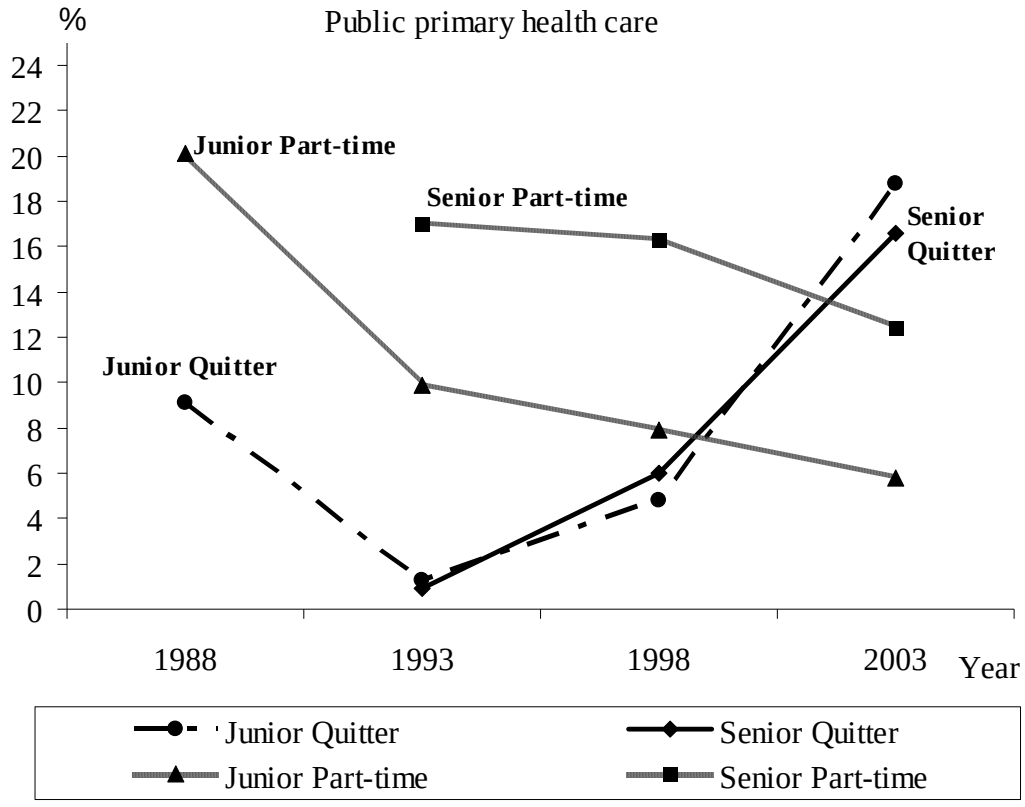

Figure 6. Percentages of 'Quitters' and 'Part-time' private practitioners in public primary health care, 'Junior' and 'Senior' subgroups.
Definition of 'Junior' and 'Senior' physician is as in Table 4.

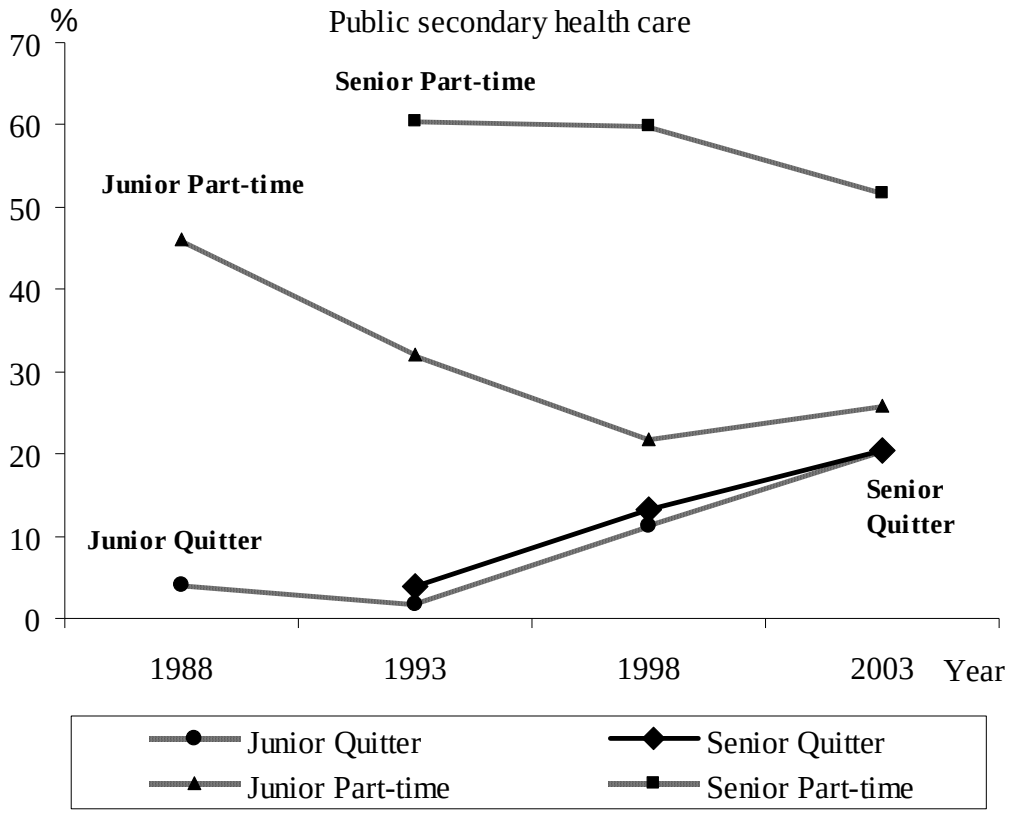

Figure 7. Percentages of 'Quitters' and 'Part-time' private practitioners in public secondary health care, 'Junior' and 'Senior' subgroups

From 1993, intention to change sector to private health care increased in all study years, both in primary and in secondary public health care. In 2003, the percentages of 'Quitters' among junior and senior physicians were the same in secondary public health care. However, in primary public health care, the percentage was greater in the 'Junior' subgroup, at 18.8% ('Senior': 16.6%).

When the percentage of those with intentions to change sector increased, the percentage of part-time practitioners decreased between 1988 (17% in the 'Senior' subgroup) and 2003 (12.4% in the 'Senior' subgroup). The part-time practitioner subgroup included physicians whose primary working sector was public but who also were running part-time private practices (see figures 6 and 7). Except in 1988, part-time practice and intentions for sector change were less prevalent in the primary public health care subgroup than in secondary public health care.

Factors related to labour supply decisions

Latent factors

Latent factors (including both pecuniary and non-pecuniary components) influencing physicians' and nurses' labour supply decisions were studied by means of structural equation models (studies II and III). Job satisfaction and dissatisfaction were hypothesised to influence voluntary turnover: physicians' willingness to change from public to private health care sector and nurses' intentions to leave health care for non-health-care roles or to stay in health care. In Table 7, we report the overall impact of latent factors 'Work', 'Job satisfaction', 'Job dissatisfaction', and 'Socio-demographic factors' on physicians and nurses' intentions to change sector. For studies of physicians we also included the latent variable 'Private practice', which determined the impact of part-time private practice on the physician's absence from primary employment in the public sector.

Increased job satisfaction decreased physicians' intentions to change sector from public to private health care statistically significantly in all study years, except in 1998. Job dissatisfaction influenced intentions to leave statistically significantly only in 1988. The latent variable 'Private practice' increased intentions to leave the public sector in 1998 and 2003. Socio-demographic factors had both direct and indirect effects on physicians' intentions to change sector. Direct effects were statistically significant in all study years except 1998. Indirect effects on 'Private practice' and 'Job satisfaction' were statistically significant in all study years, except for effects on 'Job dissatisfaction' only in 1993.

All latent variables also had statistically significant influence on RNs' intentions to remain in or leave the health care sector. The variable 'Work' was included only in the nursing study (Study III), and its increased values were associated with greater intention to leave health care. Decreased job dissatisfaction increased nurses' willingness to remain in the health care sector. More detailed interpretation of the indicators of latent variables is offered in the following sections.

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Table 7. Factors related to physicians' (year 2003) and nurses' (year 2005) sector change, results of SEM model.

	physician study		**physician study**		**physician study**		**physician study**		**nurse study**	
	1988		**1993**		**1998**		**2003**		**2005**	
Latent factors related to intentions to leave	**Estimate**	**The t-test value**	**Estimate**	**The t-test value**	**Estimate**	**The t-test value**	**Estimate**	**The t-test value**	**Estimate**	**The t-test value**
WORK									0.24	**5.35**
Intention to leave [d]										
JOB SATISFACTION	-0.44	**-4.25**	-0.62	**-4.38**	-0.01	-0.08	-0.47	**-5.32**	-0.47	**-5.54**
Intention to leave [d]										
JOB DISSATISFACTION	0.29	**3.80**	-0.10	-0.77	0.10	0.91	-0.14	-1.77	0.23	**4.15**
Intention to leave [d]										
PART-TIME PRIVATE PRACTICE	-0.12	-0.01	-0.21	-1.22	0.51	**3.33**	0.40	**8.11**		
Intention to leave [d]										
SOCIO-DEMOGRAPHIC FACTORS										
Intention to leave [d]	0.58	**4.43**	0.84	**4.53**	-0.26	-1.35	-0.14	**-3.86**	-0.20	**-13.69**
Work-related factors [in]									0.33	**17.29**
Job-satisfaction-related factors [in]	0.27	**5.03**	0.31	**5.94**	0.52	**10.63**	0.18	**5.51**	-0.05	**-2.87**
Job-dissatisfaction-related factors [in]	-0.06	-1.19	-0.20	**-3.80**	-0.08	-1.94	-0.04	-1.36	-0.18	**-11.83**
Private practice [in]	0.61	**11.37**	0.71	**13.25**	0.73	**18.22**	0.48	**14.47**		

[d] = direct effect on intention to leave

[in] = indirect effect on intention to leave

statistically significant association in bold (t-test value $\geq |1.96|$)

Pecuniary factors

Pecuniary factors influenced both physicians' and nurses' labour supply decisions, as hypothesised. The labour supply in this analysis had four dimensions. Firstly, labour supply referred to physicians' sector choice. The variable 'Importance of wage' was negatively and statistically significantly related to physicians' choice of the public health care sector in all study years. In addition, the odds ratio declined over the years, from 0.322 in 1988 to 0.181 in 2003, except in 1998, when it slightly increased (0.238). Therefore, the negative impact of that variable in choice of the public sector increased over the years.

Secondly, labour supply indicated intentions of voluntary sector change. 'Good income compared to workload' was modelled to influence physicians' job satisfaction and therefore intent to move from public to private health care. It was found to increase job satisfaction statistically significantly and therefore decrease intentions to change sector from public to private for those physicians who had first chosen the public sector as their primary working sector. The estimate had its highest value in 1988 and 1993 (0.62) and the lowest in 1998 (0.50). In 2003, the impact of good income compared to workload on intention to change sector again increased.

Pecuniary factors were indicators of the latent variable 'Work' (Study III). The estimated coefficient of RNs' own taxable wage was -0.21, decreasing the value of the variable 'Work' by that amount. According to our results, a nurse's taxable wage increased his or her intention to remain in health care. We also measured the share of income from shift work. An increased share of shift work (estimate value: -0.50) decreased intent to leave health care for non-health-care roles and was even more statistically significant a factor than wages.

Another variable measuring financial aspects of nurses' utility function, 'Satisfying income compared to workload', was modelled to affect nurses' job satisfaction. That variable was a statistically significant indicator of job satisfaction and had the highest estimate value (0.63). Therefore, the more satisfied a nurse was with his or her salary, the more satisfied he or she was with the job and thus the less the intention to change career to non-health-care roles.

Thirdly, labour supply referred to hours worked. Higher wage increased the weekly working hours supplied by female nurses. The elasticity of hours worked with respect to an RN's own wage was 0.48. Therefore, the positive substitution effect outweighed the negative income effect, and by increasing wages by 10% weekly working hours could be increased by 4.8%. In analysis of the influence of shift work on hours supplied, it was measured by a variable indicating working schedule. Regular night work and three-shift work had a negative and significant association with hours worked, when regular day work was defined as the base category. Spouses' wage was available only for nurses. It reduced hours worked statistically significantly, but the estimate value was almost zero.

When we studied labour market participation decisions for RNs currently not working, imputed wage, measuring the reservation wage, was positive and statisti-

cally significantly associated with the participation decision. However, the marginal effect of wage on participation was quite low, 0.01. Therefore, by increasing wages 10%, the probability of RNs entering the labour market increased 0.1%. Spouse's wage was statistically insignificant with respect to nurses' labour market participation decisions. In interpreting the results of participation, it must be remembered that we had only 11 responses from unemployed nurses in our data.

We also analysed factors influencing nurses' wages (Study IV). The variable 'College-level education' behaved as expected from the theory. If a nurse had a college-level education, the wage increased statistically significantly (coefficient of Heckman model: 0.0275). Variables measuring shift work, such as 'Night work' (0.1503) or 'Two-shift work' (0.0489), were all statistically significant and increased the wage from that of nurses working under normal hours. Wage increased also with seniority. Regional dummies had an impact on a nurse's wage. The Helsinki and Uusimaa district was modelled as a base category, and wages outside that area were usually lower. A full-time contract (0.2941) tended to increase wages from the wage levels of nurses working with a part-time contract. Workplace and unit also had a significant influence on wages. Nurses working in intensive care units (0.0363) usually had higher wages than those working in wards. Nurses at health centres, at mental health clinics, or in care of the elderly, in general, had lower wages than nurses working in hospitals.

Some earlier studies (Buerhaus, 1991; Chiha and Link, 2003) suggested that unmarried RNs were subject to a backward-bending supply curve; i.e., hours supplied decrease as wage increases. To analyse the situation in Finnish nursing labour markets, we firstly constructed two groups: married/unmarried RNs with children and married/unmarried RNs without children. Hours worked were analysed separately for each group. Secondly, hours supplied were analysed in three different age groups. However, no evidence for a backward-bending supply curve was found in these groups.

Non-pecuniary factors

Our results show that non-pecuniary factors were also related to physicians' and nurses' labour supply decisions. The element 'Workplace-related variables' influenced physicians' sector choice. If a physician was familiar with his or her workplace before completing medical studies, he or she tended to choose the public sector as primary working sector (Study I). This result was confirmed in every cross-section study year – i.e., for 1988, 1993, 1998, and 2003. The impact of knowing the workplace before graduation was highest in 1993 (odds ratio 6.025) and lowest in 1998 (3.432). In 2003, the impact increased, the odds ratio being 4.166. We also had control variables for physicians' identity. If a physician considered him- or herself an entrepreneurial type, he or she usually preferred the private sector as primary working sector, in all study years. In years 1993, 1998, and 2003, physicians who were the listener type mostly chose the private sector. Other elements influencing

physicians' sector choice varied from year to year. In 2003, appreciation by colleagues in the same medical field increased probability of choosing the public sector as main working sector (OR 1.513). In 2003, other variables that increased choice of the public sector included 'Possibility to progress in career' (OR 1.372) and 'Good workplace' (OR 2.199).

Job satisfaction was assumed to influence physicians' voluntary turnover. In 1988, 1993, and 2003, it was statistically significantly influencing physicians, whereas job dissatisfaction had a statistically significant impact only in 1988, as was shown in Table 6. Therefore, in Figure 8 we report estimated coefficients of measurement models of factors related to physicians' job satisfaction.

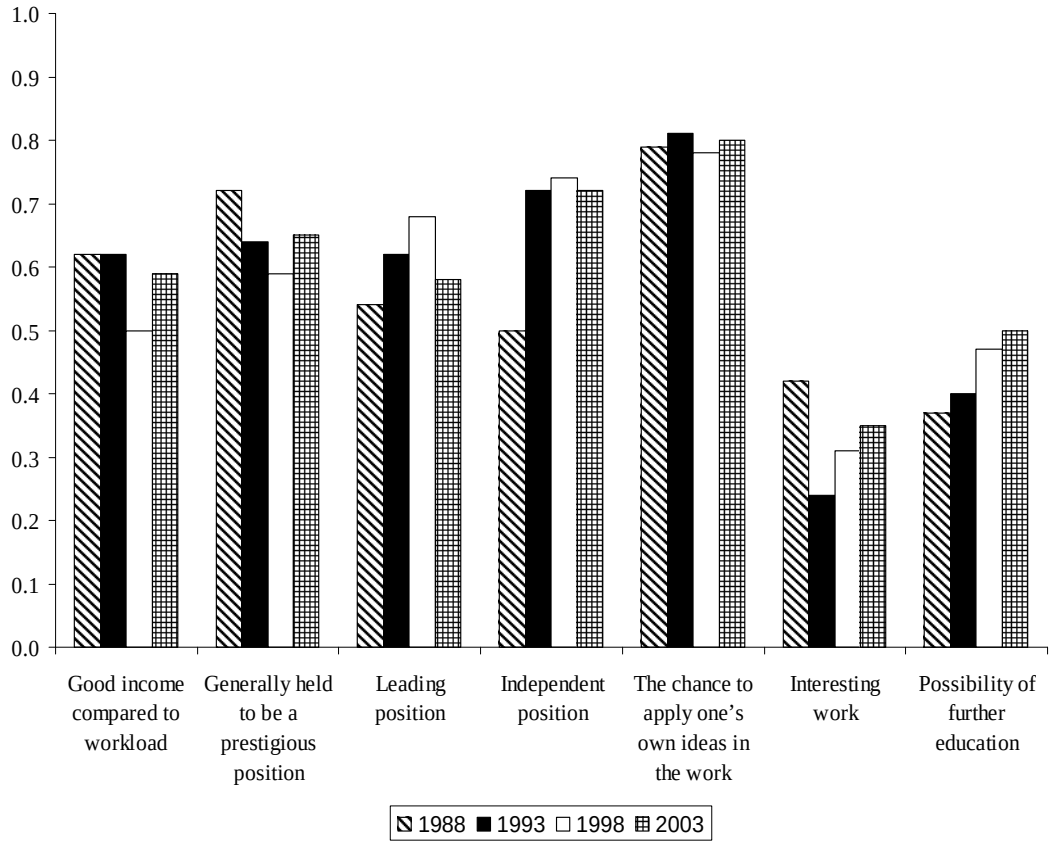

Figure 8. Factors related to physicians' job satisfaction, estimated coefficients of measurement models (standardised values).

All variables presented in Figure 8 gained statistical significance in all study years. The variable 'The chance to apply one's own ideas in the work' gained highest estimate value in 2003, as also in years 1988, 1993, and 1998. It increased physicians' job satisfaction and therefore decreased intention of sector change. The impact of 'Independent position' stayed quite the same over the years (estimate value 0.72–0.74), except in 1988 (0.50). 'Interesting work' (estimate values varying be-

tween 0.24 and 0.42) and ‘Possibility of further education’ (0.37–0.50) had the lowest estimate values in all study years. Among aspects of job dissatisfaction, the variable ‘Monotonous work’ gained highest estimate values in all study years, at their highest in 1993 (0.70) and lowest in 2003 (0.62). Also, ‘Tight and inflexible timetable’ as well as ‘Poor employee/supervisor relations’ and ‘Tense atmosphere in the workplace’ increased physicians’ job dissatisfaction and therefore willingness to move to the private sector. However, the impact of these variables varied from year to year.

Job satisfaction and dissatisfaction were hypothesised to influence also RNs’ intentions to remain in health care or leave the field. Both gained statistical significance, and therefore the impact of indicators of job satisfaction and dissatisfaction is reported upon in Figure 9.

