Can Wages Explain the Shortage of Specialist Nurses in the Swedish Health Sector?

Author: Henrik Björk
Supervisor: Professor Ulf Gerdtham

Acknowledgment

Abstract

There is a shortage of nurses in Sweden, especially specialist nurses. The magnitude of the problem is expected to increase in the near and distant future due to retiring nurses and an expected increase in the demand for health services due to an ageing population in Sweden. In this thesis it is examined whether the shortage of specialist nurses can be explained by the current economic incentives for general nurses to get specialized. It is done by performing econometric analysis on a data material covering all nurses employed by the county council located most south in Sweden, Region Skåne. It cannot be proved that economic incentives are negative and thus not too low. However, the regressions estimating specialist nurse wage premiums are likely to suffer from endogeneity and thus the estimated wage premiums are probably upward biased. Therefore it is concluded that the economic incentives might be negative even though it cannot be shown in this thesis. Nurses do react to changes in economic incentives which make it effective in reducing the shortage. Furthermore it is stated that additional factors are influential in a nurse's decision to get specialized.

Keywords: *specialist nurse, economic incentives, monopsony power, wage premium*

Contents

1. Introduction

During the most recent years, media in Sweden has reported about an eclipse in the health sector. The biggest problems lie within the hospitals and they seem to become larger as time goes by. Media reports about a lack of qualified staff, heavily downgraded working environment, low wages, increasing queues for patients, temporarily shut downs of hospital divisions and not least the increasing mortality due to the tensed situation. These problems differ in severity from county to county but it has become a national issue. Why these problems occur now is not known until this day. It might be because of the fast technological change in the health care sector. Maning et al. (1987) conclude an increasing medical expenditure in developed countries driven by technological change. Today, we can simply treat more patients than before and as a consequence the costs are increasing. Without increasing revenues in the hospital sector, problems occur as a consequence. In addition it is stated in most studies concerning health personnel in developed countries that demographic changes increase the demand for health care. The elderly become a larger share of the population in developed countries.

The focus in this thesis is to highlight the situation where it is severe. There is a shortage of nurses in Sweden, especially specialized nurses. Nurses are important as input in a hospital's production function. Barros & Olivella (2011) speak of teams of different types of staff working in hospitals. These teams can have different proportions of different kinds of staff, but clearly they cannot manage their task without certain types of hospital staff. Both general and specialist nurses can thus be seen as a complement in the hospitals production function. As technology improves the recruitment for specialist nurses is of particular importance. It make the questions of how attract nurses and to make them specialize important for policy makers.

1.1 Aim of the thesis

Can wages explain the shortage of specialist nurses in the Swedish health sector? The aim of this thesis is to provide an answer to that question. Hence, the economic incentives to become a specialist nurse are examined. They can be examined in several ways. In this thesis the aim is to examine the economic incentives to become a specialist nurse given that the person already is a nurse. It is done by examining if it breaks even economically for a nurse to specialize and if so, how long it takes for the specialization to do so.

It is also likely that other factors than economic incentives could have influence in the decision to get specialized. Thus nurses' behavior will be examined in able to tell how important economic incentives and other factors are to nurses. It implies presenting theory about nurses' and their employers' behavior. It also implies presenting the existing nurse literature and to apply it in a setting in Sweden and Skåne.

In the empirical analysis, the wage premiums for specialist nurses are compared to non-specialist nurses by econometric methods for those employed by the county council Region Skåne. The specialist nurses examined are those within ambulance, anesthesia, operation, district nursing, intensive care, psychiatry, children and midwives. There is an additional group labeled as other specialists, which are all other specialist nurses employed by Region Skåne. Since the sample only includes individuals employed by Region Skåne it is the wage premiums in secondary and primary care that are examined. Those employed by private actors and municipalities in Skåne are not included. It is hypothesized that the economic incentives for nurses to specialize are too low. The wage premium of getting specialized is hypothesized to be positive, but not large enough to cover the costs of the education. If incentives were not too low, there would probably not be a shortage.

2. Explaining the shortage of nurses in the Swedish health sector

2.1 Theoretical framework of nurses labor market

Shortage of nurses is not a typical Swedish problem. Several authors state that it is a problem for almost all developed countries, Rice (2005), Askildsen et al. (2002) and Di Tommaso et al. (2007) being some of them. Since it is such a common problem there must be some mechanism in an economy that makes this problem occur. Some argue that low wages for nurses are due to female discrimination, but the most common explanation for this phenomenon to occur is the theory of monopsony power. Hirsch & Schumacher (1995 and 2008), Sullivan (1989), Link & Landon (1975) and Calmfors & Rickardsson (2004) explain the concepts of this theory, among many others. According to Sullivan (1989), the nurse situation in most developed countries is a school book example of this theory. The theory of monopsony power is presented as an explanation for today's situation in the Swedish health sector but is not tested in the empirical analysis of this thesis.

The basic concept is described in Figure 1. Monopsony (or oligopsony) power implies, unlike a competitive labor market, a market with only one (or a few) employer(s) often because the labor force is specialized to a high degree and/or geographically isolated. Hence there is limited labor mobility among the employees, nurses in this case. The employer in this case is some actor in the health sector, often a hospital. The employer face an upward sloping labor supply curve of the nurses, i.e. the higher wage the more labor supplied. It has a downward sloping demand curve, implying that it would like to hire more nurses as the wage level decreases. So far it looks as a competitive labor market with a wage level at W* and the hired amount of nurses at L*.

Figure 1: Theory of Monopsony Power
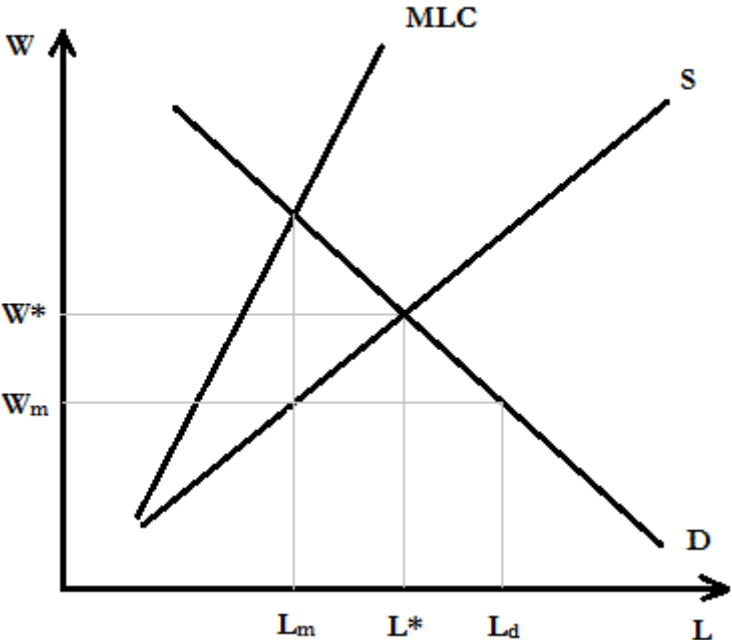
In the case of monopsony power the employer faces a higher marginal labor cost, MLC, than the supply curve. In order for the hospital to maximize its profits it would like MLC to be equal to its marginal revenue product, MRP, where MLC intersects the demand curve. Thus the nurses hired go down to L_m. At the quantity of L_m the employer only pay a wage level of W_m. As a result it gets a shortage of nurses and nurses face a low wage level. At the wage W_m the employer demands L_d nurses, but only L_m nurses are supplied. The employer would like to hire more nurses but only at the wage level of W_m. If it raises the wage level it has to do so for all nurses and thus it will not raise the wage level. In a competitive labor market, nurses would face a higher wage level and hospitals would hire more nurses.

For most of the actors in the Swedish health sector maximizing profits is not the goal of the agency since it is often run by local governments. Calmfors & Rickardsson (2004) argue that the goal of these agencies is rather to minimize the costs or to get as much health care as possible for a given budget. These goals should be equally strong as the goals of maximizing profits for a profit maximizing agency and the local governments aim for their goals by using monopsony power in the same way as a profit maximizer. Furthermore Hirsch & Schumacher (1995) states that in order to reduce the nurse shortage, it may be the case that hospitals wage discriminate as much as possible. If hospitals only pay the reservation wage of each nurse, labor supply increases while wage costs are kept constant. Hence for a given level of productivity, larger wage differences between employees should be observed in hospitals than in the competitive labor market. Theory also predicts a flatter wage development over time when monopsony power is present. Since nurses will not get compensated for their future increase in productivity, entry-level nurses demand higher wage as a consequence. The last paragraph is interesting from a Swedish perspective. It is what is observed in the Swedish health sector, not least at the hospitals. Nurse students and nurses who have recently graduated have started to demonstrate all over the country for improved entry wages.

