Specialist Payment Schemes and Patient Selection in Private and Public Hospitals

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Abstract

It has been observed that specialist physicians who work in private hospitals are usually paid by fee-for-service while specialist physicians who work in public hospitals are usually paid by salary. This paper provides an explanation for this observation. Essentially, fee-for-service aligns the interests of income preferring specialists with profit maximizing private hospitals and results in private hospitals treating a high proportion of short stay patients. On the other hand, salary aligns the interests of fairness preferring specialists with benevolent public hospitals that commit to admit all patients irrespective of their expected length of stay.

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1 Introduction

In a recent study, Simoens and Giuffrida (2004), remarked that “OECD countries generally pay specialist physicians by either salary or fee-for-service, with salary payment being more common in the public sector.” Specifically, in France and Mexico specialist physicians employed in public hospitals are paid by salary while those employed in private hospitals are paid by fee-for-service. In Austria and New Zealand a majority of specialist physicians employed in public hospitals are paid by salary while a majority of those employed in private hospitals are paid fee-for-service. In Australia and England, where patients can be treated privately in public hospitals, specialist physicians are paid by salary for treating public patients in public hospitals while they are paid by fee-for-service for treating private patients in public and private hospitals. A similar but less exact pattern is found in Germany, Greece, and Ireland.

The recent efficiency-selection literature, Ellis and McGuire (1986), Newhouse (1996), Ma and McGuire (1997), and Chalkley and Malcomson (1998), has examined the choice of payment scheme by a purchaser of health services and in the context of specialist physicians found that a prospective payment (a payment that is independent of the services the physician provides) induces physicians to under-supply services or select low cost patients. On the other hand, fee-for-service induces specialist physicians to over-supply services. This literature focuses on the payment scheme as a device to induce specialist physicians to choose the appropriate quantity and quality of treatment in an environment of moral hazard. It applies equally to profit maximising private hospitals and benevolent public hospitals. Therefore, this literature is unable to explain the above remark by Simoens and Giuffrida that salary payment, which like a prospective payment is independent
of the services provided, is more common in the public than the private sector.

This paper develops a model that predicts a private hospital offers specialist physicians payment by fee-for-service or salary while a public hospital offers payment by salary. The difference in payment schemes is not explained by moral hazard, but rather by heterogeneity in hospital objectives, patient types, and specialist preferences. Specifically, in this model, there are two types of patients who have different expected lengths of stay. There are two types of hospitals, a profit maximising private hospital and a benevolent public hospital. The utility functions of specialist physicians differ according to the weight attached to income and fairness, where fairness involves treating all patients referred to them regardless of type. A critical assumption is that private hospital profit is a concave function of length of stay, that is, more profit is earned from the patient’s first day in hospital than the second and so on.

Given the concavity of profit with respect to length of stay, the private hospital has an incentive to treat as many short stay patients as possible. However, the private hospital can not observe patient type and it is assumed that it can not write contracts with specialists specifying that they only admit short stay patients. By offering specialists fee-for-service, the private hospital attracts specialists who place relatively more weight on income and choose to treat a high proportion of short stay patients, Proposition 1. Whether it is profitable to offer fee-for-service rather than salary depends on the parameters of the model, Proposition 2. In the case where the distribution of specialist preferences is skewed towards income, the equilibrium salary is relatively high and the private hospital only employs specialists under fee-for-service, Proposition 2(iii). Essentially, fee-for-service aligns
the interests of income liking specialists with those of the private hospital. However, with other distributions, it is possible that in equilibrium the private hospital employs specialists under fee-for-service and salary, Proposition 2(iv), or just under salary, Proposition 2(ii).

The benevolent public hospital is assumed to be indifferent between the types of patients it admits. It does not prefer one type of patient to the other. By offering a payment of salary, the public hospital attracts specialists who place relatively more weight on fairness and choose to treat all patients referred to them regardless of type, Proposition 1. Payment by salary aligns the interests of fairness liking specialists with those of the public hospital.

These results complement the existing literature on specialist physician payment schemes by showing that in addition to providing incentives for appropriate treatment under moral hazard they also provide a mechanism whereby the hospitals and the specialists interests, with regard to patient mix, can be aligned.

