Do doctors respond to financial incentives? UK family doctors and the GP fundholder scheme

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November 1998

CMPO Working Paper No. 98/001

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Abstract

The 1991 reforms to the UK NHS created a group of buyers of hospital care from amongst primary care physicians. The implementation of the reforms was such that these buyers had incentives to increase their use of hospital services prior to entering the scheme in order to inflate their budgets. It has been argued that non-financial motives would limit such behaviour. The paper shows that these health care providers did respond to the financial incentives offered by the scheme, increasing hospital-based activity prior to entry and decreasing it thereafter.

JEL classification

Public sector labour markets (J450); Analysis of health care markets (I110).

Keywords

Physicians and financial incentives; health care reform

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Acknowledgements

The authors gratefully acknowledge the support and co-operation of North West Anglia Health Authority, and discussions with Simon Burgess. The project was funded by a grant from the Anglia and Oxford NHS Executive Health Services & Public Health Research Sub-Committee. This paper is, however, entirely a reflection of the views and interpretation of the authors and does not in any way reflect the views of the NHS or health authority.

INTRODUCTION

In 1990 the NHS internal market reforms changed the incentives of participants in the UK health care market. The tax financed system was retained, but the functions of insurance and supply were separated. The reforms created a set of buyers of care, known as purchasers, who received budgets from general tax finance, and a set of hospital suppliers, known as providers. It was argued that separating the two roles would improve both productive and allocative efficiency in the NHS. Perhaps the most contentious aspect of these reforms was allowing a subset of family doctors to act as purchasers under the GP fundholding scheme. Under the previous arrangements family doctors had been gatekeepers to all forms of medical care. They provided primary care in their surgeries, referred patients to hospital for further treatment or diagnostic tests and prescribed pharmaceuticals. But they were not responsible for the costs of either hospital treatment or their prescribing. Under the reforms, the fundholder scheme gave family doctors budgets for these two activities. It was argued that the scheme would increase the efficiency of family doctors by making them responsible for the financial costs of their health care decisions and that family doctors would be better purchasers of hospital care than third party purchasers who only bought but did not provide any health care.

The outcome of this scheme has been hotly debated. On the one hand, it has been argued that fundholders have been better purchasers because they have better information on patients pre- and post-hospital treatment. They have been able to innovate, to change methods of treatment, and to improve the efficiency of hospital care suppliers. This has benefited their own patients but may also have had positive spillover effects for other patients. On the other hand, it has been argued that the scheme has resulted in a two-tier service with more resources available to the patients of fundholders, leading to better treatment for this group at the expense of all other patients and possibly also higher incomes for fundholders. Much of the evidence used to support these claims is, however, based on small scale case studies, many of which are unable to distinguish between differences due to self-selection of a particular type of family doctor into the scheme and their behaviour in response to the scheme.

The essence of the problem is that fundholders were given budgets based on their activity before they became fundholders, and were subject to relatively little monitoring in how they used these funds. They therefore had unintended incentives to increase activity in the statutory waiting period before becoming a fundholder, and to decrease activity after becoming a fundholder to retain the surplus from the fund. The policy concern is whether they responded to these incentives. To address this question, the paper exploits the experiment implicit in the way fundholding was introduced, plus part of a unique and important data set scarcely used by researchers which contains information on every inpatient episode in the UK since the advent of the internal market reforms. The fundholder scheme is one of the few natural policy experiments in the UK welfare state: not all family doctors became fundholders and those that did so became fundholders at different dates. The data used is all admissions to hospital from all family doctor practices in one geographic area in the UK during four years, matched to characteristics of the practices including their fundholding status and their patients. These data are used to control for observed characteristics of the practice and populations which are associated with hospital admissions, to isolate a fixed effect associated with those family doctors who ever became fundholders, and to identify whether there was any effect on behaviour at the time these doctors became fundholders. The results provide clear evidence that fundholders have responded to the financial incentives of the scheme. Fundholders have increased admission activity in the year before becoming a fundholder where it will bring them financial benefits.

