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# An Economic Model of the Salaried Physician in a Public Health Care System

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## **Abstract**

At present there is no health economic model that can fully explain the behaviour of the salaried physician in public health care systems.

My purpose is to create a working economic model of the salaried physician in a public health care system. Any model is a simplification of reality and choices have to be made between simplicity and relevance.

For this reason I present a sequence of models that gradually evolve from simpler models towards more realistic ones. More precise, I develop three models. The first model is a neoclassical model, which considers the salaried physician as a double agent for both the patient and the hospital manager. The second model is a multidisciplinary model, which in addition integrates insights from social psychology and sociology. The third model is a bounded rationality model, which also allows for cognitive limitations and unstable preferences.

At this point, it is my conclusion that the multidisciplinary model is best suited for modelling the salaried physician in a public health care system. At the same time I am of the opinion that the challenge for the future is to further develop the bounded rationality model.

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## Background

Physician agency and behaviour has been a key issue in health economics for a long time. At present, in a number of countries with public health care systems many physicians are salaried (Fujisawa and Lafortune 2008). This form of employment is commonly found in public hospitals. In some countries, such as Sweden, salaried physicians can also be found in primary care. A model of the salaried physician in a public health care system is crucial for our understanding of these physicians and could also be of use to countries looking for an alternative system.

A look at the existent health economics literature reveals no model that can fully explain the behaviour of the salaried physician in public health care systems. Most articles only consider fee for service or capitation as remuneration while paying little or no attention to salaried physicians. Furthermore, there is a shortage of articles that use the public health care system as the basis for their analysis. Despite the fact that public health care systems is a common feature in the European countries where an average of 82% of medical services is paid for by the public sector (OECD 2010). Clearly, there is a need for a working model of the salaried physician in a public health care system.

It is necessary to include the dual role of the physician as an agent for both the patient and the hospital manager in the model. For this purpose we need a theory of what goals a hospital manager in a public health care system may favour. In the absence of explicit financial incentives, we must consider other ways for the managers to motivate the physician, such as deferred payment or the possibility of promotion. We need also question the classic assumption that the physician is motivated by self-interest only, and consider the possibility that the physician derives utility from helping her patients.

A common feature in many models of the physician is a focus on financial incentives and the effect these have on treatment patterns. It has, for example, been argued that performance based payment leads to an oversupply of health care (Ginsburg & Grossman 2005). When the physician is paid by a salary, however, strong financial incentives are missing and physician behaviour is less likely to be sufficiently explained by financial incentives alone. In order to be able to explain the behaviour of salaried physicians we should therefore consider additional incentives. We should then consider the effect that work environment and colleagues might have on her behaviour, as well as the role that intrinsic motivation plays. In order to do this

we need to take a multidisciplinary approach which includes insights from other disciplines, in particular from sociology and social psychology.

## **Purpose**

My purpose is to create a working economic model of the salaried physician in a public health care system. Any model is a simplification of reality and for this reason choices have to be made between simplicity and relevance. Through the course of this thesis I will present a sequence of models that gradually evolve from simpler models towards more realistic ones. In particular I will develop three models of the salaried physician:

1. A neoclassical model
2. A multidisciplinary model
3. A bounded rationality model

## **Delimitations**

I limit myself to specific models of salaried physicians in public health care systems. For the purpose of this thesis I take this to mean a system where every member of society is covered by a mandatory health insurance that is publically financed. Exactly what is covered by the health insurance varies by country and it is not uncommon that some areas of health care are not included in the insurance, such as dental care, glasses or physiotherapy (OECD 2010). For simplicity of the analysis I will assume that the public health insurance has full coverage of medical services.

## **Structure**

In the first chapter I create a model of the salaried physician which has a focus on simplicity. The basis for the model is a neoclassical principal-agent model with the physician as a utility maximising agent. In the A section I model the physician as an agent for the hospital manager. Here I investigate the objectives of the manager and how these may affect the physician. I consider two reward systems as alternatives to piece rate: deferred payments and social status. In the B section I model the physician as an agent for the patient. At first I portray the physician as an imperfect agent, and then I introduce sympathy for the patient. In the C section I combine the two models into a double agent model of the salaried physician as an agent for both the hospital and the patient.

In the second chapter I develop a more complex model of the salaried physician by focusing more on realism at the cost of simplicity. I investigate possible extensions to the neoclassical model. In the A section I include insights from new institutional economics and sociology in order to capture the effect of work environment, social norms and the approval of others. In the B section I include theories from behavioural economics and social psychology which describe the relevance of intrinsic motivation and motivational crowding out. In the C section I combine these insights into a multidisciplinary dual agent model of the salaried physician.

In the third and final chapter I take another step towards a more realistic model by introducing the concept of bounded rationality. In the A section I abandon the assumption that the physician is optimising and consider satisficing behaviour as an alternative. In the B section I discard the utility framework and take a look at aspiration adaptation theory. In the C section I develop a bounded rationality model of the salaried physician.

## 1. Neoclassical models of the salaried physician

In this chapter I develop a simple model of the salaried physician within the boundaries of what I see as neoclassical theory. I adopt the most common representation of rationality, which assumes that everyone acts in their perceived best interest, has complete and fully ordered preferences and makes choices that satisfy their preferences better than all other choices (Blume & Easley 2008). A convenient way of modelling rational behaviour is by using a utility function to describe preferences. Any choice that the physician makes is then the consequence of trying to maximise her utility function (Sen 2008).

I use a utility function to represent the preferences of the physician. I use labour economics as guidance for which variables to include in the utility function. Bosworth (1996: 290) suggests including wage and effort when modelling salaried employees, which is what I will use as a starting point. I assume that a salaried physician derives utility from wage ( $w$ ) and disutility from effort ( $e$ ) and that a higher wage is at least weakly preferred but suffers from diminishing marginal utility and that less effort is at least weakly preferred and suffers from increasing marginal disutility.

$$U = U(w, e)$$

$$U'(w) \geq 0, \quad U''(w) \leq 0, \quad U'(e) \leq 0, \quad U''(e) \leq 0$$

This does not mean that wage and effort are necessarily the only two things a physician derives utility from. I do not believe that wage and effort are sufficient to explain the behaviour of salaried physicians. I believe, however, that they are a necessary part in doing so. In order to allow for the possibility of other explaining factors I will include an array of unidentified variables ( $\mathbf{x}$ ) in the specification. These unidentified variables may have either a positive or a negative effect on utility. Identifying the most important of the unknown variables is crucial to the model. Accordingly, a large part of this thesis is dedicated to evaluating other potential candidates, besides wage and effort, to include in the utility function. A better representation of the utility function is therefore:

$$U = U(w, e, \mathbf{x}).$$

In economics it is common to model the relationship between employer and worker as a *principal-agent problem* in which the physician would act as an agent for her employer (Bosworth 1996: 290-291). Another possibility is to model the physician as an agent for the

patient. In a principal-agent model both the principal and the agent are trying to maximise utility. The principal wants to induce the agent to take some action that is costly to the agent. Typically there is assumed to be a conflict of interests between the principal and the agent (Varian 1992:441).

Since the physician performs several tasks with several dimensions I will use a *multitask principal-agent model* (Holmstrom and Milgrom 1991). In a multitask model the agent is free to allocate effort among different dimensions while the total effort cost depends only on the total level of effort. If effort is held fixed an increase in one dimension will cause a decrease in another dimension. McGuire (2000) considers two dimensions of health care: quantity and quality. A measure of quantity is the number of patients treated. Quality can be defined as dimensions of health care, besides quantity, that increase the value to the patient, such as time spent with the patient, the number of useful tests or procedures performed, conducting careful medical interviews, educating patients and staying up to date with medical advances.