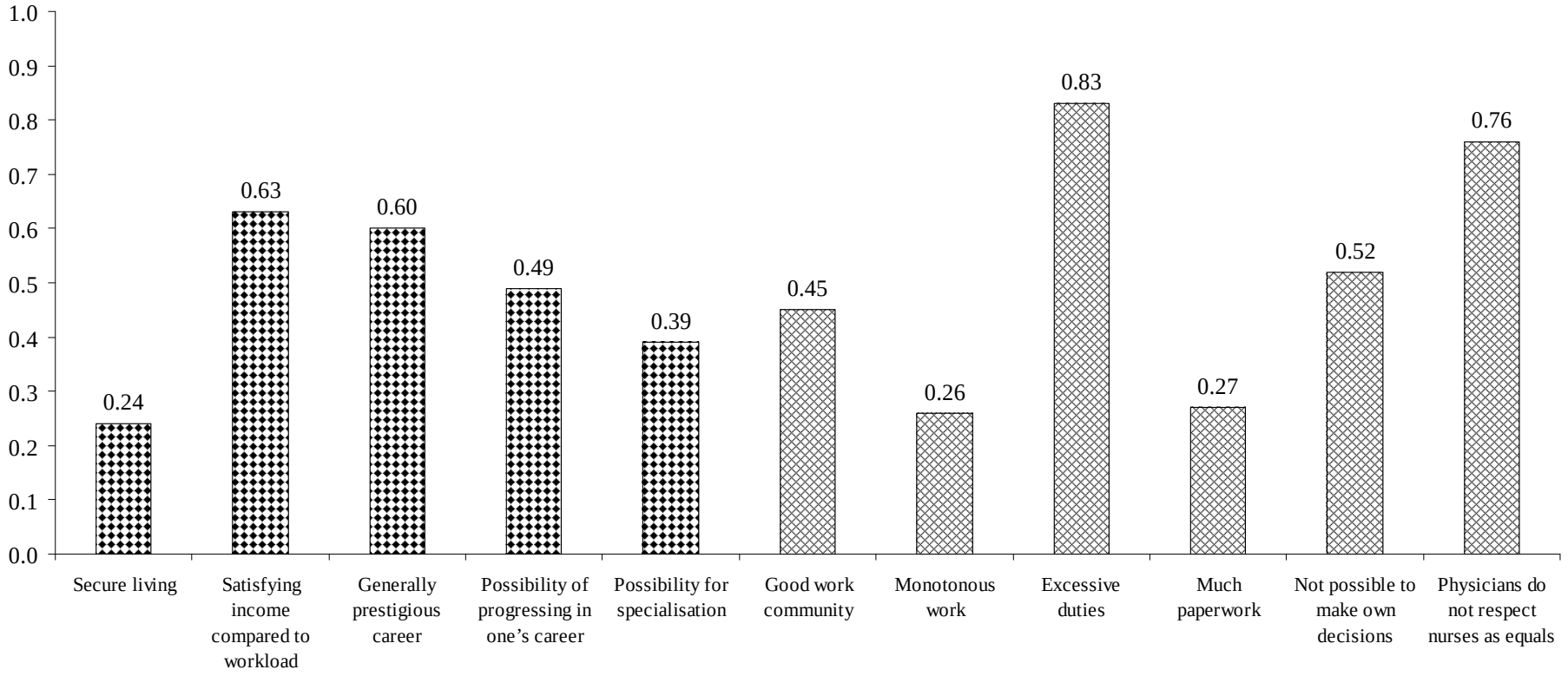

Figure 9. Factors related to nurses' job satisfaction (variables from 'Secure living' to 'Possibility for specialisation') and dissatisfaction (variables from 'Much paperwork' to 'Physicians not respecting nurses as equals'), estimated coefficients of measurement models, with standardised values for 2005.

The first five columns in Figure 9 present variables related to RNs' job satisfaction and the rest of the columns those related to job dissatisfaction. The variable 'Generally prestigious career' increased nurses' job satisfaction statistically significantly. Of the factors related to job satisfaction, this variable had the second highest estimate value, 0.60. Other variables increasing nurses' job satisfaction and therefore willingness to stay in health care included 'Possibility for specialisation' and 'Possibility of progressing in one's career'. The variable 'Physicians not respecting nurses as equals' had a high estimate value and gained statistical significance. However, only 14.5% believed the variable to express reality. Therefore, we found no strong evidence of poor relations between physicians and nurses and therefore decreased job satisfaction stemming from this. If nurses were not allowed to make their own decisions, they were more dissatisfied and more willing to leave the health care sector. Job dissatisfaction increased also if nurses had to do a large amount of paperwork.

Non-pecuniary factors influenced working hours supplied by nurses (Study IV) also. Compared to the base category 'Wards', generally longer hours were supplied by those in the 'Outpatient departments' (estimate of Heckman model 0.0372), 'Operating rooms' (0.0350), or 'Home care' (0.0318) category. Also 'Old people's home' increased hours supplied (0.0365). Impact of shift work was captured in the analysis by variables indicating working schedule. Nurses doing regular night work (-0.1614), two-shift (-0.0152), and three-shift work (-0.0174) worked fewer hours than nurses in regular day work (the base category).

Demographic factors

Demographic factors influenced both physicians' and nurses' labour supply decisions. We included in our analysis the main demographic variables identified in the literature: gender, age, years of experience, marital status, and number of children. Demographic variables had no impact on physicians' sector choice, except in 1993, when female doctors preferred the public sector. In studies II and III, demographic variables comprised one latent variable. In 1988, 1993, and 2003, latent variable demographics (including years of experience, marital status, number of children, and gender) influenced physicians' intentions to change working sector from public to private. In addition to a direct effect, demographic variables had indirect influence on intentions to change sector, via job satisfaction, dissatisfaction, and private practice.

In Study III, demographic factors included age in years, gender, and marital status. They influenced also nurses' intentions to leave the health care sector. Besides intentions to switch sector, demographic variables were related to nurses' working hours. The number of weekly working hours was reduced if a nurse had children aged two years or younger (Heckman selection model estimate -0.0272) as well as children 3–7 years of age (-0.0303). The supply of hours of nurses in the age

groups 36–45 years (-0.0592) and 46 years or over (-0.0687) was lower than that for nurses of age 35 or lower (the base category).

Discussion

Factors influencing labour supply

According to the framework for social and health care services for 2008–2011, a central objective is to ensure that services can be provided to the entire population, regardless of factors such as individuals' place of residence. To be able to meet this objective, actions to ensure an adequate supply of health care professionals' labour is set to be among the most important priorities in Finland (Ministry of Social Affairs and Health, 2007 and 2008). Therefore, it is essentially important to identify which factors influence physicians' and nurses' labour supply decisions, and how.

The economic literature has traditionally focused on analysing how financial factors influence labour supply, but non-pecuniary aspects are widely ignored, partly because of a lack of appropriate data. Psychological studies have focused on non-pecuniary factors and how they may influence variables such as job satisfaction. However, in psychological studies, an employee's labour supply responses to the level of job satisfaction and dissatisfaction are mostly ignored.

In this study, physicians' and nurses' labour supply decisions were analysed on the basis of the theory of an individual's utility maximisation, which was applied also, for example, in the studies of Shields and Ward (2001) and Ikenwilo and Scott (2007). The basic labour supply analysis of the components of utility function includes consumption and leisure, and the utility gained is assumed to depend on an individual's preferences. Therefore, depending on these preferences, utility gained from consumption of goods can differ completely between individuals. Factors that are essential aspects of one individual's utility function might have no influence in another person's utility. The theory allows inclusion of a variety of elements possibly related to utility that may come into play in decisions about labour supply.

We increased knowledge of physicians' and nurses' labour supply decisions by extending the individual's utility function to include non-pecuniary factors related to for example, work conditions and workplace. Labour supply in the economics literature often refers to a decision to participate in the labour market or a decision about hours worked, conditional upon labour market entry. However, in addition to that definition, labour supply decisions in our study included a decision to choose one's main work sector. Labour supply studies analysing sector choice are rare. Blank (1985) undertook a study from that perspective, but it did not concern health care professionals. Evidence about factors influencing physicians' decisions to choose their main work sector is of fundamental importance in Finland. The reason is that, though the total number of physicians has increased in recent years, there is a short-

age of physicians, especially in public-sector health centres. This is borne out by statistics reporting that 10% of vacancies were unfilled in 2007. In reality, the shortage could be even more serious, as not all institutions even announce an open vacancy, on account of the high likelihood of no-one applying for the position.

As expected, pecuniary factors influenced physicians' decisions about sector choice. If wage was an important factor in choice of one's main working sector, the physician tended to choose the private sector. However, factors related to a physician's workplace, identity, and appreciation by others were also associated with the choice of main working sector. According to our results, for example, the possibility of specialisation increased the attractiveness of the public sector. Specialisation involves a postgraduate university degree and is generally possible only at public hospitals, the exception being specialisation in public-sector health centres. In analysis of subgroups of physicians, we found that specialisation was mainly related to younger physicians' choice of work sector, as expected. By 2003, as many as 75% of physicians working in private sector had already specialised.

Also the geographical distribution of the labour force is of great importance, since it determines the quantity and quality of services available for the population. It is also related to the equity question, if health services are not available according to needs. If the workplace in the public sector was known to the physician before he or she applied for a job at that workplace, the physician had greater willingness to work in the public sector. In 1993, the impact of that variable was at its highest, when there was a deep recession in Finland. Therefore one might have found it easier to get a work position if the employer already knew the applicant before hiring. In 1998, the odds ratio from the analysis reached its lowest value. In the economic boom, there have been more possibilities to apply for vacancies. Education received in rural areas could therefore increase the area's future labour supply of physicians. Our finding is consistent with previous findings of literature analysing factors influencing physicians' location in rural areas (e.g., Zurn et al. 2004, Dussault and Franceschini, 2006).

Higher overall job satisfaction reduced physicians' likelihood of quitting in the studies of Sibbald et al. (2003) and Scott et al. (2006). In the present study, job satisfaction and dissatisfaction were found to be associated with physicians' intentions to change working sector from public health care to private. A positive association between physicians' income and job satisfaction was found in studies by Leigh et al. (2002) and Grembowski et al. (2003). Our results confirmed these findings, when good income increased job satisfaction and therefore decreased physicians' intention to change sector. Also non-pecuniary factors were associated with sector change. The possibility of progressing in one's career increased physicians' choice of the public sector. Interestingly, it was also associated with increased job satisfaction and therefore willingness to stay in the public sector. Therefore, professionally challenging work opportunities seem to be one element in attracting physicians to choose the public sector as well as to continue to work there. However, the results may differ between physicians at public-sector health centres and public hospitals. In papers to come, through adding a variable indicating the type of workplace in the public sector to the analysis, more accurate information could be obtained.

As expected, an increased wage decreased nurses' intentions to leave the health care sector for non-health-care roles. A similar result was obtained by Snellman (2007). In addition, shift work as a proportion of one's monthly wage had a negative association with intentions to quit, contrary to the positive effect found by Holmås (2002). According to our results, shift work is therefore not necessarily considered a disadvantage when some nurses may want to work shifts because of the better monetary compensation. The settings of Holmås and our study differed, and this might have contributed to the different outcomes. Holmås's work included nurses working in hospitals and focused on them leaving the public health care sector. Our data also covered other institutions and studied intentions to leave health care totally. Nurses' intentions to stay in the health care sector or to switch to non-health-care roles were associated also with non-pecuniary elements, related to job satisfaction and dissatisfaction. Increased job satisfaction also decreased nurses' intentions to leave health care for non-health-care roles. Job satisfaction was the most important determinant of intentions to quit also among NHS nurses (Shields and Ward, 2001).

A static labour supply model for nurses showed that increased wages increased hours worked, the same result obtained, for example, by Skåtun et al. (2005). However, even though wages mattered for nurses' labour supply, hours worked were influenced also by non-pecuniary factors, such as workplace and unit (Askildsen et al. 2003).

Also wage equations were estimated. However, there exists no consensus on what constitutes valid instruments for wages (Askildsen et al. 2003.). In construction of wage equations for RNs, not only human capital characteristics were included. The wage equation in human capital theory includes nothing that relates to the job itself. The characteristics of the job, or measures of worker fit, are excluded, at least in the most basic formulations. Human capital is measured in efficiency units, and workers are viewed as perfect substitutes (Lazear, 1995). However, in reality, wages are largely not based on employee productivity, and occupation enters significantly into wage equations. As we showed, RN wage was influenced by, for example, position and working unit. Therefore, the influence of jobs on wage and therefore factors related to job cannot be excluded from the analysis. Individuals' characteristics alone cannot sufficiently explain individual earnings.

There are many ways in which labour supply decisions can be modelled. Studies were often based on the assumption of a utility-maximising individual making the labour supply decision, and this approach was followed here. Another possibility for modelling voluntary turnover was the human capital theory, which was adopted, for instance, in the analysis of physicians' geographical movements (Snellman, 2006b). Migration was seen as an investment by the individual. Because of differences in human capital and in other personal characteristics, individuals may choose to move in different directions. According to human capital theory, an individual's productivity in the labour market sector rises when his or her stock of knowledge increases, therefore increasing monetary earnings. Productivity also increases in the household, where he or she produces commodities that enter his or her utility function (Grossman, 2000). However, a broader perspective, and thus a richer range of vari-

ables than just those related to human capital, was chosen for this analysis. Therefore, human capital theory was not adopted.

Finally, our results showed that pecuniary and also non-pecuniary factors mattered in both physicians' and nurses' utility functions. The physician samples were representative by age and gender. Therefore, results of physicians' labour supply studies could be generalised to the majority of working-age physicians in Finland. The response rate in the nursing studies (III and IV) was 68.14%. There may be several reasons that not all RNs to whom the questionnaire was posted chose to respond. One reason was the language: those whose language was not Finnish may have experienced difficulties in reading the questionnaire. Secondly, those on leave from work (e.g. on maternity leave) may have decided not to respond because of questions about current work. Thirdly, it is plausible that those nurses who were soon to leave the health care sector may have been reluctant to respond. Nevertheless, the response rate was quite high. Therefore, results obtained from Study III could be applied to all Finnish RNs, both male and female, who were working in November 2005. By contrast, Study IV included only female RNs, and therefore its results could only be applied with any certainty to female nurses in Finland.

Strengths and limitations of the study

Our literature review indicates that there are relatively few economic studies that have analysed the labour supply of health care professionals and therefore, for example, comparisons between countries with different health care systems are not easy or even possible. In Finland, there are no comparable studies. Thus, this study increased knowledge about physicians' and nurses' labour supply decisions both in Finland and internationally.

In this study we used survey data that spanned a long period, 15 years, for physicians. The response rates were fairly high, varying between 64.6% and 78.2%. The data also included a large number of non-pecuniary variables. Thus, we were able to include factors assumed to influence labour supply decisions but not often included in studies of economics – job satisfaction and dissatisfaction – in the analysis. The questionnaire for nurses was based on the physician questionnaires. The sample size for the nursing studies was also quite large, 5,000 registered nurses, chosen randomly. The response rate was 68.14%. Some nurses' mother tongue was Swedish, which may have lowered the response rate.

Traditional, but extented utility theory was found to be appropriate in modelling labour supply decisions. However, the theory also has drawbacks. Because of the very abstract nature of utility, it may be difficult to model with econometric analysis, especially if non-pecuniary aspects are also included. However, in this analysis, sophisticated analysis methods were used and, thus, at least some of the associated problems were addressed.

To get more reliable estimate values, multilevel analysis was adopted in Study I. The structure of our data was hierarchical. As noted, if multilevel analysis is not used in situations where the data naturally fall into clusters, the variances of the estimated coefficients tend to be underestimated and thus lead to false rejection of H_1 hypotheses. This study also contributes to labour economics research by developing the methodology for modelling non-pecuniary variables. In studies II and III, job satisfaction and job dissatisfaction both were latent variables by nature. Therefore, regression analysis cannot define them unambiguously. However, structural equation modelling technique also incorporates latent variables into the analysis, measured by multiple indicators.

In analysis of RNs' labour market participation and hours worked (Study IV), several analysis methods were used to show the robustness of the results. Heckman sample selection models have dominated much of the literature in microeconometrics (Leung and Yu, 1996). However, criticism of the method has also been offered. In practice, it may be the case that no exclusion restrictions are available. Another line of the criticism stresses the sensitivity of the estimated coefficients with respect to the distributional assumptions imposed on the error terms (error normality assumed) (Puhani, 2000). However, in our analysis the results were practically the same regardless of the analytic method. Therefore, we can rely quite well on the robustness of the results.

One limitation of these studies was the use of survey data, which may include measurement errors. In studies III and IV, nurses' pay was self-reported. Employees may less precisely recall information such as earnings or hours worked. In Study I, we did not have a direct measure of the wage of a general practitioner (GP); instead, a measure of importance of wages to the GP was applied, used as a proxy for actual wage in Study I. We had a control variable for the share of nurses' income accounted for by shift work. However, compensation for work at antisocial hours or on public holidays is usually paid at a higher rate and we were not able to distinguish between these different types of shift work.

There are also some variables not controlled for in the analysis. Job-related characteristics, such as the amount of administrative work, may be important in determining the quantity of outside opportunities available to these health care professionals. According to human capital theory, investment in firm-specific human capital would reduce turnover. RNs' intentions to leave or stay in the health care sector could also have been analysed by including in the analysis how much the RN him- or herself has invested in schooling (monetary value). We had an appropriate variable in our data, but, unfortunately, the large numbers of missing observations did not allow statistical analysis. Also nursing seniority and nursing speciality increase human capital. Senior nursing grades require a considerable amount of nursing-specific human capital investment. Therefore we could expect that highly trained nurses were less likely to quit than nurses with fewer years of experience. On the other hand, it may be that a large proportion of senior nurses' tasks are related to management, which requires more general skills, easily transferable to other areas of the labour market. That would, in turn, increase intention of voluntary turnover

(Shields and Ward, 2001). We had control variables also for RNs' working position in Study III, but no controls for the tenure in the particular job.

In studies II and III, the dependent variable was intentions to quit, rather than actual quitting. In reality, intentions to quit may not necessarily translate into action, but this has not yet been confirmed in Finnish nursing labour markets. However, previous literature does indicate that there is a strong association between intention to quit and actual quitting. Therefore, with respect to nurses, if even half of those with intentions to leave the health care sector actually do so, this would still be a concern, given the already scarce capacity.

Our dataset was cross-sectional and therefore static in nature. Therefore, for example, job satisfaction or dissatisfaction cannot be interpreted to have causal links to intention to change sector. It may very well be the case that a satisfied worker will intend to change sector if, for example, even better career possibilities are available. Taxes on income were also not included in our study, possibly causing a negative bias on the wage coefficient. Fixed costs, the expenses necessarily incurred in the performance of the job, and costs of labour market entry increase the reservation wage and cause discontinuities in the labour supply function. Therefore individuals will participate in the labour market only if those fixed costs, such as costs of transportation and child-care arrangements, are covered. Unfortunately, we had no information concerning commuting costs.

Finally, in the long run the supply of nurses is determined by the number of people choosing to acquire a nursing qualification and after that choosing to work as a nurse. The equivalent holds for physicians. Even though our models were short-run models, some of the results can be viewed as long-run effects, because they influence the attractiveness of these professions. When we know which factors decrease nurses' voluntary turnover, perhaps we can increase the capacity of nurses in the long run by attracting more nurses (young or returnees) to health care.

Future considerations

In this analysis, we added to the body of knowledge concerning factors influencing physicians' labour supply decisions in both the public and private sector. We also found that the percentages who had intentions to switch to the private sector increased in all study years, both in public primary and in public secondary health care. When comparing our results to the data related to physicians' actual sector changes, we can confirm the same phenomena: the percentage of physicians working primarily in the private sector is increasing. Individuals with a higher income can use services provided by occupational health care or in the private sector, but for less wealthy persons health care is provided in the public sector. Therefore, as a prerequisite for guaranteeing that all citizens in equal need have equal possibilities for health care, public health centres are needed. To alleviate the shortage of physicians at public health centres, it is essential that future studies analyse in more depth

which factors are related to labour supply decisions of physicians working primarily at public health centres.

There are a number of further research issues that are not addressed in this study. According to Häkkinen (2005), solutions to the shortage of doctors in municipally provided health services would require analysis of such factors as job satisfaction but also an analysis of the payment system for doctors as a whole. In this study, we found that wages matter in physicians' utility functions and influence physicians' sector choices as well as intentions to change working sector. There are different remuneration systems, but it is not clear which is optimal. However, when considering any new payment system, doctors do not seem to be only income-maximisers: their utility function also includes non-pecuniary variables, which should be taken into account.

