An assessment of existing hospital behavioural models and their applicability to public health system reform.

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Introduction

Current reforms to public health systems rely on the assumption that hospitals will be 'firm-like' in their responses. However, doubts have been cast from several sources on the logic of that assumption. UK hospital trusts, for example, have few incentives to maximise profits or financial surplus (Propper, 1995). The notion that the hospital is a 'black box' has been popular, and although a number of approaches to understanding the contents of the box are available, they are largely untested; and seem designed to serve a number of different purposes. Furthermore, there is scepticism of the empirical validity of a general model. Sloan (1980) surveyed aspects of the internal organisation of hospitals and concluded that it was unlikely that the behaviour of hospitals could be explained by a single model. Similarly, McGuire (1985), in a review of hospital models suggested scepticism on conceptual grounds too. McGuire argued that the theory of the firm is itself composed of several, not one, theory: "This is perhaps the main point that we should carry forward to our more specific consideration of the theory of the hospital as a firm".

Scepticism of a general model is perhaps not surprising given the variety of types of hospital actually found in markets for hospital care across the world. One important source of variation is ownership status. Some hospitals are proprietary, others are privately run but not-for-profit, others are publicly owned. Other ways in which hospitals might vary include teaching status, the types of care provided, and size. External market environments also vary in terms of the degree (and type) of competition and the way in which the hospital is financed for the services it provides.

Our purpose is to predict the response of public hospitals in different health systems to reform. In this paper, we review the available models of hospital behaviour; consider their applicability to public health systems given their origins as explanations of behaviour of private hospitals in the US; and consider the extent to which they are capable of predicting public hospital responses to reform. We use the UK reforms to illustrate the issues involved, although our concern is with the underlying generic issues, rather than the specific features of the UK model.

Models of the hospital

The hospital models literature contains a variety of possible approaches. One way in which these theories can be characterised is in terms of whether the doctor or the manager is modelled as the decisive actor. Other models define themselves by focusing on the internal bargaining process itself. We review existing theories under three categories: (a) hospitals as labour managed firms in which the doctor is the principal decision maker; (b) utility maximising theories in which the manager or administrator is modelled as the more important decision maker; and (c) behavioural approaches in which the focus is on modelling the process of internal organisation and bargaining itself.

(a) Hospitals as labour-managed firms

Pauly and Redisch (1975) modelled the hospital as a physicians' cooperative run by income maximising doctors. The doctors may either follow the cooperative strategy, operating as a cartel, or follow a non-cooperative strategy. Within the cooperative strategy, Pauly and Redisch consider three possible sets of arrangements: (i) the "closed-staff" model in which the doctors regulate their numbers in order to maximise average net revenue and each doctor takes an equal share; (ii) the "discriminatory hiring" model in which some doctors are partners who share equally in the net revenue and other doctors are hired and paid their marginal product; (iii) the "open-staff" model in which any doctor wishing to join the hospital can do so and share equally in the net revenue.

Pauly and Redisch analyse optimal staffing from the point of view of the physicians in each of these sets of arrangements. An interesting result from their model is that an increase in demand could lead to higher price levels, lower output, and fewer doctors, as the cartel seeks to maximise net revenue per physician (a result also found in models of soviet collective farms). Under the non-cooperative strategy, the cartel breaks down (or never forms) if the incentive structure encourages the individual doctor to free-ride. Pauly and Redisch suggest non-cooperation is more likely where there are larger numbers of doctors, and it results in a smaller number of doctors working in the hospital. By employing more non-physician labour

and utilising other hospital inputs, an individual doctor might be able to charge a higher price for his/her own services. But this inflates hospital costs, reducing net revenues.

(b) Utility Maximisation

Utility maximisation is a catch-all title for those approaches which have stressed the role of non-financial objectives and the decision making influence of the manager rather than the clinician. Broadly, these approaches are based on the specification of a utility function that consists of objectives defined in terms of quantity and/or quality of care provided. High on the list of human motives in these accounts of hospitals is the prestige felt by managers (and perhaps medical staff also) at working in an institution of high reputation.