I adopt McGuire's definition of quantity ( $q$ ), but make a distinction between true quality ( $t$ ) and the perceived quality ( $p$ ). I define true quality as dimensions of health care, besides quantity, that increase the value to the patient. I define perceived quality as dimensions of health care, besides quantity, that the patient perceives and that she believes increase the value to her. The perceived quality may either be true quality, which actually increases the value to the patient, or something else, which does not increase the value to the patient. I assume that the salaried physician is free to allocate effort among three dimensions of health care: quantity, true quality and perceived quality.

### **A) The physician as an agent for the hospital**

The first principal is the hospital manager. A public hospital is not a firm, as in the standard economic theory, but a bureaucracy. It is therefore necessary to look at alternative theories of what purposes public employers may favour.

#### **Manager purposes**

Newhouse (1970) suggests that non-profit hospitals, unlike for-profit hospitals, try to maximise not only the quantity of health care but also the perceived quality of health care. To motivate this he appeals to the self-interest of the hospital manager. If her performance cannot be evaluated based on profit, her salary must be a function of some other variable, such as the prestige of the hospital. Prestige, in turn, is likely related to the size of the hospital as well as

to the perceived quality of the health care it produces. The manager would then be able to increase her income by increasing either quantity or perceived quality.

Public choice economists have a slightly different perspective. According to Niskanen (1970) public employers and bureaucrats have little opportunity for monetary gains and will focus on other things, such as power or status. These may be increased by increasing the size of the budget (Rosen 2005: 127). Consequently the hospital manager will act in order to maximise her own budget which may be done by maximising quantity, with perceived quality as a constraint.

Staying with the public choice view, it is also important to consider the interests of the politicians. A common problem in many public health care systems is large waiting lists for many medical procedures; see for example Gravelle *et al.* (2003) on the UK system. The length of the waiting list is important to any politician who wishes to be re-elected, since a large number of voters are directly affected by it. An objective of the politician would then be to shorten the waiting lists which may be done by maximising quantity, while keeping perceived quality high enough not to lose voters.

Harris (1977) says that another thing that has to be considered, at least in the short run, is the resources the hospital has at its disposal, e.g. hospital beds and x-ray machines. These resources are fixed and limited and it is likely that the manager prefers an efficient use of them. One way to free up space is to limit the time patients stay and the number of tests, i.e. a decrease in quality in order to increase quantity. At the same time it is important to keep perceived quality high enough not to attract unwanted attention from the media.

I assume that the objective of the hospital manager is to maximise the quantity of health care and that she in doing this has to keep the perceived quality above a minimum level.

### **The effect on physician behaviour**

I want to identify how the objective of the employer affects the behaviour of the physician. Let us first make the unrealistic assumption that the manager cannot observe the effort level of the physician at all. In the absence of such indicators the manager has no way of monitoring the performance of the physician; there is no link between her performance and the salary the hospital pays her and her income is fixed. The implication of this is that the physician would minimise effort by doing nothing. It is, however, unlikely that the employer has no way of observing effort. A more realistic assumption is that the manager can, at the

very least, observe the quantity in the form of number of patients treated, and ask the patients of their perceived quality.

If the physician was remunerated by fee for service the employer would make income contingent on quantity in order to give the physician an incentive to work harder (Borjas 2010: 463-465). But since the physician is salaried this is not possible. Nevertheless, the manager can observe a minimum level of effort ( $e^M$ ), such as for example showing up at work, answering a number of phone calls and meeting with a certain number of patients. If the physician does not meet the minimum level she will be dismissed. The threat of dismissal should ensure that the physician meets with at least an acceptable minimum number of patients (Bosworth 1996: 290-291) while at the same time keeping the perceived quality at a bare minimum. Since both quantity and perceived quality are increasing functions of effort the following *manager constraint* must hold.

$$e \geq e^M$$

If there is no other link between utility and effort, aside from meeting the minimum requirement, the manager constraint will be binding.

$$e = e^M$$

The manager constraint is only binding as long as the salaried physician has no financial incentives to increase effort. It is, however, quite likely that the hospital provides implicit incentives for the physician to supply more than the bare minimum effort (Bosworth 1996: 290). I will consider two forms of implicit incentives: deferred payment and non-financial incentives.

### Deferred payment

As an alternative to direct monitoring the manager can use an upward sloping age-earnings profile to motivate the physician to supply more effort. This means that the employee is paid less than the value of her marginal product during her early years. As compensation, she is instead paid more than her marginal product during her later years (Borjas 2010: 479-480). Deferred payment therefore creates a relationship between wage and effort.

$$w = w(e), \quad w'(e) \geq 0, \quad w''(e) \leq 0$$

Effort then has both a *direct negative* and a *deferred positive* effect on physician utility. Whether or not the deferred effect will cause the physician to supply more than minimum

effort depends on two things: the relative magnitude of the deferred payment and the *time-preference*<sup>1</sup> of the physician. It is normally assumed that someone with long time-preferences is more likely to defer utility by studying. As someone wanting to become a physician has to study for a long time, it is plausible that most physicians have long time-preferences. If the deferred payments are large enough they create an incentive for the physician to supply more effort than the barest minimum and the manager constraint will not be binding:

$$e \geq e^M$$

### Social status

Money is not the only way for the manager to induce effort. There are also several non-financial resources, which have no real effect on income, to allocate amongst the employees. These include material resources, such as offices or research facilities, and perhaps more important, non-material resources such as promotions, symbolic rewards or the chance to work in a more interesting area. Common to the non-financial rewards is that they are all scarce resources. They are also strongly connected to the social status of the physician (Auriol & Renault 2008). Since physicians typically have a high income it is to be expected that other aspects of their work become relatively important. I assume that a salaried physician derives utility from social status ( $s$ ) and that higher status is at least weakly preferred but suffers from diminishing marginal utility.

$$U = U(w, e, s), \quad U'(s) \geq 0, \quad U''(s) \leq 0$$

In addition, I assume that social status is related to the level of effort.

$$s = s(e), \quad s'(e) \geq 0, \quad s''(e) \leq 0$$

This creates an incentive for the physician to supply more effort than the barest minimum and the manager constraint will not be binding:

$$e \geq e^M$$

Moreover, it should be noted that social status and wages are not perfect substitutes but rather work as complements so that a new title cannot offset the absence of wages (Auriol & Renault 2008). In addition, social status and wage are often connected, in that a promotion typically leads to a significant wage increase. A promotion therefore plays a double role. First it has a

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<sup>1</sup> Someone with short time-preferences is relatively more interested in utility now compared to utility in the future. A person with long time-preferences on the other hand does not discount future utility to the same extent.

direct value as a signal of status. Secondly it leads to a wage raise which would be unattainable without the promotion.

## **B) The physician as an agent for the patient**

The second principal is the patient. It is during the meeting between physician and patient that a large part of health care services are produced and consumed.

### **Patient health**

It is logical to assume that the patient is trying to maximise her utility as well, in particular the utility she derives from her health. I will assume that the patient in her meeting with her doctor is mainly interested in her health. For simplicity I use a representative patient in the model. The health ( $h$ ) of the patient may be modelled as a function of several things, amongst them the quantity and quality of health care the patient receives. I assume that both quantity and true quality of health care have a positive effect on the health of the patient and that the patient at least weakly prefers more of both, but that both suffer from diminishing returns.

$$h = h(q, t),$$

$$h'(q) \geq 0, \quad h''(q) \leq 0, \quad h'(t) \geq 0, \quad h''(t) \leq 0$$

The net benefit of health care to the patient depends on both the benefit from and the cost of health care. The cost of care depends on the insurance system and may be a complicated function involving co-payments, deductibles and limits (McGuire 2000: 478). It should be noted that the price the patient pays in most public health care systems is low compared to the benefit of health care. In Stockholm, Sweden for example the patient pays a fixed price between 200 and 350 SEK, which approximately equals between 20 and 40 EUR, for every doctor's visit (Vårdguiden 2011). More importantly, there is a yearly limit of maximum 1100 SEK, which roughly correspond to 120 EUR, for medical services in all of Sweden (Sveriges Riksdag 2011). Consequently, the cost of health care to the patient is negligible.