Physicians' labour supply decisions can be assumed to vary between specialities, and the possibility of working as a private physician may differ substantially with the speciality. For example, there are difficulties in recruiting specialists such as ophthalmologists to hospitals in the public sector, as many of them run private practices. Therefore, there is urgent need for research to find ways to also attract specialists to secondary public health care.

Especially for short-term vacancies, the demand for RNs exceeds the supply. According to Snellman (2005), a fairly large proportion of nurses are employed in other industries. Snellman has also argued that the rising average pay in other industries may indicate that pay differences have induced transitions from public health care (Snellman, 2007). We showed in this study that wage influenced RNs' intentions to leave the health care field for non-health-care roles, but also non-pecuniary factors were related to the supply decision. Therefore, our results suggest that pecuniary factors on their own are insufficient to attract nurses back to health care. More detailed analysis is needed.

Nursing is often regarded as a common example of monopsony, on account of the dominant role of hospitals in the RN labour market. According to the nursing literature, one possible reason for shortages is that hospitals face an upward-sloping labour supply curve and thus possess monopsony power (Hirsch and Schumacher, 1995). Labour market power of employers can be achieved upon, for example, examining whether wages are lower in labour markets with fewer employers (Bhaskar et al. 2002). Effects of monopsonistic markets should be observed in, for example, rural and small-town markets, where there are fewer hospitals than in densely populated areas. However, empirical support for existence of monopsony power is mixed. Empirical studies based on estimates of labour supply curve elasticities facing hospitals have mostly been supportive of the assumption of monopsony. However, Hirsch and Schumacher (2005) found no evidence of a positive relation between wages and either labour market size or hospital density. In conclusion, in this analysis the monopsonistic perspective was not studied, but it should be in papers to come.

In addition to a utility maximisation approach, there are other theoretical perspectives that potentially could be utilised in analysis of voluntary turnover. Among these are search theory, matching theory, and labour market segmentation. With

regard to econometric modelling of labour supply, much remains for improvement in papers to come. We have shown that it is also going to be essential to collect data covering non-pecuniary variables. To be able to incorporate intra-family bargaining or inter-temporal life-cycle considerations into models, there is a need for longitudinal data collection, too. At present, there are few studies utilising longitudinal data (Askildsen et al. 2003; Frijters et al. 2007). Also, in modelling of utility-maximising behaviours, the effect of borrowing or saving could be captured by a non-linear budget constraint. In addition, the most relevant economic wage measure would be the after-tax marginal wage rate, not pre-tax marginal wage rate. We also assumed that hours worked were freely chosen. However, this assumption could be relaxed in future work.

Nursing is regarded as a vocation-based profession (Heyes, 2005). The definition is that nurses are particularly devoted in doing their job, beyond the call of duty. In addition, nurses do the job because they like doing it or feel a need to do it. According to Heyes, somebody with a vocation receives a wage but also a non-pecuniary benefit, referred to as a vocational premium. Nurses who do not view nursing as a vocation receive no utility beyond their pay for providing nursing care. They view nursing simply as a job. Our questionnaire for RNs did include questions on the main reasons for applying for a career in nursing. One possible reason was ‘the desire to care’. Therefore, the possible vocational premium could be analysed, at least to some extent. In future work, assessment involving nurses could be extended by including aspects of vocational premium in the utility function.

Conclusions

The objective of this study was to analyse the labour supply decisions of physicians and nurses. Studies of physicians were based on the national postal surveys of Finnish physicians, completed in 1988, 1993, 1998, and 2005. Analyses of nurses were based on survey data collected in November 2005. In addition to these surveys, statistical data were obtained via the Finnish Medical Association, the National Research and Development Centre for Welfare and Health, and the Union of Health and Social Care Professionals.

Physicians for whom wage was important more often chose the private sector as their main working sector. Good income compared to workload also increased physicians' job satisfaction and therefore decreased their intention to move from public to private health care.

Pecuniary factors such as increased wages also increased RNs' intentions to stay in health care and therefore had long-term effects. Also short-term effects can be obtained, if more people are attracted to the nursing profession. Increased wages also increased the weekly working hours of nurses.

Thus, this study showed that wages matter for physicians' and nurses' labour supply decisions. However, on their own they are not sufficient to keep nurses in the health care sector, keep physicians in public health care, or increase the number of hours supplied by nurses. Job satisfaction, job dissatisfaction, and factors related to work and workplace also influenced labour supply decisions.

One major addition to previous research is a study of the labour supply of physicians and nurses employed in Finland, where there are no comparable studies. Also internationally there are relatively few economics studies that have analysed the labour supply of these professionals, and studying the situation in Finland may offer new insights. The main conclusion that can be drawn from this study is that both pecuniary and non-pecuniary factors were related to physicians' and nurses' labour supply decisions. Therefore, non-pecuniary variables should also be included in econometric models of physicians' and nurses' labour supply decisions.

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The role of job satisfaction, job dissatisfaction and demographic factors on physicians' intentions to switch work sector from public to private

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Abstract

This study is based on a unique data set for the years 1988–2003 and uses structural equation models to examine the impact of job satisfaction and job dissatisfaction on physicians' intention to switch from public- to private-sector work. In Finland, physicians who work primarily in a public-hospital or health-centre setting can also run a private practice. Therefore, we also analysed the impact of having a private practice on a physician's intention to change sector. We found that private practice had a positive, statistically significant effect on the intention to switch sector in 1998 and 2003. Results also suggest that job satisfaction decreases a physician's intention to switch sector, although for 1998 it had no effect. Surprisingly, job dissatisfaction significantly increased the physicians' intentions to leave the public sector only in the 1988 data.
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1. Introduction

A shortage of physicians is a characteristic of many countries, like UK [1] and Finland. Also the review of the key factors influencing the future supply and demand for physician services in the USA indicates

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a physician shortage is likely [2]. During the last few years the total number of physicians in Finland has steadily increased. However, the shortage of physicians at public health centres and hospitals has been increasing. In 1994, 71.6% of physicians were working in hospitals or health centres in the public sector; 8.4% worked in the private sector as full-time private practitioners; and 20% were, e.g., doing research, working in the pharmaceutical industry, or performing administrative duties. In 2004, the percentages were 69.4%, 10.2%, and 20.4%, respectively [3]. In 2005, there were 21,285 licensed physicians and the great majority of them still worked in the public sector. However, from the latest statistics it can be seen that even though the absolute number of physicians in public sector has increased, the percentage of physicians in public health care is decreasing and in private-sector employment increasing. The absolute number of physicians working primarily in the private sector has increased considerably, by almost 50%, since the 1990s [3].

The Finnish health care system belongs to the same family as the other Scandinavian countries and the United Kingdom, in terms of its institutional structure, financing and goals. Most services are produced by public authorities and are mainly financed through general taxation. A specific characteristic of the Finnish health care system is the existence of the National Health Insurance (NHI) scheme, which reimburses partly the same services as the tax-funded system, but also services which are provided by the private sector [4–6]. NHI is financed by all citizens in Finland. Public responsibility for health care has been decentralized to smaller local authorities, municipalities, more than in any other country [5]. Municipalities often have a very small population: 75% of municipalities have fewer than 10,000 inhabitants and 20% fewer than 2000 [6]. Municipalities are responsible for providing primary and specialised public health care services for all their citizens, regardless of ability of pay or place of residence. Most primary public health care is provided by health centres, which are owned and financed by one municipality or several municipalities together. They do not aim to make profit, since they are publicly owned and run. Health centres offer a wide variety of services, such as outpatient medical care, inpatient care and care for the elderly. Municipalities can provide services themselves, they can form federations in order to run health centres together, or they can buy services from the private sector [6]. Federations of municipalities encompass particular hospital districts. There are 20 hospital districts in Finland (if Åland Islands, which is regulated by separate legislation, is excluded), providing specialised care mostly through their own hospitals [7]. Health services organized by municipality is the main health care system, but alongside it, also private and occupational health services are provided. Private health care in Finland comprises mainly outpatient care, available mostly in the large cities [6].

In Finland, most physicians are employed as salaried workers at public hospitals and health centres. Hospital physicians are salaried employees, the basic monthly salary depending on the physician's post and length of career. Various bonuses can be paid, such as for increased responsibility, but in practice they are not often used. The doctors working in health centres are mainly general practitioners and around a half of all doctors working in health centres have specialized in general medicine [6]. Most health centres are now moving towards the principle of population responsibility which means that a multiprofessional team (e.g. doctor, nurse) is responsible for the care of a geographically defined area covering 1500–5000 persons. In this system, to improve continuity of care and increase physician accessibility, a person or a family is always assigned to the same health centre team. Physician will provide consultation as soon as possible and for any case within three days [8]. Personal doctors can plan their own schedules, but not the work of other personnel. Also most physicians working in health centres are salaried employees with the same payment conditions as hospital physicians, concerning extra remuneration. In those health centres where the personal doctor system has been introduced, doctors are paid a combination of basic salary (60%), capitation payment (20%), fee-for-service payment (15%) and local allowances (5%) [6]. However, physicians at public hospitals and health centres can also run a part-time private practice, and in majority of cases they are paid for on a fee-for-service basis [7]. About one-third of the physicians who have a full-time post in the public sector run a private practice as part-time physicians [9]. The majority of doctors working in the private sector are specialists [6]. Generally wages in private sector are higher than in public sector. In 2005, the average monthly income of physicians who work full-time for

the private sector, based on regular working hours, was about 17% higher than the corresponding figure for the public sector [9].

Voluntary labour turnover represents a source of potential costs to organisations in terms of loss of valuable human resources and disruption of ongoing activities. A considerable amount of research exists on labour turnover, especially in the field of psychology e.g. [10,11]. Psychological studies have mostly focused on analysing how the job satisfaction and job attitudes of employees affect intention to quit. However, there are relatively few studies of the labour market for the medical profession and especially papers on supply side are rare [12]. Only a few studies are based on primary data related to doctors' job satisfaction [13], but there is also an increasing interest in economics in describing and analysing the effects of working conditions and worker attitudes on turnover rates [14]. Economists have identified several determinants of job turnover and wage rate has probably received the most attention in the labour economics literature. The wage rate and the probability of a change in job are assumed to correlate negatively e.g. [15–18], but also a positive although statistically insignificant effect has been reported [19].

Tenure and demographic factors such as gender, marital status, and level of education have a potential influence on turnover. Models based on search theories typically predict that the probability of quitting decreases with tenure. The reason is that a long tenure increases the overall probability that the current match between the worker and the firm is among the best available in the labour market [20].

In Finland, the consequence of physician shortage in public sector has been that emergency physician services are now often produced by private firms, which may be a more expensive way to arrange services. In addition, it may create problems in continuity of care [4]. Therefore it is essential to identify factors that influence the labour supply of physicians. In this paper we left factors related to demand side as well as factors associated to entry to the workforce, for future research. Instead, we focused our analyses to a special case of voluntary turnover: intention to change a sector. Our addition to previous research is a study based on extensive data set covering 15 years, which make it possible to analyse changes in the impact of the chosen variables on sector change. Explicitly our research questions were: (1) examine how demographic factors, such as gender and years of experience, part-time private practice, as well as factors related to job satisfaction and dissatisfaction are associated with physicians' intentions to change their work sector from public to private; (2) analyse changes in the impact of the chosen variables on sector change between the years 1988 and 2003; (3) analyse if there are any differences between the genders on intention to change the sector.

The theoretical model underlying our analysis, one of individual lifetime utility maximisation, was derived from a review of the economics and health care literature – e.g., from empirical studies by [21–25]. The traditional neoclassical economic theory assumes that individuals will try to maximise the utility that they get from commodities, services and leisure [18]. Additional purchases of consumption goods or more hours devoted to leisure activities are assumed to increase the person's utility. We used the framework of static labour supply decisions, decisions affecting a person's labour supply at a given point in time. In order to obtain income for purchases, individuals have to work. Individuals could have monetary income that they receive regardless of whether they work or not, such as income from investments, but we assumed this non-labour income to be zero. The work itself was not assumed to provide utility; rather, working was seen as a way to earn money that could then be spent on commodities and therefore increase the physician's utility. The cost of working is the value of forgone leisure. The utility function of work could be seen as an implicit utility function where, by maximising utility from work, the consumer can maximise his or her utility gained from commodities and leisure. As in our previous labour supply study [26], we assumed that physicians choose the working sector that maximises their utility from monetary as well as non-pecuniary elements of utility function. The choice is assumed to vary depending on the tastes and preferences of the individual making the choice.

2. Methods and data

2.1. Participants

We explored the national postal surveys of Finnish physicians, completed at five-year intervals from 1988 to 2003 (Table 1).

Table 1
Descriptions of national postal surveys of physicians in 1988–2003

Study name	1988 Junior Physician	1993 Junior Physician	1993 Senior Physician	1998 Junior Physician	1998 Senior Physician	2003 Junior Physician	2003 Senior Physician
Qualification year	1977–1986	1982–1991	1977–1981	1987–1996	1977–1986	1992–2001	1977–1991
Sample size	2632	2332	1430	2492	2865	2415	4114
Number of responses	1745	1818	1118	1822	2117	1554	2735
Response rate (%)	66.3	78.0	78.2	73.1	73.9	64.6	66.4

The total number of responses was 12,909. Each year, a postal questionnaire was sent to a random sample of physicians who were registered in Finland during the time given as 'Qualification year' in Table 1. To minimise bias related to question misinterpretation, a highly structured questionnaire was used. There were no identification codes in the questionnaire itself, but the envelopes were numbered for monitoring of the mailing process. The researcher received only the completed questionnaires and, thus, could not identify individual respondents. Samples and respondents represented the overall physician population in terms of age and gender in the years between 1988 and 2003. The basic characteristics of the data have been published by, e.g., [27]. Table 2 provides definitions and descriptive

Table 2
Characteristics of the respondents' demographic factors by primary and secondary public health care, means/proportions in 1988, 1993, 1998, and 2003

	1988 ($n=838$)	1993 ($n=1479$)	1998 ($n=1817$)	2003 ($n=1950$)
Primary public health care				
Percentage of physicians	39.1	42.7	35.0	29.0
Female (%)	53.0	57.5	64.3	66.5
Mean no. of years of experience	7.0	9.7	12.4	14.2
Number of children (%)				
0	15.6	8.0	2.7	10.3
1	20.5	15.5	14.3	13.6
2	37.8	38.5	42.3	36.8
3 or more	26.1	38.0	40.8	39.2
Marital status (%)				
Single	9.7	10.2	7.2	5.4
Married	88.1	85.0	86.9	86.0
Divorced	2.2	4.4	5.2	7.9
Widow/widower	–	0.5	0.6	0.7
Secondary public health care				
Percentage of physicians	60.9	57.3	65.0	71.0
Female (%)	42.5	48.8	58.1	58.3
Mean no. of years of experience	6.9	9.4	11.6	12.9
Number of children (%)				
0	32.5	14.5	3.7	19.2
1	19.7	23.1	19.1	14.2
2	31.8	36.0	42.2	35.8
3 or more	15.9	26.3	35.0	30.8
Marital status (%)				
Single	15.6	15.9	12.6	11.8
Married	81.4	80.3	81.5	81.7
Divorced	2.8	3.5	5.8	6.3
Widow/widower	0.2	0.2	0.1	0.2

statistics for the demographic factors used in the analysis.

2.2. Variables

The questionnaire consisted of a comprehensive range of variables for each cross-section year and the variables were derived into the data directly from questionnaires. However, only those variables that were similar and asked in each cross-section data set were included in the analyses. At first stage, we included into data only those physicians who were mainly working in public sector, that is in municipal health centres and hospitals. In years 1988 and 1993 the dependent dummy variable *Change* was formulated by combining two questions. Firstly, physicians were asked "Have you carried out or are you now carrying out to change your career? Possible responses were "1 = no, 2 = have already changed the career, 3 = now carrying out/planning to change career". Since we were interested only in physicians' future plans, physicians who answered 2, were excluded. A question "What was/is the most important change in your career plans?" was finally used to include only those physicians who were planning to change to private sector or to stay at public sector. Therefore physicians who responded to change their career from a public sector physician to a private physician were included (coded as 1) into final data as well as those physicians who were intending to continue to work in public health centre/hospital (coded as 0). In years 1998 and 2003, the dependent variable *Change* was possible to formulate via one question: "What is your likely working position in 2015?" Possible responses were e.g. "Physician in public health centre, physician in public hospital or private practitioner". Those physicians who were present working in public sector and answered to continue to work in public health centre or hospital, were coded as 0 and those who answered to move to private practitioner were coded as 1.

In many studies e.g., [22,28] factors increasing or decreasing job satisfaction have been analysed by using only the single latent variable *satisfaction*. However, our questionnaire included two separate questions related to both job satisfaction and dissatisfaction. Since we were also interested in determining any differences between the impact of variables identifying job satisfaction versus job dissatisfaction, we included into analysis two vectors, where JOBSAT represents factors related to job satisfaction and DISSAT denotes characteristics possibly affecting job dissatisfaction (see Appendix A). A five-point ranking was used for characteristics of job satisfaction as well as job dissatisfaction. A number of factors related to job satisfaction were assessed with the question: 'How well are the following aspects of job satisfaction realised in your present work?', followed by a list of factors such as "the opportunity to use one's skills, good income compared to workload and moderate workload". Possible responses were: 1 = very poorly, 2 = quite poorly, 3 = difficult to say, 4 = quite well, and 5 = very well. The vector DISSAT included factors related to work content, relationships between employees and supervisors, atmosphere in the workplace, and choice of work schedules. Factors related to job dissatisfaction were assessed using the question: 'How often do the following possible aspects of dissatisfaction apply to your present work?' The possible responses here were: 1 = never, 2 = not often, 3 = sometimes, 4 = quite often, and 5 = continuously. We assumed factors related to JOBSAT to decrease, and factors related to DISSAT to increase, physicians' intentions to change sector from public to private. We also included in our analysis the most popular demographic variables identified in the literature: years of experience, number of children, gender, and marital status. Finally, the latent variable PRIVATE with one indicator: *Practice* was included in the analysis for determining the impact of part-time private practice on intention to change sector. Physicians possible part-time private practice was assessed by a question: "Do you run private practice?" If the physician was not running a private practice in his/her absence from primary employment in the public sector, the variable had the value 0; otherwise, its value was 1. A detailed description of the variables used in the preliminary analysis is presented in Appendix A.

2.3. Statistical analyses

For our purposes, we defined sector change as an intention to voluntarily leave the primary sector in which the physician is working, the public sector. Physicians' decision to change their sector can be written as:

$$U_i = f(d_i Z + u_i) \quad (1)$$

Here, i is an index of sector (1 = public and 2 = private), Z is a set of explanatory variables, d is a vector of coefficients associated with Z, and u is a random error term. A worker will remain in the public sector if the utility (s)he gains is greater from public employment than from private employment – i.e., $U_1 - U_2 > 0$. When we extend the model further, the function for physicians' utility from changing sector can be expressed as:

$$\text{intention to change} = f(\text{JOBSAT, DISSAT, PRIVATE, DEMOG}) \quad (2)$$

Preliminary analysis of the data was performed using the logistic regression analysis available in SPSS 12.1 to uncover the factors that could be associated with change of work sector from public to private. Analysis revealed that several variables related to job satisfaction as well as dissatisfaction influenced the intention to switch. However, job satisfaction and dissatisfaction are latent variables by nature, and regression analysis cannot define them unambiguously. The structural equation modelling technique allows us to consider all of these variables simultaneously and incorporate latent variables measured by multiple indicators into the model. Therefore, the final data analysis was conducted through structural equation models (SEMs), a method covering a variety of modelling techniques, such as factor and regression analysis. The basic idea of SEMs is to analyse the difference between the population (sample) covariances and the covariances predicted by the model. Formally it can be formulated as: [29]

$$\Sigma = \sum(\theta) \quad (3)$$

where Σ denotes the matrix of observed covariances in the sample and θ is a vector of model parameters. The purpose of the modelling is to minimise the difference between the sample covariance matrix and the model covariance matrix so that Eq. (3) holds with some acceptable statistical precision. The measurement models (Eqs. (4) and (5)) and a structural equation model (Eq. (6)) can be formulated using three matrix equations:

$$x = \Lambda_x \xi + \delta \quad (4)$$

$$y = \Lambda_y \eta + \varepsilon \quad (5)$$

$$\eta = B\eta + \Gamma\xi + \zeta \quad (6)$$

where Λ_x and Λ_y are factor loadings and δ, ε, and ζ are measurement errors. The SEM includes two types of latent variables: exogenous (ξ) and endogenous (η). Exogenous variables are independent variables in all equations in which they appear, while endogenous variables are dependent variables in at least one equation. Observed variables that are associated with exogenous variables are labelled with 'x', while those associated with endogenous variables are labelled with 'y'. Matrix B includes estimates related to η, and matrix Γ represents relationships between ξ and η.