2 Participants

2.1 Patients

There are two types of patients, 1 and 2. Both have medical condition $k$ for which they seek treatment. Type 1 patients only have condition $k$ while type 2 patients have additional medical conditions. The proportion of type 1 patients is $\theta_1$ and the proportion of type 2 patients is $\theta_2 = 1 - \theta_1$. Every period, $K$ new patients have condition $k$.

It is assumed that there are two possible lengths of stay in hospital, $l_1$ and $l_2$, where $l_2 > l_1$. Let $\rho_i$ be the probability that a type $i = 1, 2$ patient has a length of stay of $l_2$. It is assumed that $\rho_2 > \rho_1$. The rationale for this is that a type 2 patient has extra medical conditions that lead to a higher
probability of a longer period of recovery following initial treatment. Given these assumptions, a type 2 patient has a longer expected length of stay than a type 1 patient, that is,

\[ E_2(l) > E_1(l), \] (1)

where \( E \) is the expectation operator. For simplicity, \( l_1 \) is normalised to 1 and \( l_2 = \lambda \), where \( \lambda > 1 \).

It is assumed that all patients are indifferent between which specialist treats them and in what type of hospital they are treated. In addition, all patients are assumed to suffer disutility from being referred to a specialist, who on observing their type, refuses to treat them.\(^1\)

### 2.2 General Practitioner

It is assumed that the general practitioner acts in the patient’s interest, that is, acts to maximize the patient utility. Therefore, the general practitioner acts to minimize the extent of treatment delays and inconvenience through there choice of referral specialist.

### 2.3 Private Hospital

It is assumed that private hospital profit, \( \pi \), from providing hospital services to patients is a function of the length of stay, \( \pi(l) \), with \( \pi'(l) > 0 \) and \( \pi''(l) < 0 \). That is, private hospital profit increases with the length of stay but at a decreasing rate. Assuming that the private hospital is reimbursed under fee-for-service, concavity of private hospital profit in the length of stay follows from the observation that more hospital services are used on the first day in hospital, operating theatres, staff, etc. than on the following days in

\(^1\)This disutility arises because of the delay in treatment that such a referral causes, or because of the inconvenience of attending an additional specialist appointment.
hospital with the least amount of services used on the last day in hospital.  
It is assumed that the capacity of the private hospital is fixed at $N^{pri}$ beds and that the private hospital maximizes profit.

2.4 Public Hospital

The public hospital is assumed to be indifferent between the type of patients it admits. This is consistent with notions of equity of access and fairness. The capacity of the public hospital is fixed at $N^{pub}$ beds. It is assumed that

$$N^{pri} + N^{pub} = K + (\lambda - 1)K(\rho_1\theta_1 + \rho_2\theta_2)$$  (2)

The first term on the right hand side of (2) is the number of new patients with condition $k$ every period and the second term is the expected number of type 1 and 2 patients that are still being treated from previous periods. Condition (2) states that the total number of beds in hospitals of any type is equal to the total expected number of patients requiring beds.

2.5 Specialists

It is assumed that the amount of services provided by specialists to treat patients with condition $k$ is fixed and independent of patient type. It is further assumed that specialists observe patient type and choose the number

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Footnotes:

2Carey (2000) demonstrates that length of stay reductions yield greater cost saving in hospitals that have smaller length of stays than those that have larger length of stays. This is evidence that more hospital services are used in the first day of stay than the last. A similar result can be found in Polverejan et al (2003) and in Evans (1984, p193). Alternative private hospital reimbursement schemes are discussed in the conclusion.

3In the terminology of Chalkley and Malcomson (1998 p15), the public hospital is a benevolent hospital and “it is supposed to be treating all those who want treatment.”

4Although the total number of hospital beds is exogenous in this paper, (2) can be viewed as a long run equilibrium condition.

5The specialist performs a procedure, eg. a knee replacement, and once this is done the specialist provides no additional services regardless of patient type or length of stay. This is equivalent to the assumption made in Ellis and McGuire (1986) that the “physician’s input for a given episode is fixed.” The assumption is made because this paper is not about moral hazard, but about specialist payment schemes being used to influence a hospital’s patient mix.