I assume that the objective of the patient is to maximise the quantity and true quality of her health care. Since it is not possible for the patient to maximise true quality she will instead end up trying to maximise quantity and perceived quality.

### **The effect on physician behaviour**

Most economic literature portrays the physician as having some market power; a popular representation of this is monopolistic competition (McGuire 2000: 475-477). The basic

concept is that the patient considers physicians to be imperfect substitutes for each other. Most patients have a family doctor or some other regular source of care which they prefer. The patient typically has a demand for the services of their family doctor as opposed to a demand for physicians' services in general. This may be explained by the location of the physician, the quality of the physician, the long lasting relationship between the physician and the patient or some element of taste (McGuire 2000: 475-477). Although physicians are not perfect substitutes there can be assumed to be a minimum amount of health care, below which the patient will switch to another doctor (McGuire 2000: 479) or make a complaint to the hospital manager. If the physician cares about this, then effort must be kept above a minimum level ( $e^P$ ), which leads to the following *patient constraint*:

$$e \geq e^P$$

Arrow (1963) calls attention to the information asymmetry between physician and patient. In a competitive model all actors are assumed to have perfect information; both buyers and sellers know the price and quality of the goods in the market. This, however, is typically not the case in the health care market. The patient often lacks knowledge about both what kind of and what quantity of health care to demand. The physician on the other hand has this information and may act as an agent for the patient. In doing so, the physician is not only controlling the quantity supplied but also the quantity demanded. As McGuire puts it "the doctor's position is not, 'here is the price of my services, how many do you want?' It is more like, 'here is what you should do.' " (McGuire 2000: 465).

Note, however, that the price of health care is normally fixed so that the physician cannot change it to increase demand. But, as Evan (1974) suggests, if the physician has a financial incentive, she may use her unique position as agent for the patient to induce demand for her services in order to maximise earnings. The existence and importance of supplier induced demand has been argued over for a long time and the evidence of supplier induced demand is mixed; see, for example, Labelle *et al.* (1994) for a list of different studies regarding supplier induced demand.

Does the salaried physician induce demand? The information asymmetry between patient and physician persists in the public health care system. Thus, the ability of the physician to affect demand is unchanged. A test of supply inducement by fee for service physicians in a public health care system found mixed evidence (Grytten & Sorensen 1995). A later study on salaried physicians, however, found no evidence of supply inducement (Grytten *et al.* 2001).

But let us consider the incentives for a salaried physician to induce demand. We know that effort has a direct negative effect on utility. It is, however, possible that effort has a positive effect on utility through the wage. If the positive effects outweigh the negative, the physician has an incentive to induce demand. If the negative effects outweigh the positive, however, the physician has an incentive to reduce demand, *physician-reduced demand*.

Let us now turn to the quality of health care. Typically the quality is unknown to the patient before treatment, hard to observe during treatment and, since recovery from disease is unpredictable, it is even difficult to evaluate the quality based on the outcome (Arrow 1963). If the patient finds that the perceived quality is below a minimum level she will likely switch to another doctor or complain to the manager. As before, if the physician cares about this, then effort must be kept above a minimum level, which leads to the same patient constraint

$$e \geq e^P$$

If there is no connection between the health of the patient and the utility of the physician the patient constraint will be binding as the physician will supply the barest minimum effort in order to avoid complaints or losing the patient.

$$e = e^P$$

### Sympathy

I have assumed that the patient's utility function and the physician's utility function are independent. A more realistic assumption is that the physician feels sympathy towards her patient so that the welfare of the patient affects the welfare of the physician. The idea is not a new one; in fact Adam Smith put the same idea into writing in 1759: "Nature, when she formed man for society, endowed him with an original desire to please, and an original aversion to offend his brethren. She taught him to feel pleasure in their favourable, and pain in their unfavourable regard." (Adam Smith 1759: 99). Since then, support for the existence of sympathetic behaviour has been found in several experiments<sup>2</sup>. It is not uncommon in health

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<sup>2</sup> See for example Forsythe *et al.* (1994) who constructed a two player dictator game where one player was given ten dollars; the player was then free to keep the money or share it with the other player. On average the players gave away 2 dollars and 30 cents, which indicates sympathetic behaviour.

economics to include patient health as an input in physician utility; see for example McGuire and Pauly (1991) or Ellis and McGuire (1986). I believe that the physician to some extent has feelings of sympathy towards her patients. I therefore assume that the salaried physician derives utility from the health of her patients and that the health of her patients has a positive effect on utility but suffers from diminishing marginal utility.

$$U = U(w, e, h), \quad U'(h) \geq 0, \quad U''(h) \leq 0$$

Sympathy creates an incentive for the physician to supply more effort than the barest minimum and the patient constraint will not be binding.

$$e \geq e^P$$

It should be noted that this does not violate the assumption that the physician is acting in order to maximise a preference order; it is just a broader interpretation of the meaning of self-interest.

### C) The neoclassical model

Until now I have been considering two rather different and rivalling models to explain the behaviour of the salaried physician, with the key difference between the two models being that they feature two different principals: the hospital manager and the patient. In this section I expand on the idea of Blomqvist (1991) and combine the two models into one single model with the physician as a double agent for the manager and the patient at the same time.

#### A neoclassical double agent model

I assume that the salaried physician as an agent for the hospital manager derives utility from social status and that higher status is at least weakly preferred but suffers from diminishing marginal utility. Furthermore I assume that the salaried physician as an agent for the patient derives utility from the health of her patients and that the health of her patients has a positive effect on utility but suffers from diminishing marginal utility. Consequently, the neoclassical double agent model of the salaried physician looks as follows:

$$U = U(w, s, e, h).$$

The physician will maximise this function subject to the manager constraint:

$$e \geq e^M,$$

and the patient constraint:

$$e \geq e^P.$$

In order to find out if any of the constraints will be binding we must know the form of the utility function. If the physician derives a lot of utility from either deferred payment or status, the manager constraint will most likely not be binding. If the physician derives a lot of utility from the health of her patients the patient constraint will probably not be binding either. As all patients are not homogenous we must also know what type of patient we are dealing with. For high demand patients the patient constraint is more likely to be binding than for low demand patients.

### **A possible specification**

There are several possible forms of the utility function. One is suggested by McGuire (2010) and incorporates a measure of the degree of sympathy the physician feels for the patient ( $\alpha$ ). By varying this it is possible to fit the model to different types of physicians. The utility function could then have the following form:

$$U = w + \alpha h - e$$

Auriol and Renault (2008) have suggested a functional form that captures the complementary relationship between social status and wages. The utility function would then have this form:

$$U = ws - e$$

It is of course possible to picture a number of different functional forms and combinations of these. The utility function that McGuire suggested can for example be combined with the one by Auriol and Renault to capture both different levels of sympathy and the relationship between social status and wages. One way to write this is as follows:

$$U = ws + \alpha h - e$$

## 2. Multidisciplinary models of the salaried physician

In this chapter I develop a more realistic model of the salaried physician than the one in the previous chapter. Since neoclassical health care models often conflict with empirical results (McGuire 2000: 464), I will include insights from neighbouring disciplines in my model. I believe that valuable insight can be gained from looking at institutional economics, behavioural economics, sociology and social psychology. It should be noted, however, that including more information in the model is done at the expense of simplicity. I use the double agent model from the previous chapter, with an array of unidentified variables added to it, as the starting point for this chapter:

$$U = U(w, s, e, h, x).$$

### A) A socially rational physician

In this section I incorporate insights from institutional economics and sociology concerning the impact that work environment and colleagues have on physician behaviour.