Examples of this approach include Feldstein (1968), Rice (1966), Reder (1965), Lee (1971), Newhouse (1970), Joseph (1975). Feldstein assumes an objective of maximum output for a given quality; Rice assumes output maximisation; Reder models clinicians as quality-maximizers and administrators as having a combined quality/quantity maximising objective related to prestige and salary; in Lee's model, managers are motivated by the prestige acquired for the institution through high input utilisation; Newhouse suggests the prestige of the hospital is maximised via a dual objective of quality and quantity; finally, Joseph includes quality, quantity and also the number of patients turned away. As an example of these approaches we describe that of Newhouse in more detail below.

The objection function is defined in terms of quality and quantity of services provided, implying for example that a hospital would be prepared to make sacrifices in terms of quantity (for instance, number of patient days), in order to provide higher quality. This can be represented by an indifference curve. For each level of quality, the hospital faces a given demand curve and a given cost function. Increases in quality from low levels would bring increases in demand, as improved quality attracted patients. There would therefore be no trade-off at these low quality levels. But at higher levels of quality, the higher costs of

provision would deter those with lower ability to pay, leading to a reduction in quantity of service provided. The result is the unconventionally shaped budget constraint of Figure 1. Chosen quantity-quality level is Ql*Qn*.

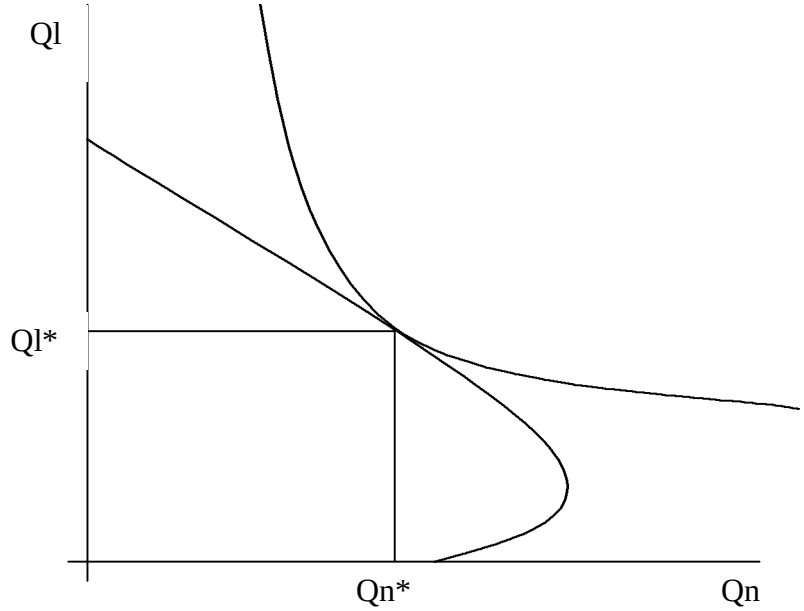

Figure 1: Newhouse model of hospital behaviour

The model yields a number of predictions, including: least cost production; a bias towards high quality services and away from low quality services, even where these low quality services would be demanded; duplication of equipment and capital intensity.

(c) behavioural theories

The third category of approach involves a focus on the internal processes by which hospital resources are allocated and which influence hospital responses to changes in its external environment. We describe the account given in Harris (1977) of the internal operation of hospitals, and models of internal bargaining described in Muurinen (1986).

Harris (1977) described the hospital as composed of two separate firms, rather than as a single firm. One of these firms is made up of medical staff who comprise a demand

division. The hospital administration comprises a second firm, or supply division. Harris views these two firms as quite separate structures: "Each half of the organisation has its own managers, objectives, pricing strategies and constraints." He describes the interaction of noncooperative oligopoly-type game". The level of spare capacity forms a key battleground. He writes: "I have in mind here a disequilibrium model in which everyone behaves as if the hospital is not big enough. The administration, on the one hand, wants the hospital filled. But the doctors want bigger defensive margins. The administration will expand capacity only if doctors can fill up the beds. Since there is internal conflict over the control of these defensive margins, doctors will expand utilisation and increase quality to obtain their share. As a result, the administration will tolerate the creation and perpetuation of these separate empires even though it negates the advantages of risk pooling." In Harris's discussion the doctors would seem to be the more powerful group. But despite his emphasis on conflict, his final conclusions are in fact similar to those of Newhouse: "To a certain extent, this is not much different from the kind of quantity-quality maximising model which has been used to explain hospital cost inflation in the post-Medicare period. There is a built-in drive to expand size and complexity". This discussion predicts conflict over the level of spare capacity and a tendency to expand (given a soft budget constraint).