Structural equation models comprise two components: a measurement model and a structural model. The measurement model relates observed responses or indicators to latent variables. The structural model specifies relationships among latent variables and regressions of latent variables on observed variables e.g. [30]. The behaviour of latent variables can be observed only indirectly – i.e., through their effects on manifest variables. The structural model in our analysis consisted of the exogenous variable DEMOG and four dimensions as endogenous variables: JOBSAT, DISSAT, PRIVATE, and INTENT. The latent variable INTENT had only one indicator (*Change*), as well as latent variable PRIVATE (*Practice*), whereas JOBSAT and DISSAT had several indicators. We expected imperfect observation of the indicators related to DEMOG, JOBSAT, and DISSAT. This was modelled by specifying a specific error factor for each observed variable. However, when the latent variable has only one indicator, as is the case with the latent variables INTENT and PRIVATE in our model, the error terms of their indicator variables had to be fixed at 0 due to the modelling technique. Also, the factor loading of observed variables *Change* and *Practice* was fixed to the value 1, in order to give the latent factors an interpretable scale.

A confirmatory factor analysis (CFA) was conducted using LISREL 8.7 [31] see [32]. To obtain parameter estimates, we used the generally weighted least squares (WLS) estimation technique. We began by running a multi-sample analysis where each year comprised one group, for four groups in total. In the first model, factor loadings, error variances, and factor correlations were constrained so as to be identical between the years. The value of all fit indices indicated

an unsatisfactory fit for the model. Therefore, we concluded that there were differences between the years in intentions to change work sector and proceeded to seek a less constrained model. In the next phases, we ran the model using different combinations of constraints (factor loadings, error variances, and factor correlations), letting all or some of them differ. In the final phase, the models were run separately for each year, and factor loadings and error variances were allowed to differ between the years. For each year, the error variances between latent variables indicating job satisfaction and job dissatisfaction were allowed to correlate.

3. Results

3.1. The role of demographic factors, private practice, job satisfaction and dissatisfaction on intention to change sector

Since we were also interested in the development in each explaining variable during the years, the final statistical analysis was made separately each year. In addition, the model fit improved remarkably. Our final data included only those physicians who were working mainly in the public sector. They also had to satisfy two sampling conditions. Firstly, physicians who were not planning to change sector but who planned to continue working in either a hospital or a health centre in the public sector were included in the analysis as 'Stayers'. Secondly, physicians who were planning to move or were already in the process of moving from the public to the private sector were included as 'Quitters'. In 1988, together in primary and secondary public health care, there were 50 physicians (6%) who were planning to move to private sector, whereas in 1993 the figure was 29 (2%). In 1998 and 2003 the corresponding figures were 192 (10.6%) and 400 (20.5%). In Table 3 we report percentages on intentions to change the sector separately by primary and secondary health care as well as by Junior and Senior Physician subgroups. The primary public health care subgroup included those physicians who were working in public health centres, whereas those who worked in public hospitals were included in secondary public health care.

In all study years, part-time practice and intentions to sector change were less prevalent among primary public health care than in secondary public health care. In 1993, the percentage of Quitters was bigger in Junior subgroup in primary public health care, whereas in secondary public health care it was smaller. In 1998, the percentages of Quitters were bigger in Senior Physician subgroup, both in primary and secondary public health care. However, in 2003 the percentages of Quitters among Junior and Senior Physicians were the same in secondary public health care. In primary public health care, the percentage was bigger in Junior subgroup.

In Fig. 1, the final SEM is presented as a path diagram. The latent constructs are represented by ellipses and the indicators of the latent constructs by rectangles. The arrows from the latent factors to the observed variables represent linear regression coefficients or factor loadings.

Table 4 shows the estimated coefficients for hypothesised measurement models for 1988, 1993, 1998, and 2003. All indicators of endogenous latent variables in the final model had high *t*-test values (> critical value |1.96|), implying that they are good indicators of latent

Table 3
Percentages of Stayers, Quitters, and part-time private practitioners in Junior and Senior subgroups by primary and secondary public health care

	1988 ($n = 838$)	1993 ($n = 1479$)		1998 ($n = 1817$)		2003 ($n = 1950$)	
	Junior	Junior	Senior	Junior	Senior	Junior	Senior
Primary public health care							
To stay in the public sector (Stayer)	90.9	98.7	99.1	95.2	94.0	81.2	83.4
Will switch to private sector (Quitter)	9.1	1.3	0.9	4.8	6.0	18.8	16.6
Part-time private practitioner	20.1	9.9	17.0	7.9	16.3	5.8	12.4
Secondary public health care							
To stay in the public sector (Stayer)	96.0	98.2	96.2	88.7	86.7	79.5	79.5
Will switch to private sector (Quitter)	4.0	1.8	3.8	11.3	13.3	20.5	20.5
Part-time private practitioner	46.0	32.0	60.5	21.7	59.9	25.8	51.7

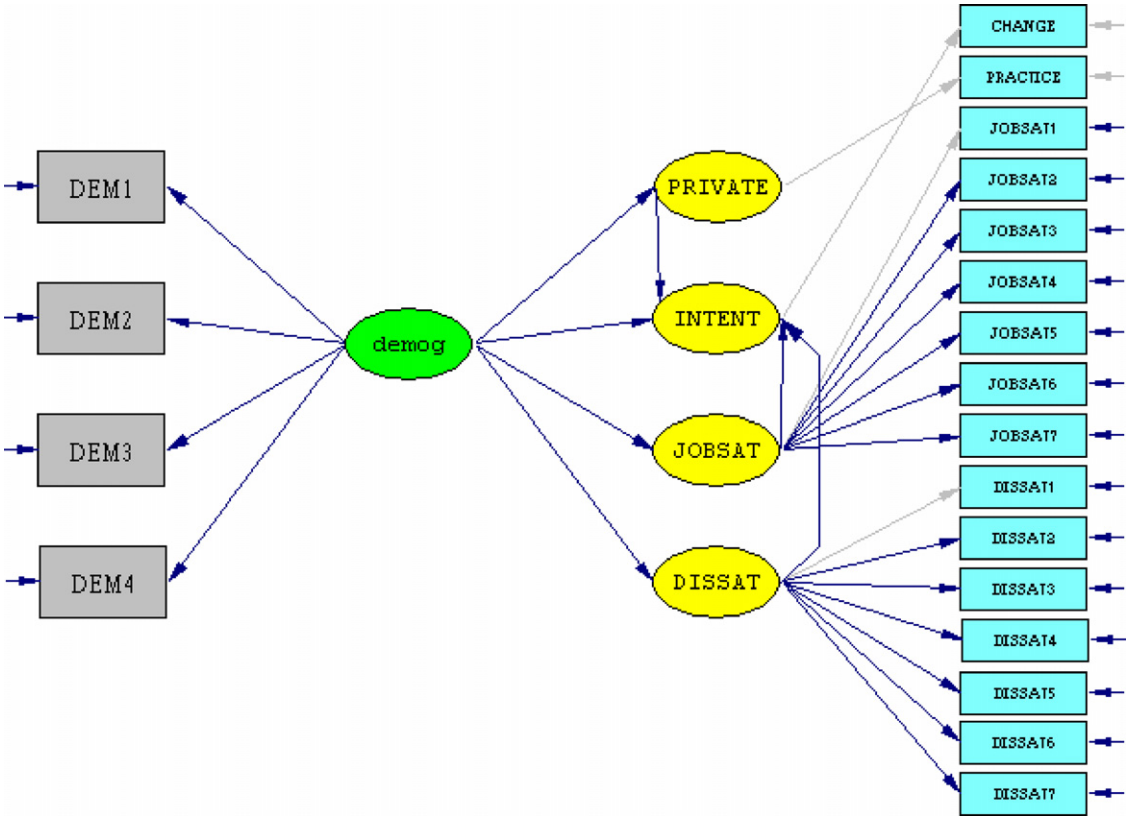

Fig. 1. The path diagram for the years 1988, 1993, 1998, and 2003.

variables. For 1993 through 2003, the indicator *Marital status* had a low *t*-test value, implying that it did not represent the latent variable DEMOG well. Results are based on a model that includes males and females in the same data set.

In SEM models, standardised structural coefficients are used to judge the relative importance of independent variables. If, for example, the standardised structural coefficient is 0.62, then the latent dependent increases by 0.62 standard units for each unit of increase in the latent independent. Each year, the variable *Chance to apply one's own ideas in the work* emerged as one of the most important job satisfaction dimensions affecting intention to change work sector. Also, *Generally held to be a prestigious position* seemed to have high *t*-test values each year, implying that it is also a good indicator of physicians' job satisfaction, when the variable *Good income compared to workload* was modelled as a base variable. *The possibility of specialising* variable did not gain statistical significance and was not included in the final model. In Finland, specialisation involves a post-graduate degree. If a physician wishes to specialise, (s)he has to work in the public sector. Therefore, it was expected for the variable not to correlate significantly with job satisfaction. For factors affecting job dissatisfaction, variables such as *Tight, inflexible timetable*, *Poor employee/supervisor relations*, and *Tense atmosphere in workplace* had the highest *t*-test values, when the variable *Monotonous work* was modelled as baseline.

Table 5 presents the overall impact of job satisfaction/dissatisfaction, private practice and demographic factors on intention to leave.

For 1988, direct effects of job satisfaction and job dissatisfaction were statistically significantly related to physicians' intentions to move from public- to private-sector work. The total effect of *job dissatisfaction* on *intention to leave* was statistically significant only

Table 4
The estimated coefficients of measurement models, standardised values

	1988		1993		1998		2003	
	Estimate	The *t*-test value	Estimate	The *t*-test value	Estimate	The *t*-test value	Estimate	The *t*-test value
Observed '*y*' variables related to *job satisfaction*								
JOBSAT1 = good income compared to workload	0.62		0.62		0.50		0.59	
JOBSAT2 = generally held to be a prestigious position	0.72	10.98	0.64	17.34	0.59	15.45	0.65	18.27
JOBSAT3 = leading position	0.54	9.75	0.62	16.09	0.68	16.45	0.58	17.27
JOBSAT4 = independent position	0.50	9.74	0.72	16.55	0.74	15.61	0.72	17.98
JOBSAT5 = the chance to apply one's own ideas in the work	0.79	10.94	0.81	17.28	0.78	16.88	0.80	19.98
JOBSAT6 = interesting work	0.42	6.75	0.24	6.19	0.31	8.41	0.35	9.71
JOBSAT7 = possibility of further education	0.37	9.11	0.40	12.62	0.47	14.21	0.50	16.68
Observed '*y*' variables related to *job dissatisfaction*								
DISSAT1 = monotonous work	0.65		0.70		0.67		0.62	
DISSAT2 = tight, inflexible timetable	0.55	10.50	0.52	10.47	0.55	12.57	0.53	13.87
DISSAT3 = inconvenient work schedule	0.54	9.03	0.36	8.59	0.35	9.54	0.47	12.28
DISSAT4 = poor employee/ supervisor relations	0.48	8.50	0.60	12.54	0.64	13.62	0.51	13.40
DISSAT5 = tense atmosphere in workplace	0.45	8.02	0.51	11.37	0.57	13.98	0.57	14.90
DISSAT6 = excessive duties	0.59	9.99	0.32	8.28	0.32	9.59	0.40	11.44
DISSAT7 = ungrateful patients	0.52	9.43	0.33	8.45	0.36	10.49	0.39	11.61
Observed '*x*' variables related to DEMOG								
DEM1 = years of experience	0.39	11.73	0.31	12.32	0.48	19.00	0.53	12.51
DEM2 = marital status	0.44	6.54	0.07	1.42	0.07	1.32	0.03	1.03
DEM3 = number of children	0.18	6.96	0.17	7.44	0.18	9.18	0.30	13.59
DEM4 = gender	−0.57	−12.29	−0.50	−12.73	−0.47	−16.55	−0.50	−15.16

Table 5
Estimated structural coefficients from SEMs, *t*-test values and standardised values

Structural path	1988		1993		1998		2003	
	Estimate	The *t*-test value	Estimate	The *t*-test value	Estimate	The *t*-test value	Estimate	The *t*-test value
Job satisfaction								
Intention to leave	−0.44	**−4.25**	−0.62	**−4.38**	−0.01	−0.08	−0.47	**−5.32**
Job dissatisfaction								
Intention to leave	0.29	**3.80**	−0.10	−0.77	0.10	0.91	−0.14	−1.77
Private practice								
Intention to leave	−0.12	−0.01	−0.21	−1.22	0.51	**3.33**	0.40	**8.11**
Demographic								
Intention to leave	0.58	**4.43**	0.84	**4.53**	−0.26	−1.35	−0.14	**−3.86**
Private practice	0.61	**11.37**	0.71	**13.25**	0.73	**18.22**	0.48	**14.47**
Job satisfaction	0.27	**5.03**	0.31	**5.94**	0.52	**10.63**	0.18	**5.51**
Job dissatisfaction	−0.06	−1.19	−0.20	**−3.80**	−0.08	−1.94	−0.04	−1.36

Statistically significant effects in bold.

for 1988, with a positive impact then. In all other years except 1998, job satisfaction had a significant direct effect. Job satisfaction decreased the intention to change sector. In the 1998 material, only *Private practice* had a direct, positive association. Also, in 2003, *Private practice* increased the intention to switch sector, whereas in 1988 and 1993 it had no significant association.

Demographic factors were statistically significantly related to intentions to move from public to private sector in all study years, except in 1998. In addition to direct effects, demographic factors had indirect effects on intention to leave through their impact on job satisfaction, job dissatisfaction, and entering private practice. In all study years, demographic factors had statistically significant indirect effect on private practice and job satisfaction, but only in 1993 on job dissatisfaction. For 1988, in addition to the direct effect of 0.58 on latent variable INTENT, there was an indirect effect of -0.12 ($= -0.44 \times 0.27$) via *job satisfaction*, -0.02 via *job dissatisfaction*, and -0.07 via *private practice*.

To assess how well the hypothesised model fits the data, we conducted several statistical tests, such as Chi-square tests. The use of a Chi-square values with 104 degrees of freedom ($p < 0.05$) from the observed covariance matrix failed to fully explain the relationships observed, due to our large sample size. However, support for the good fit of the final model was obtained from fit indices that were less dependent on the sample size [31,32], Table 6.

All statistics in Table 6 suggest that the model fits the data well. If the value of NFI, NNFI, CFI, AGFI, and GFI is 0.90 or over, the model fit is good. If the value is over 0.95, the model fit is very good. The critical value for RMSEA is 0.05, and values below that indicate a good fit. In addition, if the CN value for the model is lower than the actual number of observations, the model fit can be said to be good. In our model, the value of CN ranged between 399 and 454, which was far below the number of observations.

Table 6
The model fit indices for the years 1988, 1993, 1998, and 2003

	1988	1993	1998	2003
Chi-square	292.49	457.47	640.72	669.74
d.f.	104	104	104	104
RMSEA	0.047	0.048	0.053	0.053
NFI	0.95	0.96	0.93	0.94
NNFI	0.94	0.94	0.90	0.91
CN	402.96	454.82	399.12	409.77
CFI	0.97	0.97	0.94	0.95
AGFI	0.97	0.98	0.97	0.97
GFI	0.99	0.99	0.99	0.99

3.2. Gender differences

To obtain information on any differences between genders in terms of intention to change one's work sector, we modified the model and ran it separately for males and females for years 1998 and 2003. The number of observations in 1988 and 1993 for the dependent variable CHANGE was too low for us to undertake statistical analyses. The 1998 results were similar to those found with the combined data for female and male physicians. Job satisfaction and dissatisfaction gained no statistical significance in relation to intention to change sector. However, the variable *Private practice* was statistically significant in both groups and increased intention to change sector among the female subgroup (estimate: 0.44) as well as in the male subgroup (estimate: 0.35).

The 2003 data showed some gender-based differences. Job satisfaction was a statistically significant factor and decreased females' intention to change sector (estimate: -0.47), but it showed no statistical significance in the male subgroup. Job dissatisfaction had a statistically significant positive effect (estimate: 0.18) for the male subgroup, increasing male physicians' intention to switch sector, but had a negative estimate in the female subgroup (-0.33). In combined data, job dissatisfaction gained no statistical significance in 2003. The variable *Private practice* had a statistically significant, positive effect (estimate: 0.36) for both subgroups (estimate: 0.30).

4. Discussion and conclusions

In this study we identified both financial and non-pecuniary factors related to physicians' intentions to change their sector of work from public to private. In addition, we examined whether demographic factors and running a private practice while performing primary work in the public sector may have a relationship with physicians' willingness to change sector. Voluntary labour turnover represents potential costs

to organisations in terms of loss of valuable human resources and the disruption of ongoing activities. As we have noted, there are many studies, especially in the field of psychology, analysing employees' satisfaction or dissatisfaction with their work. However, most of these do not analyse employees' responses to that level of satisfaction or whether they actually change their behaviour at all. Thanks to our extensive data set, we were able to assess how physicians might respond to satisfaction or dissatisfaction with their present work.

In the economics literature, the role of financial incentives in influencing physicians' behaviour has had primary focus, while psychological phenomena have gained less attention. [24]. However, job satisfaction and various non-pecuniary characteristics of one's current job might influence sector change and should therefore be included in the analysis. Although SEMs have been used mostly in psychological studies and in studies related to public health, we utilised SEM strategy in our empirical analysis, in order to incorporate into the model latent variables measured by multiple indicators. Among the other advantages of the SEM approach are the desirability of testing models rather than individual coefficient.

Intention to leave an organisation has gained much empirical and theoretical support as an important predictor of actual turnover, especially in the psychology literature [25,33,34]. However, economists have been more sceptical in interpreting intention data. Even if individuals have rational expectations and stated intentions are the best predictions of behaviour, there can be divergences between intentions and actual behaviour. The information available to the respondent at the time of the survey can be more limited than the information (s)he will possess at the time when behaviour is determined [35]. However, researchers such as Van der Klaauw [36] showed that data concerning subjective expectations can hold great promise in making a substantial contribution to our understanding of intertemporal decision-making under uncertainty. In our analysis, responses concerning intentions were not assumed to be subject to major divergences between intentions and actual behaviour. For example, data related to physicians' actual sector changes revealed the same phenomena as our data did: the percentage of physicians in the private sector is increasing (8.4% in 1994 and 10.2% in 2004), whereas in the public sector it is decreasing (71.6% in 1994 and 69.4% in 2004). Therefore, *intention to change sector* was used in our model as a proxy for physicians' actual change of sector.

The total number of Quitters has increased since 1988, except in 1993, when the number of Quitters was very low both in primary and secondary public health care. In 1993 there was a deep recession in Finland. Gross domestic product (GDP) decreased by 13%, and unemployment rose from 3% to 17% [5]. During the recession, few people could afford to visit private physicians, therefore decreasing the number of private consultations.

"Going private" has primarily been a phenomenon among the better-off in Finland [37] which highlights also our result that under boom private sector offers new job possibilities and therefore increases the percentage of physicians planning sector change. In 2003 the percentages of Quitters were bigger than in other study years. Interestingly, in primary public health care the number of Quitters was bigger in Junior Physicians subgroup than in Senior subgroup. It has been reported that e.g. in the United States the newest generation of physicians is unlikely to be willing to work the long hours that prior generations of physicians worked [38]. It might be the case also in Finland that Junior Physicians will control their working hours by intending to move to the private sector, where it possibly is easier to influence one's own working schedules. In 2003, in secondary public health care there were no differences between Junior and Senior Physicians in intentions to change sector. Also in SEM – model latent variable *Private* was statistically significant factor in 1998 and 2003. If physician was running a part-time private practice, it had positive association with intention to change sector. In addition, the *t*-test value of variable *Private* increased from 1998 to 2003, implying that it's importance has increased.