#### Social approval

Most sociologists and institutional economists do not believe that people are functioning in a social vacuum. It is my belief that most of us care as much about social approval as about financial gain. It is then a viable assumption that the physician cares about what others think of her, in particular her colleagues. According to Fehr & Falk (2002) social approval ( $a$ ) is not only valued as an instrument to reach material benefits but also as an end in itself. Approval makes us proud and happy while disapproval makes us ashamed and unhappy. I share the belief of Bénabou & Tirole (2006) that we derive utility directly from being respected and having the approval of others. I assume that a salaried physician derives utility from approval and that more approval is at least weakly preferred but suffers from diminishing marginal utility.

$$U(w, s, e, h, a), \quad U'(a) \geq 0, \quad U''(a) \leq 0$$

We have already considered status or promotion as ways for the manager to motivate the physician. In this section I will instead focus on the colleagues and the effects they may have on the behaviour of the physician. Harvey (2005) suggests that the norm to provide an honest day's work for an honest day's pay may well affect behaviour. This may very well be the case if the physician is part of a team, especially if the team members are evaluated based on team output. Any free-rider who provides less effort than the other team members would then be

the object of disapproval by her team members. Thus, the physician might be motivated to supply extra effort in order to gain the approval of her colleagues. In this situation social approval has an *effort-enhancing* effect. In an environment where physicians are evaluated based on their personal output, however, social approval works the other way around. Should one member supply more effort than the others, it may lower the chances of promotion for them, unless they also raise their effort levels. Therefore, in order to gain social approval it is better to supply less effort. In this case social approval will have an *effort-decreasing* effect (Fehr & Falk 2002). The exact form of the social approval function is therefore unknown, but it is plausible that it depends on the physician's own effort as well as on the average effort level of her colleagues ( $\bar{e}$ ).

$$a = a(e, \bar{e}), \quad a'(e) \leq 0, \quad a''(e) \leq 0$$

It is worth noting that social approval often counteracts financial incentives. When the financial incentives are team based the physician has financial incentive to supply less effort in order to free-ride. At the same time there is an opposing social incentive to supply more effort. Should the financial incentives instead be individually based the physician has financial incentives to supply more effort, while at the same time having an opposing social incentive to supply less effort. The relative magnitude of the two effects is therefore something that may well be worth studying closer.

### **Efficiency wages and gift exchange**

I also want to include the possibility that the employer is paying the physician *efficiency wages*<sup>3</sup>. The underlying idea of efficiency wages is that the firm may benefit from paying their workers more than they need to (Bosworth 1996: 305-306). An efficiency wage is when the marginal cost of increasing the wage equals the marginal gain in productivity. At this point the elasticity is one, a one per cent increase in the wage leads to a one per cent increase in output. In accordance with this perspective, the employer only considers the situation within the firm when setting the wage, while ignoring the situation outside. As such, the theory stands in conflict with the neoclassical competitive theory. It is important to realise that the efficiency wage ( $w_e$ ) is actually higher than the competitive wage ( $w_c$ ) (Borjas 2010: 483-486).

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<sup>3</sup> For empiric evidence about the existence of efficiency wages see for example Krueger (1991) about above-average wages where monitoring is harder or Levine (1992) about a positive relationship between relative wages and productivity

$$w_e > w_c$$

There are several theories as to why paying an efficiency wage might lead to a higher profit than paying competitive wages. According to one theory paying a higher wage will give the employees more to lose. This could in turn lower the costs for monitoring as well as turnover costs (Bosworth 1996: 305-306). A rivalling theory is the gift exchange theory of Akerlof (1982). He sees the efficiency wage as a gift from the employer to the worker. It is possible that the higher wage changes the work environment and raises work morale. As a result of the higher wage the employees will work harder to repay this gift (Borjas 2010: 487). Unlike in normal trade, fairness and regard for each other play an important role as do norms of what is a fair wage and a fair effort in exchange (Bosworth 1996: 314). Under the gift exchange hypothesis the physician will be supplying, at least, a fair amount of effort ( $e^F$ ) which is higher than the minimum level of effort in the standard model. This gives rise to the *fair wage constraint*, which replaces the old manager constraint if the manager is paying efficiency wages.

$$e \geq e^F$$

## B) A self-motivated physician

In this section I include contributions from behavioural economics and social psychology about the relevance of intrinsic motivation and motivational crowding out.

### Intrinsic motivation

In social psychology it is natural to distinguish between different forms of motivation. An important distinction is made between *intrinsic motivation*, when you do something for its inherent satisfaction, and *extrinsic motivation*, when you do something for other reasons than an interest in the activity itself (Deci & Ryan 2000). So far I have only considered extrinsic motivational sources such as money, status or approval. I will now take a look at the role of intrinsic motivation and consider its possible inclusion in the model.

Intrinsic motivation is strongly connected to emotions such as interest and enjoyment. We are naturally drawn to situations that interest us and challenges which are suited to our competences and require the use of creativity or resourcefulness (Deci & Ryan 1985: 32-34). We are intrinsically motivated when we do something out of interest, because of the pleasure we derive from the task itself or because of the satisfaction we get from completing or working on a task (Deci & Ryan 1985). As Frey (1997) points out, it is hard to imagine a

scientist or artist without a significant level of intrinsic motivation. Intrinsic motivation has to play a motivational part in certain professions. It seems that there are certain factors that play an important role in creating intrinsic work motivation: how *interesting* the work is, how *enjoyable* the work is (Deci & Ryan 1985) and the amount of *personal relationships* between principals and agents (Frey 1997). Personal relationships are often present between physician and patient, and it could be argued that being a physician is interesting if not enjoyable. Hence, it is a reasonable assumption that intrinsic motivation should be included in the utility function of the salaried physician. I assume that the salaried physician derives utility from being intrinsically motivated and that the intrinsic motivation has a positive effect on utility but suffers from diminishing marginal utility.

$$U(w, s, e, h, i), \quad U'(i) \geq 0, \quad U''(i) \leq 0$$

Scott & Farrar (2003) claim that individuals, for different reasons, often receive positive but diminishing utility from working. Lindberg and Frey (1993) argue that the standard assumption, that effort must have a negative effect on utility, is too restrictive. Instead they believe that most people prefer a certain level of activation. Any effort above the activation level is perceived as negative while any effort below it is perceived as positive. A possible way to model this is by thinking of intrinsic motivation as an increasing function of effort suffering from diminishing returns. At low levels of effort intrinsic motivation dominates over the standard negative effect from effort while at high levels the standard effect dominates.

$$i = i(e), \quad i'(e) \geq 0, \quad i''(e) \leq 0$$

### **Motivational crowding out**

The relevance of intrinsic motivation at the margin is less certain. Fehr and Falk (2002) agree that many economic activities may be intrinsically rewarding, and that we should not routinely consider effort as negative at all levels of effort. But they argue that in the presence of financial rewards the marginal utility of effort is most likely negative at the optimal level. As long as the marginal utility of intrinsic motivation is not affected by other incentives in the model we only need to focus on the effort levels where marginal utility is negative.

There is, however, a large literature in social psychology which claims that extrinsic incentives may crowd out intrinsic motivation (Fehr & Falk 2002). This stands in conflict with the economic law, which states that an increase in monetary incentives should always lead to an increase in supply. If the crowding-out theory is correct, raising monetary

incentives may, contrary to standard theory, reduce supply (Frey & Jegen 2001). One of the first to acknowledge this problem was Titmuss (1970) who argued that paying for blood donations would undermine intrinsic motivation and *reduce* the willingness to donate blood. Since then, the hypothesis of motivational crowding out has been the focus of many studies. Gneezy and Rustichini (2000) have noticed that while the introduction of a financial incentive indeed had a negative effect on motivation, the incentive itself had a positive effect, which if large enough would dominate. Deci *et al.* (1999) have made a meta-study of 128 different psychological studies of motivational crowding out ranging from 1971 to 1990. Their conclusion is that while rewards can be used to control behaviour they may also undermine self-regulation so that people take less responsibility for motivating themselves.