Hirsch & Schumacher (1995 and 2008) state that the empirical evidence for monopsony power among hospitals is mixed. Since many of the papers about monopsony power and nurses are from different countries it is not very surprising. The settings in different countries' health sector usually differ. Thus the magnitude of monopsony power is likely to vary between countries too. The majority of empirical studies are made in USA, which is probably one of the countries in the world with the least monopsony power in the health sector. On the other hand, the health sector in Sweden is very likely to be monopsonistic. Especially since there is only a single provider of secondary care in each market, namely the county council of concern. Swedish hospitals do not compete with each other like in USA. Thus the usual way of testing for monopsony power by observing the hospital concentration and wages in different areas is not appropriate in the Swedish case. Calmfors & Rickardsson (2004) argue that another problem with testing for monopsony power in that way is that areas with a higher concentration of hospitals are urban areas. These areas often have a higher price and wage level in general and thus higher wages in urban areas might not be a proof of less monopsony power but rather reflected in a higher price level in general.

Askildsen et al. (2002) conclude that the market for health personnel is monopsonistic in the UK and the Scandinavian countries and that these countries suffer from a nurse shortage. However, the fact that the county councils own the hospital market in Sweden does not mean that there is complete monopsony power in the overall labor market for nurses. It stretches beyond the hospitals. The question is to which degree is the Swedish labor market for nurses monopsonistic? When looking only at the hospital labor market for nurses it is likely that there is a high degree of monopsony power. When looking at the whole labor market for nurses, the degree of monopsony is probably smaller. There are indications that nurses' employers other than the county councils often pay better and the working conditions are better in general. They compete with the county councils in attracting nurses and thus they probably decrease the overall degree of monopsony in nurses' labor market. There are also indications that the country councils have started to compete with each other to some degree. Increasing entry level wage differences between county councils is one such indicator. Other competitors are Norway and Denmark. There is a large difference between Norwegian and Swedish nurse wages. The Norwegian wage is the higher of them but one must not forget that there is a higher general price level in Norway too. One reason of the rapidly increasing dissatisfaction of Swedish nurses might be that the degree of monopsony has decreased in Sweden. Hospitals might not have noticed it and thus have not yet adapted to the new nurse

Figure 2: Decreased Monopsony Power
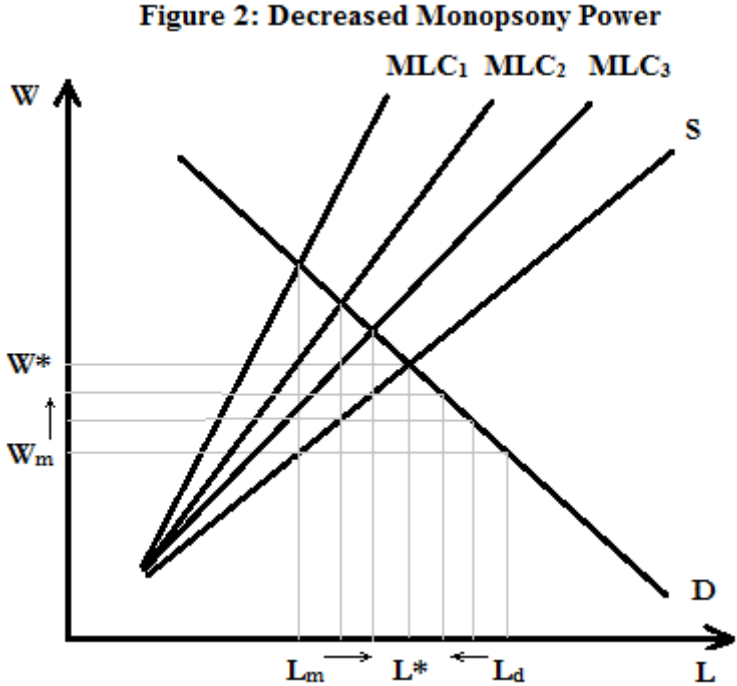
labor market. Most specialist nurses only have a county council as potential employer. Thus they are probably more exposed to a monopsonistic labor market than general nurses. They are less mobile.

A situation with decreasing monopsony power takes the theoretical form shown in Figure 2. Monopsony power becomes oligopsony power by tilting the MLC curve closer to the supply curve. Wages get closer to the equilibrium level and the shortage should be reduced with an employment level closer to equilibrium.

2.2 The nurse situation in Sweden

To become a nurse in Sweden you have to study for three years at the university level, which leads to a bachelor degree in medicine with a specialization in nursing. To become a specialist nurse you have to study additional one to one and a half years depending on your specialization. The prerequisite for becoming a specialist nurse differs between universities. In all universities the nurse at least need its bachelor degree. In addition one year of experience as a nurse is needed for all specialist nurse educations except the one within children at Lund University. The specializations are within ambulance, oncology, surgery, anesthesia, operation, district nursing, medicine, intensive care, psychiatry, geriatric care and children. Midwife is also a further education for nurses. Working as a company nurse is another possibility for nurses. It also demands additional education beyond the bachelor degree. There are also radiographic nurses, but their education differs from the general nurse education. It is of the same length but a radiographic nurse's bachelor degree differs from a general nurse's.

The lengths of all specialist nurse educations covered in the data are described in Table 1 below. A specialist nurse education is usually unpaid, unlike a doctor's specialization. Like all studies at the university level the education is free, but students usually have to take a loan from the Swedish National Board of Student Aid (called CSN in Sweden) in able to make a living. It is argued to be the most likely way to finance a specialist nurse education. However, there are other possibilities of financing the education. In some cases nurses get paid by its county council for getting specialized. It is not very common though. A nurse could also choose to work parallel to the studies. In that case the nurse reduces its amount of leisure which is argued in this thesis to cause disutility. To become a nurse assistant you need a high

Table 1: Length of Different Specialist Nurse Educations

	ECTS-credits	Semesters	Needed work experience in Lund (years)
Ambulance	60	2	1
Anesthesia	60	2	1
Children	60	2	0
Midwife	90	3	1
District	75	2.5	1
Intensive care	60	2	1
Operation	60	2	1
Prychiatry	60	2	1

Source: Lund University

school education. To become a doctor you need to study five and a half years at the university level. In order to get the license you need additional one and a half years of education which you get paid for. A doctor must specialize and that demands around additional five years which they also get paid for. The latter two educations are included in their job.

In Sweden, health care by a hospital is provided by the county council you live in. It is provided to all citizens and the patients have to pay small out-of-pocket fees. Some hospitals are owned privately, but they are very rare. They get their revenues from the county council and must offer health care just like the county council owned hospitals. Nurses not only work on a hospital. They also work with primary care on health centers. Health centers are financed in the same way as hospitals, but the private owners are more frequent than in the hospital sector. A nurse can also work for a municipality. The municipalities are responsible for the geriatric care. Private actors also provide a share of the geriatric care. Some nurses work for companies as a company nurse. Many Swedish nurses also choose to work in Norway (and to some extent Denmark) due to higher wages and better working conditions. Di Tommaso et al. (2007) state that a large share of the nurses in Norway come from other countries, especially from Sweden.

Statistics Sweden (2013) concludes that there is an overall shortage of nurses in Sweden, especially experienced and specialist nurses. In their forecast they conclude that it is likely to be an increased magnitude of this problem in the near and distant future. The Swedish National Board of Health and Welfare (2014) and the Swedish Association of Local Authorities and Regions (2014) come to the same conclusions. According to the two latter reports, the increasing magnitude of the problem is because of an ageing labor force and

expected future increased demand for health care due to demographic changes in the Swedish population. In all three reports it is stated that there are some regional differences but there is a shortage in all county councils. According to the Swedish National Board of Health and Welfare (2014) the number of specialist nurses has decreased by 19% in the period 1995-2011. To some extent it is due to changes in the education systems. During the same period the median age of specialist nurses has gone from 46 to 54 years old and those above 65 years old have gone from 3% of the labor force to 12%. The specialist nurse shortage is most severe within psychiatry, anesthesia, operation, intensive care and geriatric care. In southern Sweden, the number of specialist nurses adjusted to the population is close to national average.

Furthermore they state the economic incentives for nurses to get specialized are low. Even if powerful actions are taken today, it will take several years for the increased amount of specialist nurses to be larger than the number of those retiring or leaving the health sector. In Graph 1 the average monthly wages for staff in the Swedish hospital sector are presented. The graph should be interpreted with caution since it does not say anything about characteristics like differences in age and gender composition, which should affect the wage