Muurinen (1986) argues that a realistic model must take account of the influence of several groups of actors in the non-profit hospital decision making process. This might be captured by a bargaining model. Muurinen applies the approach of Svejar (cited in Muurinen, 1984) in which the bargaining process is modelled as having a Nash solution. The paper describes three models: (i) groups within the hospital bargain over their incomes and over the share of any residual hospital income (profit); (ii) fixed salaries, groups bargain over residual income of hospital in order to spend on inputs; (iii) groups of doctors bargain over the share of the price of hospitals services which accrue to them.

(i) In the first model the various interest groups within the hospital are assumed to be income maximizers. The average income of each group will be determined by a bargaining process. In addition, this process determines the share of residual hospital income allocated to each group. The residual income is the same as profit: "This….corresponds to the profit level that the hospital could earn and distribute to its shareholders if it were a pure profit maximizer."

Muurinen argues that the model developed by Pauly and Redisch is a special case of this general bargaining model in which physicians are the only group with bargaining power, forming a single bargaining group seeking to maximise their income.

(ii) In public sector owned and operated non-profit hospitals, incomes are frequently fixed externally. Instead of bargaining over income, groups within the hospital are modelled as seeking to maximise the quantity of some input. Residual revenue would be divided amongst various groups not as income, but to be spent on these inputs. The stronger a group's bargaining power, the larger the share of the residual revenue obtained for purchase of such items. This input could be, for example, in the case of doctors, facilities for research.

(iii) The third model is an adaptation of Pauly/Redisch. The hospital is run as a physicians' cooperative. However, this time the different types of physicians have differing amounts of bargaining power. Physicians are paid out of the fixed hospital charges for items of service delivered. Income maximising physicians bargain for as large a proportion as possible of the fixed hospital charges. The proportion appropriated by each physician group depends on the opportunity costs and the bargaining power of each physician group.

A conceptual framework for interpreting hospital models

We consider that the various models can be viewed from the perspective of principal-agent theory.

The principal in this approach is conceived of as an individual or group (a government ministry of health perhaps, or even 'society') whose aim is social welfare. The problem is to reconcile the behaviour of the hospital with the goal of social welfare. This might be the objective of health sector reform from a hospital perspective. Doctors' and managers' objective functions clash. For example, doctors might be characterised as having an objective function increasing in service intensity. Managers might be characterised as having an objective function increasing with the meeting of financial targets (though whether these are the right kinds of maximand is questioned below). From the principal's perspective, the problem is to align incentives so that the tension between the objective functions of doctors and managers produces hospital behaviour approaching that consistent with maximisation of

social welfare as closely as possible (depending on the actual components of objective functions, perfect incentive alignment may not be possible).

This offers an approach to further analysis of the hospital models literature by focusing on agency costs and hence the central role of objective functions and incentives faced by two sets of actors, doctors and managers, in determining hospital behaviour.

Where the incentives of the agents are perfectly aligned with those of the principal, the hospital pursues social welfare. At the other extreme, social welfare is sacrificed to the pursuit of other objectives. Between these two extremes, a continuum of models describe the various levels of agency cost. The Newhouse approach can be seen as one in which there is implicitly a fairly (but not perfectly) successful alignment of incentives thus of the behaviour of the hospital, with social objectives (the hospital aims at balancing quantity and quality, but with over-emphasis on quality relative to the efficient solution). However, under the Harris account of hospitals, where the hospital is essentially split into two firms, the agency problem appears more pronounced with considerable costs associated with the active conflict between the two groups. Managers find themselves giving way to more powerful doctors presumably with considerable social welfare costs. The model described by Pauly and Redisch is one in which the hospital, dominated by doctors, who pursue their own ends is likely to be very far from effective incentive alignment.