Frey and Jegen (2001) have tried to merge empiric evidence from psychology with the standard economic theories in order to produce a more correct model. They insist that there is a systematic interaction between extrinsic and intrinsic motivation. According to economic theory external incentives raise the effort level by increasing the marginal benefit of supplying effort; the *relative price effect* is positive. Normally intrinsic motivation is assumed to be constant or absent and the total effect of the extrinsic rewards positive. If, however, intrinsic motivation is not constant and extrinsic rewards undermine intrinsic motivation there is an opposite *crowding-out effect* which is negative. In this case, intrinsic motivation and financial incentives counteract each other. The relative magnitude of the two effects is therefore something that may well be worth studying closer.

### **C) The multidisciplinary model**

In this section I combine the contributions from institutional economics and sociology with those from behavioural economics and social psychology. I build on the neoclassical double agent model but incorporate social approval, intrinsic motivation and fair wages.

#### **A multidisciplinary double agent model**

I assume that a socially rational salaried physician derives utility from social approval and that more social approval is at least weakly preferred but suffers from diminishing marginal utility. Furthermore, I assume that a self-motivated salaried derives utility from being intrinsically motivated and that intrinsic motivation has a positive effect on utility but suffers from diminishing marginal utility. The multidisciplinary model of the salaried physician incorporates both the socially rational and the self-motivated physician and looks as follows:

$$U(w, s, e, h, a, i)$$

The physician will maximise this function subject to either the manager constraint:

$$e \geq e^M,$$

or the fair wage constraint:

$$e \geq e^F,$$

in combination with the patient constraint:

$$e \geq e^P.$$

As with the neoclassical double agent model, we must know the form of the utility function and the type of patient in order to decide which constraint will bind. In addition, we must also know if the manager is paying competitive wages or fair wages in order to know if we should use the manager constraint or the fair wage constraint.

### **A possible specification**

I will start with the specification from chapter one:

$$U = ws + \alpha h - e$$

Social approval can then be included in the same way as sympathy by using a measure of how sensitive the physician is to social approval or disapproval ( $\beta$ ).

$$U = ws + \alpha h + \beta a - e$$

Intrinsic motivation can be added by using a measure of the level of intrinsic motivation ( $\gamma$ ).

$$U = ws + \alpha h + \beta a + \gamma i - e$$

A way to include a target activation level is to model intrinsic motivation and effort like this:

$$i(e) - e^2,$$

which leads to the following specification:

$$U = ws + \alpha h + \beta a + \gamma i - e^2$$

Motivational crowding out may for example be modelled by using a measure to signify the trade-off between intrinsic motivation and extrinsic motivation ( $\delta$ ):

$$U = \delta(ws + \alpha h + \beta a) + (1 - \delta)\gamma i - e^2$$

### **3. Bounded rationality models of the physician**

Throughout the previous chapters I have gradually expanded the concept of rational behaviour. In the first chapter I allowed for self-interest to include sympathy for others and in the second chapter I considered other forms of motivation, such as the approval of others and fulfilment of intrinsic goals. In this chapter I take one further step towards a more realistic model by questioning the rationality assumptions, which state that the physician is trying to maximise a preference order of complete and fully ordered preferences, represented by utility maximisation.

#### **A) A satisficing physician**

In this section I try to handle the cognitive limitations of human beings and consider satisficing theory as an alternative to optimising theory.

##### **Cognitive limitations**

Simon (1957) questions the belief that rationality must be defined as optimisation, arguing that the human brain does not have the capacity to formulate and solve the complex maximisation problems that are needed for maximisation behaviour. In the context of a typical economic textbook, it may seem easy to maximise a utility function subject to a budget constraint or to find the lowest point of a U-shaped curve. In most real-world situations, however, genuine maxima are not computable within realistic limits of effort, at least not without assuming that people have the computational abilities of a computer (Simon 2008).

A classic defence of optimisation is that we do not have to understand the calculations in order to act according to them. Friedman and Savage (1948) make an analogy to a professional billiard player who makes his shots as if he knew the mathematical formulas involved in predicting the direction of travel of the billiard balls, even though he does not know them. Thaler (1980) agrees that optimising may well describe the behaviour of an expert player, who chooses among all shots the best one. A descriptive model of an average billiard player, however, has to be quite different, probably including rules-of-thumb and heuristics, while a model of a novice player might be as simple as always aiming at the ball that seems easiest to sink, without giving much thought to anything else. It does not follow that the novice or the average players act irrationally. Instead of trying to optimise they settle for a satisfactory solution, which may well be a rational choice for them.

## Satisficing theory

Simon (1957) created *satisficing theory* as an alternative to the optimising theory, which he found psychologically unrealistic. According to satisficing theory individuals are believed to be looking for a satisfactory solution rather than an optimal one. Given the cognitive limitations of humans, it is normally easier to find a solution satisfying a number of constraints, than a solution optimising a function.

Within satisficing theory our decisions are modelled as a search process. The individual is believed to use past experience to construct an expectation of how good a solution she might possibly achieve, an *aspiration level*. This aspiration level is the result of one or several relevant variables that must be reached or surpassed for a solution to be satisfactory. Contrary to optimising theory, the different choices are not given at the start, but are found during the search process. The search is continued until a solution is found that meets the aspiration level for the included goal variables (Goodrich *et al.* 2000). The aspiration levels are not fixed but may change depending on the situation. When satisfactory alternatives are easy to find the aspiration levels may increase and when satisfactory alternatives are hard to find they may decrease (Selten 2002: 14).

Todd and Gigerenzer (2007) give examples of typical aspiration levels, such as a maximal acceptable house-buying price or a minimal acceptable job salary. One aspiration of the physician might be a minimal acceptable job salary or what is often referred to as a *target income* (Newhouse 1970, Evans 1974). In that case she will not try to maximise her income but will be satisfied by reaching her target income. A target income may for example be the average income level of her colleagues with the same status level as hers.

There is an alternative way to model cognitive limitations, without giving up the ideal of maximisation, which is known as optimisation with decision costs taken into account. An optimal point to stop looking for new information is then when the expected gain from further searching equals the opportunity cost of searching. In order to find this point, however, the person not only needs reliable estimates of benefits and costs but also has to perform computations so complicated that we would have to assume that ordinary people have the computational capabilities and statistical software of econometricians. In the end, the desire to retain optimisation leads to a model that is even less psychologically plausible than the original optimisation model (Gigerenzer & Selten: 4-5). This is why I prefer satisficing for modelling cognitive limitations.

## Modelling satisficing

Satisficing can be modelled in different ways. We can use the same utility function as before. The difference is that the physician will no longer try to maximise the function. One way to model satisficing is by comparing a utility level  $[V(v; \theta)]$ , defined over the consequences of an option ( $v$ ) in a given situation ( $\theta$ ), to an aspiration level  $[A(\theta)]$ . In this model an option is satisficing if, for all feasible  $\theta$ , it is true that:

$$V(v; \theta) \geq A(\theta).$$

This can also be represented using two utility functions, the first function  $[V_1(v; \theta)]$  representing the utility from accepting option  $v$  and the second function  $[V_2(-v; \theta)]$  representing the utility expectation from rejecting option  $v$ . The aspiration level can then be thought of as the utility needed to reject  $v$  (Goodrich 2000).

$$A(\theta) = V_2(-v; \theta)$$

The model is satisficing if, for all feasible  $\theta$ , it is true that:

$$V_1(v; \theta) \geq V_2(-v; \theta).$$

## B) A rationally bounded physician

In this section I try to handle unstable preferences and goal incommensurability and consider aspiration adaption theory as a way to model the physician.