Graph 1
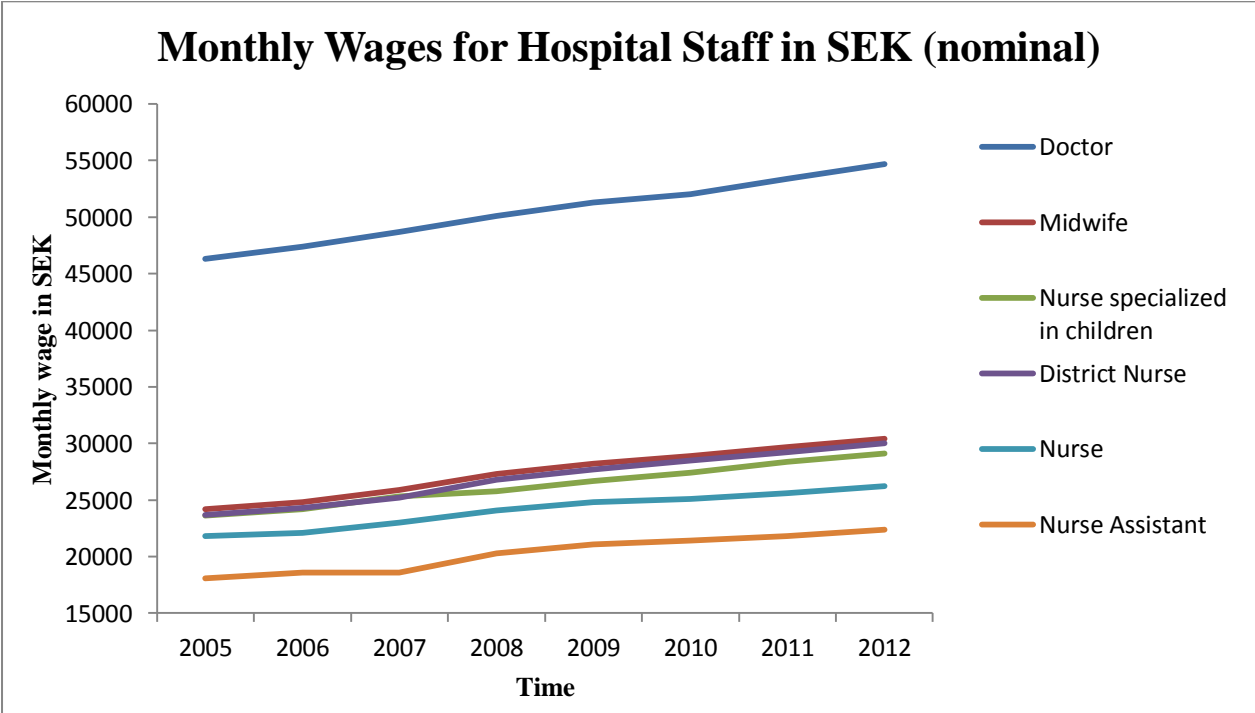
Source: Statistics Sweden

level. However, it gets the reader and indication about the nurse wage situation. The difference between a nurse and a nurse assistant is less than 4000 Swedish Crowns (SEK) in 2012. The difference between a nurse and a specialist nurse is a bit lower. A much larger difference is the one between different nurses and an average doctor. Not only is the difference high in 2005, it is also increasing over time in absolute values. An average doctor has more than twice the wage of an average general nurse in 2012. The difference between a specialist nurse and an average doctor is a little less.

There are regional wage differences between nurses according to Vårdfokus (2014). The offered hospital entry-level monthly wage before tax for general nurses in university hospitals is 22.000 SEK in Skåne, 22.300 SEK in Stockholm, 22.500 SEK in Gothenburg, 22.700 SEK in Linköping, 23.500 SEK in Örebro, 23.600-24.000 SEK in Umeå and 24.000-25.500 SEK in Uppsala. It is only in Stockholm and Uppsala that it is possible to negotiate up to 25.000 SEK. Most of the hospitals with the higher offered wage level used to offer a much lower entry-level wage but has recently increased it. It is an indication that the competition for attracting nurses seem to increase between county councils. In addition Radio Sweden (2013) reports that many nurses in Skåne choose to work for a municipality instead of the hospitals, indicating that each county council seem to get additional competition from municipalities. In many cases an average municipality pays thousands of SEK more per month and the working environment is better than at a hospital. It is stated by the Swedish Association of Health Professionals (2014) for other parts of the country too.

2.3 Theory for explaining nurses' behavior

Both Phillips (1995) and Kankaanrata & Rissanen (2009) develop reasonable neoclassical models for explaining nurses' labor supply. In their models there are two decisions of a nurse. At first the individual chooses to participate in the labor force or not. It could be both individuals educated as a nurse and individuals considering becoming a nurse. The decision is pure economical. A nurse will participate in the labor force if the offered market wage is at least as high as his or her reservation wage. The market wage is determined by the employer(s) and the reservation wage is determined by individual characteristics and non-labor income. If the market wage is below a nurse's reservation wage he or she will offer zero hours of labor supply. In the opposite case, a nurse will take the decision of how many hours

of labor to supply. That decision depends on individual characteristics, the non-labor income, working conditions and working environment.

These models could be used for explaining nurses' further educational decisions too by letting the market wage be the expected net gain in lifetime income by specializing and compare it to reservation net gain in by specializing. It would be a pure economic decision. The economic incentives for a general nurse to become a specialist nurse are examined in this thesis but on the other hand it is argued that the decision of getting further educated does not depend on economic incentives alone. As shown in the nurse literature, there are additional important factors in a nurse's overall satisfaction. Thus a nurse might take other factors into account in its educational decision if it is the case that other factors than the economic do change when a nurse gets specialized. Hence, using the models developed by Phillips (1995) and Kankaanrata & Rissanen (2009) is not appropriate for explaining a nurse's further educational decision.

2.3.1 Explaining nurses' educational decision

Instead of applying the above mentioned models for explaining a nurse's decision to get specialized, it is argued that if the net utility of getting specialized is positive the nurse will specialize. The net utility is the difference between an individual's utility as a specialist nurse and as a general nurse. The inequality is described in Equation 1 where U_i^S is the individual's utility as a specialist nurse and U_i^G is the individual's utility by keep working as a general nurse.

$$U_i^S - U_i^G > 0 \qquad (1)$$

A nurse's utility function could be explained as in Equation 2, irrespective of being a general or a specialist nurse.

$$U_i = U(Y_i, l_i, S_i, I_i, WL_i, WC_i, E_i, |IC_i) \qquad (2)$$

In Equation 2, Y_i is a nurse's household income including the nurse wage, l_i is leisure, S_i is skill level, I_i is the level of influence at the workplace, WL_i is workload, WC_i is other working conditions like contractual arrangements and environmental factors and E_i is effort. In this

case effort could be the mental cost of go back to school. In the utility function a nurse gets different levels of utility for different values of these parameters given his or her individual characteristics, IC_i. Individual characteristics are variables like age, sex, marital status, ethnicity, number of children and ability. It is reasonable to assume that for example a given level of leisure will result in different levels of utilities for a nurse with children and a nurse without children. Furthermore it is assumed that the variables Y_i, l_i, S_i and I_i are positively related to utility for all nurses. The variables WL_i and E_i are assumed to be negatively related to all nurses' utilities. The variable WC_i corresponds to different levels of utility depending on the contractual arrangements and working environment of the nurse's workplace. All variables are assumed to have a decreasing marginal effect. The assumptions of the utility function in Equation 2 will be even clearer to the reader in the next section, 3. Previous Research.

The interesting question is when Equation 1 is true, i.e. when the utility of becoming a specialist nurse is higher than the utility of keep working as a general nurse. In order to get an answer to the question one must first conclude which variables are affected by the decision to get specialized. The lifetime household income will change. If the change in lifetime income is positive or negative is examined in the empirical analysis of this thesis. Since a nurse acquires greater skills by specializing the difference will result in a higher level of utility. A nurse's influence on the workplace will probably increase as a consequence of the specialization and will therefore have a positive effect on utility. An amount of effort is needed to get specialized and therefore there will also be a negative effect of utility by getting specialized. The other variables are assumed to be unaffected by the decision of specializing. Thus, for a nurse to get further educated the inequality in Equation 3 must be fulfilled. The only variable with unknown effect on the level of utility is the change in lifetime income. If the difference in income is negative, the wage premium for specialist nurses is too low and will have a negative effect on utility. It will cause fewer nurses to get specialized, ceteris paribus.

In this thesis, economic incentives are argued to be an important factor for nurses. However, the inequality in Equation 3 might be fulfilled for some individuals even though there are negative incentives. On the other hand, if it is the case that incentives are positive, Equation 3 might still not be fulfilled for some individuals. Higher economic incentives and/or improvements in other variables are needed for some nurses to specialize. For example nurses

with a higher level of ability will probably get a quite low disutility of the effort demanded by the further education than a nurse with a lower level of ability. In addition the high ability nurse will probably have higher marginal effect on utility by the change in skill and influence too. Thus the nurse with high ability need lower economic incentives, ceteris paribus.

$$U_i = U(\Delta Y_i, l_i, \Delta S_i, \Delta I_i, WL_i, WC_i, \Delta E_i, |IC_i) > 0 \qquad (3)$$

where,

$$\Delta Y_i = Y_i^S - Y_i^G, \qquad \Delta S_i = S_i^S - S_i^G, \qquad \Delta I_i = I_i^S - I_i^G, \qquad \Delta E_i = E_i^S - E_i^G$$

3. Previous Research

As far as I know there is no existing research concerning specialist nurse wages or Swedish nurses alone in an economic focus. However there are a number of valuable research areas for the purpose of this thesis.

3.1 Nurses' response to wage changes

It is not only important to determine what nurses' economic incentives are. In able to reduce problems of nurse and specialist nurse shortages it must also be discussed how nurses react to changes in economic incentives like wage changes. Several studies from several countries have been made about nurses' wage elasticity. Some of them are Rice (2005) who estimates the nurse wage elasticity in UK, Askildsen et al. (2002) and Di Tommaso et al. (2007) estimate it with Norwegian data. They all state that it is a well-studied area and that most of the researchers come to similar conclusions even though they are applied in different countries. Almost all research focus on the nurse wage elasticity of the existing labor force. Thus it is the short term wage elasticity that is examined and it is true that it is a well-researched area. However, it is argued in this thesis that the dynamic long-run effects of economic incentives are of at least equal importance to reduce the shortage in Sweden and other countries. It implies the possibility of attracting more individuals both to the profession of nursing and for nurses to get specialized by an expected higher wage level. In addition a higher wage level will probably retain the existing labor force to a larger extent too. Kankaanrata & Rissanen (2007) confirms this statement, at least for the Finnish health sector.