The paper contributes to the growing literature that examines the power of professional norms versus financial incentives as rewards for employees. Wilson (1989) argues that the nature of government is such that goals of government employees must differ from employees in the private sector, but notes that this does not mean that government will maximise the public interest. The material presented to support this argument is, however, mostly derived from case studies. In one of the few non-case study empirical tests, Heckman et al. (1996) examine whether bureaucrats who are rewarded on the basis of measured outcomes respond to these financial incentives. In an examination of case workers who place job applicants under the Job Training Partnership Act they find that case workers prefer to accept the least employable applicants rather than the most

employable as suggested by a cream skimming argument and conclude that financial incentives may be a countervailing force against the preferences of case workers. It has long been argued that to understand the choices of doctors it is necessary to understand their objective functions (e.g. Pauly 1980). Hellinger (1996) reviews the evidence and finds that financial incentives do affect the referrals of physicians working in managed care plans in the US, which share some features of the fundholder scheme. More specifically, the paper contributes to the literature on the effect of fundholding in the NHS reforms. To date most of this literature has not been able to separate out fundholder fixed effects from the impact of the scheme (e.g. Dixon and Glennerster 1995, Gosden and Torgerson 1997). We find that family doctors contracted to the UK public sector do respond to financial incentives, but that the welfare implication of this change in behaviour is not clear. The change in admissions resulting from fundholding might benefit family doctors, or patients or, perhaps, both.

The paper is organised as follows. Section 1 examines the incentives under the GP scheme, reviews the existing knowledge and puts forward our hypotheses. Section 2 presents the data we use. Section 3 presents the results and the final section discusses their significance.

1. FUNDHOLDER INCENTIVES

Family doctors, known in the UK as general practitioners or GPs, play a central role in determining access to hospital care and specialist services in the UK NHS. There are essentially two routes into hospital: as an elective or an emergency patient. Elective patients are usually admitted to hospital only if they have been referred by a GP, and they are admitted only to scheduled appointments. By contrast emergency cases can be admitted directly, at any time, and people can self-refer themselves. A large number of people are also referred to hospital as emergency cases by their GPs. GPs therefore affect both how many people are admitted to hospital and whether they are admitted as emergency or elective cases. A number of factors affect GPs' referral decisions, including not only a patient's health but also the prevailing economic and legal institutions. In the UK, a key component of the institutional structure affecting their decisions has been the advent of the GP fundholding scheme, introduced as part of the 1990 Internal Market reforms to the NHS.

The Internal Market reforms divided organisations within the NHS into purchasers and providers. Purchasers comprised health authorities and a self-selected subgroup of GPs, called GP fundholders (GPFHs). Health authorities are government agencies responsible for the health of the population of a particular geographic district. They are given an annual budget allocation by central government, and are required to purchase health care on behalf of their residents. In theory they can purchase care from any health care provider: in practice, they purchase most care from within-district NHS providers, which, after the reforms, were formed into self-governing NHS trusts.

GPs are self-employed but receive almost all their income from the government. Some of this income is dependent on the number of patients registered in their practice. GPFHs were given an additional source of income, a budget from which they were required to purchase a specific range of services on behalf of their registered patients. These services include hospital based elective care, some diagnostic services, and pharmaceutical drugs. Non-fundholding GPs do not hold budgets for secondary care. They are responsible for the provision of primary care (as are GPFHs). Health authorities meet non-fundholders' prescribing and secondary care costs. Health authorities also meet the costs of that hospital care of GPFHs which is not covered by the fund (some elective care and all emergency admissions). The fundholding scheme also had an element of 'stop-loss' insurance: health authorities paid any costs incurred on a single patient in a year that were above £5000.

The fundholding scheme was voluntary, GPs joining as they wished in successive years. To be eligible, practices had to have a certain minimum number of registered patients (in the first year of the scheme this was 11,000, then reduced to 9000 in the second year and subsequently to 7000). GPs who wished to become fundholders applied for fundholding status at least a year before they were granted this status. During their preparatory period the health authority assessed their suitability for the scheme as well as their prescribing and referral activity. Very few practices were rejected from the scheme if they met the practice size criteria. The scheme has expanded over time as successive governments have followed a policy of expanding the purchasing role of GPs. This is evident in increases in the number of hospital services included in the scheme, in the number of fundholders, and finally in the piloting of 'total fundholding', which expands the scheme so that some GPs hold a unified budget from which they are required to purchase all health care for their patients, including emergency care[1]. We do not examine total fundholding here. Fundholders who underspent their budgets were allowed to keep their surpluses, provided that the monies were spent on improving patient care. There was little monitoring of this requirement, and as GPs (and GPFHs) own their practices, improvements to the practice can be translated into future income. GPFHs who overspent their funds by more than £5000 p.a. could have their fundholding status removed by the health authority.