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of each type of patient to treat in order to maximize utility. Specialist utility is not only a function of their income, but also a function of the extent to which they treat all patients equally regardless of type. The latter reflects a specialist’s preferences for fairness, to some extent all patients are worthy of treatment. To capture these two influences it is assumed that specialists’ utility functions are a weighted average of income and a measure of fairness. The weight attached to income is $\alpha$ and to fairness is $(1 - \alpha)$. The total number of specialists is given by $M$ and the weight, $\alpha$, is distributed over $[0, 1]$ with density $g(\alpha)$ and distribution function $G(\alpha)$.

Specialist income, $Y$, is a function of the number of patients of each type the specialist treats, $(n_1, n_2)$. Define $n^*_i$ as the number of type $i$ patients a specialist treats if the specialist does not discriminate between patients. That is, the specialist acts fairly. Fairness, $Z$, is measured by the extent that the specialist’s choices of $n_1$ and $n_2$ deviate from $n^*_1$ and $n^*_2$. Specifically, the utility of specialist $j$ is given by

$$U^j(n^j_1, n^j_2) = \alpha^j Y(n^j_1, n^j_2) - (1 - \alpha^j)Z(n^j_1 - n^*_1, n^j_2 - n^*_2),$$

(3)

where $Y$ is increasing in $n^j_1$ and $n^j_2$, and $Z$ reaches a maximum at $n^*_1 = n^j_1$, and $n^*_2 = n^j_2$. The functions $Y(\cdot)$ and $Z(\cdot)$ are the same for all specialists.

3 The Game

The interaction between the private hospital, the public hospital, specialists, and general practitioners is modelled as a multi-stage game. In the first stage, the private and public hospitals choose payment schemes for specialists. These schemes are restricted to be either (i) a fixed salary, or (ii) fee-for-service. Under salary, the specialist is paid a fixed sum regardless

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*The assumption that specialists care about their patients’ welfare is common in the literature and can be found in Chalkley and Malcomson (1998), Ellis and McGuire (1986) and Ma and McGuire (1997).*
of the amount of services provided and the number of patients treated. In this way, it is similar to a prospective payment, except here the amount of specialist services provided per-patient is fixed while in the supply-side cost sharing literature the amount of services provided per-patient is chosen by the specialist, Ellis and McGuire (1986) and Newhouse (1996).

Under fee-for-service, the specialist is paid a fixed fee for each service provided. As the amount of services provided per-patient is fixed, the specialist’s income is greater the more patients the specialist treats.\(^7\)

In the second stage, specialists choose in which type of hospital to work. In stage three, specialists choose which types of patients to treat and in stage four, general practitioners choose which specialist to refer a particular type of patient to.

### 3.1 Stage Four - General Practitioner Referral

The general practitioner observes patient type, knows in what type of hospital each specialist works, and knows what types of patients they accept. They are assumed to act in the patient’s interest and so choose referral specialist to minimize delays in treatment and inconvenience. Therefore, if a specialist only accepts type 1 patients, then general practitioners never refer type 2 patients to them. It turns out that different specialists accept different proportions of type 1 and 2 patients and so an individual general practitioner might refer a patient to a specialist who already is treating their preferred number of that type of patient. To avoid complication and given this stage of the game is not the central focus of the paper, it is assumed that the referral process is optimal in the sense that patients are referred to

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\(^7\)Given the amount of specialist services provided per-patient is fixed, under fee-for-service the specialist is essentially paid a fixed fee per patient treated. This may have the appearance of a prospective payment, but it is really fee-for-service with specialist services fixed for each patient.
specialists who will accept them as patients.

3.2 Stage Three - Specialist Choice of Patients to Treat

Given payment schemes and the type of hospital at which the specialist works, the specialist chooses which types of patients to treat.