3.2 Short term and long-run effects

By excluding the long-run effects, researches focus on how part time nurses' labor supply (in hours) changes due to wage changes. Most of the studies, including the three above, estimate a wage elasticity around 0.2-0.4. They conclude that nurses do react to wage changes but it would be very costly to attract nurses just by increasing wages. However, looking at the Swedish case it is very likely that potential future nurses might choose not to become a nurse when media recurrently reports about low wages and bad working conditions. This fact must also be taken into account. In addition it is less likely for nurses to get specialized if there is not a high expected wage increase of the decision. Additional factors make it extra important to include the long-run wage elasticity in Sweden. If wages are low there is an imminent risk of losing both general and specialist nurses to neighbor countries, especially to Norway. Region Skåne also competes with Denmark because of its geographical location. In addition an average nurse employed by Region Skåne works 95.9% of full time and hence there is not much space for short term effects either.

The arguments about including the long-run effects on labor supply by wage changes is confirmed by Phillips (1995), Kankanraata & Rissanen (2007 and 2009) and Hanel et al. (2012). Phillips (1995) examines the labor supply of nurses in UK. He concludes that labor participation, i.e. attracting more people to join the nurse labor force, is highly responsive to wage changes. The elasticity of probability of participation with respect to wages is estimated to 1.4, meaning that a 10% increase in wages lead to a 14% higher probability of labor participating. Furthermore he points out the importance of examining long-run effects because of the future expected increase in demand for health care in developed countries. Hanel et al. (2012) start by estimating the short term wage elasticity and come to similar results as previous studies. They continue by also including the long run wage elasticity and then state an overall wage elasticity of 1.3.

Both Phillips (1995) and Kankaanrata & Rissanen (2009) develop models that aim to explain the nurse labor supply. They argue that a nurse will only participate in the labor force if the market wage is above his or her reservation wage. That is a decision of pure substitution effect. In this case it could be a general nurse, specialist nurse or even a potential future nurse. Once the decision to participate is made, the next decision is how many hours he or she is willing to work given the nurse's individual characteristics. The latter decision is a

15

combination of income and substitution effect, where the substitution effect seems to dominate according to previous studies about the short term nurse wage elasticity. In conclusion, when taking both short term and long-run effects into account, increasing wages seem to be an effective tool of reducing the nurse shortage. Thus it is probably the case that higher economic incentives for general nurses to get further educated will make more of them to do so.

3.3 Wage and productivity

There are additional positive effects of raising nurse wages. It will probably make nurses more productive. The existing labor force might feel more appreciated and thus raise their loyalty and productivity. In addition more productive individuals might be attracted to the profession. Economic theory suggests that a higher wage level leads to raised productivity. Hall et al. (2008) confirm this relationship. They examine how hospital productivity is affected by wages outside the health sector in different areas of the UK. Wages for health personnel are centralized to a high degree in the UK and thus very equal all over the country. However, the presence of labor markets with higher offered wages outside the health sector differ very much around the country. By comparing the productivity in hospitals between regions with differences in competing labor markets for potential health personnel, they conclude that productivity is lower when the outside wage is higher. Thus when wages in the health sector are on a significant lower level than the local labor market outside the health sector, hospitals find it hard to attract productive personnel and to retain its existing stock of personnel. Hall et al. (2008) state that a 10% increase in outside wages on average increase mortality by 4%-8% for acute myocardial infarction patients. Since nurse wages in Sweden are considered very low, these results might be applicable to a Swedish setting as well.

3.4 Non-economic factors

In addition to the above mentioned conclusions, Phillips (1995) and Kankaanrata & Rissanen (2007 and 2009) come to the conclusion that it is probably not enough to focus only on nurses' wages. Working conditions and career possibilities might be important factors as well for an increased participation rate, to retain personnel and to raise the labor supply of the existing labor force. It is concluded by Kankaanrata & Rissanen (2007) that there is a significant lowered risk for a Finnish nurse to leave the health sector if there is a possibility of

getting specialized. In the studies by Askildsen et al. (2002), Di Tommaso et al. (2007) and Rice (2005) it is also concluded that tougher working conditions make nurses less responsive to wage changes. Working shift is often the most significant factor. Personal characteristics also matter, like being married, having children and the nurse's household disposable income.

There are researchers who choose to focus on other factors influencing the nurse labor supply than economic incentives. Most of them focus on how to retain the existing labor force. Heinen et al. (2012) examine what factors make nurses leave the health sector. The study is empirical and made on 10 European countries. They conclude that the working environment is very important in a nurse's decision not to leave the health sector. However, there are differences between countries in which parts of the working environment that are significant in a nurse's decision. Thus it is important to account for country specific factors. The most important variable for a nurse's decision in the overall sample is experience from burnout and 28% of the nurses have had such an experience. Other influential factors are satisfaction with the leadership, nurse-physician relationship and lack of participation in hospital affairs. The nurses most likely to leave the health sector are men, older nurses and those working part time. Aiken et al. (2012) perform a similar study for 12 European countries. Sweden, Norway and Finland are included and Sweden stands for a large fraction of the sample. In the overall sample, 11%-56% of the nurses are dissatisfied with their situation. In Sweden that share is 20%. The dissatisfaction concerns wages, educational possibilities and possibilities of advancement. More than half of the overall sample is dissatisfied with the possibilities of advancement. In Sweden more than half of the nurses rate their working environment as poor or only fair against the alternatives good or excellent. It is also stated that a large fraction of the nurses intend to leave the profession.

The conclusion by Aiken et al. (2012) is that a shortage of nurses is to be expected when a country improves economically unless the hospital working environment does not improve. They argue that improving the working conditions could be done at relatively low costs. There should be better possibilities for nurses' development by clear career ladders. Furthermore there are additional effects of improving nurses working conditions. It is shown by Alenius et al. (2013) that improving working conditions is strongly related to a nurse's assessment for patient safety.

4. Data and method

4.1 Describing the data material

The data covers nurses employed by Region Skåne. It is the county council located most south in Sweden of the 21 county councils in Sweden and is Skåne's biggest employer. Its responsibilities are to provide both primary and secondary care for the citizens against small out-of-pocket fees. To provide psychiatric care is also a task for the county council. However, pure geriatric care is not one of the county councils responsibilities. According to Statistics Sweden, Sweden has a population of 9 658 301 citizens of which 1 274 069 live in Skåne in 2013. It corresponds to 13.19% of the population. One of the biggest hospitals in Sweden is run by Region Skåne. It is the Skåne University Hospital and is located both in Malmö and Lund.

The data is a cross-section set on individual level that covers all nurses and specialist nurses employed by Region Skåne in March 2014. There were 9 658 nurses and specialist nurses employed. Nurses stand for almost a third of the labor force in the health service provided by Region Skåne. Not all of the nurses got paid in March for unknown reasons. Many of those are probably summer interns who have not started to work yet. There were 514 individuals who did not get paid in March and thus they were excluded from the sample in order to not bias the results. Additional 343 nurses were excluded. Those were radiographic nurses and are considered to be too different from other nurses and do not have the same specialization possibilities as a general nurse. Those exclusions shortened the sample to 8 801 observations.

The variables in the data set are monthly wage in SEK before tax, dummy variables for each type of nurse, age in years, sex, type of employment and variable for how much a nurse works in quantity as a share of full time employment. The wage variable is without any additions and expressed as if the nurse is working full time even if he or she works part time. The dummy variables for each type of nurse take the value of one if it is true for that type of nurse and zero otherwise. The nurse specializations included in the sample and having dummy variables are specialists within ambulance, anesthesia, operation, district nursing, intensive care, psychiatry, children's health and midwives. Specialists in oncology, medicine and surgery are also included in the sample but they are all labeled as other nurse specialist. Included in the same category are also further educated nurses in smaller areas. It could be nurses specialized within eyes, ultra-sound and pain relief. Hence, all specialties not

18

mentioned above are compounded into one single dummy variable. The general nurse is considered as the baseline. The sex variable is a dummy variable taking the value of one if it is a female nurse and the value of zero if it is a male nurse. The variable for type of employment is a dummy variable taking the value of one if the nurse is permanently employed and zero if he or she is only employed for a limited period of time. How much the nurse works in quantity is measured as a value between zero and one, where one means full time employment and every number lower than one is the share of full time employment.

The average age is 44.19 years (median of 44 years) and the average monthly wage is 28 667.27 SEK (median of 29 000 SEK) in the sample. There are 4 347 specialist nurses and they stand for a share of 49.39%. The number of women are 7 953 which corresponds to 90.36% of the sample. 7 810 nurses are permanently employed which corresponds to 88.74%. The average amount of work as a share of full time employment is 95.90%, meaning that a surprisingly large fraction of the sample has a full time employment. Statistics for each sub sample is presented in Table 2 below. There are no large wage differences between different kinds specialist nurses with the exception of those specialized in ambulance. Their mean and median wage is below 29 000 SEK per month before tax. All other specialist nurses lie in the interval 30 000-31 900 SEK. The largest group of further educated nurses is midwives. They stand for 6.74% of the sample. Specialist nurses within ambulance are the only group with an average age below 40 years. All other groups of specialist nurses have an average age above 45. The two oldest groups are specialists within psychiatry and district nursing. These groups each have an average age above 50 years. The high average age for many groups of specialist nurses is an indication of the need of better recruitment of specialist nurses.