Fundholding was designed to close the gap between the fundholders' decisions over referral and prescribing and the financial consequences of these decisions. The aim was that GPFHs would improve the efficiency of service provision. A limited budget was supposed to give them an incentive to maximise the health-care return to any given expenditure as they were believed to be in a position to get information on the quantity and quality of hospital services. But as enacted the fundholding scheme gave incentives for certain types of behaviour. Fundholders' elective care budgets were based on their activity in the period before they became a fundholder. In the scheme's early years, most fundholders' budgets were based on their activity in the year before they

[1]Under recently announced government policy the fundholding scheme will be replaced by local Primary Care Groups, comprising groups of GPs and other health care professionals, eventually holding a budget from which they will have to purchase all services for their patients.

became fundholders. This gave them an incentive to increase referrals in that 'preparatory' year[2]. The scheme also gave GPFHs budgets that covered only a subset of elective procedures. This altered their relative prices of emergency and elective activity, making emergency admissions cheaper than non-emergency admissions, and of different types of elective activity, as not all elective admissions came under the scheme.

Fundholding may affect not only GPs' referral behaviour, but also providers' behaviour with respect to admissions, because of the relative size of fund-holder and health authority budgets and the form of contracts between the two types of buyers and the sellers of services. Health authorities are the larger buyers and tend to use lump sum payments for a total amount of activity (known as block contracts) (Propper 1996). GPFHs, at least in the first few years of the scheme, tended to use cost per case reimbursement. If GPFHs use cost-per-case contracts and health authorities use block contracts for elective activity, providers have an incentive to admit fundholders' patients as elective cases. There is also evidence that, particularly in the early years of the scheme, fundholders were given generous funds *(*Petchy 1995), which may have increased their bargaining power with respect to sellers of health care compared to non-fundholders, allowing them better access for their patients than those of non-fundholding GPs.

There is a small, but growing, body of evidence on the behaviour of fundholders. But the picture that emerges from this literature is far from clear. There are several studies which test for differences between fundholders and non-fundholders. Some find a negative association between fundholding and services utilisation. Whynes et al (1996) found fundholders prescribe more generic drugs, have a lower overall volume of prescriptions, and have a slower rate of increase in prescriptions, compared to non-fundholders. Howie et al (1994) found that fundholding status has a negative association with the utilisation of elective services and Fear and Catell (1994) found that fundholders are less likely to request domiciliary visits from psychiatrists (visits which are paid for by fundholders). But other studies have found little difference between referrals made by fundholders and non-fundholders, and some have found that fundholders are unlikely to alter their referral patterns by switching activity from one provider to another (Coulter and Bradlow 1993).

Toth, Harvey and Peters (1997) examine whether fundholders substitute emergency for elective activity using data on four procedures to which patients may be referred as either elective or emergency admissions. They find no evidence that fundholders substitute emergency for non-emergency referrals after becoming fundholders, but find some, though not overwhelming, evidence that fundholders have a lower ratio of emergency to total referrals. Healey and Reid (1994) examined whether fundholders inflate preparatory year prescribing expenditure and found no evidence of this. On the other hand, Surender et al. (1995) found a significant increase in preparatory year referrals comparing 10 fundholders with 6 non fundholders.

[2] In later years, some fundholders were assessed on their activity over a number of preceding years.

The conclusions that can be drawn from these studies are limited. It could be the case that the mixed results are because the incentives of the fundholder scheme described are not be strong enough to outweigh other factors that drive fundholder behaviour. One study found that GPs joining the scheme in its early years were attracted by the prospect of freedom and autonomy, and not necessarily solely by personal financial incentives (Newton 1993). If exercising freedom and autonomy are consistent with changing the level and pattern of referrals in a direction that is the opposite to the financial incentives given by the fundholding scheme then studies of fundholders versus non-fundholders may find little difference between them. On the other hand, these non-financial goals may not be incompatible with changing referral patterns for financial gain so we might still expect to see an impact of a major change in financial incentives.

But it is more likely the case that many of the studies carried out to date are not able sufficiently to disentangle fundholder and non-fundholder behaviour in response to the incentives of the scheme from differences between the practices that became fundholders from those that didn't (Dixon and Glennerster 1995, Gosden and Torgerson 1997, Petchey 1995). This may be because the data on differences between fundholders and non-fundholders practices which are known to affect referrals was not available to the researchers, or because the studies are small, or because they use data from very early in the scheme, when the only fundholders were a group who are acknowledged to be rather different from other GPs.