### Unstable preferences

The satisficing model by Goodrich is a way to handle cognitive limitations, but the classic rationality assumption suffers from other weaknesses besides this. Sen (1977) questions the assumption that the choices we make should reveal our preferences. That is, that a person has revealed a preference for  $x$  over  $y$  by simply choosing  $x$  while rejecting  $y$ . He does not believe it to be possible for one preference order to represent all the interests of an individual, summarise her idea of what should be done and describe her actual choices and behaviour. According to Sen this way of thinking misses two important factors. First, it ignores the fact that a choice may reflect a compromise between a variety of different preferences and considerations, some of which may not be related to one's own utility. Secondly, it ignores all non-choice sources of information about preferences. If the assumption about revealed preferences is true it should rule out both *preference reversal* and *counter-preferential choice*.

Several studies, have, however, shown that the choices people make depend on how the information is framed or presented. In fact, Kahneman and Tversky (1981) showed that when the same problem is framed in a different way it might lead to a reversal of preferences. In their classic example, the *Asian disease problem*, the participants were asked to imagine preparing for an outbreak of the Asian disease, which may potentially kill 600 citizens. The participants are divided into two groups and each group is given two alternatives to choose between. The participants in the first group make a choice between (A) and (B):

*(A) 200 people will be saved*

*(B) There is a one-third probability that 600 will be saved, and a two-thirds probability that no people will be saved.*

While the participants in the second group are given a choice between (C) and (D):

*(C) 400 people will die*

*(D) There is a one-third probability that nobody will die, and a two-thirds probability that 600 people will die.*

The problem is designed so that (A) and (C) are equivalent in terms of lives lost or at risk, as are (B) and (D). According to the revealed preferences assumption this means that anyone choosing alternative (A) must also choose alternative (C). Despite this, in the first group 72% preferred alternative (A) while in the second group 78% preferred alternative (D). The result is an example of preferences reversal which contradicts the revealed preferences assumption.

I will now introduce the concept of *commitment* and make a distinction between sympathy and commitment. Consider, for example, the act of torture. If the knowledge of torture of others makes a person sick, it is a case of sympathy. If it does not make her feel personally worse off, but she still thinks that it is wrong and is ready to try to stop it, it is instead a case of commitment. Commitment is when a person chooses an action even though she believes that it will yield lower utility for herself than some other alternative action. This means that commitment involves counter-preferential choice (Sen 1977). Imagine, for example, that since most physicians are taught medical ethics during their education they have an alternative reason for valuing the health of their patients, not because it makes them better off, but because they believe it to be the right thing to do. Commitment to the patient may lead to counter-preferential choice, something that is not possible to model within the classic utility framework.

### Goal incommensurability

Another problem with the utility framework is *goal incommensurability*, which occurs when not all variables in the utility function are compensatory and therefore cannot be measured by a common psychological currency (Gigerenzer 2002: 46). One example of this is Darwin's list of reasons for and against marriage. He found that one reason for marriage was *having children* while one reason against marriage was *missing out on conversations with clever friends*. It is not possible to compare these two using one common currency as it is hard to say how many conversations with friends would equal having one child. Some things simply have no price tag (Gigerenzer 2002: 46). Most people would probably agree that you cannot put a price on life itself, which would mean that it is impossible to have a utility function that includes both patient health and money, using one currency.

### Aspiration adaptation theory

Selten (1998)<sup>4</sup> has developed *aspiration adaptation theory* as a starting point for alternative models of rationality. He assumes that individuals have limited cognitive abilities and that rationality therefore is bounded. An important difference from standard theory is that this theory does not use a utility function to represent the behaviour of the individual. In place of a utility function the individual has a *goal vector* of different goal variables ( $G$ ).

$$G = (G_1, \dots, G_m).$$

By removing the utility function the goal incomparability problem disappears. The goal variables are all constructed in a way so that more is better for each goal (by using negative costs). In this theory the aspiration level is represented by a vector containing values for all the goal variables ( $A$ ). Each element in the vector is a *partial aspiration level*, which is allowed to vary in discrete steps (Selten 1998).

$$A = (a_1, \dots, a_m)$$

Aspiration adaptation is done through a sequence of adjustment steps from the current aspiration level to a neighbouring point by the change of one goal variable at a time. Upward adjustments are made by increasing the most urgent goal variable. The most urgent variable is governed by an *urgency order* ranking all the goal variables. Downward adjustments, on the other hand, are done by decreasing a *retreat variable*. An important distinction is that the retreat variable does not have to be the least urgent variable, which allows for asymmetry

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<sup>4</sup> The theory was put forth in German by Sauermann & Selten (1962) but this is the first English version.

between upward adjustment and downward adjustment. By constructing a new urgency order and a new retreat variable for every point on the aspiration grid it is possible to form an *aspiration scheme* which takes the place of the preference order in standard theory. Instead there are only *local preferences* which allows for preference reversals (Selten 2002: 18-19).

Consider a case where the physician has to make a choice between a finite number of alternatives, each alternative represented by a set of specific values for all goal variables in the goal vector. The physician starts with an initial aspiration level, generally created from past experience. Depending on the situation this aspiration level will or will not be attainable given the choice alternatives. The physician may adjust her aspiration level through downward or upward adjustment steps until a final aspiration level is reached which is attainable given the available choices.

- *Downward rule:* If, given the choice alternatives, the current aspiration level is set too high, so that it is not attainable, a downward adjustment step is taken by lowering the partial aspiration level of the retreat variable, leading to a new lower aspiration scheme.
- *Upward rule:* If, on the contrary, the current aspiration level is set too low, given the choices, so that a higher aspiration level is still attainable, an upward adjustment step is taken by increasing the partial aspiration level of the most urgent goal variable, resulting in a new higher aspiration scheme.
- *End rule:* If the current aspiration is attainable and no upward adjustment is possible then the final aspiration level has been reached and a choice is made (Selten 2002: 19-20).

So far we have seen how the aspiration level may be adjusted in response to a number of given choices. This, however, is not enough, as we also want the model to allow for new choices to be found. Selten solves this by including a search process where the physician, in our case, starts with a *default alternative* but may also search for more alternatives. The search, however, is limited by a resource stock that is diminished through searching, such as time or other resources depending on the nature of the search. As before the physician starts with an initial aspiration level, which may again be adjusted upwards or downwards in response to the choice alternatives found through searching. In addition, aspiration levels which are not attainable at the given point in time are *potentially* attainable if they may

become attainable through further search and *unattainable* otherwise. Furthermore, *permissible* aspiration levels are defined, following a principle of cautious optimism, so that

- (1) All attainable aspiration levels are also permissible.
- (2) A potentially attainable aspiration level is permissible if it can be reached by a *single* upward adjustment step (Selten 2002: 20-21).

The word *attainable* in the upward rule, downward rule and end rule has to be replaced by *permissible*. In addition, a fourth rule is added to decide whether search is continued or not.

- *Continuation rule*: As long as the current aspiration level is potentially attainable, then search is continued (Selten 2002: 21).

### **C) The bounded rationality model**

It is interesting to consider what conclusions would be reached by using an aspiration adaptation model of the salaried physician. The goal vector of the physician would then look like this:

$$G = (w, s, -e, h, s, i).$$

In order to go forward with the model, however, we would have to consider the form of the urgency orders and the retreat variables of the physician. Unfortunately this is beyond the scope of this thesis.

## Conclusions

Through the course of my thesis I have developed three models of the salaried physician:

1. A neoclassical model
2. A multidisciplinary model
3. A bounded rationality model

Some basic features are the same for all models. First, the physician is modelled as a double agent for both the patient and the hospital manager. Secondly, the physician is believed to be, at least, interested in her wage, her status and her own effort level. Thirdly, a level of sympathy towards the patient is allowed in all models.