Relevance of these models to public systems

Apart from the model of Muurinen, these models all originate in the USA (Muurinen's model is also developed on the basis of earlier US models). They thus describe the consequence of incentive structures common there. While some of the models focus particularly on the not-for-profit hospital (eg. Newhouse; Muurinen), this does not resolve the likely difficulties of application of the models from a US to UK, or other public health system. The incentive difference we will initially focus upon is one (at least usually and largely) external to the hospital – the payment mechanism through which the hospital earns its income. Under traditional publicly budgeted systems, we will assume that the payment mechanism does not permit payment to vary with activity levels: the payment-activity relationship is absent. This

is assumed to be true at hospital department as well as at hospital level. Under reformed public systems (the pre-1997 UK reform model will suffice as a definition of 'reform' for the purpose of this paper), the relationship between payment and activity is 'weak'. Certain components of the budget will respond to hospital activity levels – where there are cost-per-case contracts; and where additional cases outside those financed by the main public purchaser are financed on a cost-per-case or even fee-for-service basis (such as extra-contractual referrals and GP fundholder contracts under the pre-1997 UK reform version). In other respects, payment is much less activity responsive, even where purchasing modes of payment are used because ultimately there is a firm upper limit to the total expenditure of the principal purchaser. Under reformed systems, some form of devolved budgeting reflecting hospital level payment mechanisms at lower (eg. department) level, is assumed to apply also. However, under the US arrangements on which the models described above are based, the majority of care is funded through cost-per-case and fee-for-service contracts. (The growing importance of 'managed care' arrangements is ignored because it does not seem to have impinged on any of the previously described models). There is also no firm upper limit to total expenditure in the system. These arrangements are defined as a 'strong' payment activity relation.

1. 'Traditional' public budgeted systems

To some extent the models described above can be adapted. In the absence of a payment-activity relation, the upward sloping part of Newhouse's budget constraint is eliminated. An objective function represented by an indifference curve reconciling the trade-off between quantity and quality through tangency with a normally shaped budget constraint could be proposed. But does the difference in the nature of the payment-activity relation between a 'not-for-profit' and a 'public' hospital predict changes in decision space? With respect to decision space, if we further assume that under traditional public budgeted systems demand, as it presents to the hospital, simply has to be met, quantity is not then a decision variable. A fixed budget and a fixed quantity are determinant of the level of quality that can be offered, assuming the objective function is the same.

Will such public hospitals maximise quality subject to budget constraint and exogenously determined demand (quantity)? The other models suggest some alternative possibilities for the objective function which might predict something different. If we assume that doctors

salaries are fixed, the physician income or profit maximisation model of Pauly and Redisch, is excluded, but the possibility that doctors' interests are pre-eminent resulting in maximisation of doctors' objective functions, or factors closely associated with medical promotion criteria are not ruled out. This might translate to the unwarranted selection (for example judged by cost-effectiveness criteria) of research-valuable patients, for instance. Where there is conflict between the objective functions of doctors and managers and both have significant influence on decision making, conflict focusing on resource use within the hospital might ensue, similar to that described by Harris and Muurinen.

However, the conceptual framework through which we interpret these models suggests that given the differences in incentive structures, the balance of tension between the two 'firms' is likely to be different. To conclude that the models of Harris or Muurinen apply because some kind of tension is apparent, as many UK commentators have done, can only provide a starting point to an understanding of hospital behaviour in public systems.

The assumptions applied have been highly stylised (ignoring discretion over quantity, and strategies to secure budget increases which apply to all publicly budgeted systems). We now draw on qualitative evidence describing the tension between doctors and managers in UK hospitals in the 'old' NHS from Strong and Robinson (1990).