The present study overcomes many of these problems by utilising the experiment that occurred in fundholding. Not all GPs became fundholders and those that did became so at different dates. Using all referrals to hospital over four years from a large sample of GPs, some of whom became fundholders at different dates in the four year window and others who did not, we can isolate both a fixed effect associated those who were ever fundholders and any effect on behaviour at the time practices became fundholders. We can observe whether fundholders changed their referral patterns before becoming a fundholder to inflate their fund and whether they changed them afterwards. By matching this data to measures of factors other than GP fundholder status known to determine referrals we can further isolate whether there is a fundholder effect over and above these observed differences between practices and practice populations. So we allow for the fact that fundholder status may measure characteristics other than the financial incentives that fundholding gives, and that fundholding status may be correlated with other features of the practice which determine referral levels.

Referral decisions to emergency and non-emergency treatments are modelled as:

(1) $r^j = f^j(Z, X, F)$

where r^j is the number of referrals, j indexes whether the referral is emergency or non-emergency, Z is a vector of population characteristics which determine the level of referrals[3], X is a vector of GP characteristics other than fundholding and F is a vector of fundholding status and timing dummies.

Our focus is on the effect the timing of fundholder status has on referrals, holding constant the fixed 'fundholder ever' effect. We hypothesise that fundholders will increase non-emergency admissions the year before becoming fundholders. In this year they will either not alter emergency admissions, or will at the margins substitute non-emergency for emergency admissions to the extent that they can re-classify in this way. So the level and the ratio of non-emergency admissions to total will rise in the year prior to fundholding. We have less clear priors about the level of non-emergency admissions once a GP becomes a fundholder. Some fundholders may maintain non-emergency admissions at the higher level. Others may use the larger fund to provide different types of care or to save the surpluses, either of which will result in a fall of non-emergency admissions after becoming a fundholder. We would expect a rise in the level of emergencies as fundholders seek to get cases treated for free. So there will either be a fall or no change in the level of non-emergencies, and a fall in the ratio of non-emergencies to total admissions.

2. THE DATA

The data we use are from the Contract Minimum Data Set (CMDS). The CMDS and its derived data sets are an important resource almost unused by economists. The CMDS contains information about every inpatient episode in the UK since the creation of the internal market in 1990. Martin and Smith (1996) analysed one year of these data from a sample of Health Authorities to explain the determinants of hospital length of stay, and these data aggregated to small area level to model waiting times for elective surgery (Martin and Smith, 1999). We use four years of data from one Health Authority enabling us to exploit the panel nature of the data and undertake analyses of a type not previously conducted to examine fundholder and non-fundholder behaviour.

We use the CMDS for North West Anglia Health Authority (NWA). This is a record of all hospital admissions for individuals resident in the geographical area covered by NWA. (There are approximately 100 HAs in the UK: each resident of the UK falls under one HA). Each admission is classified by details of the date and type of admission and discharge, the speciality, the diagnosis, the patient's GP, and the patient's age, sex, and postcode. In our statistical analysis we use data relating to admissions from all the GP practices within NWA

[3] There is evidence that referral rates tend to decrease with distance from hospital; increase with patients' age; are higher for women; and are usually higher for people coming from deprived areas. (e.g. Hull, Jones and Moser 1997). Holding health status constant, there is evidence that different GPs have significantly different 'referral thresholds' (Roland and Coulter 1993). There is evidence that referrals differ according to the number of partners in a practice (in which case in-house referrals might substitute for out-patient referrals, the length of time elapsed since qualified; the "social distance" between the GP and patient (Scott, Sheil and King

during the four financial years 1993/4 to 1996/7, to two hospitals, Peterborough Hospitals Trust (PH) and the King's Lynn and Wisbech Hospitals Trust (KL). As shown in the appendix, this gives almost 350,000 records for 324,000 admissions. Of these admissions, 303,200 (99%) could be associated with a GP practice in NWA[4]. This is not the whole dataset as there are at least 6,000 admissions to local hospitals by GPs outside NWA[5], and NWA GPs can refer people to other hospitals outside the NWA district. Analysis is confined to admissions to the two local hospitals, PH and KL, given the likelihood of a different set of constraints governing admissions to distant hospitals, comprising as they do a lower proportion of emergencies[6]

In each of the four years covered by our data there were at most 59 general practices in NWA[7]. Table 1 shows the fundholding status of these practices over the sample period. The patient and GP characteristics of the GPFH practices which are ever fundholding in the sample period are compared to those of the non-fundholder practices in Table 2. The table shows that fundholders on average were located in more deprived parts of the district, were closer to one of the two hospitals in NWA, had larger list sizes per GP, and had a higher median age of the GPs in the practice than non-fundholders. The population characteristics of the Health Authority are described in Appendix 1. Within NWA GP services are administered in four discrete areas, with boundaries roughly coterminous with those of local district councils: Peterborough, Fenland, King's Lynn, and Swaffham. Their geographical boundaries were partly defined by a natural east/west polarisation within the district, since prior to 1992 NWA was two separate health authorities[8], and during our four years the east and west sides of the district were served by two different social services departments. GPs in Fenland also differ from those in other areas in that they are also almost equi-distant from the two local acute providers.