The wage distribution of the whole sample, i.e. both for general and specialist nurses, is presented in Graph 2. It is shown in the graph that almost every fourth nurse earns less than 25 000 SEK per month before tax, 95% of them earn less than 35 000 SEK and about 60% earn less than 30 000 SEK. Approximately half of the sample has a university education of three years while the other half has a university education of at least four years. In comparison to other professions with an equal amount of education in Sweden, the nurse wages are considered very low. In other words there is a high opportunity cost of becoming a nurse or specialist nurse.

Table 2: Statistics for each sub sample

	Mean wage (SEK)	Median wage (SEK)	Mean age (years)	Median age (years)	No. of individuals	Fraction of sample (%)
General Nurse	26115	25600	39.51	37	4 454	50.61
All Specialist Nurses	31282	31100	49.00	49	4347	49.39
Children	30719	30450	46.71	46	409	4.65
Operation	31294	31263	46.90	47,5	348	3.95
Intensive Care	31595	31560	47.53	48	456	5.18
Ambulance	28864	28848	39.13	39	103	1.17
Psychiatry	30451	30225	51.34	52,5	358	4.07
District	31288	31000	50.30	51	449	5.10
Anesthesia	31831	31800	47.60	46	427	4.85
Midwife	31644	31550	48.27	48	593	6.74
Other Specialist Nurse	31431	31200	51.43	52	1204	13.68
Total	**28 667**	**29000**	**44.19**	**44**	**8801**	**100.00**

Graph 2

Wage distribution among nurses in Skåne
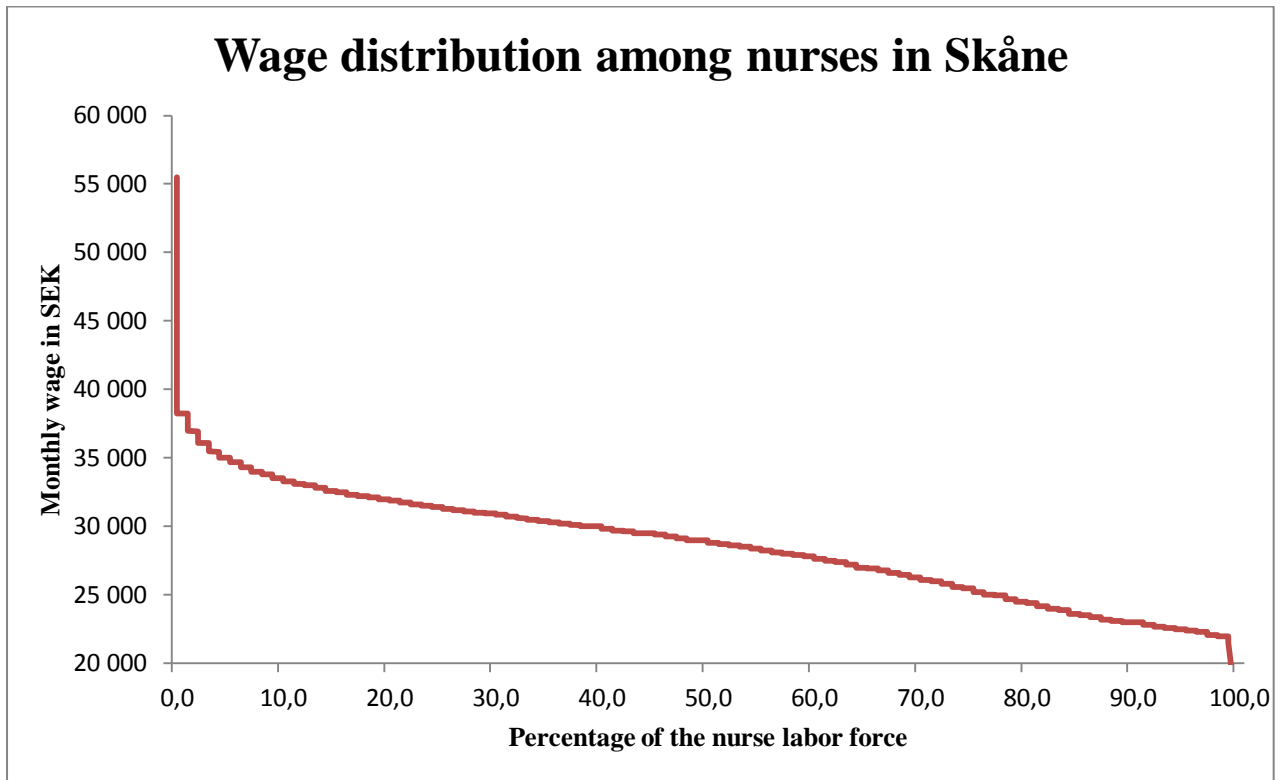
Source: Region Skåne

4.2 The model

In order to estimate the wage premium for different specialist nurses, the model in Equation 4 is estimated.

$$W_i = \alpha + \beta_1 Sex_i + \beta_2 Age_i + \beta_3 Age_i^2 + \beta_4 Employment_i + \beta_5 WorkQ_i + \gamma S_i + \varepsilon_i \quad (4)$$

$$where \; S_i = \begin{bmatrix} Children_i \\ Operation_i \\ Intensive_i \\ Ambulance_i \\ Psychiatry_i \\ District_i \\ Anesthesia_i \\ Midwife_i \\ Other\; Specialist_i \end{bmatrix}, and \; \gamma = \begin{bmatrix} \gamma_1 & \gamma_2 & \gamma_3 & \gamma_4 & \gamma_5 & \gamma_6 & \gamma_7 & \gamma_8 & \gamma_9 \end{bmatrix}$$

In Equation 4 all of the above mentioned variables are included. The variable W_i is the wage, α is an intercept term, Sex_i is the dummy variable for being a woman, Age_i is the age, $Employment_i$ is the dummy variable for being permanently employed, $WorkQ_i$ is the variable for quantity of work in terms of share of full time work, S_i is a vector of dummy variables for each nurse specialist previously described with a corresponding vector of coefficients, γ, and ε_i is the error term.

In the model β_1 is hypothesized to be negative since men often earn more than women in general. The coefficient β_2 is expected to be positive because people often get more productive when they are older and thus they get better paid. Age can also be seen as a good proxy for work experience, which also use to be positively related to productivity and thus also to the wage level. On the other hand this relationship is probably concave, meaning there is a decreasing marginal effect of age on the wage level. Hence, β_3 is expected to be negative. Being permanently employed should give better opportunities for an employee to negotiate about his or her wage. Therefore β_4 is expected to be positive. However it seems to be hard to negotiate about the wage at all for nurses in the Swedish health sector and therefore it is expected to be small in its magnitude. The measurement for quantity of work might be an indicator of effort, which is probably reflected in a nurse's productivity in other tasks. It might also be the case that those nurses working part time live in a household where the disposable income is already high excluding the nurse's wage. Therefore they are in less need of a wage increase and will not negotiate as hard as other nurses. Both of these hypotheses make β_5 to be expected with a positive sign. When it comes to the γ-values they are all expected to be positive. It is shown in both Graph 1 and Table 2 that the average wage level of any specialist nurse is higher than the average wage level of a general nurse. Simple economic theory also predicts that there must be economic incentives for people to get educated and an employer should be willing to pay more for better educated personnel. The question is if the γ-values are large enough for the specialization to break even economically.

The variables of main interest for the purpose of this thesis are the γ-values, i.e. the nurse specialist wage premiums. Therefore it is relevant to discuss the reliability and interpretations of these coefficients. There is a risk for those coefficients to suffer from endogeneity due to omitted variables. If that is the case, the coefficients get biased. A likely omitted variable that might bias the results is a measurement for ability. In this case it is reasonable to assume that nurses who choose to get specialized probably have higher ability than those who do not

choose to do so. Individuals with higher ability can in this case be individuals that are more intelligent, have greater effort and/or are more motivated. Hence, because of higher ability on average, individuals who choose to get specialized would probably get better paid than other general nurses even if they had chosen not to specialize. Unfortunately there is no measurement for ability in the data used in this thesis. Such a measurement could be cognitive tests from tryouts to the Swedish military or high school grades. Unfortunately the cognitive tests are mostly performed by men and most nurses are women. High school grades are probably a good indicator of intelligence. It is not perfect because teachers probably do not give grades in exactly the same way, some high school programs might be tougher than others and school grades are not only a function of intelligence but also effort. On the other hand, effort could be count as a part of a person's ability too and thus high school grades might be a good measurement for ability.