Even though overall dissatisfaction has been reported to increase voluntary employee turnover, dissatisfaction/satisfaction cannot be interpreted as always having a direct causal link to intention to leave. Although employees might, generally, be satisfied with their current work, they may want to apply for a new job that offers, for example, even better possibilities for career advancement. We found that job satisfaction was an important factor affecting

physicians' willingness to switch their work sector, and non-pecuniary elements were important factors affecting job satisfaction/dissatisfaction. The observed relationship was in line with labour supply theory and previous empirical findings e.g., [23,39,40] which demonstrate that, e.g., job dissatisfaction leads to increased turnover. Job satisfaction was negatively and statistically significantly correlated with physicians' intention to switch sector except in the 1998 material. In addition, job satisfaction gained more significant, negative values towards the year 2003, implying that it's importance has increased during the years. Based on our results, we believe job dissatisfaction might also affect physician willingness to make a sector change. However, contrary to expectations, job dissatisfaction increased intention to leave only in the 1988 data and was not statistically significant in other years. Therefore, we conclude that it is more important to influence factors related to job satisfaction than those related to job dissatisfaction if we want to decrease physicians' willingness to move from the public to private sector.

Also demographic factors influenced both directly and indirectly via job satisfaction, job dissatisfaction and private practice, physicians' intentions to change the work sector. Only in 1998 demographic factors were not statistically significantly, directly associated with intention to change sector. However, in all study years they influenced sector change indirectly via job satisfaction and private-practice and in 1993 also via job dissatisfaction. We also examined whether there were gender differences in 1998 and 2003 in intention to change sector. For 1998, the results were the same as for combined (female + male) data. However, 2003 data showed some gender-based differences. Our results indicate that factors related to job dissatisfaction among the males were positively correlated with a sector change from public to private, whereas factors related to job satisfaction in the female subgroup decreased intention to switch sector. However, in the female group, also job dissatisfaction had a negative impact on intention to change sector, possibly indicating that even if female physicians were dissatisfied with their work they did not intent to move to the private sector.

A discussion of some limitations of this study is in order. There are some studies revealing that both previous changes in occupation and previous job switches predict current on-the-job searching [14,41]. Unfortunately, our data included no information about physicians' previous job changes. In addition, we could assume that a physician's speciality affects his/her willingness to switch work sector, because the possibility of work as a private doctor can differ substantially based on the speciality. In Finland, there are major difficulties in recruiting, e.g., ophthalmologists for hospitals in the public sector, as many of them run private practices. Our data did include information on speciality, but unfortunately the number of observations was too low for statistical analysis, especially in 1993 when the absolute number of Quitters was quite low. However, inclusion of the variable *Private practice* partly makes up for this shortcoming for specialty, because almost all private practitioners are specialists. Our data included also information on sector of public health care (primary or secondary public health care). Unfortunately we failed to run the model due to low number of observations in 1993. However, we were able to split our data by primary and secondary public health care, which gave information about the impact of sector in public health care. Physicians' intentions to sector change seem to be less prevalent among health centre physicians than among public hospital physicians. Willingness to change a work sector could also possibly be explained by changes in organisational structures of hospitals and health centres. If conditions of physician work change, it might influence his/her job satisfaction and therefore intentions to sector change. Unfortunately we had no data to prove that hypothesis. There are still questions that cannot be addressed in this model. It would be interesting to know, for example, how investment in human capital affects willingness to change sector, if it has any effect at all. Such questions are matters for future research.

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Appendix A

Description of '*y*' and '*x*' variables used in the preliminary models

	Description	Categories
Factors related to job satisfaction		
JOBSAT		
JOBSAT1	Secure life	1 = very poorly
JOBSAT2	Good income compared to workload	2 = quite poorly
JOBSAT3	Generally held to be a prestigious position	3 = difficult to say
JOBSAT4	Leading position	4 = quite well
JOBSAT5	Independent position	5 = very well
JOBSAT6	The chance to apply one's own ideas in the work	
JOBSAT7	No work after normal hours	
JOBSAT8	Moderate workload	
JOBSAT9	Observable performance	
JOBSAT10	Gratitude for accomplishments	
JOBSAT11	Interesting work	
JOBSAT12	Possibility of progressing in one's career	
JOBSAT13	Possibility of further education	
JOBSAT14	Possibility of developing professionally	
JOBSAT15	Possibility of specialising	
Factors related to job dissatisfaction		
DISSAT		
DISSAT1	Monotonous work	1 = never
DISSAT2	Tight, inflexible work timetable	2 = not often
DISSAT3	Inconvenient work schedule	3 = sometimes
DISSAT4	Pointless work	4 = quite often
DISSAT5	Too often interfering manager	5 = continuously
DISSAT6	Unconcerned manager	
DISSAT7	Fear of failure in work	
DISSAT8	Poor employee/supervisor relations	
DISSAT9	Tense atmosphere in workplace	
DISSAT10	Excessive duties	
DISSAT11	Ungrateful patients	
DISSAT12	Mentally exhausting work	
DISSAT13	Patients do not follow instructions of treatment	
Factors related to demographics		
DEMOG		
DEM1	Years of experience: number of years since graduation	Continuous
DEM2	Marital status: single, married/cohabiting, widow	1 = single, 2 = has family 3 = divorced, 4 = widow
DEM3	Number of children	Continuous
DEM4	Gender: male/female	1 = male, 2 = female

Appendix B

Descriptive statistics for variables used in preliminary analysis

	1988 survey ($n = 838$) % of answers in categories 4 and 5	1993 survey ($n = 1479$) % of answers in categories 4 and 5	1998 survey ($n = 1817$) % of answers in categories 4 and 5	2003 survey ($n = 1950$) % of answers in categories 4 and 5
Observed '*y*' variables related to job satisfaction				
Secure life	58.7	59.5	67.7	75.6
Good income compared to workload	22.4	29.5	19.7	33.1
Generally held to be a prestigious position	22.9	37.8	42.3	50.7
Leading position	5.6	11.8	13.0	14.4
Independent position	40.7	59.1	53.7	57.0
The chance to apply one's own ideas in the work	42.7	58.6	51.0	51.7
No work after normal hours	31.3	38.2	31.8	36.9
Moderate workload	52.6	73.3	65.7	63.6
Observable performance	42.3	60.2	58.0	62.9
Gratitude for accomplishments	25.3	34.1	32.5	37.3
Interesting work content	72.7	81.5	80.9	84.4
Possibility of progressing in one's career	25.0	21.1	23.2	26.1
Possibility of further education	52.5	58.1	53.5	65.8
Possibility of developing professionally	63.8	70.2	66.8	73.9
Observed '*y*' variables related to job dissatisfaction				
Monotonous work	12.3	8.5	8.5	7.3
Tight, inflexible work timetable	44.3	35.6	51.5	45.2
Inconvenient work schedule	14.1	8.9	9.4	11.2
Useless work	11.7	5.1	4.2	5.4
Too often interfering manager	4.7	4.0	3.3	2.0
Unconcerned manager	10.1	11.2	13.8	11.8
Fear of failure in work	16.7	14.0	15.0	16.0
Poor employee/ supervisor relations	7.2	8.2	9.7	7.2
Tense atmosphere in workplace	6.9	9.1	13.0	10.7
Excessive duties	17.3	8.2	11.2	13.3
Ungrateful patients	9.7	4.7	4.4	4.0
Mentally exhausting work	42.4	33.3	43.1	38.2
Patients do not follow instructions of treatment	15.5	10.9	11.3	15.6

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ORIGINAL PAPER

Nurses' intentions to leave nursing in Finland

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Abstract The shortage of nurses is a problem in many countries. We examined how factors related to wage, work, job satisfaction/dissatisfaction, and workplace or demographic factors were associated with nurses' intentions to switch from health care to non-health-care roles. Wage and share of income from shift work were negatively and statistically significantly related to nurses' intention to leave the health care sector. However, some non-pecuniary variables, such as Possibility for Specialisation gained a positive, statistically significant association with job satisfaction and thereby decreased intention to change work sector. Therefore, not only economic factors influence the labour supply of nurses.

Keywords Nurses · Labour supply · Selection

Introduction

Many countries, such as the UK, the USA, and Finland, currently are experiencing a shortage of registered nurses (RNs) [9, 30]. The mismatch between labour supply and demand (oversupply or shortage) can exist within a single organisation, in either the public or the private sector as a whole, or in the overall labour market for nurses. There are plentiful indicators of potential shortages. The extent to which an organisation is unable to recruit staff to fill vacant posts often is used as an indicator of shortages. Another possible indicator is the extent to which nursing staff regularly and consistently have to work additional hours [6]. Recruitment difficulties can also be measured by the number of months the vacancy has remained unfilled. The reasons for such shortages are numerous. The demand for nurses is expected to rise in many countries because of increasing demand for health care services. The reasons for such increases relate to factors such as an increasing proportion of aging population. It has been estimated that in 2020 a quarter of the Finnish population will be over 65 years of age [34]. Also, advances in medical practice and technology, as well as changes in public expectations of the health care system will increase demand for RNs [6]. Demographic factors are related to both the demand and supply side of the labour force. The average age of both nursing educators and nurses in clinical roles is rising [3]. Therefore, many retirements are expected in the coming years. In addition, the number of those completing the education needed before nurse's training is decreasing [7]. Perhaps most importantly, voluntary turnover is decreasing the labour supply in the nursing field. By some reports, as many as one in five nurses are expected to leave the profession within the next 5 years [20].

The Finnish health care system is similar to those found in other Nordic countries and the United Kingdom in terms of institutional structure, financing, and goals. Most services are produced by public authorities and financed mainly through general taxation. A specific characteristic of the Finnish health care system is the existence of the national health insurance (NHI) scheme, which provides a tax-funded health care system but also provides reimbursement for some services provided by the private sector [12]. The NHI system is financed by all taxpayers in Finland. Public responsibility for health care has been decentralised to smaller local authorities at the municipality level more than in any other country [13]. Municipalities are responsible for providing primary and

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specialist public health care services for all of their residents, regardless of ability to pay or place of residence. Municipalities can provide services themselves, form federations in order to run health centres together, or buy services from the private sector [16]. Federations of municipalities encompass particular hospital districts, of which there are 20 in Finland (if the province of the Åland Islands, which is regulated by separate legislation, is excluded), providing specialised care mostly through their own hospitals [28]. Health services organised by municipality constitute the main health care system, but alongside it private and occupational health services are provided. Private health care in Finland comprises mainly outpatient care, available mostly in larger cities [16]. Most nurses are employed by publicly run hospitals and health centres. In 1995, in public health care, there were 43.1 RNs per 10,000 inhabitants, whereas in 2004 the figure was 66.9 [36].

Even though the supply of nursing labour has been of interest in many countries, the majority of studies are from North America [1]. Many factors influence the labour supply of nurses. Through increasing nursing school enrolment, it is possible to increase the size of the workforce, while retirements decrease the supply of labour. In this paper, we leave factors related to the demand side, as well as those associated with entry to the workforce for future research. Instead, we focused on factors related to exit from nursing. In labour economic literature, the wage rate and the probability of a job change are assumed to have a negative correlation [14, 24], but the impact on hours worked then has been reported to be ambiguous [1]. As nursing is a 'caring profession', other factors in addition to wages are likely to be important in determining nurses' attachment to the job [26, 27]. Job satisfaction/dissatisfaction has been reported to be one predictor of intent to stay or leave the field [8, 10, 31]. However, more research is required before we can understand the relative importance of the many factors identified [21]. There are many possible reasons for nurses to be dissatisfied with their work. The nurse–physician relationship can have negative effects on nurse satisfaction and turnover [22, 25, 29]. Also, poor career advancement and training opportunities may have a stronger impact on intention to quit than workload or pay [1].

In Finland, the shortage of nurses exists at the overall labour supply level, even though the nurse density has increased in recent years. As a result, even permanent nurses' vacancies have remained unfilled. Moreover, some RNs are changing occupation, moving outside health care, which is decreasing the labour force still further. Therefore, in this study we were not interested in nurses' intentions to change workplace within the health care sector. Instead, we analysed factors influencing their intentions to stay or totally leave nursing in health care. The intention to leave an organisation has gained much empirical and theoretical support as an important predictor of actual turnover [33], especially in the psychology literature. Despite economists' scepticism in interpreting intention data, researchers such as van der Klaauw [35] showed that data concerning subjective expectations can hold great promise in making a substantial contribution to our understanding of intertemporal decision-making under uncertainty. We examined how wage-related factors, factors related to work, and workplace or demographic factors were associated with nurses' intentions to switch from health care to non-health-care roles. We also included factors related to job satisfaction/dissatisfaction in our analyses.

Materials and methods

Theoretical model

We defined a change as an intention to move voluntarily from the health care in which a nurse was working primarily (public or private) to a field outside health care. The theoretical model underlying this analysis, the model of individual lifetime utility maximisation, was derived from a review of the economics and health care literature. As in our previous labour supply study [19], it was assumed that individuals will try to maximise the utility that they get from commodities, services and leisure [5]. Additional purchases of consumption goods or more hours devoted to leisure activities are assumed to increase the person's utility. In order to obtain income for purchases, individuals have to work. The cost of work is the value of forgone leisure. The work itself was not assumed to provide utility, but working was seen as a way to earn money that could be spent on commodities and therefore increase nurse's utility. The utility function of work could be seen as an implicit utility function where, by maximising utility from work, the consumer can maximise his or her utility gained from commodities and leisure. The choice is assumed to vary depending on tastes and preferences of the individual making the choice. Change results from an individual re-evaluating his/her current employment situation and deciding not to continue existing employment. The nurse's decision to make a change can be written as:

$$U_i = f(d_i * Z + u_i) \quad (1)$$

where i indexes the sectors (0 = health care and 1 = outside health care), Z is a set of explanatory variables, d is a vector of coefficients associated with Z, and u is a random error term. A nurse will remain in the health care sector if his/her utility from employment (and therefore utility from monetary and non-pecuniary elements of utility function) is

higher than his/her utility from employment outside the health care sector—i.e., $U_0 - U_1 > 0$.

A number of factors may influence nurses' intentions to leave the health care sector. Work-related factors are likely to affect intentions, and wages may be a key factor affecting a worker's behaviour. If employers are not able to offer a salary competitive with those offered to workers with, e.g., a similar education, they may have difficulty retaining staff. Also, high workload can increase pressure on workers and therefore increase quitting rates. Generally, age and quitting are held to be inversely related, as age correlates with length of service and the acquisition of firm-specific capital leading to higher pay [9, 11]. However, this generalisation need not hold true always. Younger workers can have higher quitting rates since they have lower investments in their job and community. Older workers' quitting rates can rise when moves occur for promotion [11]. Acquisition of occupation-specific skills in the health care sector is also somehow different from the equivalent in, e.g., industry, because the skills are not wholly transferable to sectors outside health care. Therefore, it is difficult to predict age's relationship to sector change. In summary, in extending the model further, nurses' utility function from changing sector can be expressed as:

$$\text{Intention to change} = f(\text{WORK, SATISFACTION, DISSATISFACTION, SOCIODEMOGRAPHICS}) \quad (2)$$

where WORK includes factors related to work and workplace as well as financial factors.

Data

Survey data were collected in November 2005. In the previous spring, the questionnaire was piloted twice and improved slightly on the basis of the results obtained. A random sample of nurses was drawn from the registry of the Union of Health and Social Care Professionals. The questionnaire was posted to 5,000 Finnish nurses who were registered with a completed nursing qualification. After two reminders, the response rate was 68.14%. Some 0.01% of responses were blank or indicated unwillingness to participate in the survey. Only one response had to be excluded due to incomplete response, Fig. 1. In 2004, according to the registry of the Union of Health and Social Care Professionals, 93.5% of the members were female and the mean age of nurses (including men and females) was 41.7 years [23]. Therefore our sample represented the nurse population in the above registry in terms of age and gender.

Variables

In our final data (n = 2,866), we included those qualified nurses who were not unemployed or pensioners on the survey date. In addition, those nurses who were not working in the health care sector were excluded. Therefore, all who were included were working mainly in the health care sector, whether public or private. The question 'What is your likely working organisation in year 2010?' was used to formulate the dependent dummy variable 'Work2010'. We excluded also those nurses who answered

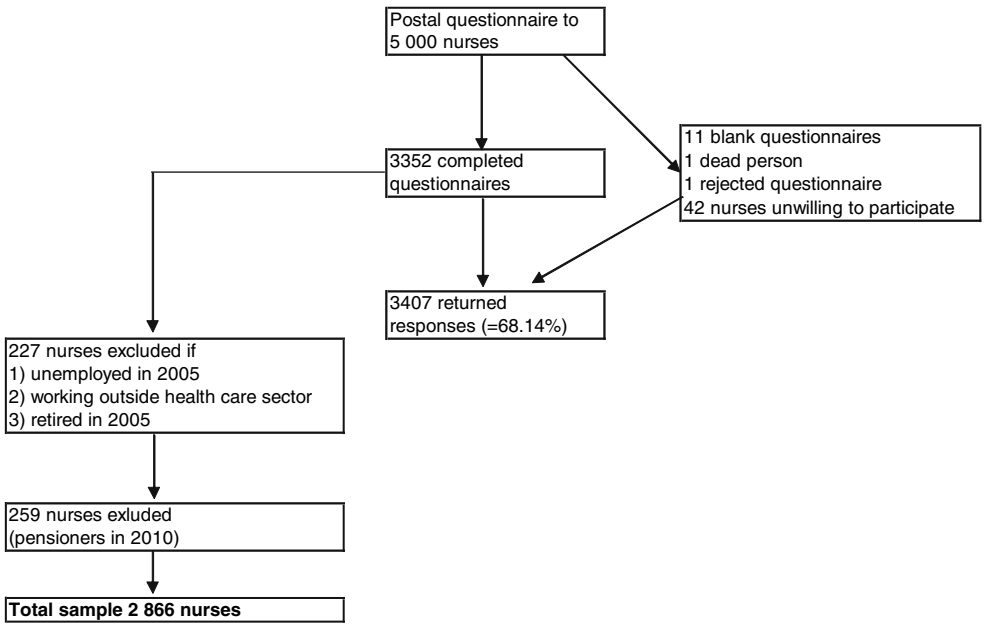

Fig. 1 Constructing the sample

that they would be pensioners in 2010, Fig. 1. If a nurse answered that he/she would be working in the health care sector (public or private) in 2010, the dummy variable was coded as 0, otherwise as 1.

The data consist of a comprehensive range of variables. In Table 1, we report the descriptive statistics of the work- and wage-related characteristics, factors related to job satisfaction/dissatisfaction, and sociodemographic factors used in preliminary analyses. Aspects of job satisfaction were assessed via the question 'How well are the following aspects of job satisfaction realised in your present work?' A five-point rating was used, and the answers were classified as 1 = not at all, 2 = a little, 3 = sometimes, 4 = quite a lot, 5 = very much. Factors related to job dissatisfaction were assessed by means of the question 'How inconvenient are the following possible elements of dissatisfaction in your present work?' The answers were classified again as above (1 = not at all … 5 = very much). In the data analysis a five-point rating was used for factors related to job satisfaction and job dissatisfaction, but for the descriptive statistics (Table 1) we combined categories 1–3 (not at all, a little, some) as category 0 and categories 4 and 5 (quite a lot/very much) as category 1. Nurses work under different contractual arrangements and quite often work shift hours also. In our study sample, 45.2% of nurses worked in three-shift rotation, 18.8% in two-shift work, 31.6% days only, and 4.4% nights only or under other contract arrangements. Askildsen et al. [2] showed in their study that it is important to control for this aspect of nurses' work conditions also, since shift work can affect the labour supply itself and also lead to biased wage effect if omitted. In our data, shift work was calculated as the share of total monthly income that a nurse receives as compensation for shift work.