Strong and Robinson describe four distinct phases in the life of hospitals within the UK NHS: 1) from inception of the NHS in 1948 to its first major reorganisation in 1974; 2) from 1974 to the Griffiths reforms of 1984; 3) from Griffiths to the reforms of 1990; 4) the 1990 reforms and beyond. These phases can be characterised in terms of the influence of clinical power within the hospital.

At the formation of the NHS, a powerful medical profession was able to secure concessions from the new government in return for its cooperation. One of these concessions was the autonomy given to the hospital doctor. Individual doctors were not subjected to any form of managerial control, not even from other doctors. In the words of Strong and Robinson: "No hospital had a boss; no doctor had a manager".

Each practitioner was independent, yet collective identification and cooperation in protecting their privileges was strong. This power reached its highest point in the period 1974 to 1984,

described by Strong and Robinson as "the apotheosis of health service syndicalism". Under the reforms of 1974, each trade was to manage itself (nurses to manage nurses, accountants to manage accountants, doctors to manage doctors). The ideal behind these reforms was notion of "consensus management". However, clinical power remained unchallenged within this structure: "The power of medical syndicalism meant that little basic information was gathered on individual medical activity". Doctors remained independent and unaccountable.

The intention of the Griffiths reforms of 1984 was to introduce general management to the NHS. Many of the new managers came from outside the health service. However, even this radical reorganisation failed to tame medical power. Managers had no powers of sanction over doctors. "Yet the 1984 reorganisation had failed to face up to medical syndicalism. The might of the nationally organised medical workforce meant that the new local leaders were still unable to manage the dominant clinical trade." Management remained weak when trying to improve performance in the face of obstruction from doctors. Strong and Robinson report examples of the types of problems managers were unable to tackle, including variation in clinical practice, variation in activity rates, and the enforcement of protocol. Doctors were also criticised for lacking a sense of institutional responsibility and for engaging in competition with one another for power and resources. Managers, it seemed, were often powerless to stop this ("The new cardiac surgeon has been told not take on more than four patients a week and he simply refuses to do this"). Strong and Robinson conclude that "….the individualistic ethic of medicine allowed the most powerful individual clinicians to

This discussion suggests that from 1948 up to and after the Griffiths reforms of 1985, doctor objectives were dominant within the UK hospital. The division between the two firms, and the competition for resources, described by Harris are consistent with the picture portrayed in Strong and Robinson, but the specific fields of conflict differ. For example the quotation above referring to the cardiac surgeon suggests that managers were not supportive of activity expansion in contrast to the managers of the Harris model. A casual scrutiny of the differing incentive structures is sufficient to explain this. Concern with financial balance predicts very different behaviour on the part of managers in the traditional public system in comparison with a market based system. Strong and Robinson appear also to describe a different tension balance point than Harris, with doctors more dominant in the UK hospitals than in the Harris model.

2. Reformed public systems

Two aspects of reformed public health systems will be given attention here. Under 'weak' payment-activity relationships, the hospital faces fixed reimbursement for some patients and services; and reimbursement responsive to activity levels for others. Second, devolved budgeting to departmental level is a characteristic of reformed systems which would seem to have considerable a-priori significance since it directly aims to address agency issues in the relationship between managers and clinicians, in the same way as it is used within profit seeking firms to address agency problems between senior management andmanagers at devolved levels of the organisation. The underlying principle is to align higher level objectives with incentives at lower levels (eg. Jensen and Meckling, 1998). Thus the objective of devolved budgeting would seem to be precisely to dismantle the operation of the Harris model.

Resource management, the UK version of devolved budgeting (among other things) has been considered in these terms before (Farrar, 1993). Farrar considers the possibility that the UK reforms – specifically the resource management initiative and later the purchaser-provider split might achieve a 'vertical integration' of the two 'firms' of the Harris model. Farrar concludes that RM cannot do this alone, and therefore does not confront the possible implications for the Harris model - if 'vertical integration' were to occur, this would presumably imply a more consensual hospital behavioural model – or in our terms, doctors and managers incentives would become more clearly aligned with each other.