If it is the case that the model suffers from endogeneity, the γ-values are biased and cannot be interpreted as the causal wage effect of becoming a specific nurse specialist. However, it is argued in this thesis that the results of such a model are valuable even though the model might suffer from endogeneity. Following the arguments by Angrist & Pischke (2009) and Lundborg (2008) the error term in Equation 4, ε_i, takes the form of Equation 5 if the model suffer from the above described problem.

$$\varepsilon_i = \beta_6 A_i + v_i \qquad (5)$$

In Equation 5, the variable A_i is the measurement for ability and v_i is a white noise error term. If there is no measurement for A_i it will be reflected in the error term as an unobserved omitted variable and ε_i will not be a white noise error term. Instead the dummy variables for being a certain type of specialist will be correlated with the error term, $Cov(S_i,\varepsilon_i)\neq0$. Following the arguments by Angrist & Pischke (2009) and Lundborg (2008) again, the expression for the OLS estimator of γ_n takes the form of Equation 6 for all ns. It is then assumed that $Cov(\gamma_n,v_i)=0$ and $Cov(\gamma_n,\alpha)=0$ for all ns and that there are no problems with multicolinearity.

$$\hat{\gamma}_n^{OLS} = \frac{Cov(S_i, W_i)}{Var(S_i)} = \cdots = \gamma_n + \beta_6 \frac{Cov(S_i, A_i)}{Var(S_i)} = \gamma_n + bias\ term, \quad (6)$$

23

It is shown in Equation 6 that the OLS estimator of γ_n for all ns is the true value of γ_n plus a bias term. However, it is argued that the results are of value even though such a regression suffers from the problem with endogeneity. The reason is the assumption that $Cov(S_i, A_i)$ for all specializations are positive, implying that the γ-values are all upward biased. The aim of this thesis is to find out if it ever breaks even economically for a nurse to get specialized, i.e. if the wage premium minus the costs is positive or negative. Then if it shown that it never breaks even economically, one can with certainty still say that it is the case. Because if the true γ-values are estimated instead, the results would be even worse with the same student loan and the same loss in income due to absence from work but with a lower wage increase by getting specialized. If it is shown that it does break even for a nurse to specialize and how long it would take for it to do so, then one could say that it at best breaks even after that certain period of time. Due to the upward biasedness of the wage premium it is likely to take longer for the investment to break even than shown in the results.

5. Empirical results

5.1 Regression analysis

The results from the regressions are presented in Table 3[1]. The standard errors are presented below all coefficients. The model described above is the regression named S2. All other regressions are modification of that model in able for the reader to see the difference between models. In all models, the R^2 and adjusted R^2 are surprisingly high for being individual level data. The first two regressions, F1 and F2, are models with a dummy variable taking the value of one if the nurse is further educated and zero otherwise. In those regressions all specialist nurses are labeled the same. In F1 there is only one age variable. In addition the squared age variable is included in F2. It is the only difference between the two models. The main conclusions from these models are that age is positively correlated with a nurse's wage level. However, there is a decreasing marginal effect of age which is reflected in the negative coefficient for the squared age variable. In addition the model is improved by adding the squared age variable both by lowering Aikake's information criteria (AIC) and the Schwarz Bayesian information criteria (BIC). Both the R^2 and the adjusted R^2 get improved too. In

---

[1] In all models both the Breusch-Pagan test and White's test indicate heteroskedastic residuals. The problem is dealt with by using White's heteroskedasticity-consistent robust estimator in all regressions presented in Table 3. The residuals of S2 are presented in the Appendix.

Table 3: Regressions

	F1	F2	S1	S2	log1	log2
α_i	16729,85***	10622,91***	16536,86***	10698,44***	9,8281***	9,5652***
	319,59	422,47	312,67	409,39	0,0104	0,0137
Age_i	187,54***	499,35***	190,64***	489,40***	0,0067***	0,0200***
	2,49	16,89	2,48	16,57	0,0001	0,0006
Age_i^2		-3,47***		-3,33***		-0,0002***
		0,19		0,19		0,0000
Sex_i	45,42	19,12	-64,15	-92,30	-0,0012	-0,0024
	91,40	89,87	93,28	91,78	0,0031	0,0030
$Employment_i$	203,54**	48,70	225,43***	77,43	0,0124***	0,0058**
	80,31	80,22	80,59	80,65	0,0028	0,0028
$WorkQ_i$	1826,40***	1630,85***	1983,28***	1792,03***	0,0614***	0,0528***
	276,78	266,36	268,38	258,76	0,0088	0,0083
$Specialist_i$	3392,56***	3257,22***				
	54,86	55,65				
$Ambulance_i$			2707,65***	2437,87***	0,1040***	0,0918***
			198,31	204,63	0,0068	0,0071
$Anesthesia_i$			4156,41***	4004,36***	0,1450***	0,1381***
			112,61	112,61	0,0035	0,0035
$Children_i$			3245,56***	3106,48***	0,1179***	0,1116***
			107,74	104,67	0,0036	0,0034
$Midwife_i$			3945,25***	3822,57***	0,1379***	0,1324***
			97,92	99,93	0,0031	0,0031
$District_i$			3175,06***	3064,80***	0,1135***	0,1085***
			126,44	125,62	0,0038	0,0037
$Intensive\ care_i$			3937,16***	3759,30***	0,1390***	0,1310***
			110,16	108,84	0,0035	0,0034
$Operation_i$			3722,16***	3559,61***	0,1309***	0,1236***
			137,30	135,11	0,0044	0,0043
$Prychiatry_i$			2045,14***	2031,94***	0,0760***	0,0754***
			138,51	130,76	0,0046	0,0042
$Other\ specialist_i$			3030,96***	2918,74***	0,1065***	0,1015***
			90,76	89,60	0,0029	0,0029
R^2	66,46	67,66	67,50	68,59	69,53	71,35
Adjusted R^2	66,44	67,63	67,45	68,54	69,49	71,30
F-stat.	3485,438***	3065,77***	1403,66***	1370,53***	1542,60***	1562,81***
AIC	18,34	18,30	18,31	18,27	-2,28	-2,34
BIC	18,34	18,31	18,32	18,29	-2,27	-2,33

*=10% level of significance, **=5% level of significance and ***=1% level of significance..

General nurse is the baseline in all regressions.

both models the variable Sex_i indicate that female nurses earn more than male nurses, but the variable does not significantly differ from zero and it is very low in its magnitude. The coefficient for the variable $WorkQ_i$ should be multiplied by the share of full time employment a nurse works and it seems that the effect of working part time affect the wage level for a given quantity of work. The dummy variable for being permanently employed is significant on a five percent level in F1 but in F2 it is not significant on conventional levels. Its small positive coefficient indicates a small but positive effect on wages by being permanently employed. All other variables are significant on a level of one percent. The wage premium of getting specialized is on average around 3300 SEK per month before tax according to these two models.

In order to fulfil the purpose of this thesis and to get models that fit better with the data, the models are extended to S1 and S2. It is then possible to state wage premiums for each kind of specialist nurse. In addition these models get an overall improvement. AIC and BIC get even lower and R^2 and adjusted R^2 get even higher. Again, it is concluded that the addition of a squared age variable improves the model and that there is a decreasing positive marginal effect of age on the wage level. Thus S2 is the preferred model so far. All variables differ significantly from zero on a one percent level in all cases but for Sex_i in both models and $Employment_i$ in S2. The variable Sex_i in both models now indicate that female nurses earn less than male nurses but once again the variable is low in its magnitude and does not differ from zero on conventional levels of significance. It is in line with the conclusion by Calmfors & Rickardsson (2004) that women earn slightly less than men in the Swedish health sector but the difference is relatively small. The coefficients for the specialist nurse variables are of main interest for the purpose of this thesis. From the models one can observe a difference in wage premiums depending on which kind of specialist a nurse chooses to become. In S2, the lowest average wage premium belongs to a nurse specialized in psychiatry. It is estimated to an extra amount of 2 031.94 SEK per month before tax. Those specialized in anesthesia get the highest average wage premium. It is estimated to 4 004.36 SEK per month before tax. It is almost the double average wage premium even though their education is of equal length.

The logarithmic models, log1 and log2, are the same models as S1 and S2 but with the wage of logarithmic character. In the logarithmic models R^2 and adjusted R^2 get even higher and the information criteria are negative. These models fit well with the data but it is hard to compare these models to the non-logarithmic models. The interpretations of the coefficients in the

26

logarithmic models are in relative terms. In able to answer the question of this thesis, absolute values are needed. Therefore the logarithmic models are not used when determining the economic incentives for a general nurse to get specialized. S2 is the preferred model when answering the questions in this thesis. Otherwise the implications of the log models are similar to S1 and S2. The only difference is that Empoyment$_i$ significantly differs from zero on a level of five percent in log2 while the same variable is not significant on conventional levels in S2. The best and worst paid specialist nurses are the same in the log models. A psychiatry nurse has an average wage premium of 7.54% compared to a general nurse while it is 13.81% on average for a nurse specialized in anesthesia.

5.2 Economic Incentives

In this section the magnitude of a general nurse's economic incentives to get specialized in different areas are presented when taking both the costs and benefits into account. In Table 4 and 5, the results of simple illustrative calculations are shown. Both tables exhibit economic outcomes for an average general nurse employed by Region Skåne to get specialized in certain areas. In Table 4, the monetary benefit and net benefit for an average general nurse until retirement is presented with different assumptions and discount rates chosen. In Table 5, the number of years for a specialist nurse education to break even is presented with the same assumptions made. In the sample an average general nurse is 39.51 years old, permanently employed, works 95.6% of full time employment and is a woman. For simplicity the calculations are performed on an average general nurse working full time. According to the model S2, the wage of an average general nurse is expected to be 26 213.56 SEK per month before tax.