**Private Hospital:** Assume that the private hospital allocates all specialists \( A \leq N_{\text{pri}} \) beds for \( T \) periods. The specialist’s choice of the numbers of each type of patient to treat must satisfy the following constraint

\[
    n_1E_1(l) + n_2E_2(l) = AT. \tag{4}
\]

Substituting this constraint into the specialist’s utility function gives utility as a function solely of \( n_1 \). That is,

\[
    u(n_1) = \alpha y(n_1) + (1 - \alpha)z(n_1 - n_1^*), \tag{5}
\]

where \( y(n_1) \) is income and \( z(n_1 - n_1^*) \) is fairness solely as a function of \( n_1 \). By definition, \( z \) reaches a maximum at \( n_1 = n_1^* \) and the derivative of \( u(n_1) \) is given by

\[
    \frac{du}{dn_1} = \alpha \frac{dy}{dn_1} + (1 - \alpha) \frac{dz}{dn_1}. \tag{6}
\]

(i) **Fixed Salary, \( S \):** Specialist income is independent of the type of patient treated so \( y(n_1) = S \). If a specialist cares about fairness at all, then \( \alpha < 1 \) and the specialist chooses \( n_1 = n_1^* \). That is, the specialist does not discriminate between patients based on type. In fact, even if \( \alpha = 1 \), given \( S \) is fixed, the specialist does not discriminate between patients based on type. Specialist maximized utility is

\[
    v = \alpha S + (1 - \alpha)z(0).
\]

(ii) **Fee-for-Service:** Assume that all patients, regardless of type, pay the same fee to the specialist for treatment. In this case, \( Y = n_1 + n_2 \), where the fee is normalized to one. Substituting constraint (4) into income gives

\[
    y = \frac{AT}{E_2(l)} + n_1(1 - \frac{E_1(l)}{E_2(l)}).
\]

8
(a) If $\alpha = 1$, the specialist only values income and chooses $n_1$ to maximize $y$. As $E_2(l) > E_1(l)$, $(1 - \frac{E_1(l)}{E_2(l)}) > 0$ and $\frac{dy}{dn_1}$ is monotonically increasing in $n_1$. Therefore, income is maximized with $n_1 = AT$ and $n_2 = 0$. Maximized utility is $v = AT$.

(b) If $\alpha = 0$, the specialist only values fairness and chooses $n_1 = n_1^*$. Maximized utility is $v = z(0)$.

(c) If $0 < \alpha < 1$, then the specialist chooses $n_1 > n_1^*$ because the derivative in (6) is greater than zero at $n_1 = n_1^*$. As $\alpha$ varies between 0 and 1, $n_1$ varies between $n_1^*$ and $AT$. That is $n_1(\alpha)$ and $\frac{dn_1}{d\alpha} > 0$. Maximized utility is

$$v(\alpha) = \alpha y(n_1(\alpha)) + (1 - \alpha)z(n_1(\alpha) - n_1^*).$$

(7)

Public Hospital: The problem faced by a specialist working in the public hospital is identical in structure to that faced by a specialist working in the private hospital.

3.3 Stage Two - Specialist Choice of Payment Scheme

Given the payment schemes offered by each type of hospital, the specialist works at that hospital which yields the greatest utility. Essentially the choice is not between hospitals, but between payment schemes. Specialist $j$ will choose to work under fee-for-service if

$$\alpha^j y(n_1(\alpha^j)) + (1 - \alpha^j)z(n_1(\alpha^j) - n_1^*) \geq \alpha^j S + (1 - \alpha^j)z(0).$$

(8)

The LHS of (8) is maximized utility under fee-for-service while the RHS is maximized utility under salary.

Maximized utility under salary is a linear function of $\alpha$, as $S$ and $z(0)$ are constants. It has slope $S - z(0)$ and is shown in Figure 1. It is assumed that $S > z(0)$. 9
Using familiar techniques it can be shown that maximized utility under fee-for-service is a convex function of \( \alpha \). Applying the envelope theorem, its slope is given by

\[
\frac{dv(\alpha)}{d\alpha} = y(n_1(\alpha)) - z(n_1(\alpha) - n_1^*). \tag{9}
\]

It is assumed that \( AT > S \) and that \( y(n_1^*) < S \). The first assumption guarantees that at \( \alpha = 1 \) maximized utility under fee-for-service is greater than under salary, while the latter assumption guarantees that at \( \alpha = 0 \) the slope of maximized utility under fee-for-service is less than under salary. Maximized utility under fee-for-service is also drawn in Figure 1.