We think this casts further light on the conclusions predicted by Sloan (1980), and McGuire (1985) discussed above. There is no single generic hospital model because the types of models specified are endogenous to the hospital environment and specifically, incentive structures, rather than exogenous and capable of predicting the implications of changes to the environment. We conclude that the latter task can only be achieved through an anticipation of how environmental changes alter the hospital model.

Ideally, identification of an underlying generic model, itself capable of predicting the model forms exemplified in the literature in the context of specific hospital environmental features, would be sought. This would involve the specification of underlying doctors' and managers'

objective functions rather than the specification of the intermediate maximands through which objective functions are pursued, and an understanding of the relationships between decisions affecting hospital performance and those underlying maximands. For example, an objective function specifying service intensity as the maximand of doctors might be further predicated on maximisation of income or prestige or of benefits to individual patients. Incentives can be best understood in relation to the cause rather than the symptom.

The question remains as to whether or not such 'vertical integration' or in our terms alignment of managers' and doctors' incentives (whether or not in such a way as they are also aligned with the 'principal') is likely to result from reform. While Farrar (1993) is convincing that this has not occurred in relation to the specific features of RM rather than the generic ones of devolved budgeting, the overall implications of reform for hospital models remain an open question in the Farrar paper , and one which we will now address further.

We review further empirical qualitative evidence from Propper and Bartlett (1997) (P&B) to add to Farrar's analysis of the likely implications of reform in these respects. P&B conducted interviews with CEOs, finance managers, business managers and development directors in three trust hospitals between 1994-5. Inevitably, our discussion of this evidence is tentative, given the second hand nature of the evidence which is rather briefly summarised by P&B in this paper. However, we conclude that a level of incentive alignment occurred in each of the three hospitals.

In the first hospital, which was characterised by low levels of competition and little strengthening of the payment-activity relation, clinical dominance appears to have been brought to a sudden end by severe financial crisis – suggesting real impact of the 'hardening' of the budget constraint which is supposed to be associated with a purchasing environment, even when nothing else appears to have changed greatly. Instead managerial dominance subsequently prevailed, and financial accountability dominated the resulting objective function. In the second hospital, competition was also low but the stronger payment-activity relationship associated with GPFH purchasing was growing in importance. In this hospital, vertical integration was characterised by clinical dominance. Devolved budgeting was applied to a limited degree in that shares of surpluses generated accrued to the generating directorate. This appears to have been judged sufficient to co-opt clinicians to managerial objectives with quality concerns pursued within an agreed and viable financial framework. In

the third hospital, high levels of competition and recent financial crisis appeared to have produced the strongest model of clinical co-option to management, and the strongest version of devolved budgeting with complete capture of surpluses generated by the generating directorate, and clinical directors directly involved in the negotiation of contracts.

If our interpretation of this data is correct, and if these hospitals are typical of the wider environment which they were intended to be, the reformed hospital environment of the UK has substantially changed the hospital models which are most useful in explaining current behaviour. P&B conclude that the managerially dominated hospital is pursuing a different objective function than the clinically dominated ones, suggesting a different reconciliation of objective functions of the former (apparently dominated by financial targets) with the latter (apparently dominated by quality, throughput and employment.)

Is there a model which can represent this greater reconciliation of objective functions?

One candidate is the model of Frank and McGuire (1994) (F&M). F&M develop a model for a public community mental health care provider (CMHC) which incorporates differences in payment mechanism for different patient groups (as under a 'weak payment-activity relation as defined above). Although this is another US focused model, the characteristics of public community mental health care provision have more in common with public health systems in other parts of the world than the for-profit, or not-for-profit US hospital; and the incorporation of dual payment mechanisms has particular relevance.

CMHCs rely substantially on direct grants and patients without insurance entitlements covering their services make up a substantial proportion of their case load. F&M focus on the rationing function of CMHCs under the assumption that state grants are insufficient to enable them to do everything it would deem worthwhile (with a positive perceived net value).