36% of the admissions in our dataset are classified as emergency, and the remainder comprise elective day cases, elective in-patients, maternity-related cases, and inter-hospital transfers. Within this CMDS dataset 39 specialities are defined. The boundary between some specialities is unclear and defined differently in the two hospitals in our sample, so we grouped together General Medicine and Care of the Elderly as Integrated Medicine, and General Surgery and Urology as Surgery, and also grouped together specialities where the number of admissions into each was small.

1996) and the level of risk the GP is willing to bear (Lowy, Kohler and Nicholl 1994). There is also evidence that women use health services more than men (e.g. Social Trends 1995).

[4]Those records that could not be associated with a practice were evenly distributed across specialty, hospital, and admission method.

[5]Admissions to any particular hospital comprise the following different categories: first, admissions from local GPs of local residents; second, admissions of local residents by out-of-district GPs; and third, admissions of out-of-district residents by out-of district GPs. Using our data-set, derived from one district, we can estimate the first two categories but not the last. Hospital sources confirm that the majority of admissions to PH and KL are from NWA GPs.

[6] 87% of all admissions from NWA GPs were to these two hospitals.

[7] These 59 practices ccontained, in total, 226 individual general practitioners.

[8]Peterborough DHA and West Norfolk DHA.

We first use these data to examine whether there are any GP practice effects in referral patterns. Table A2 presents a simple regression analysis of the patterns in emergency and non-emergency admissions on only year, quarter, hospital, speciality and GP practice effects. Referrals have a long upper tail, so all analyses of referral levels are in logs. Table A2 shows an upward but not significant drift in non-emergency admissions over the period and some evidence of a quarterly effect. Overall, however, year and quarter effects explain relatively little of the variation in referrals. On the other hand, specialities clearly have different levels of admissions, and there are different patterns of emergency to non-emergency admissions across specialities. This is unsurprising: the nature of health care and illnesses means that different specialities will account for different proportions of emergency and non-emergency activity and that the ratio of emergency to total admissions will vary across specialities. There are significant differences in levels of both types of admissions by hospital: admissions being higher at Peterborough. Croxson et al (1998) provide further discussion of speciality and hospital effects. The table also shows that there are significant practice effects for both emergency and non-emergency admissions. These GP effects are the focus of this paper, which explains them in terms of practice population characteristics which measure demand (e.g. the demographic profile of the practice population, the deprivation of the practice population, distance to hospital facilities) and GP behaviour in response to the incentives under the fundholding scheme.

3. EMPIRICAL SPECIFICATION AND RESULTS

Figure 1 shows all non-emergency admissions by financial year for 4 groups of fundholders in the data. These are those who became fundholders in the third (1993/4) to sixth (1996/7) year of the scheme. (Each cohort of fundholders is known as a "wave".) The vertical bars indicate referrals to the NWA hospitals by financial year, beginning in 1993/4. So for the first group of fundholders, this year was the year in which they became fundholders. For the second group, this year was the preparatory year. The figure shows a clear pattern for the first three groups. Admissions to NWA hospitals fall in the year in which the practice is first a fundholders, and for the second and third groups depicted it the figure, admissions rise in the preparatory year. We do not observe the preparatory year for the practices who became fundholders in the third wave (or for those who became fundholders in the first and second year of the scheme although they are part of our data set). The figure indicates that the behaviour of fundholders in the third to the fifth wave was to increase referrals in the preparatory year and decrease them in the year of becoming a fundholder. There is less of a rise for final group (for whom we only observe the preparatory year). But this pattern is consistent with the change in the way fundholding budgets were set for this group. Their budgets were dependent on activity in a number of proceeding years and not just in the preparatory year. The aim of the econometric analysis is to examine whether these results are robust to differences between and within fundholders and other GPs, and whether they are most evident in those specialities in which GPFHs have the greatest incentive and opportunity to alter their referral patterns.