As drawn, Figure 1 reveals that there is an \( \bar{\alpha} \) defined by \( \bar{\alpha}y(n_1(\bar{\alpha})) + (1 - \bar{\alpha})z(n_1(\bar{\alpha}) - n_1^*) \equiv \bar{\alpha}S + (1 - \bar{\alpha})z(0) \) such that for those specialists with \( \bar{\alpha} < \alpha \leq 1 \) fee-for-service is preferred to salary while for those specialists with \( 0 \leq \alpha \leq \bar{\alpha} \) salary is preferred to fee-for-service. Note that \( \bar{\alpha}(S) \) is an increasing function of \( S \). This is summarized in the following proposition.

**Proposition 1:** Given \( S > z(0) \), \( AT > S \), and \( y(n_1^*) < S \), specialists who attach a relatively high weight to income, \( \bar{\alpha} < \alpha_j \leq 1 \), prefer to work under fee-for-service and choose to treat a high proportion of short stay patients while specialists who attach a relatively high weight to fairness, \( 0 \leq \alpha_j \leq \bar{\alpha} \), prefer to work under salary and choose to treat all patients referred to them regardless of type.
Figure 1
Specialist Choice of Payment Scheme
Salary vs. Fee-for-Service

Utility

z(0)

Fee-for-Service

Salary

AT

α

1

α
3.4 Stage One - Hospital Choice of Specialist Payment Scheme

It is assumed that the total number of specialists is such that all patients can be treated in a hospital. As \( A \) is the number of beds allocated to each specialist, this requires

\[
M = \frac{N^{pri} + N^{pub}}{A}
\]  

(10)

**Public Hospital:** The public hospital acts benevolently by admitting all patients who seek treatment regardless of type. As salary is independent of patient type, it does not provide an incentive for specialists to discriminate between patients based on type. Therefore, the public hospital offers payment by salary as this aligns the interests of the public hospital with those of fairness liking specialists.

**Private Hospital:** Assume the private hospital can offer payment by fee-for-service or by salary to specialists.

*Salary:*

Under salary, it is assumed that the fee for a specialist’s services is paid to the private hospital. Therefore, the choices made by a specialist, with preference parameter \( \alpha \), contribute

\[
\Pi^S = n_1^*E_1(\pi) + n_2^*E_2(\pi) + n_1^* + n_2^* - S
\]  

(11)

to expected private hospital profit, where \( E_i(\pi) = (1 - \rho_i)\pi(l_1) + \rho_i\pi(l_2) \) \( i = 1, 2 \) is the expected private hospital profit obtained by providing hospital services to one patient of type \( i \), \( n_1^* \) and \( n_2^* \) are the number of patients of types 1 and 2 respectively that the specialist chooses to treat under salary, and \( n_1^* + n_2^* - S \) are the fees paid to the private hospital for the specialist’s services net of salary. Note that \( \Pi^S \) is independent of \( \alpha \) as specialists do not have an incentive to discriminate between patients of different types.
**Fee-For-Service:** Under fee-for-service, the fee for a specialist’s services is paid directly to the specialist by the patient. Therefore, the choices made by a specialist, with preference parameter $\alpha$, contribute

$$\Pi^F(\alpha) = n_1(\alpha) \cdot E_1(\pi) + n_2(\alpha) \cdot E_2(\pi),$$

(12)

to expected private hospital profit, where $n_1(\alpha)$ and $n_2(\alpha)$ are related by the constraint $n_1(\alpha) \cdot E_1(l) + n_2(\alpha) \cdot E_2(l) = AT$ and $n_1$ and $n_2$ are functions of $\alpha$ because they are chosen by the specialist and depend on the specialist’s preference parameter.

Substituting in the constraint yields

$$\Pi^F(\alpha) = n_1(\alpha) \cdot E_1(\pi) + (\frac{AT}{E_2(l)} - \frac{n_1(\alpha) \cdot E_1(l)}{E_2(l)})E_2(\pi).$$

(13)

The private hospital prefers to have the specialist with preference parameter $\alpha$ work under fee-for-service rather than salary if

$$\Pi^F(\alpha) > \Pi^S$$

(14)

### 3.5 Equilibrium

An equilibrium is a salary, $S^*$, and an $\bar{\alpha}^*$ such that given $S^*$ the number of specialists who prefer payment by salary, $\int_0^{\bar{\alpha}^*} g(v)dv$, is equal to the number of specialists the public and private hospitals want to employ under salary.