Statistical analyses

Preliminary analysis of the data was performed using the logistic regression analysis (SPSS 14.0) to uncover the factors, suggested by the theory and other empirical studies, that could be associated with nurses' intentions to continue to work or leave the health care sector. The variables were found to be related to relatively few characteristics, such as job satisfaction and dissatisfaction. However, these factors are latent variables by nature and regression analysis cannot define them unambiguously. However, the structural equation modelling technique (SEM) covers a variety of modelling techniques, such as factor and regression analysis. SEM is a very powerful analytical tool, which takes into account e.g., nonlinearities and correlated independents as well as measurement errors. Especially when one tries to measure such abstractions as people's behaviour, measurement models are important. There may be many other variables that are associated with the dependent constructs, but are not included in the model. The aggregation of all such omitted variables is presented in the model by a set of stochastic error terms, one for each dependent construct [17]. When including into model multiple indicators per latent variable, it is possible to reduce measurement error. Utilizing SEM it is also possible to test models overall, not only individual coefficients. Therefore, a confirmatory factor analysis was conducted through SEMs using LISREL 8.7, the basic idea of which is to analyse the difference between the population (sample) covariances and the covariances predicted by the model. Formally, it can be formulated as: [4]:

$$\sum = \sum(\theta) \tag{3}$$

where Σ denotes the matrix of observed covariances in the sample and θ is a vector of model parameters. The purpose of the modelling is to minimise the difference between the sample covariance matrix and the model covariance matrix so that Eq. (3) holds with some acceptable statistical precision. Structural equation models comprise two components: a measurement model and a structural model. The measurement model relates observed responses or indicators to latent variables. The structural model specifies relationships among latent variables and regressions of latent variables on observed variables [32]. The behaviour of latent variables can be observed only indirectly—i.e., through their effects on manifest variables. In SEM, there are two types of latent variables: exogenous (ξ) and endogenous (η). Exogenous variables are independent variables in all equations in which they appear, while endogenous variables are dependent variables in at least one equation. Observed variables that are associated with exogenous variables are labelled with 'x', while those associated with endogenous variables are labelled with 'y'. Matrix B includes estimates related to η, and matrix Γ represents relationships between ξ and η. The measurement models (Eqs. 4 and 5) and a structural equation model (Eq. 6) can be formulated as:

$$x = \Lambda_x \xi + \delta \tag{4}$$

$$y = \Lambda_y \eta + \varepsilon \tag{5}$$

$$\eta = B\eta + \Gamma\xi + \zeta \tag{6}$$

where Λ_x and Λ_y are factor loadings and δ, ε, and ζ are measurement errors. As suggested by [17], we began the data analysis by first specifying an initial model on the basis of theory and stated hypothesis. The relationships between the observable indicators and the theoretical constructs (SOCIODEM, WORK, SATISF, DISSAT and INTENT) were specified. The measurement model for each

Table 1 Definitions and descriptives of variables used in preliminary analyses—for continuous variables, means, and standard deviations (in brackets)

Name	Definition	Categories	Descriptives
Work2010	Nurse's likely working organization in year 2010	0 = in the health care sector	94.7%
		1 = outside health care sector	5.3%
		Total	100.0%
Work- and wage-related characteristics			
Employment	Full-time or part-time job	0 = part-time job	7.1%
		1 = full-time job	92.9%
		Total	100.0%
Job status	Job status of current work	1 = nurse	76.3%
		2 = midwife/nurse	2.7%
		3 = immediate superior	7.3%
		4 = manager in highest position/ assistant manager	8.5%
		5 = other	5.2%
		Total	100.0%
Nurses	Number of nurses in current work unit	Continuous	15.48 (19.375)
Hospital	Hospital district	19 different hospital district dummies	
Work unit	Current main work unit	0 = hospital/health centre ward	48.6%
		1 = outpatient department	20.4%
		2 = intensive care unit, observation ward	7.0%
		3 = operating ward	9.0%
		4 = home care unit	7.9%
		5 = other	7.1%
		Total	100.0%
Organisation	Current working organisation	0 = private sector	10.0%
		1 = public sector	90.0%
		Total	100.0%
Wage	Nurse's gross taxable wage per month	Continuous, measured in 2005 euros	2145 (347)
Shift work	Proportion of total monthly income that a nurse receives as compensation for shift work	Continuous, %	11.45 (10.240)

Factors related to job satisfaction		Categories	% in category 1
Secure	Secure living	Category 0 = not at all, a little, some Category 1 = quite a lot / very much	66.0
Satisfying income	Satisfying income in comparison to workload	For all variables related to job satisfaction	15.6
Prestigious career	Generally prestigious career		32.0
Independent	Independent position		41.2
Normal hours	No work after normal work hours		44.1
Job description	Well-defined responsibilities and job description		51.9
Progress	Possibility of progressing in one's career		15.5
Specialisation	Possibility for specialisation		28.3
Community	Good work community		64.6

Table 1 continued

Factors related to job dissatisfaction		Categories	% in category 1
Monotonous work	Monotonous work	Category 0 = not at all, a little, some Category 1 = quite a lot / very much for all variables related to job dissatisfaction	6.8
Tight	Tight, inflexible work schedule		30.4
Inconvenient	Inconvenient work schedule		11.9
Relations	Poor relations between employee and supervisor		14.2
Atmosphere	Tense atmosphere in workplace		15.0
Excessive duties	Excessive duties		14.6
Patients	Ungrateful patients		9.5
Much paperwork	Much paperwork		25.1
Workload	Excessive workload		36.8
Decisions	Not possible to make own decisions		6.9
Physicians	Physicians do not respect nurses as equals		14.5

Sociodemographic characteristics		Categories	
Gender	Male/female	0 = male	6.1%
		1 = female	93.9%
		Total	100.0%
Age	Age, in years	Continuous	41.6 (9.2)
Marital	Marital status	1 = single	10.7%
		2 = has family	78.7%
		3 = divorced/widowed	10.6%
		Total	100.0%
Experience	Years of experience in nursing profession	Continuous	12.69 (8.605)
Children	Number of children	Continuous	2.22 (0.986)

construct was estimated separately as well as for all the constructs. Finally we included into the model the relationships between the latent constructs and estimated the structural equation model for the constructs jointly with the measurement model. To obtain parameter estimates, we used the generally weighted least squares (WLS) estimation technique. To fit the model, we ran several models using different combinations of constraints (factor loadings, error variances, and factor correlations), letting all or some of them differ. Paths with the largest modification indices were added or dropped if the model fit improved and the change reflected a theoretically viable relationship. We expected imperfect observation of the indicators related to SOCIODEM, WORK, SATISF, DISSAT and INTENT. However, when the latent variable has only one indicator, as is the case with the latent variable INTENT in our model, the error term of its indicator variable WORK2010 had to be fixed at 0, on account of the modelling technique. The observed variables *Job status of current work*, *Possibility of progressing in one's career*, *Excessive duties*, and *Age* were modelled as base variables. Therefore their factor loadings were fixed at the value 1, in order to give the latent factors an interpretable scale. To assess how well the hypothesised model fits the data, we conducted several statistical tests, such as chi-square tests and fit indices that were less dependent on the sample size [17, 18].

Results

In the analysis, 94.7% of nurses (n = 2,713) were planning to continue to work in the health care sector, and 5.3 % (n = 153) planned to leave the health care sector until the year 2010. The sample and respondents were representative of the overall nurse population in terms of age and gender as well as nurse density in the various hospital districts. In Fig. 2, the final SEM is presented as a path diagram. The latent constructs are represented by ellipses and the indicators of the latent constructs by rectangles. The arrows from the latent factors to the observed variables represent linear regression coefficients or factor loadings.

Fig. 2 The path diagram

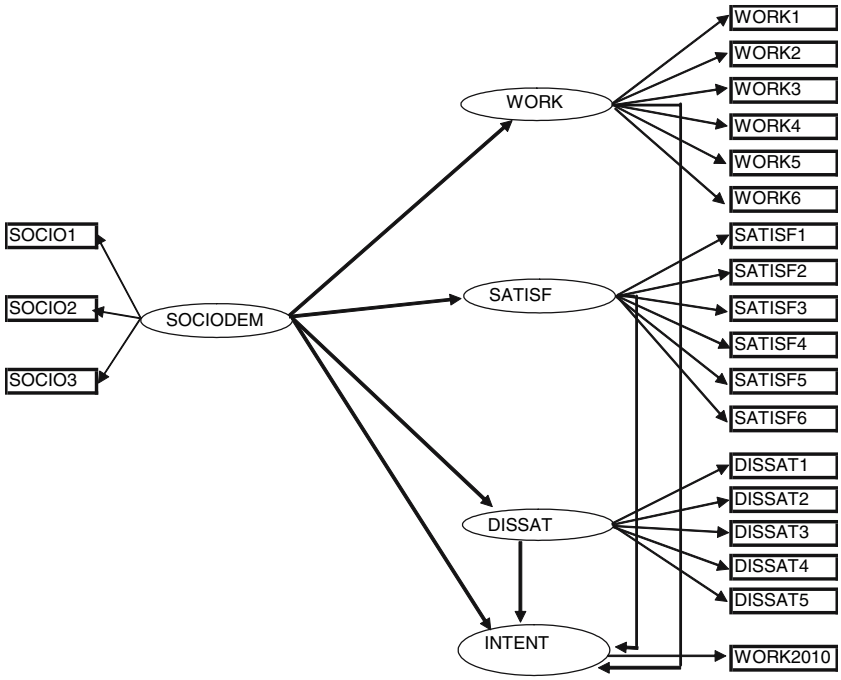

Table 2 Estimated structural coefficients from SEMs for intention to leave, *t*-tests, standardised values

Structural path	Coefficient	*t*-test
WORK	0.24	5.35
Intention to leave		
JOB SATISFACTION (SATISF)	–0.47	–5.54
Intention to leave		
JOB DISSATISFACTION (DISSAT)	0.23	4.15
Intention to leave		
SOCIODEMOGRAPHIC FACTORS (SOCIODEM)		
Intention to leave	–0.20	–13.69
Work	0.33	17.29
Job satisfaction	–0.05	–2.87
Job dissatisfaction	–0.18	–11.83

The structural model in our analysis consisted of the exogenous variable SOCIODEM and four dimensions as endogenous variables: WORK, SATISF, DISSAT, and INTENT. The latent variable INTENT had only one indicator (WORK2010), whereas latent variable WORK had indicators from WORK1 to WORK6, latent variable SATISF indicators from SATISF1 to SATISF6 and latent variable DISSAT indicators from DISSAT1 to DISSAT5.

Table 2 presents the overall impact of latent factors related to work, job satisfaction, job dissatisfaction, and sociodemographic factors on intention to change working sector.

All hypothesised latent factors had statistically significant association with intention to change sector. Latent factors SATISF and SOCIODEM were negatively and statistically significantly related to intention to leave. The other latent variables, WORK and DISSAT, had a statistically significant but positive association. Therefore, by, e.g., influencing factors related to nurses' satisfaction, it could be possible to decrease intention to leave the health care sector. In addition to direct effects, demographic factors had statistically significant indirect effects on intention to leave through their impact on factors related to work, job satisfaction, and job dissatisfaction. Table 3 shows the estimated standardised coefficients and *t*-test values for the hypothesised measurement model. All indicators of endogenous latent variables in the final model had high *t*-test values (>critical value |1.96|), implying them to be good indicators of latent variables.

In SEM models, standardised structural coefficients are used to judge the relative importance of independent variables. If, for example, the standardised structural coefficient is 0.76, then the latent dependent variable increases by 0.76 standard units for each unit of increase in the latent independent. Both wage-related factors in our analysis, *Wage* and *Share of income from shift work*, were negatively and statistically significantly related to latent variable WORK. Therefore by increasing their value it could be possible to decrease nurses' intention to leave the health care sector. In addition to *Share of income from shift work*, *Job status of current work* and *Number of nurses in work unit* had the greatest values for standardised coefficients. Increasing the number of nurses in a work unit decreases the value of latent variable WORK and thereby possibly also nurses' intention to leave the

Table 3 The estimated coefficients and *t*-tests of measurement models, standardised values

Observed *y*-factors related to latent variable WORK	Coefficient	*t*-test
WORK1 = Job status of current work	0.60	
WORK2 = Hospital district	0.07	3.47
WORK3 = Current main work unit	–0.17	–6.32
WORK4 = Number of nurses in work unit	–0.50	–7.82
WORK5 = Wage	–0.21	–3.93
WORK6 = Share of income from shift work	–0.50	–7.64
Observed *y*-factors related to latent variable SATISF		
SATISF1 = Secure living	0.34	11.88
SATISF2 = Satisfying income in comparison to workload	0.63	15.75
SATISF3 = Generally prestigious career	0.60	15.75
SATISF4 = Possibility of progressing in one's career	0.49	
SATISF5 = Possibility for Specialisation	0.39	18.20
SATISF6 = Good work community	0.45	10.38
Observed *y*-factors related to latent variable DISSAT		
DISSAT1 = Monotonous work	0.26	9.23
DISSAT2 = Excessive duties	0.83	
DISSAT3 = Much paperwork	0.27	9.83
DISSAT4 = Not possible to make own decisions	0.52	11.95
DISSAT5 = Physicians do not respect nurses equals	0.76	20.66
Observed *x*-factors related to latent variable SOCIODEM		
SOCIO1 = Age, in years	1.00	
SOCIO2 = Gender	0.17	18.36
SOCIO3 = Marital status	0.41	6.60

health care sector. Observed variables *Satisfying income in comparison to workload* and *Generally prestigious career* had the greatest positive standardised structural coefficients, indicating these responses to be good predictors of job satisfaction. Therefore, increased values here indicate increased job satisfaction and possibly decreased intention to leave the health care sector. The *Not possible to make own decisions*, *Excessive duties*, and *Physicians do not respect nurses as equals* variables had the highest estimate values, being the best indicators of job dissatisfaction. The more often nurses felt it was not possible to make their own decisions or felt they had an excessive workload, the more dissatisfied they were and the more often they were planning to leave the health care sector. Also, the variable *Physicians do not respect nurses as equals* had a high estimate value and gained statistical significance, but the proportion of nurses who held that view was quite low, at only 14.5% (Table 1). Therefore, we can conclude that our study does not provide strong evidence for poor relations between nurses and physicians. In addition, sociodemographic factors influenced nurses' intentions to switch sectors.

Table 4 The model fit indices

Name of fit index	Value
Chi-square	831.54
df	145
P-value	<0.001
RMSEA	0.041
(Root mean square error of approximation)	
NFI (normed fit index)	0.90
NNFI (non-normed fit index)	0.88
CN (critical N)	647.12
CFI (comparative fit index)	0.92
AGFI (adjusted goodness of fit index)	0.98
GFI (goodness of fit index)	0.99

The model fit of our data was assessed in several ways. The use of chi-square values with 145 degrees of freedom ($P < 0.05$) from the observed covariance matrix failed to fully explain the relationships observed, due to our large sample size. However, support for the good fit of the final model was obtained from fit indices that were less dependent on sample size [17, 18], Table 4.

Discussion

Comparing all professions (including those outside health care), one finds two main professions that for many years have suffered from recruitment difficulties: physician and nurse [15]. Due to demographic factors, many retirements are expected in the future. Also, the number of persons available to enter nurse's training is decreasing. In Finland, there has been discussion about reorganising the balance of duties between nurses and physicians. Therefore, some duties that previously have been taken care of by physicians could in the future be included among nurses' responsibilities. Our study also has confirmed one threat that still may worsen the shortage of RNs: 5.3% of nurses in this study were planning to leave health care completely for non-health-care work in the next 5 years. In international terms, this percentage is quite low, but in the Finnish context it is high. With labour resources in the health care sector already scarce, it is essentially important to prevent RNs who still perform nursing duties from moving outside health care. For the reasons mentioned above, the shortage of RNs is projected to remain or even increase in the near future, indicating that more research is urgently needed to determine the factors related to RNs' labour supply decisions.

In this study we have shown that both economic and non-economic variables are influencing nurses' labour availability. Our study identifies a wide range of factors related to work, workplace, job satisfaction, job dissatisfaction, and socioeconomic status that may influence the movement of nurses away from health care. Our results showed that *Wage* and *Share of income from shift work* were negatively associated with latent variable WORK, and thereby nurses' intentions to leave the health care sector. The policy implication therefore would be that wage-related factors matter for nurses' labour supply. An interesting finding was that *Share of income from shift work* seemed to be even more important than wages in nurses' labour supply decisions. Therefore, it could be possible to decrease nurses' intentions to leave health care by increasing not only wages but also proportion of income from shift work. Although, in the short run we can not increase the number of nurses, we could increase working hours supplied. However, also non-pecuniary factors were related to intention to change sector. *Possibility for Specialisation* gained a positive, statistically significant association with job satisfaction, and thereby decreased intention to change work sector. Therefore, that investment for occupational development opportunities is one policy instrument to retain nurses in the health care sector. Organisational culture should be examined also, as the variable *Good community* was positively associated with job satisfaction thus decreasing intention to switch sector. Factors related to job dissatisfaction, such as *Monotonous work* and *Excessive duties*, were also positively statistically significantly related to intention to leave the health care sector. More flexible work schedules could be designed to balance work and leisure time. We also found a positive association between *Much paperwork* and job dissatisfaction. In Finland, hospitals and health centres are planning to replace traditional, paper-based reporting systems with electronic ones. Would that still increase administrative work? Also, autonomous decision-making is an important issue in considering how to provide health care, even though only 6.9% of nurses in our study felt it was not possible to make their own decisions.

A discussion of some limitations of this study is in order. Firstly, there are potential limitations of the SEM modelling technique. Possible limitations of the path analysis are the interpreted causal relationships between the latent variables and their corresponding measurement variables, based on a linear equation system. However, there is a possibility of non-linear relationships between these variables. Therefore, SEM analysis allows only a weak evaluation of hypothesized causal hypothesis and consequently our present findings do not permit causal interpretations. Also sample size is an important factor influencing the accuracy of statistics. Consequences of using small sample sizes are related to e.g. convergence failures and lowered accuracy of parameter estimates, in particular standard errors (SEM program standard errors are computed under the assumption of large sample sizes). However, in this analysis, sample size was sufficiently large. Secondly, the data were obtained via nurse self-reports in postal surveys. If the nurse was planning to leave the health care sector, he/she may have been reluctant to respond to this survey, therefore lowering the response rate. In addition, some nurses' mother tongue was Swedish, which may have lowered the response rate to this Finnish-language questionnaire. Nonetheless, the response rate was quite high. Secondly, questions remain that cannot be addressed in this model. Our variable indicating share of income from shift work might not wholly enough control the influence of shift work. It would have been useful to distinguish between normal shift work and shift work in unsocial hours or public holidays, since these are usually paid at a higher rate and may have been misconstrued for multiple shifts in the data. Unfortunately it was not possible to distinguish between these types of shift work in our analysis.

Also many nurses in Finland have fixed-term contracts. It would be interesting to know how these affect nurses' intention to switch working sector. Including that perspective in the analysis would be one interesting subject for our future research. In addition, considering also those nurses who already have left nursing would provide additional information on factors affecting nurses' labour supply decisions.

Conclusions

In conclusion, not only economic factors influence the labour supply of nurses. Both short- and long-term strategies exist to deal with nurse shortages. Increased wages can have short-term effects on recruitment but can have long-term effects as well if more people are attracted to staying in the nursing profession. Although financial incentives are important, on their own they do not suffice to keep nurses in the health care sector. Attention should be paid also to long-term strategies involving efforts to improve nurses' work environment as well as the work content. More flexible work schedules could be used to balance duty time and leisure time.

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ORIGINAL PAPER

The labor supply of registered nurses in Finland: the effect of wages and working conditions

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Abstract Many countries report, to varying degrees, of suffering from a shortage of nurses. We examined both pecuniary and non-pecuniary factors that may be associated with nurses' labor supply. We approximated a classical labor supply model and calculated the wage elasticities of hours of work and participation. Even though the wage elasticity was quite small, the effect on the hours supplied was significant. However, wages alone may not sufficiently increase the labor supply from the current stock of nurses; other elements, such as contractual conditions, seem to play an important role as well.