We model the count of admissions, emergency or non-emergency, per practice, financial year, and speciality. To allow for the impact of numbers of patients in the practice, we divide the number of admissions by list size. We sum admissions across the two hospitals, as many of the counts are zero by hospital as GPs generally refer to either one or the other for each type of treatment. We model these admissions as a function of population characteristics, characteristics of the GPs in the practice, and practice fundholder status. The population characteristics are intended to measure demand for health care in the practice population. They are from either the CMDS or the Census, in which case they are matched to the GP identifier in the CMDS. The characteristics we examine are the proportion of males in the practice population and a measure of socio-economic deprivation of the ward the practice is located in (the Jarman score)[9]. It is well established that hospital use is negatively associated with distance to medical facilities, so distance from the practice to the nearest hospital was included as a measure of demand. Characteristics of the GPs in the practice were included to allow separate identification of the effect of being a fundholder from other characteristics that might be associated with both fundholder status and referral behaviour. These included median age of the GPs in the practice and the list size per GP[10]. Three fundholder dummy indicators were constructed for each practice: the first indicating whether the practice was ever a fundholder, the second the financial year in which the practice became fundholding and the third the year indicating the financial year immediately prior to the practice became fundholding. Finally, we allow for differences in the levels of admissions across time, speciality and area. The means of these variables are presented in Table 3 and further details of their construction are provided in the Appendix.

Pooled estimates

We begin by estimating the number of referrals by practice i in year t pooling across specialities:

$$(2) \qquad r^{j}_{ist} = \beta_1 + \beta_2 Z_{it} + \beta_3 X_{it} + \beta_4 F_{it} + \beta_5 S + \beta_6 T + \beta_7 A + \varepsilon_{ist}$$

where r^{j}_{ist} is the (log of) the number of referrals by practice i in speciality s and year t, j indexes whether the referral is emergency or non-emergency, Z_{it} is a vector of population characteristics including the ratio of men to women and level of deprivation of the practice population, X_{it} is a vector of GP characteristics, F_{it} a vector of fundholding status dummies which identify whether a practice was ever a fundholder, the year before the practice became a fundholder and the year in which the practice was first a fundholder. S, T, and A are speciality, time, and area dummies respectively and ε_{ist} is white noise error.

[9] Other commonly used measures of practice population need for health care are the Standardised Mortality and Morbidity rates of the practice area and its age distribution. However as these measures are strongly correlated with the Jarman scores they were not used as covariates in the final regressions.

[10] A number of insignificant variables with no theoretical association with referrals were dropped, including dummy indicators of dates when the number of GPs in the practice rose or fell and ratio of male to female partners.

We estimate (2) using OLS with robust standard errors to allow for heteroscedasticity and robust regression where large outliers from the OLS regression are given less weight (also allowing for heteroscedasticity)[11]. We report only robust estimates[12]. To examine whether fundholders are shifting to emergency from non-emergency admissions after becoming fundholders we also estimate the ratio of emergency to total admissions using the same estimators.

The results for the level of admissions of each type are in Table 4. The estimates in column (1) are for emergency admissions, those in columns (2) - (4) are for non-emergency admissions. Column (2) is all non-emergencies. Column (3) examines the subset of specialities in which we would *a priori* expect GPFHs to have most effect in altering timing and location of treatment, since the proportion of both non-emergency admissions and admissions paid for by fundholders vary across specialities. We would expect to find the greatest impact of fundholder incentives in the five specialities in which elective care is important and fundholder procedures make up a higher proportion of activity. These specialities are Ear Nose and Throat (ENT), Gynaecology, General Surgery, Ophthalmology and Orthopaedics. Column (4) repeats Column (2), but constrains the effect of GP characteristics to be zero. Column (5) is the ratio of emergency to total admissions.

Table 4 shows that practice population and GP characteristics affect admissions in addition to the year and speciality shown in Table A2. The sex distribution of the practice population is not significantly associated with admissions, though practices with higher ratios of male to female patients have lower levels of non-emergency referrals, consistent with the fact that women have greater contact with health service providers (e.g. Social Trends 1995). Deprivation is positively associated with the level of both emergency and non-emergency admissions. Distance to medical facilities is negatively associated with non-emergency referrals. Neither list size per GP nor the median age of GPs within the practice is consistently associated with emergency admissions, but both are negatively associated with non-emergency admissions.

Fundholder status *per se* (practices that were fundholders or were in their preparatory year at some point in the 4 year window) is not associated with either emergency or non-emergency admissions across all specialities. But for the subset of specialities in which we expect fundholders to alter their behaviour (column 3), being a fundholder is associated with lower admissions[13]. But the timing of fundholder status is associated with admissions. Column (1) shows that emergency admissions fall the year the practice became a fundholder. The

[11] All estimates were undertaken using STATA version 5. The robust estimator is the rreg command, and the OLS allowing for heteroscedasticity is the newey command. The observations which were given less weight in the robust regression were predominantly those from specialities where the level of admissions was very small (paediatrics for non-emergency, and orthopaedics and oral surgery for emergency admissions). Observations from three (of the 59) practices were weighted less more frequently than from other practices. One of these practices is known to have unusually low referral (and prescribing) rates; the other two are located in the lower part of Fenland and have high referrals to hospitals outside the area througout the period.