Let $S(\bar{\alpha})$ be the salary such that specialists with $\alpha \leq \bar{\alpha}$ prefer to work for salary rather than fee-for-service. It is the inverse function of $\alpha(S)$. As $\alpha(S)$ is an increasing function of $S$, $S(\bar{\alpha})$ is an increasing function of $\bar{\alpha}$. Define $\hat{\alpha}$ by

$$\frac{N_{pub}}{A} = \int_0^{\hat{\alpha}} g(v)dv.$$

(15)

Therefore, $\hat{S} = S(\hat{\alpha})$ is the salary such that the number of specialists the public hospital employs equals the number that want to work under salary.
Substituting $S(\bar{\alpha})$ into $\Pi^S$ yields $\Pi^S(\bar{\alpha})$. Let $\Pi^S(\bar{\alpha} = \hat{\alpha}) \equiv \hat{\Pi}^S$ and $\Pi^S(\bar{\alpha} = 1) \equiv \Pi_1^S$. $\Pi^S(\hat{\alpha})$ is the contribution of the choices made by those specialists with $\hat{\alpha} < \alpha \leq \bar{\alpha}$ to expected private hospital profit under payment by salary.

In equilibrium the following condition must be satisfied

$$\Pi^F(\alpha \in [\hat{\alpha}, \bar{\alpha}^\ast]) \leq \Pi^S(\bar{\alpha}^\ast) < \Pi^F(\alpha \in (\bar{\alpha}^\ast, 1]).$$

(16)

Given $S^*$, $\int_0^{\bar{\alpha}^\ast} g(v)dv$ specialists prefer to work under salary and the public and private hospitals want to employ them under salary (the left-hand side inequality). The public hospital employs the specialists with $0 \leq \alpha \leq \hat{\alpha}$ and the private hospital employs the specialists with $\hat{\alpha} < \alpha \leq \bar{\alpha}$. Specialists with $\bar{\alpha}^\ast < \alpha \leq 1$ prefer to work under fee-for-service and the private hospital wants to employ them under fee-for-service (the right-hand side inequality).

A particular equilibrium is shown in Figure 2. $\Pi^S(\bar{\alpha})$ is a decreasing function of $\bar{\alpha}$ as $\frac{d\Pi^S(\bar{\alpha})}{d\bar{\alpha}} = -S'(\bar{\alpha}) < 0$. The intuition is clear, an increase in $\bar{\alpha}$ requires an increase in salary and this reduces the contribution specialists employed under salary make to private hospital profit.

In the Appendix, it is shown that $\Pi^F(\bar{\alpha})$ is an increasing function of $\bar{\alpha}$. Once again the intuition is clear, the greater is $\alpha$, the greater is a specialist’s preference for income. Therefore, a specialist with a greater $\alpha$ chooses a greater number of short stay patients than a specialist with a lower $\alpha$. As hospital profit is a concave function of length of stay, a specialist’s contribution to private hospital profit is greater the greater is $\alpha$. Let $\Pi^F(\bar{\alpha} = \hat{\alpha}) \equiv \hat{\Pi}^F$ and let $\Pi^F(\bar{\alpha} = 1) \equiv \Pi_1^F$.

$\Pi^S(\bar{\alpha})$ and $\Pi^F(\bar{\alpha})$ are shown in Figure 2, where it has been assumed that $\hat{\Pi}^S > \hat{\Pi}^F$ and $\Pi_1^S < \Pi_1^F$. Equilibrium occurs at $\bar{\alpha}^\ast$ where salary, $S^* = S(\bar{\alpha}^\ast)$, is such that the specialists with $0 \leq \alpha \leq \bar{\alpha}^\ast$ prefer to work under salary and the public and private hospitals want to employ them under salary. The
specialists with the highest preference for income, $\bar{\alpha}^* < \alpha \leq 1$, prefer to be employed under fee-for-service and the private hospital wants to employ them under fee-for-service.

Figure 2
Private Hospital Choice
Salary vs. Fee-for-Service
Analysis of Figure 2 leads to the following proposition.