Keywords Nurses' labor supply · Heckman · Selection

Introduction

Nursing professionals play an essential role in the delivery of health services. However, many countries report, to varying degrees, of suffering from a shortage of nurses [7, 13], which can lead to, e.g., reduced quality of care and increased patient waiting times. Reasons for the shortages are associated with both demand- and supply-side factors. Demand for health care professionals and health care has increased, due to factors such as advances in medical practice, coupled with increasing expectations regarding treatment and an ageing work force. At the same time, the supply of nurses has declined. In the past few decades, employment opportunities have opened up for women, and nursing is no longer the main option besides teaching when a woman is planning her career [7]. Therefore, nursing now faces more competition with other professional occupations, which has been one factor leading nurses to drift away from the health care sector. Also, increasing numbers of nurses retire each year. To ensure adequate numbers of motivated and well-educated nurses, it is important to identify factors that influence these shortages.

In Finland, retaining an adequate number of nurses is set to present one of the greatest challenges in the health and social care sector in the near future [16]. In Finland, municipalities have, by law, the main responsibility for arranging social and health services. There are 416 municipalities (as of 1st January 2007), which are responsible for providing public primary and specialized health services for their citizens. Municipalities can provide services themselves, they can form federations in order to run health centers together, or they can buy services from the private sector. Federations of municipalities encompass particular hospital districts, the number of which is 21 (the self-governing Åland islands are excluded here). The public health care sector in Finland exists alongside the private sector, and the two are separate in terms of funding. According to the Organisation for Economic Co-operation and Development (OECD) Health Data 2007, in 2004, there were 7.6 practicing nurses (RNs) per 1,000 inhabitants [11]. Most nurses were employed by publicly owned and run institutions.

Wage policy can be powerful in the health care sector if it alleviates the shortage. It could be assumed that higher wages induce some increase in the supply of working hours of RNs. Also, some of those currently not working in health care may decide to re-enter the field. In addition, those working part-time may switch to full-time work or even work overtime hours. By far the most popular policy voiced by nursing unions has been to increase nurses'

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wages. However, economic theory is ambiguous in this respect, and it is not clear how effective wage increases will be [13]. Also, when one looks at the literature, the usefulness of wage policies has been shown to be only of minor importance, especially in affecting the hours supplied. The main conclusion of previous empirical studies has been that the wage elasticity is unresponsive or inelastic and that very large increases in wages would be needed to induce even moderate increases in the labor supply [13]. The wage elasticities for females have been quite small or even negative [1, 3, 12]. The average wage elasticity across all US studies has been around 0.3 [13], and, generally in studies of the wider female labor market, it has been 0.2 [4].

The traditional empirical economics literature has focused on the role of wages, but that of the non-pecuniary elements, such as the flexibility of working hours and control over shifts/hours, has been neglected [1]. However, in some studies [5, 14], it is also recognized that non-pecuniary factors matter in nurses' labor supply. Therefore, they need to be integrated with the traditional labor supply models [1]. Also, shift work has been reported to affect nurses' hours of work; thus, if it is not controlled for in the analysis, the models will underestimate any potential wage effect [2].

To conclude, the evidence for different kinds of policies aimed at addressing the mismatch between labor supply and demand is still quite unclear. The reason for this is that little is currently known about the factors that influence the labor supply of health professionals [1, 13]. In addition, the RN labor supply literature has been US-dominated, which partly reflects the availability of data [13]. The aim of this paper is to examine both pecuniary and non-pecuniary factors that may be associated with nurses' labor supply. The factors related to the demand side are left for future research. We will approximate a classical labor supply model and calculate the wage elasticities for the hours of work and participation. We hope to offer new evidence about how increases in wages might affect the hours of work supplied by nurses currently working in the health care sector. In addition to wages, we controlled for nurses' individual characteristics, as well as the type of contract and other workplace- and work-related characteristics, thereby, also offering new evidence regarding non-pecuniary elements in the model.

The model

In the neo-classical framework, individuals attempt to maximize their utility subject to income and time constraints. They choose to work or not to work by comparing their personal valuation of time. Individuals are observed as working only if the market wage (the wage they could achieve in the labor market) exceeds their reservation wage (the wage required to make them choose to enter the labor market). Following Phillips [12], the probability that nurse i works can be expressed as:

$$\Pr(i \text{ works}) = \Pr(W_{\mathrm{m}} > W_{\mathrm{r}}) \quad (1)$$

where W_{m} equals the real market wage and W_{r} is the real reservation wage.

The market wage (Eq. 2) and reservation wage (Eq. 3) can be expressed as:

$$W_{\mathrm{m}} = \beta_0 + \beta_1 S_i + v_i \quad \text{regression equation} \quad (2)$$

$$W_{\mathrm{r}} = \beta_0 + \beta_1 Z_i + \beta_2 I_i + e_i \quad \text{selection equation} \quad (3)$$

where S_i and v_i represent vectors of observable and unobservable human capital characteristics affecting the market wage, such as a higher degree of qualifications and experience as a nurse, as well as factors related to nurses' work and workplace. Z_i represents a vector of individual characteristics (e.g., number of children and marital status), and I_i represents the non-labor income such as the spouse's wage.

If nurses choose to work, the supply of hours, H_i, is determined by the equality of the market wage and the marginal rate of substitution between consumption and leisure [12]. If the market wage exceeds the reservation wage, the hours of work can be represented by the same terms as in Eq. 3, as well as characteristics related to nurses' work and workplace:

$$H_i = \beta_0 + \beta_1 Z_i + \beta_2 I_i + \beta_3 J_i + \beta_4 C_i + e_i \quad \text{if } W_{\mathrm{m}} \geq W_{\mathrm{r}} \quad (4)$$

where J_i represents a vector of work-related characteristics, such as nurses' position or working schedule, whereas C_i includes factors like the workplace and working unit. If the market wage is below the reservation wage, the hours of work will be zero. The participation decision is assumed to be influenced by factors related to household composition, the geographic region where the nurse is living/working, and nurses' specific personal variables.

Data, variables, and empirical specifications

Data

Survey data were collected in November 2005. Before that, the questionnaire was piloted twice. A random sample of nurses was drawn from the registry of the Union of Health and Social Care Professionals. The questionnaire was posted to 5,000 Finnish nurses who were registered as having a completed nursing qualification. After two reminders, the response rate was 68.14% ($n = 3{,}407$).

Some 0.01% of these responses were blank or indicated unwillingness to participate in the survey. Only one response had to be excluded due to incomplete responses. In the end, we obtained 3,352 complete responses. The mean age of these nurses was 42.9 years, and there were 195 males (5.8%) in the data. In 2004, according to the registry of the Union of Health and Social Care Professionals, 93.5% of the members were female and the mean age of nurses (including both males and females) was 41.7 years [18]. Therefore, the sample and respondents were considered to be representative of the overall nurse population in the registry of the Union of Health and Social Care Professionals in terms of age and gender.

In the construction of our sample, nurses licensed but employed outside the nursing field were excluded, as well as those who were already retired at the time of the survey ($n = 221$). The nature of the female labor supply is different from that of males: featuring more prominently are both career breaks and variation in the hours of work [15]. Therefore, the focus of this study was on female nurses, and only their responses were included. Female working-age nurses, midwives, and clinical nurses account for about 94% of the work force in the nursing profession in Finland [9]. Nurses were either not employed at all (i.e., unemployed) or were employed by the public, private, or third health care sector. Those working nurses who did not report weekly working hours or monthly salary were excluded ($n = 515$), but, unfortunately, our data also included many missing observations for partners' wage and variables related to the working place and work itself. The variable representing the working schedule was particularly strongly affected. Therefore, before estimation, the sample was reduced to 1,486 cases (1,475 workers, 11 not in the labor force); see Fig. 1.

Variables and empirical specifications

One major methodological issue in labor supply models has been the sample selection bias, which can occur when the hours of work supplied are only observed for those nurses who have made the decision to work. Therefore, the sample of workers on which the imputation is based may not be a random sample of individuals with nursing qualifications. Heckman's sample selection models are widely used in labor economics and were also used in this analysis, in addition to the ordinary least squares (OLS) and Tobit methods. Heckman's models consist of two equations: the first is a probit-type equation that predicts whether or not somebody is working. The following, second equation is a linear regression equation conditional on the individual working [8], predicting, e.g., monthly wage or hours supplied.

The variables used in the analysis are defined in Table 1. The joint model for the market wage (Eq. 2) consisted firstly of the binary probit equation for the labor market participation decision (Eq. 3), followed by the wage equation. Participation was assumed to be affected by variables related to household composition, such as the number of children and having pre-school children, market wage, partner's wage, nurse's own age, and working/living region, as well as each nurse's specific personal variables. Identification of the Heckman selection model can rely on

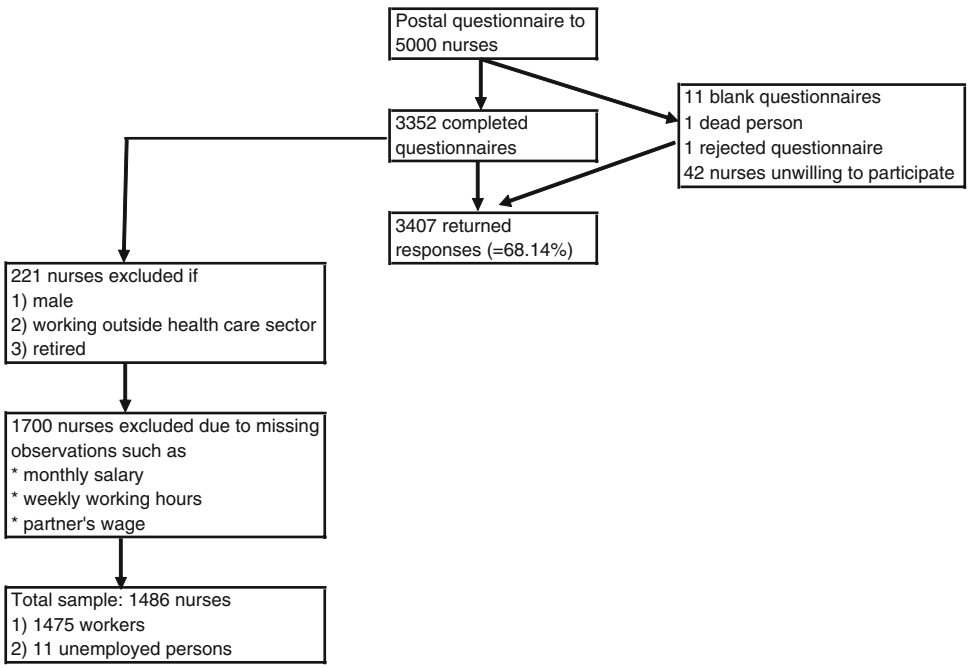

Fig. 1 Flowchart of the creation of the study sample

Table 1 Variable names and definitions

Variable	Definition	Value
ln wage	ln (natural logarithm) of the nurse's reported gross taxable monthly wage in 2005 (EUR), including all bonuses and overtime	7.65 (0.17)
ln hours	ln of reported weekly hours of work	3.60 (0.14)
Imp wage	Imputed wage for those not working, ln of nurses' average monthly wage (1,623 EUR)	7.39
Experience	Years of experience in nursing profession	13.82 (9.33)
Experience^2	Square of experience	
Education in health care	Basic nursing education (base category)	0.41 (0.49)
	College-level education	0.21 (0.41)
	Higher degree qualification	0.37 (0.48)
	Another qualification equivalent to a nursing qualification	0.01 (0.10)
Age	Respondent's age	
	$\leq$35 years (base category)	0.28 (0.45)
	36–45 years	0.34 (0.45)
	46 years or over	0.38 (0.49)
	Mean age across all categories	42.0 (9.47)
Children <18	Number of children <18 years of age	1.08 (1.14)
Children 3–7	1 if the nurse has children between the ages of 3 and 7, 0 otherwise	0.23 (0.42)
Child <3	1 if the nurse has children aged 2 or younger, 0 otherwise	0.08 (0.27)
Family	1 if the nurse is married/cohabiting with children, 0 otherwise	0.80 (0.40)
Partner's wage	Partner's gross monthly wage in 2005 (EUR)	2,717 (1,293)
Working schedule	Regular working schedule:	
	Day work (base category)	0.36 (0.48)
	Night work	0.01 (0.09)
	Two-shift work	0.18 (0.38)
	Three-shift work	0.42 (0.50)
	Other schedule	0.03 (0.16)
Position	Respondent working as:	
	Staff nurse (base category)	0.82 (0.38)
	Senior nurse	0.17 (0.38)
	Other (teaching co-ordinator, assistant, therapist)	0.01 (0.07)
Contract (in hours equation)	Reported working hours/week:	
	=38 hours (base category)	0.64 (0.48)
	<38 hours	0.19 (0.40)
	>38 hours	0.17 (0.37)
Contract (in wage equation)	1 if having full-time contract, 0 if part-time contract	91.12 (0.28)
Working unit	Ward (base category)	0.46 (0.50)
	Outpatient department	0.22 (0.41)
	Intensive care unit	0.07 (0.25)
	Operating room	0.10 (0.30)
	Home care	0.09 (0.28)
	Other unit	0.06 (0.24)
Working place	1 if nurse working in the place, 0 otherwise:	
	Hospital (base category)	0.53 (0.50)
	Health center or mental health clinic	0.28 (0.45)
	Long-term care of the elderly	0.05 (0.22)
	Nursing home	0.05 (0.22)
	Other	0.09 (0.29)

Table 1 continued

Variable	Definition	Value
Region	1 if nurse is living or working in the region, 0 otherwise:	
	Region 0 (HYKS, base category)	0.28 (0.44)
	Region 1 (TYKS)	0.13 (0.34)
	Region 2 (TAYS)	0.23 (0.42)
	Region 3 (KYS)	0.20 (0.40)
	Region 4 (OYS)	0.16 (0.37)

Data shown are sample statistics and mean values for the total sample ($n = 1{,}486$), with standard deviations in parentheses

finding some explanatory variables that enter the probit equation, but do not enter the second-stage regression [8]. Variables related to children were assumed to affect the nurse's participation decision, but not the market wage.

The nurses' market wage variable (see Eq. 2) was assumed to be based on traditional Mincer human capital characteristics, such as labor market experience and education. Further variables were, e.g., factors related to nurses' work unit and contracts. All nurses in the sample had completed a nursing qualification. Three dummy variables, which were related to education in health care, were added to capture additional qualifications over the minimum nursing qualification. Basic nursing education was used as a reference category to include nurses who had no additional education in health care. College-level education included nurses who had the basic nursing education but also health care education acquired before it. Higher degree education (e.g., for a specially trained nurse) refers to those nurses who have basic education but also a higher degree and, perhaps, college-level education as well. If a nurse had another qualification equivalent to a nursing qualification (as in the case of therapists) and, perhaps, also college-level education in addition to basic education, she was included in the group equivalent to a nursing qualification. Labor market experience tends, in general, to produce overestimates of the participation of female workers, since it does not consider career breaks occurring as a result of marriage or pregnancy [15]. However, as in Skåtun's work, only female nurses were included in the analysis; thus, we were not comparing labor supply between genders. A geographical division of the labor market was implicitly taken into account by way of dummy variables Region 0 to Region 4, which were constructed from the five university hospital districts in Finland. Observations of nurses living or working in the Åland islands were excluded from the analysis. Contractual arrangements, such as shift work, are reported to be important determinants of nurses' labor supply [2]. As variables for the shift work, the type of working schedule (regular day work, regular night work, two-shift work, etc.) was included in the analysis. We also had information about the proportion of total monthly income that a nurse receives as compensation for shift work, but it was too highly correlated (>0.68) with the working schedule and was, therefore, excluded from the analysis. As other variables for the market wage of nurses, we used information about the unit of work (ward, intensive care unit, outpatient clinic, etc.) and the kind of job (staff nurse or head nurse). In addition, we controlled for the workplace of the nurse (hospital, health center, nursing home, etc.).

Besides the sample selection bias, the endogeneity of wages is another important methodological issue in labor supply models. The market wage is an important determinant of the labor market participation decision, as well as the hours of work supplied (Eq. 4). In the participation decision, the market wage has only a substitution effect and could be expected to have a positive impact on participation. In the hours model (see Eq. 4), one's own wage could also have an income effect, which reduces the hours worked. Therefore, an increase in the wage may increase or decrease the hours worked, depending on which of the effects dominates. We had only 11 unemployed nurses in our sample, and when we estimated a wage for them (i.e., predicted what the wage rate would be if they were employed as nurses), based on the wage equation (Eq. 2), the model failed to converge. Therefore, as market wages for unemployed nurses, we used nurses' average monthly wage without extra bonuses due to shift work, which obtained directly from the Kunnat database of statistics [17]. This database includes information about the wages of nurses working in the public sector. The hours model was then estimated by using the OLS and Tobit methods, and participation decision by the probit method.

Person-specific variables, such as the number of children and marital status, were assumed to affect nurses' work/leisure preferences and, therefore, working hours (see Eq. 4), as well as the participation decision. An increase in the number of young children is expected to increase a nurse's reservation wage and, therefore, have a negative impact on the hours worked and labor force participation. In the estimations of the structure of the household, we followed partly the work of Askildsen et al. [2]. The

structure of the household was represented by the total number of children aged under 18 years and several dummies covering various stages of childhood, such as pre-school and school-age children. To indicate whether the nurse was single or married/cohabiting with children, we included the dummy variable Family in the analysis. In addition to the spouse's wage, our data included information about other types of income, such as interest on investments and other unearned income of the family. Unfortunately, these variables had to be omitted due to the large number of missing observations. In Finland, senior nurses usually do not work outside normal hours, unlike staff nurses, who work shift hours as well. Therefore, due to senior nurses' different work schedules, the variable Position was not included in the model for hours of work supplied, as including it in the analysis would yield misleading information in the Finnish health care context. Finally, in an attempt to capture any non-linearity in the working hours/age relationship, we employed a dummy variable for age (see Table 1) in the analysis.

Some earlier studies (e.g., [6]) have suggested that unmarried RNs are subject to a backward-bending supply curve. We constructed several models of hours supplied, both by marital status and by age group. To test the impact of marital status on any existence of a backward-bending supply curve, two groups were constructed: married/unmarried nurses with children and married/unmarried nurses without children. Also, dummy variables representing several wage ranges were added. The supply curve was then analyzed both by age group and by marital status.

The Heckman models can be estimated by maximum likelihood estimation (FIML) or by a two-step estimator. Because of the FIML's computational complexity, models are usually estimated via a simpler two-step procedure, even though its estimators sometimes perform poorly [10]. Potential problems with the two-step method are related to, e.g., inconsistent standard errors [10]. The FIML estimation procedure, which recognizes that hours of work supplied are observed for only those nurses who have already made the decision to work, was adopted in this analysis. It was assumed that the error terms of the two equations come from a bivariate normal distribution, which allows for a correlation between the two error terms and, therefore, the possibility of sample selection bias [8].

Results

The results for the wage equations (Eq. 2), based on the Heckman sample selection model and Tobit estimation method, are given in Table 2. As suggested by Leung and Yu (1996), diagnostics for analyzing collinearity between the regressors and the IMR in the hours equation was made. VIF values obtained were far less (average 1.5) than the suggested limit of 30. In addition, in Heckman's sample selection model, the lambda term was not statistically significant. Therefore, no evidence of sample selection bias was found. However, for comparison purposes, the wage equation, as well as the hours equation, were analyzed by Heckman's sample selection, Tobit, and OLS methods. As expected, the estimated coefficients and standard errors for the three models were quite similar. For the hours model (Eq. 3), only the results obtained from Heckman's sample selection (FIML estimation method) and Tobit methods are reported in Table 3. For the participation decision, Probit estimates are reported.

Years of experience in the nursing profession had a statistically significant positive impact on nurses' wages. The negative, significant coefficient of the variable for squared experience indicated a concave relationship between experience and wages. Also qualifications proved to behave as expected: college-level education above the basic nursing qualification was associated with increased wages. However, higher degree qualification, as well as another qualification equivalent to a nursing qualification, such as a therapist's qualification, had no impact. We also ran the model without controlling for age in the wage equations. Then, also, higher degree qualification gained statistical significance. Therefore, age partially hid the effect of education.

The regional dummies indicate that those nurses who live or work outside Region 0 (HYKS) usually had lower wages. Compared to a staff nurse, which was modeled as a base category, senior nurses tended to have higher wage levels. Dummy variables reflecting shift work were all statistically significant and associated with wages higher than those of nurses who worked under normal hours. Also, contract type was an important determinant of nurses' wages. Full-time contracts tended to increase wages over those seen under part-time contracts. Also, the workplace and work unit had a significant impact on wages: nurses working in an intensive care unit usually had higher wages than those working in wards. Nurses working in the care of the elderly generally had lower wages than those working in hospitals (the base category).