[12] OLS results are available from the authors.

next two columns show the timing of fundholder status has the hypothesised association with non-emergency admissions. Column (2) indicates there is a statistically significant rise in non-emergency admissions in the preparatory year and a statistically significant fall in the year of becoming a fundholder. The rise in the preparatory year is of a similar magnitude to the fall in the year immediately after. Column (3) indicates that the pattern of a rise followed by a fall is clear in the speciality subset where we would expect GPFHs to have greatest ability to alter behaviour: in other words, the rise and fall appear where we would expect behavioural change.

The analysis of the ratio of emergency to total admissions (Column 5) shows the net effect of the fundholding timing on changes in non-emergency and emergency admissions. There is a significant fall in the ratio of emergency to total admissions the year before practices become a fundholder. This indicates that not only do practices raise their non-emergency admissions the year before they become fundholders, but they raise them as a share of all admissions from their practice. There is also a rise in the share of emergency admissions after becoming fundholders, though this is not statistically significant.

These results are from data aggregated across specialities, and we ignore the fact we have data for each practice over 4 years. We can go below aggregate level to speciality level and can explore the impact of timing of becoming a fundholder relative to an individual GP mean, and report the results of such analyses below. But first we need to address the possibility that fundholder status might be endogenous. As outlined above, fundholder status was voluntary, and it is possible (and plausible) that early entrants to the scheme might be those who were best able to extract rent from the scheme. If this was the case we might expect the estimates on fundholder status to be upwardly biased. This might also bias the fundholder timing variables (the focus of this paper) since timing is, by definition, relative to the date at which a practice became a fundholder.

We examine possible bias in two ways. First, in column (4) of table 4 we report estimates without those controls which may be associated with fundholder status. The results indicate that the estimates on the timing of fundholder status are robust to exclusion of these controls: the coefficients on preparatory and first year of fundholder status change little. Second, we estimate admissions for fundholders only, controlling for possible endogeneity of fundholder status by standard Heckman 2SLS methods. Identification in the Heckman model other than by functional form requires that there are some variables which affect the probability of becoming a fundholder, but which do not affect the level of admissions conditional on being a fundholder. With the data available, one candidate for exclusion from the determinants of the level of admissions is age of the GPs in the practice. This may well determine the desire of the practice to take on more management, and as the capital value of practices is realised on retirement, will affect the value of gains from becoming a fundholder, but should not affect the level of admissions. We therefore estimate the probability of becoming a fundholder as a

[13] As discussed below, the last group of fundholders differs from those in earlier waves. It has higher admissions, controlling for other variables in Table 4.

function of all practice characteristics, excluding calendar year and speciality, and admissions as a function of practice characteristics other than average age of the GP, allowing for year and speciality effects[14].

The results in Table 5 indicate the coefficient estimates in the probit equation are well defined, but the impact of inclusion of the IMR from the probit equation in the admissions equation is negligible (as expected given the IMR is insignificant). Comparison with estimates of the level of admissions for fundholders with no correction for endogeneity of fundholder status (column 3) shows the correction for self-selection has no impact on the estimated impact of the two timing variables. It does, unsurprisingly, affect the estimates on characteristics of the practice, but these are not the focus of our analysis: they are controls for variation in the characteristics of GP practice, which may affect the level of referrals.

To further explore the issue we re-estimated the model in Column (2) of Table 5, allowing for interactions between year of becoming a fundholder with being a fundholder, and for interactions between area and timing of fundholder status. No interactions were significant, and the estimates on preparatory year and year of becoming a fundholder remained positive and negative respectively. However, there is some indication that the last group of fundholders in our data set (those who were in their preparatory year in 1996/7) are different to other fundholders. All other fundholders on average, controlling for the variables in Table 4, have lower levels of referrals than the final group. This confirms that the patterns in the raw data in Figure 1 are robust to the controls used here (results available from authors).