**Proposition 2:** (i) All specialists employed by the public hospital work under salary. (ii) If $\hat{\Pi}^S > \hat{\Pi}^F$ and $\Pi_1^S \geq \Pi_1^F$, then in equilibrium the specialist salary is such that all specialists work under salary in the private hospital. The public and private hospitals have the same patient mix as payment by salary does not give specialists an incentive to discriminate between patient types. (iii) If $\hat{\Pi}^S \leq \hat{\Pi}^F$, then in equilibrium the specialist salary is such that all specialists work under fee-for-service in the private hospital. Payment under fee-for-service gives specialists an incentive to treat short stay patients, so the proportion of type 1 patients treated at the private hospital is greater than the population proportion $\theta_1$. (iv) If $\hat{\Pi}^S > \hat{\Pi}^F$ and $\Pi_1^S < \Pi_1^F$, then in equilibrium those specialists with $\hat{\alpha} < \alpha \leq \bar{\alpha}$ work under salary in the private hospital and those with $\bar{\alpha} < \alpha \leq 1$ work under fee-for-service in the private hospital. Once again the proportion of type 1 patients treated in the private hospital is greater than $\theta_1$, but less than in (iii).

In Proposition 2, the relationship between $\hat{\Pi}^S$ and $\hat{\Pi}^F$ is crucial. If the distribution of the preference parameter $\alpha$ is skewed towards the high end, then $S(\hat{\alpha})$ will be large and $\hat{\Pi}^S \leq \hat{\Pi}^F$. In this case, the private hospital only employs specialists under fee-for-service and the public hospital has to pay a high salary to attract the number of specialists it needs. In equilibrium, specialists who work in the private profit maximizing hospital treat a high proportion of type 1 patients, patients with only one condition. This maximizes not only the profit of the private hospital, but also the utility of these specialists as they weigh income relatively more highly than fairness. Fee-for-service aligns the interests of these specialists with those of the private hospital. On the other hand, specialists who work in the public hospital are paid a salary and do not discriminate between the types of
patients they treat. These specialists weigh fairness relatively more highly than income. Salary aligns the interests of these specialists with those of the public hospital.

Interestingly, where the parameters of the model are such that the private hospital employs some specialists under fee-for-service, the private hospital treats a higher proportion of type 1 patients than the public hospital. That is, the private hospital treats relatively healthy patients who only stay a short time and are very profitable while the public hospital treats relatively unhealthy patients who stay a long time and are not very profitable.

These results complement those found in Ellis and McGuire (1986), where profit maximizing hospitals that receive a prospective payment have an incentive to employ specialists that place little weight on patient welfare. These specialists order few hospital services and so are very profitable from a hospital's perspective. On the other hand, hospitals that receive cost-plus reimbursement have an incentive to employ specialists that place a lot of weight on patient welfare as these specialists order many hospital services and so are very profitable. Ellis and McGuire stress the importance of how the hospital is paid in determining which specialists it would like to hire. The current paper stresses the importance of how specialists are paid in determining which specialists different types of hospitals employ and what types of patients they treat.

4 Conclusion

This paper has shown that equilibria exist in which the private hospital employs some specialists under fee-for-service while the public hospital employs specialists under salary. The specialists the private hospital employs under fee-for-service are the ones with the greatest preference for income over fair-
ness and these specialists choose to treat a relatively high proportion of relatively healthy and highly profitable patients. Fee-for-service aligns the interests of income preferring specialists with those of the profit maximising private hospital. On the other hand, the specialists the public hospital employs under salary are the ones with the greatest preference for fairness over income and in equilibrium they treat a relatively high proportion of relatively unhealthy and unprofitable patients. However, as the public hospital is not a profit maximiser, but acts benevolently by admitting all patients who seek treatment regardless of type, payment by salary aligns the interests of fairness preferring specialists with those of the public hospital.

The existence of equilibria in which the private hospital offers only salary, Proposition 2(ii), only fee-for-service, Proposition 2(iii), and both salary and fee-for-service, Proposition 2(iv) is consistent with the evidence of Simeons and Giuffridia concerning the methods of payment used in private hospitals. If we extend the assumption of profit maximisation to the treatment of private patients in the public hospital, then observing some fee-for-service in public hospitals, as in Australia, Austria, England, and Germany, is also consistent with the main thrust of this paper.