### The choice between optimisation and satisficing

The largest difference between the three models is between the neoclassical model and the multidisciplinary model on one hand and the bounded rationality model on the other hand. The neoclassical model and the multidisciplinary model both model the salaried physician with the help of a utility function that the physician tries to maximise, while the bounded rationality model models the salaried physician with a goal vector which the physician tries to satisfy.

The strength of using the neoclassical model or the multidisciplinary model to explain the behaviour of the physician is the mathematical properties of the models. With these models it is possible to compute practical economic solutions that may explain the behaviour of the physician. The weakness of using these models is that the models are not fully realistic and may lead to the wrong conclusions about the behaviour of the physician. Most economists, however, believe that the utility models, despite their weaknesses, are still doing a good job of approximately describing behaviour.

The strength of using the bounded rationality model to explain the behaviour of the physician is the realism of the model. The risk of drawing the wrong conclusion about the behaviour of the physician is much smaller. The weakness is the mathematical properties of the model. There is no easy way to compute a practical economic solution that explains the behaviour of the physician. The cost of realism may be too high and a simpler model may be needed. At the same time I believe that there is a strong need to question the standard economic assumptions and try to construct more realistic models based on the insights presented in the third chapter.

At this point, it is my opinion that the neoclassical model and the multidisciplinary models are more easily applied than the bounded rationality model.

### **The choice between the neoclassical model and the multidisciplinary model**

The first difference between the neoclassical model and the multidisciplinary model is the factors which are included in the utility function. The neoclassical model includes wage, status, sympathy and effort. The multidisciplinary model includes all of these and in addition social approval and intrinsic motivation. If the physician is part of a team or if there are strong work ethics involved I suggest the use of the multidisciplinary model. If there is reason to believe that there are personal relationships between the physician and her patients I recommend using the multidisciplinary model. If there is reason to believe that none of the above are present the neoclassical model may be better.

The second difference is the constraints that are used. The neoclassical model uses a manager constraint and a patient constraint. The multidisciplinary model uses a manager constraint, a fair wage constraint and a patient constraint. If there is reason to believe that the hospital manager is paying efficiency wages I advocate the use of the multidisciplinary model. If there is no reason to believe this the neoclassical model might be better.

As can be seen, in most cases I believe that there are reasons to use the multidisciplinary model or by the very least some aspect of it.

### **A note on true quality and perceived quality**

Since I use multitask models where the physician is free to allocate effort among three dimensions, quantity, true quality and perceived quality, only looking at the level of effort does not capture the full behaviour of the physician. Wages and status increase perceived quality but not true quality. Sympathy and intrinsic motivation increase true quality but not perceived quality. Social approval might affect both true quality and perceived quality depending on the situation.

This is especially important when there is a crowding-out effect. First, extrinsic motivation will counteract intrinsic motivation so that the end result will be either effort increasing or effort decreasing depending on the magnitude of the two effects. Secondly, extrinsic motivation will lead to an increase in perceived quality at the cost of a decrease in true quality. The physician can increase her wages or her status by focusing on the aspects of

quality which are observable. As the observable aspects are not necessarily the most important to the patient extrinsic motivation may lead to worse health care.

This is also important if the approval of her colleagues is related to the true quality of health care. Wages and status often counteract social approval so that the end result will be either effort increasing or effort decreasing depending on the magnitude of the two effects. Wage and status will lead to an increase in perceived quality at the cost of a decrease in true quality, while social approval will lead to an increase in true quality at the cost of observed quality. The physician can increase her wages or her status by focusing on perceived quality, which may lead to worse health care, or increase her social approval by focusing on true quality, which may lead to better health care.

### **The greater challenge**

I see two important challenges for future research on the behaviour of salaried physicians in public health care systems.

The first challenge is to further develop the bounded rationality model of the salaried physician further. In this, the mathematical ways to model satisficing behaviour as well as aspiration adaption theory is especially important.

The second challenge is to empirically test the models. It should be emphasised that the models I have developed in my thesis are the products of theorizing. The greater challenge is to validate the models. Future research should focus on ways to empirically test the models and their assumptions. Inspiration on how to test the assumptions of satisficing and target income can be found in field studies by Farber (2005), Fehr and Goette (2007) and Camerer *et al.* (1997) who have studied the labour supply of taxi drivers and bike messengers. An idea of how to test the assumptions of intrinsic motivation and motivational crowding out might be found in the survey data study by Pouliakas (2010). These are, however, merely suggestions for future researchers and the focus of future research should be inventive ways to test the different assumptions that may affect the behaviour of salaried physicians in public health care systems.

## Summary

There is a need for a working model of the salaried physician in the public health care system. To meet this need I have developed three models: a neoclassical model, a multidisciplinary model and a bounded rationality model.

In the neoclassical model the physician is modelled as a double agent for the hospital manager and the patient at the same time. The physician is assumed to derive positive utility from three things: her wage, both as direct payment and deferred payments, her social status and her patients' health. She is also assumed to derive disutility from effort.

In the multidisciplinary model the physician is still modelled as a double agent for the hospital manager and the patient. But, in this model the physician is assumed to derive positive utility from the social approval as well as from her wage, her social status and her patients' health. In addition, she is assumed to derive both positive utility and disutility from effort, depending on the effort level.

In the bounded rationality model the physician is also modelled as a double agent. The physician is, however, no longer assumed to have a utility function. Instead she is assumed to have a goal vector which contains the same variables as the utility function in the multidisciplinary model: her wage, her social status, her patients' health, the social approval of others and her effort level. In addition, she is assumed to have satisficing behaviour instead of maximising behaviour.

All the models have their own strengths and weaknesses, but I arrive at the conclusion that the multidisciplinary model is overall the most useful.

## References

- Akerlof, G.(1982). Labor Contracts as Partial Gift Exchange. *The quarterly Journal of Economics*, 97(4): 543-569.
- Arrows, K. (1963) Uncertainty and the welfare economics of medical care. *The American economic review*, 53(5): 941-973.
- Auriol, E. & Renault, R (2008). Status and incentives. *The Rand Journal of economics*, 39(1):305-326.
- Bénabou, R. & Tirole, J.(2006). Incentives and Prosocial Behaviour. *The American Economic Review*, 96(5): 1652-1678.
- Blomqvist, A. (1991). The Doctor as a double agent: information asymmetry, health insurance, and medical care. *Journal of Health Economics* 10(4): 411-432.
- Blume, L& Easley, D.(2008).Rationality, in Durlauf, S. & Blume, L. (eds.): *The new Palgrave dictionary of economics online*, Palgrave Macmillan, [http://www.dictionaryofeconomics.com/article?id=pde2008\\_R000277](http://www.dictionaryofeconomics.com/article?id=pde2008_R000277), 13 June 2011.
- Borjas, G. (2010). *Labor Economics*, New York: McGraw-Hill.
- Bosworth, D. (1996). *The Economics of the Labour Market*, Harlow: Longman.
- Camerer, C., Babcock, L., Loewenstein, G. & Thaler, R. (1997) Labor supply of New York cab drivers: One day at a time. *The Quarterly Journal of Economics*, 112(2): 407-441.
- Deci, E. & Ryan, R. (1985). *Intrinsic Motivation and Self-determination in human behaviour*. New York: Plenum.
- Deci, E. & Ryan, R.(2000). Intrinsic and Extrinsic Motivations: Classic Dentition and New Directions. *Contemporary Educational Psychology*, 25(1): 54-67.
- Deci, E., Ryan, R. & Koestner, R. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin*, 125(6): 627-668.
- Ellis, R. & McGuire, T. (1986). Provider behaviour under prospective reimbursement. *Journal of Health Economics*, 5:129-151.