The CMHC spends its budget across patient groups but one patient group (the uninsured) has a higher price (net cost to the budget) than the other because no fee is received. The objective function is assumed to be quadratic in the volume of services: a 'loss function' is assumed increasing proportional to the square of the difference between the target expenditures for the population and the actual. This loss function can be conceptualised as the lost benefit associated with untreated patients as perceived by the CMHC decision makers, with the target

expenditure defined as the point at which marginal benefit falls to zero. Minimising this loss function subject to the budget constraint sets the marginal benefit from each unit of expenditure from the budget equal across the two client groups.

This implies that those for whom payment is received will receive more treatment than those for whom it is not, since treatment for this patient group will be provided until marginal benefit *per unit of treatment* (rather than per unit of net expenditure from the budget) reaches a lower level. A 'two-tier' system will operate. This accords with pre-1997 anecdotal evidence in the UK of waiting lists being jumped by patients whose contracts were funded through GP fundholding contracts or extra contractual referrals (Harrison, 1998; Hamblin, 1998)

A number of further implications follow. Own price elasticities will always be negative. Income (budget) elasticities will always be positive for both groups, and for equal marginal benefit functions, higher for the uninsured group. The model enables a comparison to be made of the effect on patient expenditures and its distribution between patient groups of a budgetary change, or the same change in state expenditure used to reduce the price of treating one or both groups. In other words, the model is capable of predicting how the institution will react to reforms to payment systems; and in particular a switch from budgeting to purchasing modes of reimbursement.

However, a query remains. Since the objective function in the F&M model is specified in terms of the decision makers' (reconciled) perceived benefits of treating different patient groups, and target expenditure is set in reference to that, F&M have not clearly specified it. 'Benefit' might relate to cost-effectiveness; effectiveness; some other measure of patient gain; or benefits captured by health professionals rather than by patients. Indeed the differing compromise objective functions of P&B might suggest different answers to this question in different hospitals even within the same health system. These suggest very different normative implications of the model – or alignment of the compromise objective function between doctors and managers with the objective of the social welfare maximising 'principal'.

Nevertheless, we consider that this model is promising for adaptation to 'reformed' public health systems. At this preliminary stage, interpreting the compromise objective function that

might constitute 'benefit' in the model, and specifying the incentive structure embodied in payment mechanisms and purchaser decision making might be informed by the type of qualitative evidence used above. Predictions generated by models developed in this way could then be subjected to empirical tests.

Conclusions

In trying to predict the impact that introducing reform of the type introduced to the UK health system might have on other public health systems, models of hospital behaviour are useful. However, they cannot be applied quite as profit-maximising models of firm behaviour because they cannot be assumed to stay constant as the hospital environment changes. The underlying 'fundamental' model of the hospital which would predict the change in hospital behavioural characteristics which currently constitute the various models of the hospital available, has not been discovered. Even if the notion of a common model of the type in the literature is a red-herring, it remains possible that an underlying model specified in terms of an agency relationship, may exist. The various models reviewed in this paper can then be seen as examples of models involving different levels of agency cost.

Much emphasis has been placed in the British literature on the Harris model of the hospital. Superficially this provided good fit to pre-reform NHS hospitals. Limited empirical evidence of more recent hospital behaviour suggests a more consensual model (or models) has greater relevance in the post-reform NHS. We consider that the Frank and McGuire model has a believable objective function, albeit one requiring further specification (it may even benefit from being flexibly specified), and offers an approach to treating dual payment mechanism issues which are important in many reform contexts – even if they are becoming less important in the UK.

In terms of the principal-agent framework proposed in this paper, agency costs were high in the pre-reform NHS and may now have been reduced. However, a closer alignment between managers and doctors incentives is a necessary but not sufficient condition for reduced agency costs in the absence of an understanding of the alignment between the compromise objective function and that of the social welfare maximising principal. Reform *may* have reduced agency costs through devolved budgeting and a more tangible budget constraint, leading to a new model of hospital behaviour more closely aligned with social welfare.

Our future work will apply these perspectives to a range of countries with public health systems under reform with a particular aim to understand the characteristics of ‘two-tier’ provision in response to dual payment mechanisms; and its implications for the access to hospitals of disadvantaged groups.

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