In the traditional selection literature, a prospective payment provides specialists with an incentive to under-service or select low cost patients (patients that require few services). In this paper, it is assumed that specialists provide the same fixed services to patients irrespective of their type, therefore, there is no under-servicing or stinting in the model. However, there is selection of another type. Fee-for-service provides income preferring specialists with an incentive to select the relatively profitable short stay patients and so aligns the interests of the specialists with those of the profit maximising private hospital. This paper, therefore, complements the existing
selection literature as it also focuses on the mix of patients but that mix is not selected through distortion of service quality as in Frank, Glazer, and McGuire (2000) or quantity as in Newhouse (1996), but rather through the sorting of profitable short stay patients to private hospitals.

A crucial assumption in this paper has been that private hospital profit is an increasing concave function of length of stay. This assumption was rationalised by assuming the private hospital is reimbursed by fee-for-service and noting that most hospital services are delivered early in a patient’s stay. An alternative private hospital reimbursement scheme that is often used is prospective payment where the hospital is reimbursed a fixed amount per patient regardless of the services the patient consumes. Under this scheme, private hospital profit is a decreasing function of length of stay and the profit maximising private hospital has an interest in treating as many short stay patients as possible. As under private hospital reimbursement by fee-for-service, the incentives of the private hospital and income preferring specialists are aligned by paying the specialists fee-for-service. Therefore, the main thrust of this paper is independent of whether the private hospital is reimbursed by fee-for-service or prospective payment. This is not true if the private hospital is reimbursed through a per-diem payment for then the profit maximising private hospital has an interest in treating as many long stay patients as possible.

In this paper, the ownership structure of hospitals and the number of beds they have is taken as given. Private and public hospitals differ in that the former maximizes profit while the latter commits to admit all patients regardless of type. To the extent that private not-for-profit hospitals differ from profit maximising private hospitals and also commit to admit all patients regardless of type, the results in this paper carry over from public
hospitals to private not-for-profit hospitals. However, Duggan (2000) rejects the theory that decision makers in not-for-profit hospitals are more altruistic (fair) than their counterparts in profit maximising hospitals and so questions the suggestion that private not-for-profit hospitals and public hospitals have similar motivations. In a similar vein it may be questioned whether public hospitals only value fairness and place no weight on profit. Therefore, a fruitful area of future research involves analyzing the choice between salary and fee-for-service in a world inhabited by profit maximising private hospitals, private not-for-profit hospitals, and welfare maximising public hospitals that place some weight on profit.
5 Appendix

Differentiating $\Pi^F(\alpha)$ gives

$$\frac{d\Pi^F(\alpha)}{d\alpha} = \left( E_1(\pi) - \frac{E_2(\pi)E_1(l)}{E_2(l)} \right) \cdot \frac{dn_1}{d\alpha}.$$  \hspace{1cm} (17)

Now calculation yields

$$E_i\pi(l) = (1 - \rho_i)\pi(1) + \rho_i\pi(\lambda) \quad ; \quad E_i(l) = (1 - \rho_i) + \rho_i\lambda.$$  \hspace{1cm} (18)

Let $R = \frac{E_i(\pi(l))}{E_i(l)}$. Calculation yields

$$\frac{dR}{d\rho_i} = \frac{\pi(\lambda) - \lambda\pi(1)}{(1 + \rho_i(\lambda - 1))^2}.$$  \hspace{1cm} (19)

The denominator of (19) is positive so the sign of (19) is the same as the sign of the numerator. By the concavity of $\pi(l)$, $\pi(\lambda) < \lambda\pi(1)$, so the numerator of (19) is negative. Therefore, $\frac{E_1(\pi)}{E_1(l)} > \frac{E_2(\pi)}{E_2(l)}$ as $\rho_2 > \rho_1$ and the first term in (17) is strictly greater than zero.

The term $\frac{dn_1}{d\alpha} > 0$, so overall $\frac{d\Pi^F(\alpha)}{d\alpha} > 0$.
6 References