In the hours equation, the family variables showed results in line with those suggested by the theory (Table 3). The presence of children aged 2 or younger, as well as between 3 and 7, had a negative impact on the hours of work. The spouse's wage had a significant, negative association with the hours worked. Thus, increases in spouses' wages tended to decrease nurses' working hours. The higher the nurses' own wage, the higher the number of hours supplied in general. Because in the models both the wage and hours variables were in logs, the wage coefficients measured elasticities. The elasticity of hours worked

Table 2 ln monthly wage equations (Eq. 2), Tobit, and Heckman sample selection (FIML) estimates

Dependent variable	Tobit	Heckman
Experience	0.0092*** (0.0016)	0.0092*** (0.0016)
Square of experience	−0.0002*** (0.00004)	−0.0002*** (0.00004)
College-level education	0.0275*** (0.0099)	0.0275*** (0.0098)
Higher degree qualification	0.0145 (0.0089)	0.0144 (0.0088)
Equivalent to nursing	0.0131 (0.0332)	0.0133 (0.0331)
Region 1	−0.0325*** (0.0113)	−0.0324*** (0.0117)
Region 2	−0.0386*** (0.0096)	−0.0384*** (0.0096)
Region 3	−0.0372*** (0.0100)	−0.0373*** (0.0100)
Region 4	−0.0534*** (0.0108)	−0.0532*** (0.0111)
Senior nurse	0.0971*** (0.0107)	0.0972*** (0.0106)
Other position	0.0637 (0.0502)	0.0635 (0.0501)
Night work	0.1579*** (0.0378)	0.1503*** (0.0374)
Two-shift work	0.0489*** (0.0107)	0.0489*** (0.0107)
Three-shift work	0.0935*** (0.0111)	0.0934*** (0.0111)
Other schedule	0.1082*** (0.0225)	0.1085*** (0.0224)
Outpatient department	−0.0182 (0.0112)	−0.0183 (0.0112)
Intensive care unit	0.0362** (0.0144)	0.0363** (0.0144)
Operating room	−0.0031 (0.0138)	−0.0035 (0.0137)
Home care	−0.0219 (0.0163)	−0.0218 (0.0163)
Other unit	0.0063 (0.0168)	0.0065 (0.0168)
Contract	0.2944*** (0.0121)	0.2941*** (0.0120)
Health center or mental health clinic	−0.0131 (0.0086)	−0.0131 (0.0086)
Old people's home	−0.0525*** (0.0169)	−0.0525*** (0.0169)
Nursing home	−0.0041 (0.0197)	−0.0043 (0.0197)
Other workplace	0.0033 (0.0134)	0.0025 (0.0134)
Lambda		−0.0004
Constant	7.2250*** (0.0219)	7.2252*** (0.0219)
Age 36–45	0.0147 (0.0112)	0.0145 (0.0117)
Age 46 or over	0.0052 (0.0133)	0.0050 (0.0142)
Partner's wage	0.00001*** (0.000003)	0.00001*** (0.000003)
Family	−0.0094 (0.0094)	−0.0090 (0.0096)

Standard errors are shown in parentheses

*, **, and *** are statistically different from zero at the 10, 5, and 1% significance levels, respectively

with respect to one's own wage was 0.48; i.e., the positive substitution effect outweighed the negative income effect. Therefore, increasing wages by 10% could possibly increase the weekly working hours by 4.8%.

We also measured whether the nurse was working under a full-time or part-time contract. However, this variable is somewhat problematic in the hours model (Eq. 4) because, in Finland, having a full-time contract need not necessarily mean a 38-hour-or-more working week. Also, in our data, there were nurses who were working under a full-time contract, but had their number of working hours per week set at 18. Therefore, we created dummy variables <38 hours, >38 hours, and =38 hours, which were based on the reported real weekly working hours and, therefore, were better in indicating the actual contractual arrangement. After the inclusion of these variables in the analysis, wage elasticity fell to 0.33 and the variable <38 hours gained strong statistical significance ($z = 25.55$). Other results remained quite similar. To investigate the model further, we split the data into two groups: those nurses who were working <38 hours ($n = 285$) and those working ≥38 hours ($n = 1{,}190$). The models were run separately for both groups. In the <38 hours group, the wage elasticity became statistically significant and even higher: 0.59. However, the wage elasticity in the other group was −0.020 and not statistically significant.

Shift work in our analysis was defined by variables indicating working schedule. When regular day work was defined as a base category, regular night work, two-shift and three-shift work had a negative and significant association with the hours of work. In general, longer hours were supplied by nurses working in outpatient departments, in operating rooms, or in home care than those in the base category ward. In the preliminary analysis, we found evidence that nurses' labor supply might not have a linear association with age. Therefore, to capture the non-linear

Table 3 Estimated coefficients of probit participation (Eq. 3). Tobit and Heckman sample selection effects on nurses' ln weekly working hours (Eq. 4)

Dependent variable	Participation	ln weekly hours	
	Probit	Tobit	Heckman
Night work		−0.1615*** (0.0316)	−0.1614*** (0.0315)
Two-shift work		−0.0152* (0.0089)	−0.0152* (0.0089)
Three-shift work		−0.0173** (0.0086)	−0.0174** (0.0086)
Other schedule		−0.0205 (0.0191)	−0.0205 (0.0191)
Outpatient department		0.0372*** (0.0092)	0.0372*** (0.0092)
Intensive care unit		−0.0185 (0.0123)	−0.0184 (0.0122)
Operating room		0.0349*** (0.0117)	0.0350*** (0.0117)
Home care		0.0317** (0.0139)	0.0318** (0.0139)
Other unit		0.0136 (0.0141)	0.0136 (0.0141)
Health center or mental health clinic		0.0055 (0.0073)	0.0055 (0.0073)
Old people's home		0.0363** (0.0144)	0.0365** (0.0144)
Nursing home		0.0170 (0.0167)	0.0170 (0.0166)
Other workplace		−0.0153 (0.0114)	−0.0151 (0.0114)
Lambda			−0.02557 (0.0280)
Constant	−15.7700*** (4.5664)	−0.0205 (0.1371)	0.0072 (0.1404)
ln wage		0.4826*** (0.0180)	0.4791*** (0.0184)
Region 1	−0.3129 (0.3918)		
Region 2	0.1501 (0.4468)		
Region 3	0.3365 (0.4937)		
Region 4	−0.1286 (0.3861)		
Imputed wage	2.4282*** (0.6014)		
Child <3	0.4284 (0.4767)	−0.0272** (0.0119)	−0.0271** (0.0119)
Child 3–7	0.5651 (0.3871)	−0.0298*** (0.0089)	−0.0303*** (0.0089)
Children <18	−0.1565 (0.1543)	0.0034 (0.0036)	0.0035 (0.0036)
Age 36–45	0.6150 (0.3728)	−0.0588*** (0.0086)	−0.0592*** (0.0086)
Age 46 or over	1.1816** (0.5473)	−0.0682*** (0.0083)	−0.0687*** (0.0083)
Partner's wage	−0.00010 (0.00007)	−0.000008*** (0.000002)	−0.000008*** (0.000002)
Family	−0.3211 (0.4969)		

Standard errors are shown in parentheses

*, **, and *** are statistically different from zero at the 10, 5, and 1% significance levels, respectively

age effect, we divided age into three categories. We found that both age groups had a significant, negative association with hours supplied when compared to the base category age, <35 years. Therefore, labor supply tends to fall with age. Finally, nurses working in old people's homes were found to be more associated with longer work hours than those in the base category (i.e., working in hospitals).

Only imputed wage and age 46 or over was found to be positively and statistically significantly associated with nurses' participation decisions. Being married with children also had a negative impact but it did not achieve statistical significance. The marginal effect of wage on participation was 0.01. Therefore, if wages increase by 10%, the probability of entering the labor market increases only 0.1%. Also, spouse's wage had negative association, but it gained no statistical significance. However, it must be remembered that there were only 11 unemployed nurses in our data.

The coefficients showing a possible backward-bending supply curve are presented in Table 4. The dependent variable is the natural logarithm of the weekly working hours. If the supply curve is backward-bending, the coefficients are negative and above the wage interval representing the base group. The coefficient in the wage range 1,901–2,000 EUR for married/cohabiting nurses with children was −0.0111 and not statistically significant, implying that nurses in this wage range tended to work 1% less than similar nurses in the base wage group. The results

Table 4 Coefficients of wage dummies measuring possible backward-bending supply by marital status with children and by age groups

Wage	€700–1,900	€1,901–2,000	€2,001–2,200	€2,201–2,500	€2,501–3,100
Whole sample ($n = 1{,}475$)	−1.1316***	−0.0094	Base category	0.0187**	0.0344**
Married/cohabiting with children ($n = 1{,}176$)	−0.1456***	−0.0111	Base category	0.0222**	0.0359**
Married/cohabiting without children, single, divorced, widow/widower ($n = 299$)	−0.0766***	−0.0036	Base category	0.0042	0.0255
Age ≤35 years ($n = 413$)	−0.0712***	−0.0175	Base category	−0.0155	0.0124
Age 36−45 years ($n = 497$)	−0.1298***	−0.0021	Base category	0.0234	0.0448
Age over 46 years ($n = 565$)	−0.02617***	−0.0009	Base category	0.0116	0.0162

show that backward-bending supply was also not found in the analysis to be differentiated by the three different age groups.

Sensitivity analysis

Sensitivity analysis was performed in several ways. To compare the differences in results due to different estimation techniques, OLS, Tobit, and Heckman sample selection methods were used (Table 5). The signs and significance levels were consistent across models. We also analyzed the effect of the functional form of the dependent variable on the results. Therefore, the dependent variable, hours of work, was defined in a variety of ways. A new variable, annual working hours, was created by multiplying the weekly working hours by 47 working weeks. Using the weekly working hours and annual working hours, the signs and significances of the coefficients were identical. Using weekly and annual working hours as well as the natural logarithm of weekly working hours, the signs and significances of the coefficients were substantively equivalent.

We also analyzed how participation decision was influenced by changes in the market wage. As for the market wage for unemployed nurses ($n = 11$), we used the natural logarithm of nurses' average monthly wage without extra bonuses (7.39), measured in year 2003. We then replaced the wage by 7.51, which represented the wage level in year 2005. The signs and significances of the coefficients did not, again, differ substantially. Therefore, these analyses suggest that our results are fairly robust. The signs and significances were consistent across models and also hours specifications.

Discussion and conclusions

Nursing is a vital profession in the provision of health care. To be able to attract new entrants to the nursing profession, as well as prevent currently trained nurses from leaving health care for other professions, and to motivate them to supply more hours, fundamental problems have to be solved. A thorough understanding of the supply side of the labor market for RNs is central to the evaluation of any suggested policy. The theoretical response of nurses' labor supply to wage changes is ambiguous and will depend on the relative income and substitution effects. If the elasticity of working hours with respect to the wages of nurses is high, wage increases would provide a method for increasing the hours worked by nurses [13].

In our data, there were only 11 unemployed nurses, and, therefore, the results of participation decision analysis should be interpreted with considerable caution. Accordingly, our discussion and study mostly concentrate on the hours decision. Only age 46 or over and imputed wage gained statistical significance in relation to the participation decision. Interestingly, age was positively associated with participation. This may reflect nurses' willingness to work until retirement age in order to receive a more reasonable pension. The marginal effect of wage on participation was 0.01 in the probit model. Therefore, a 10% increase in wages would yield only a 0.1% increase in the probability of participation.

We found that the elasticity of hours worked with respect to the nurse's own wage was slightly higher than, e.g., in Askildsen et al.'s study from Norway [2]. However, in our study, the dependent variable was measured in hours per week, rather than the hours per year of Askildsen et al.'s study. Also, the wage level in Norway is higher than in Finland. We might conclude that wages matter for nurses' supplied hours, especially for those working under 38 hours per week. However, also, other factors, such as contractual arrangements, play an important role. We found no evidence to suggest the existence of a backward-bending supply curve either for different age groups or according to marital status.

Nurses working in old people's homes tended to work longer hours than nurses in hospitals. One possible reason for this could be that hospitals may also pay overtime as bonuses, and not only compensate for extra work as time off. The presence of children younger than school age, as measured via two different variables, had a negative association with the number of hours of work.

Table 5 Estimates of OLS, Tobit, and Heckman sample selection on ln wages and ln weekly hours

Dependent variable	ln wage			Participation	ln hours		
	OLS	Tobit	Heckman	Probit	OLS	Tobit	Heckman
Experience	0.0092*** (0.0017)	0.0092*** (0.0016)	0.0092*** (0.0016)				
Square of experience	−0.0002*** (0.00004)	−0.0002*** (0.00004)	−0.0002*** (0.00004)				
College-level education	0.0275*** (0.0100)	0.0275*** (0.0099)	0.0275*** (0.0098)				
Higher degree qualification	0.0144 (0.0089)	0.0145 (0.089)	0.0144 (0.0088)				
Equivalent to nursing	0.0133 (0.0335)	0.0131 (0.0332)	0.0133 (0.0331)				
Region 1	−0.0324*** (0.0114)	−0.0325*** (0.0113)	−0.0324*** (0.0117)	−0.3129 (0.3918)			
Region 2	−0.0384*** (0.0097)	−0.0386*** (0.0096)	−0.0384*** (0.0096)	0.1501 (0.4468)			
Region 3	−0.0373*** (0.0101)	−0.0372*** (0.0100)	−0.0373*** (0.0100)	0.3365 (0.4937)			
Region 4	−0.0533*** (0.0109)	−0.0534*** (0.0108)	−0.0532*** (0.0111)	−0.1286 (0.3861)			
Senior nurse	0.0972*** (0.0108)	0.0971*** (0.0107)	0.0972*** (0.0106)				
Other position	0.0635 (0.0506)	0.0637 (0.0502)	0.0635 (0.0501)				
Night work	0.1503*** (0.0378)	0.1579*** (0.0378)	0.1503*** (0.0374)		−0.1615*** (0.0318)	−0.1615*** (0.0316)	−0.1614*** (0.0315)
Two-shift work	0.0489*** (0.0108)	0.0489*** (0.0107)	0.0489*** (0.0107)		−0.0152* (0.0089)	−0.0152* (0.0089)	−0.0152* (0.0089)
Three-shift work	0.0934*** (0.0112)	0.0935*** (0.0111)	0.0934*** (0.0111)		−0.0174** (0.0087)	−0.0173** (0.0086)	−0.0174** (0.0086)
Other schedule	0.1085*** (0.0227)	0.1082*** (0.0225)	0.1085*** (0.0224)		−0.0204 (0.0192)	−0.0205 (0.0191)	−0.0205 (0.0191)
Outpatient department	−0.0183 (0.0113)	−0.0182 (0.0112)	−0.0183 (0.0112)		0.0373*** (0.0093)	0.0372*** (0.0092)	0.0372*** (0.0092)
Intensive care unit	0.0363** (0.0145)	0.0362** (0.0144)	0.0363** (0.0144)		−0.0185 (0.0123)	−0.0185 (0.0123)	−0.0184 (0.0122)
Operating room	−0.0035 (0.0139)	−0.0031 (0.0138)	−0.0035 (0.0137)		0.0350*** (0.0118)	0.0349*** (0.0117)	0.0350*** (0.0117)
Home care	−0.0218 (0.0165)	−0.0219 (0.0163)	−0.0218 (0.0163)		0.0317** (0.0140)	0.0317** (0.0139)	0.0318** (0.0139)
Other unit	0.0065 (0.0169)	0.0063 (0.0168)	0.0065 (0.0168)		0.0136 (0.0142)	0.0136 (0.0141)	0.0136 (0.0141)
Contract	0.2941*** (0.0122)	0.2944*** (0.0121)	0.2941*** (0.0120)				
Health center or mental health clinic	−0.0131 (0.0087)	−0.0131 (0.0086)	−0.0131 (0.0086)		0.0055 (0.0074)	0.0055 (0.0073)	0.0055 (0.0073)
Old people's home	−0.0525*** (0.0171)	−0.0525*** (0.0169)	−0.0525*** (0.0169)		0.0363** (0.0145)	0.0363** (0.0144)	0.0365** (0.0144)
Nursing home	−0.0043 (0.0199)	−0.0041 (0.0197)	−0.0043 (0.0197)		0.0171 (0.0168)	0.0170 (0.0167)	0.0170 (0.0166)
Other workplace	0.0025 (0.0136)	0.0033 (0.0134)	0.0025 (0.0134)		−0.0153 (0.0115)	−0.0153 (0.0114)	−0.0151 (0.0114)
Lambda			−0.0004 (0.1264)				−0.02557 (0.0280)

Table 5 continued

Dependent variable	ln wage			Participation	ln hours		
	OLS	Tobit	Heckman	Probit	OLS	Tobit	Heckman
Constant	7.2252*** (0.0221)	7.2250*** (0.0219)	7.2252*** (0.0219)	−15.7700*** (4.5664)	−0.0210 (0.1380)	−0.0205 (0.1371)	0.0072 (0.1404)
ln wage					0.4827*** (0.0181)	0.4826*** (0.0180)	0.4791*** (0.0184)
Imputed wage				2.4282*** (0.6014)			
Child <3				0.4284 (0.4767)	−0.0272** (0.0119)	−0.0272** (0.0119)	−0.0271** (0.0119)
Child 3–7				0.5651 (0.3871)	−0.0299*** (0.0089)	−0.0298*** (0.0089)	−0.0303*** (0.0089)
Children <18				−0.1565 (0.1543)	0.0034 (0.0036)	0.0034 (0.0036)	0.0035 (0.0036)
Age 36–45	0.0145 (0.0113)	0.0147 (0.0112)	0.0145 (0.0117)	0.6150 (0.3728)	−0.0587*** (0.0086)	−0.0588*** (0.0086)	−0.0592*** (0.0086)
Age 46 or over	0.0051 (0.0134)	0.0052 (0.0133)	0.0050 (0.0142)	1.1816** (0.5473)	−0.0682*** (0.0084)	−0.0682*** (0.0083)	−0.0687*** (0.0083)
Partner's wage	0.00001*** (0.000003)	0.00001*** (0.000003)	0.00001*** (0.000003)	−0.00010 (0.00007)	−0.000008*** (0.000002)	−0.000008*** (0.000002)	−0.000008*** (0.000002)
Family	−0.0090 (0.0095)	−0.0094 (0.0094)	−0.0090 (0.0096)	−0.3211 (0.4969)			

Probit participation estimates are shown, along with the standard error in parentheses

*, **, and *** are statistically different from zero at the 10, 5, and 1% significance levels, respectively

Interestingly, having children between 3 and 7 years of age decreased the hours supplied even more than having children aged 2 or under. We found the supplied hours to fall with nurses' age. The reasons for this are not revealed in this study, but the fact should, nonetheless, be taken into account in seeking ways to encourage nurses to stay in the nursing profession for as long as possible and to work as many hours a week as possible.

Although our results mostly confirm previous findings and theoretical hypotheses, there are a few limitations as well. Our model was static by nature, not allowing any life-cycle choices. Therefore, our results should be taken as the short-term response of nurses' labor supply to the variables used in analysis. However, wage can also be seen as an important factor in the long term, if it increases the number of new entrants into nursing. Another limitation is that we employed cross-sectional data, not allowing control for unobservable heterogeneity, such as factors related to motivation. In addition, we report associations, not causal effects. However, our data were rather rich and diversified, and did make it possible to thoroughly analyze, e.g., the effects of working conditions on labor supply. This study provides new evidence for policy development by including detailed information about working practices and employment characteristics, as well as behavioral aspects of nurses' choices in labor markets. The most important finding from a labor market policy point of view is that, even though wage elasticity was quite small, the effect on the hours supplied was significant. However, wages alone may not sufficiently increase the labor supply from the current stock of nurses; other elements, such as contractual conditions, seem to play an important role as well. We also suggest that, e.g., possibilities for professional development and promotion should be devised so that nurses can expect to advance in their career. Although these factors do not fall within the scope of this study, they will be analyzed in papers to come.

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