- Evans, R. (1974). Supply-induced demand: some empirical evidence and implications in Perlman, M (ed.): *The Economics of Health and Medical Care*, New York: Wiley.
- Farber, H. (2005). Is tomorrow another day? The labour supply of New York taxi drivers. *Journal of political Economy*, 113(1): 46-82.
- Fehr, E. & Goette, L (2007). Do workers work more if wages are high? Evidence from a randomized field experiment. *The American Economic Review*, 97(1): 298-317.
- Fehr, E. & Falk, A. (2002). Psychological foundations of incentives. *European Economic Review*, 46:687-724.
- Frey, B. (1997). On the relationship between intrinsic and extrinsic work motivation. *International Journal of Industrial Organization*, 1: 427-439.
- Frey, B. & Jegen, R. (2001). Motivational Crowding Theory. *Journal of Economic Surveys*, 15(5): 589-611.
- Friedman, M. & Savage, L (1948). The Utility Analysis of Choices Involving Risk. *Journal of Political Economy*, 56(4): 279-304.
- Forsythe, R., Horowitz, J., Savin, N. & Sefton, M. (1994). Fairness in simple bargaining experiments. *Games and Economic Behaviour*, 6: 347-369.
- Fujisawa, R: & Lafortune, G. (2008) *The Remuneration of General Practitioners and Specialists in 14 OECD Countries: What are the Factors Influencing Variations across Countries?*, OECD Health Working Paper, No.41, OECD Publishing, doi: 10.1787/228632341330, 26 January 2012.
- Gigerenzer, G. (2002). The adaptive toolbox in Gigerenzer, G. & Selten, R. (eds.): *Bounded rationality: The adaptive toolbox*, Cambridge: The MIT press.
- Gigerenzer, G. & Selten, R. (2002). Rethinking rationality in Gigerenzer, G. & Selten, R. (eds.): *Bounded rationality: The adaptive toolbox*, Cambridge: The MIT press.
- Ginsburg, P. & Grossman, J. (2005). When The Price Isn't Right: How Inadvertent Payment Incentives Drive Medical Care. *Health Affairs*.  
<http://content.healthaffairs.org/content/early/2005/08/09/hlthaff.w5.376.citation>, 25 August 2011.

- Gneezy, U. & Rustichini, A. (2000). Pay or Don't Pay at All. *The Quarterly Journal of Economics*, 115(3): 791-810.
- Goodrich, M., Stirling, W. & Boer, E. (2000). Satisficing revisited. *Minds and machines*, 10(1): 79-110.
- Gravelle, H. & Giuffrida, A. (2001). Inducing or restraining demand: the market for night visits in primary care. *Journal of Health Economics*, 20(5): 755-779.
- Grytten, J., Carlsen, F. & Sorensen, R. (1995). Supplier inducement in a public health care system. *Journal of Health Economics* 14: 207-229.
- Grytten, J. & Sorensen, R. (2001). Type of contract and supplier-induced demand for primary physicians in Norway. *Journal of Health Economics*, 20: 379-393.
- Harris, J. (1977). The internal organization of hospitals: some economic implications. *The Bell Journal of Economics*, 8(2): 467-482.
- Harvey, J. (2005). Why did you do that? An economic examination of the effect of extrinsic compensation on intrinsic motivation and performance. *Journal of Economic Psychology*, 26: 549-566.
- Holmstrom, B. & Milgrom, P. (1991) Multitask Principal-agent analyses: Incentive contracts, asset ownership, and job design. *Journal of Law, Economics & Organization*, 7(special issue): 24-52.
- Krueger, A. (1991). Agency and Wages: An Examination of Franchising in the Fast Food Industry. *The Quarterly Journal of Economics* 106(1): 75-101.
- Labelle, R., Stoddart, G. & Rice, T. (1994). A re-examination of the meaning and importance of supplier-induced demand. *Journal of Health Economics* 13: 347-368.
- Levine, D. (1992). Can Wage Increases Pay For Themselves? Tests with a Productive Function. *The Economic Journal* 102(414): 1102-1115.
- Lindenberg, S. & Frey, S., 1993. Alternatives, Frames, and relative prices: A Broader View of Rational Choice Theory. *Acta Sociologica*, 36(3): 191-205.
- McGuire, T. (2000). Physician agency, in Culyer, A. & Newhouse, J. (eds.): *Handbook of Health Economics*, 1A., Amsterdam: North-Holland.

McGuire, T. (2010). Physician agency and payment for primary medical care in Glied, S. & Smith, P. (eds.): *The oxford handbook of health economics*, Oxford: Oxford University press.

McGuire, T. & Pauly, M. (1991). Physician response to fee changes with multiple payers. *Journal of Health Economics* 10(4): 385-410.

Morris, S., Devlin, N. & Parkin, D. (2007). *Economic Analysis in Health Care*, Glasgow: John Wiley & Sons.

Newhouse, J. (1970). Toward a theory of non-profit institutions: An economic model of a hospital. *The American economic review*, 60(1):64-74.

OECD (2010). *Health at a Glance: Europe 2010*, OECD Publishing, [http://dx.doi.org/10.1787/health\\_glance-2010-en](http://dx.doi.org/10.1787/health_glance-2010-en), 13 June 2011.

Pouliakas (2010). Pay enough, Don't pay too much or don't pay at all? The Impact of Bonus Intensity on Job Satisfaction. *KYKLOS*, 63(4): 597-626.

Rosen, H. (2005). *Public Finance*. New York: McGraw-Hill.

Sauermann, H. & Selten, R (1962). Anspruchsanpassungstheorie der Unternehmung. *Zeitschrift für die gesamte Staatswissenschaft*, 118: 577-597.

Scott, A. & Farrar, S. (2003). Incentives in Health Care, in Scott, A., Maynard, A. & Elliot, R. (eds.): *Advances in Health Economics*. Wiley.

Sen, A., 1977. Rational Fools: A Critique of the Behavioural Foundations of Economic theory. *Philosophy & Public Affairs*, 6(4): 317-344.

Selten, R. (1998) Aspiration adaptation theory, *Journal of mathematical psychology*, 42: 191-214.

Selten, R. (2002). What is bounded rationality?, in Gigerenzer, G. & Selten, R. (eds.): *Bounded rationality: The adaptive toolbox*, Cambridge: The MIT press.

Sen, A. (2008). Rational behaviour, in Durlauf, S. & Blume, L. (eds.): *The new Palgrave dictionary of economics online*, Palgrave Macmillan, [http://www.dictionaryofeconomics.com/article?id=pde2008\\_R000022](http://www.dictionaryofeconomics.com/article?id=pde2008_R000022), 13 June 2011.

Smith, A. (1759). *The Theory of Moral Sentiments*. New York: Prometheus Books.

Simon, H. (1957). *Models of man*. New York: Wiley.

Simon, H. (2008). Satisficing in Durlauf, S. & Blume, L. (eds.): *The new Palgrave dictionary of economics online*, Palgrave Macmillan,  
[http://www.dictionaryofeconomics.com/article?id=pde2008\\_S000013](http://www.dictionaryofeconomics.com/article?id=pde2008_S000013), 13 June 2011.

Sveriges Riksdag (2011) *Högekostnadsskyddet för mediciner och läkarbesök höjs*,  
<http://www.riksdagen.se/webbnav/index.aspx?nid=11015&id=5164>, 20 January 2012.

Thaler, R., 1980. Towards a Positive Theory of Consumer Choice. *Journal of Economic Behaviour and Organization*, 1: 39-60.

Titmuss, R. (1970). *The Gift Relationship: From Human Blood to Social Policy*.

Todd, P. & Gigerenzer, G. (2007). Environments that make us smart: Ecological rationality. *Current directions in psychological science*, 16(3):167-171.

Tversky, A. & Kahneman, D. (1981). The Framing of Decisions and the Psychology of Choice. *Science*, 211(4481):453-458.

Varian, H. (1992). *Microeconomic Analysis*. New York: W. W. Northon & Company.

Vårdguiden (2011). *Patientavgifter* <http://www.varldguiden.se/Sa-funkar-det/Stod/Patientavgifter/>, 20 January 2012.