5.2.1 Calculations and assumptions

The calculations in Table 4 are made according to Equation 7 below. Those made in Table 5 are based on the same calculations and assumptions. It is then solved for the time it takes for the net benefit to be equal to zero, i.e. the time it takes for the investment to break even. The

$$\overline{NB} = \sum_{t=1}^{n} \frac{B_t}{(1+r)^t} - C \quad (7)$$

variable B_t is the wage benefit by getting specialized estimated in S2. It is assumed to be constant over time in real terms. Thus future inflation can safely be ignored. It gets discounted at the interest rate of r and the time index indicates the time passed in years since the average nurse got specialized. If the average nurse gets specialized today, n is equal to 25.49 years. It is the remaining time until retirement. According to economic theory, future income should be discounted since individuals tend to value present income more than the same amount in the future. How valuable the future gain in income is differs across individuals and thus several interest rates are used. The variable C is the cost for the average nurse to get specialized today. It contains the loss in income as a general nurse during the studies and the needed loan. It is assumed that an individual only cares about the after tax income. Thus the tax is subtracted from both benefits and costs. The average tax rate in Sweden 2014 is 31.86% according the Swedish tax authority.

Full time studies in Sweden last 40 weeks per year. Thus the loss in income the first year is based on the above mentioned wage after tax during 40 weeks. If the nurse becomes a midwife or a district nurse, the education continues the second year. In the second year the nurse is one year older and is expected to have a loss in income of 26 404.20 SEK before tax per month according to the model S2. For a district nurse the additional loss in income is during 10 weeks while it is additional 20 weeks for a midwife.

It is assumed that the average general nurse finances its studies by the earlier mentioned loan from the Swedish National Board of Student Aid (CSN). In 2014 the interest rate on such a loan is 1.2% on a yearly basis and thus it is expected not to grow in real terms over time. A Swedish student also gets a monthly transfer each month for studying. The loan minus the transfer is included in the cost and is 16 820 SEK per semester for a full time student. The loan plus the transfer is considered as very low income in Sweden. If the student has worked before studying, there is a possibility to get an additional loan of 17 580 SEK per semester for a full time student. Almost all nurses who choose to get specialized have worked for several years before starting their additional education. A general nurse has probably adapted his or her lifestyle in line with the present income and thus it is reasonable to assume that he or she would choose to get the additional loan in order to make a living. In the tables both the situation with the normal loan and the additional loan are presented. In Table 4, the normal loan situation is labeled as Net benefit 1 and the additional loan situation is labeled as Net

Table 4: Economic incentives for an average general nurse to get specialized

	Wage benefit (SEK)			
	0%	**1%**	**3%**	**5%**
Ambulance	508 116.82	446 569.09	351 676.46	283 729.47
Anesthesia	834 615.06	733 518.88	577 651.55	466 044.18
Children	647 473.79	569 045.87	448 127.83	361 545.59
Midwife	796 725.39	700 218.76	551 427.45	444 886.81
District	638 785.94	561 410.37	442 114.82	356 694.34
Intensive Care	783 537.82	688 628.59	542 300.11	437 522.95
Operation	741 918.15	652 050.27	513 494.41	414 282.76
Psychiatry	423 509.37	372 210.06	293 118.18	236 485.16
Other Specialist	608 343.15	534 655.09	421 044.84	339 695.26
	Net benefit 1 (SEK)			
	0%	**1%**	**3%**	**5%**
Ambulance	310 161.85	248 614.11	153 721.49	85 774.49
Anesthesia	636 660.08	535 563.91	379 696.57	268 089.20
Children	449 518.81	371 090.89	250 172.86	163 590.61
Midwife	499 195.44	402 688.80	253 897.50	147 356.85
District	391 043.48	313 667.91	194 372.36	108 951.88
Intensive Care	585 582.85	490 673.61	344 345.13	239 567.97
Operation	543 963.17	454 095.29	315 539.44	216 327.79
Psychiatry	225 554.39	174 255.08	95 163.20	38 530.18
Other Specialist	410 388.17	336 700.11	223 089.86	141 740.29
	Net benefit 2 (SEK)			
	0%	**1%**	**3%**	**5%**
Ambulance	275 001.85	213 454.11	118 561.49	50 614.49
Anesthesia	601 500.08	500 403.91	344 536.57	232 929.20
Children	414 358.81	335 930.89	215 012.86	128 430.61
Midwife	446 455.44	349 948.80	201 157.50	94 616.85
District	347 093.48	269 717.91	150 422.36	65 001.88
Intensive Care	550 422.85	455 513.61	309 185.13	204 407.97
Operation	508 803.17	418 935.29	280 379.44	181 167.79
Psychiatry	190 394.39	139 095.08	60 003.20	3 370.18
Other Specialist	375 228.17	301 540.11	187 929.86	106 580.29

Table 5: Number of years for a specialist nurse education to break-even economically

	Normal loan (years)				With additional loan (years)			
	0%	1%	3%	5%	0%	1%	3%	5%
Ambulance	9.93	10.51	11.97	14.06	11.69	12.50	14.62	18.01
Anesthesia	6.05	6.27	6.77	7.38	7.12	7.42	8.13	9.02
Children	7.79	8.15	9.01	10.12	9.18	9.67	10.89	12.59
Midwife	9.52	10.05	11.38	13.24	11.21	11.94	13.86	16.84
District	9.89	10.46	11.90	13.97	11.64	12.44	14.53	17.88
Intensive Care	6.44	6.69	7.26	7.96	7.58	7.93	8.73	9.77
Operation	6.80	7.08	7.72	8.52	8.01	8.39	9.30	10.49
Psychiatry	11.91	12.75	14.96	18.56	14.03	15.19	18.48	24.78
Other Specialist	8.29	8.70	9.68	10.98	9.77	10.33	11.73	13.74

benefit 2. Under Wage benefit, no costs are subtracted. All values are in SEK at the Swedish price level of 2014.

5.2.2 Net benefit of getting specialized

In all cases shown in the tables there is no nurse specialist education that does not break even economically for an average general nurse in Region Skåne. In the case with additional loan and specializing in psychiatry it is very close that the investment does not break even with a chosen discount rate of five percent. The different discount rates are shown to have a large impact on the results. It is likely that nurses have different preferences and thus value their future income in different ways. A slightly higher discount rate than five percent would turn several educations to negative investments. How long it would take for the different educations to break even is shown in Table 5. It is shown that some educations would not break even for nurses older than the average general nurse in Region Skåne. However, it would be even more beneficial for younger nurses to specialize since they will benefit from the specialist nurse wage premium in more years and lose less in income during their studies on average. The results in both tables indicate a large difference between different specialist nurse educations. Specializing in anesthesia is the most beneficial education while the least beneficial is specializing in psychiatry. In all cases but one it takes at least twice the time for the decision to specialize in psychiatry to break even economically than specializing within anesthesia. For nurses specializing within anesthesia and intensive care it takes less than ten years for the education to break even economically in all cases. For midwives and nurses who choose to get specialized within ambulance or district nursing it takes at least ten years for the

education to break even in all cases but one. If the nurse chooses to specialize within psychiatry it is expected that it will take more than ten years for the education to break even in all cases. Nurse specialist educations within children and operation lie between those two groups. In the calculations it is assumed that the length of the education for other specialist nurses is one year. However, there are many kinds of specialist nurses labeled as other specialist nurse and thus the reliability of their result is lower than for the other groups.

6. Discussion

In this thesis it is stated that there is a shortage of both general and specialist nurses in Sweden. Their wage level is low and a large fraction of Swedish nurses are unsatisfied with their working conditions. The shortage is largest for specialist nurses and thus the focus in this thesis is how to reduce the shortage of this particular group. For several reasons it is important to reduce the shortage of specialist nurses. There are technological improvements in the health sector which increase the demand of specialized nurses. Like in most developed countries, there are demographic changes in Sweden with an increasing share of elderly in the population. It makes the demand for health care go up and thus also for nurses. In addition it is a group with a heavily increasing median age and thus the magnitude of the problem will probably increase in the near and distant future unless actions are taken by policy makers. It is concluded that the upcoming of this situation is due to a monopsonistic labor market for nurses. However, there are factors reducing monopsony power for nurses like increased competition between county councils and increased competition by the municipalities. It is argued that specialist nurses are more exposed to employers' monopsony power than general nurses. Most specialist nurses are bound to work for the county council since it is the only provider of health care where certain types of specialist nurses are needed. Thus they have fewer potential employers than a general nurse. Furthermore it is concluded that nurses react to economic changes. However, a nurse's utility is not only determined by economic factors but also factors like working conditions and possibilities of advancement.

It cannot be proved that economic incentives are negative for an average general nurse employed by Region Skåne to get specialized in any area with the chosen discount rates. However, it does not mean that the economic incentives are positive either. It is argued that the nurses who choose to specialize have higher ability on average than nurses who do not choose to do so since they have higher marginal effects on utility when it comes to increasing

levels of skill and influence. In addition the disutility of the effort demanded is argued to be lower for individuals with higher ability. Because of higher ability they would most likely get better paid than other nurses even if they had chosen not to get specialized. It makes the regressions suffer from endogeneity and the estimated wage premiums for different specialist nurses are probably all overestimated. Without a measurement for ability it is hard to determine how large the differences between the estimates and the true causal wage premiums are. One can only say that the wage premiums are most likely lower than presented in the results. It might be the case that the level of ability differs between different specialist nurse groups too and thus the upward biasedness may differ between nurses specialized within different areas.

The conclusion is that the estimated wage premiums in the regressions are for certain not higher than what is shown in the regressions. The same reasoning applies to the presented net benefits of nurse specialist educations. They are likely to be lower than shown in the results. The number of years it takes for a nurse specialist education to break even should be interpreted as the number of years it at least takes for the education to break even. It probably takes a longer time for all nurse specialist educations to break even economically than shown in the results. Thus a specialist nurse education might be a negative investment within some or all areas even though it cannot be shown in the results. In addition the indications that municipalities pay nurses more than county councils makes the incentives even lower for the nurses employed by a municipality to get specialized because the wage premium for those nurses would be even lower. At least within those areas presented in this thesis. It might also attract nurses to start working for a municipality instead of getting specialized.

If the true economic effects are negative for an average general nurse to get specialized it might be the case that some nurses get a positive utility by doing so anyway due to the change in other variables like the level of skill and influence. However it is less likely than in the opposite case. For the same reason a nurse might not choose to get specialized even though the economic incentives are positive. Thus economic incentives can be too low despite the fact that they are positive. Thus, there is a need to complement this thesis by estimating general nurses' reservation wage premium of getting specialized. Since there is a shortage of specialist nurses in Sweden and Skåne, economic incentives, the change in effort and the level of skill and influence for nurses when specializing are concluded not to cause a positive utility for enough nurses. Even though it cannot be shown in this thesis that the existing economic

incentives cause disutility for a nurse when getting specialized, ceteris paribus, raising specialist nurse wages is a policy that would reduce the shortage. Another policy implication is to reduce the costs for a nurse to get specialized by offering more paid specialist nurse educations than today. In addition higher economic incentives are argued to increase the productivity of nurses. Another possible problem might be that the wage level for general nurses is to low and thus too few nurses with the needed ability to get a positive utility of getting specialized are attracted in today's situation. An additional policy implication is to increase the influence of specialist nurses. One such policy would be to let specialist nurses assist the physicians more than they today and/or to take over some tasks from the physician. In addition such a policy would reduce costs for the county councils since a specialist nurse costs less than a physician and the physician gain more time to perform other advanced treatments.

The contribution of this thesis is the analysis of specialist nurses in Sweden. As far as I know there is no research regarding economic incentives for nurses to get specialized, nor has it been done any research regarding Swedish nurses alone. The results in this thesis are specific for the Skåne region in Sweden. There is high internal validity. The external validity is lower. There are some regional differences in Sweden, but the results and conclusion might to some extent be valid for the whole country. At least when it comes to the theoretical conclusions and those based on previous research. However, there is no reason to believe that the empirical results in this thesis are applicable in other countries. I urge future researchers to perform similar studies in Sweden for other county councils and/or for the whole country. It might be the case that negative incentives can be proved with a data material covering the whole country or other regions. In addition, it is important to include nurses working for municipalities and private actors in the analysis. In order to get the true causal wage effect for becoming different kinds of specialist nurses, a measurement for ability is to be preferred. In addition researchers should aim at trying to estimate general nurses' reservation wage premium for getting specialized.

7. Conclusions

It is concluded that the utility of getting specialized is not positive for enough nurses and thus there is a shortage of specialist nurses in Skåne and Sweden. The main conclusion of this thesis is that it cannot be proved that economic incentives for an average nurse employed by

Region Skåne to get specialized do not exist. On the other hand it is concluded that it might still be the case that there are no economic incentives for an average nurse to get specialized, because the true causal effect of getting specialized is not estimated in the analysis. It is also argued that even if there are economic incentives to get specialized they might be too low. Raising the wage premiums would still be an effective way of attracting general nurses to specialize. Future researchers are urged to perform similar studies and to complement this study by adding measurements for ability and/or to reveal nurses' reservation wage premiums.

References

Aiken L.H. et al. (2012), Nurses' reports of working conditions and hospital quality of care in 12 countries in Europe, *International Journal of Nursing Studies* 50, pp. 143-153.

Alenius L. S. et al. (2013), Staffing and resource adequacy strongly related to RNs' assessment of patient safety: a national study of RNs working in acute-care hospitals in Sweden, *BMJ Qual Saf* 23, pp. 242-249, Karolinska Instituet, Stockholm.

Angrist J. D. & Pischke J-S. (2009), *Mostly Harmless Econometrics: An Empiricists Companion,* Princeton University Press.

Askildsen J. E., et al. (2002), Will Increased Wages Reduce Shortage of Nurses? A Panel Data Analysis of Nurses' Labour Supply, *Working Papers in Economics,* No. 21/02.

Barros, P. P. & P. Olivella (2011), Hospitals: Teaming up. In Glied, S. & Smith, P.C., *The Oxford Handbook of Health Economics*, Oxford UP: New York: pp. 432-462.

Calmfors L. & Rickardsson K. (2004), Marknadskrafterna och lönebildningen i landsting och regioner, *IFAU – Institutet för arbetsmarknadspolitisk utvärdering,* Rapport 2004:9.

Combes J-B., et al. (2012), Hospital Staffing and Local Pay: an Investigation onto the Impact of Local variations in the Competitiveness of Nurses Pay on the Staffing of Hospitals In France, *Thema Working Paper,* No. 2012-35.

Di Tommaso M. L., et al. (2007), Nurses Wanted. Is the job too harsh or is the wage too low? *CHILD Working Papers,* No. 11/2007.

Hall E., et al. (2008), Can Pay Regulation Kill? Panel Data Evidence on the Effect of Labor Markets on Hospital Performance, *CEP Discussion Paper,* No 843, London School of Economics and Political Science, London.

Hanel B., et al. (2012), Nurses' Labour Supply Elasticities: The Importance of Accounting for Extensive Margins, *IZA Working Paper,* No. 6573.

Heinen M. M. et al. (2012), Nurses' intention to leave their profession: A cross sectional observational study in 10 European countries, *International Journal of Nursing Studies* 50, pp. 174-184

Hirsch B. T. & Schumacher E. J. (1995), Monopsony power and relative wages in the labor market for nurses, *Journal of Health Economics* 14, pp. 443-476.

Hirsch B. T. & Schumacher E. J. (2008), Underpaid or Overpaid? Wage Analysis for Nurses Using Job and Worker Attributes, *IZA Working Paper,* No. 3833.

Kankaanrata T. & Rissanen P. (2007), Nurses' intentions to leave nursing in Finland, *The European Journal of Health Economics*, Vol. 9, pp. 333-342

Kankaanrata T. & Rissanen P. (2009), The Labor Supply of Registered Nurses in Finland: The Effect of Wages and Working Conditions, *The European Journal of Health Economics,* Vol. 10, No. 2, pp. 167-178

Lundborg P. (2008), The Health Returns to Education - What Can We Learn from Twins?, *IZA Working Paper,* No. 3399, Lecture 4.

Link C. R. & Landon J.H. (1975), Monopsony and Union Power in the Market for Nurses, *Southern Economic Journal,* Vol. 41, No. 4, pp. 649-659

Maning W. G., et al. (1987), Health Insurance and the Demand for Medical Care: Evidence from a Randomized Experiment, *American Economic Review* 77, pp. 251-77.

Phillips V.L. (1995), Nurses' labor supply: Participation, hours of work, and discontinuities in the supply function, *Journal of Health Economics* 44, pp. 567-582.

Radio Sweden (Sveriges Radio) (2013-05-26), "Sjuksköterskor väljer kommun framför Region Skåne", http://sverigesradio.se/ (2014-03-03)

Rice N. (2005), The labour supply of nurses in the UK: evidence from the British Household Panel survey, *HEDG Working paper,* 05/10.

Sullivan D. (1989), Monopsony Power in the Market for Nurses, *Journal of Law and Economics*, Vol. 32, No. 2, pp. 135-178.

Statistics Sweden (2013), *Labour market tendency survey for 71 training categories in 2013.*

Swedish Association of Local Authorities and Regions (Sveriges Kommuner och Landsting) (2014), *Så möter vi rekryteringsutmaningarna i vården och omsorgen.*

The National Board of Health and Welfare (Socialstyrelsen) (2014), *Nationella planeringsstödet 2014: Tillgång och efterfrågan på visa personalgrupper inom hälso- och sjukvård samt tandvård,* 2014-1-32.

The Swedish Association of Health Professionals (Vårdförbundet) (2014-02-13), "Bristen på sjuksköterskor stor på flera aukutmottagningar", www.vardforbundet.se (2014-03-03)

Vårdfokus No.2 2014 (Newspaper of the Swedish Association of Health Professionals)

Appendix

Graph 3

Residuals in S2