Estimates by speciality allowing for fixed effects

Equation (2) aggregates across specialities and treats each of the 4 observations for each GP as a separate observation. To allow for a richer error structure and differential behaviour across specialities, we can estimate fixed effects regressions i.e. allow for an individual GP effect which is time invariant plus a random white noise term, and estimate this fixed effects regression for each speciality. Any variable which is fixed within a practice (including the 'ever a fundholder' dummy) forms part of the GP specific mean, so given our data we estimate only year and fundholder timing effects. Table 6 presents fixed effects regression results for each of the 9 specialities for non-emergency admissions. The 9 specialities are grouped into those in which we expect behavioural change and those where we expect less. Table 7 presents fixed effects regression results for emergency admissions, where we expect less change in either group of specialities. Both tables report only the impact of the timing coefficients.

The results presented in Table 6 show significant timing effects in non-emergency admissions in those specialities where GPFHs have ability and incentives to alter behaviour. In Gynaecology, Opthalmology and Orthopaedics there is a significant rise in admissions in the year before becoming a fundholder. In Surgery

[14] The results are robust to several different specifications of the two equations.

there is a significant fall in the year of becoming a fundholder. In the four specialities in which GPs have less ability and fewer incentives to alter behaviour (the right hand panel) there is a timing effect in only one speciality. This is a fall in admissions in the year of becoming a fundholder, which may reflect changes in behaviour in this non-surgical speciality (Integrated Medicine) if GPFH's are substituting non-hospital based treatment for hospital treatment. In Paediatrics and Oral Surgery where there are few fundholding procedures, there is no association between either fundholding or the timing of fundholding and non-emergency admissions. Table 7 shows less evidence of change associated with fundholder timing in the level of emergency admissions. There is some association between the timing of fundholding and emergency admissions in those specialities where fundholding is important and where fundholders could affect admissions: a singificant fall in General Surgical emergency admissions in the year before and the year of becoming a fundholder, a significant increase in the year of becoming a fundholder in emergency admissions to Orthopaedics. But there are no significant changes in the specialities where GPFHs are less likely to be able to change admissions. These disaggregated analyses therefore confirm the patterns in the aggregate data: the changes are in non-emergency admissions, occur in those specialities where ex ante behaviour would be predicted to be changeable, and are robust to differences across individual GPs.

4. DISCUSSION

In this paper we have examined the impact of the GP Fundholding scheme on the behaviour of fundholders. We argue that the way the scheme was implemented gave fundholders a financial incentive to increase non-emergency referrals to hospital in the year prior to which they became fundholders, and to lower them or to substitute emergency for non-emergency admissions thereafter. We use a data set containing all admissions by 59 GPs over a four year period and focus on admission to the two main hospitals used by these GPs. The size and panel structure of the data enables us to control for observed and unobserved difference between practices which became fundholders and those that did not, and allows us to identify the association between the timing of fundholder status and admissions behaviour. In line with the literature, we have focused on the effect of the fundholding incentive structure on GP behaviour, not on the factors affecting whether GPs joined the fundholding scheme.

We find that fundholders do appear to respond to financial incentives. They have a rise in elective admissions prior to becoming a fundholder, and a fall in elective admissions immediately on assuming fundholding status but there is little evidence that they substitute free emergency for elective hospital treatment. So fundholders raise those admissions over which they have most control and which determine their budgets in the year before they becoming fundholders and lower them immediately afterwards. These results are robust to controlling for possible endogeneity of fundholding. Holding constant for practice effects that may affect the level of admissions, there is not a clear difference in the behaviour of fundholders and other GPs on average[15]. Our

[15] Early fundholders (those who became fundholders before wave 6) have lower rates of admission for both emergency and non-emergency treatment than other GPs. Later fundholders have higher rates. This result fits

clear findings are in contrast to the rather confused picture that has emerged to date from case studies and studies unable to control for factors over and above fundholding which may affect GP referral behaviour.

Our statistical analysis examines referrals to the two hospitals within the health authority. The fall in referrals in the fundholding year might be the result of fundholders switching away from the two local hospitals to others outside the district. While fundholders do have a slightly lower referral rate to local hospitals over the four year window (83.7% of all referrals by fundholders were to local hospitals, compared to 84.4 % of referrals by non-fundholders) there is no evidence that the drop in referrals in the year of becoming a fundholder is accompanied by an increase referrals to other hospitals. On the contrary, both local and distant NHS hospital referrals fall in the year practices become fundholders and the likelihood of being referred to a local hospital actually rises.

Our results are from the analysis of data from one district health authority out of about 100 in the UK. This health authority is fairly typical and we observe a large number of GPs and their behaviour over four years. Our finding that hospital admissions increase in the preparatory year is consistent with studies that have found that prescribing may be inflated in the year prior to fundholding and that prescribing patterns change once the practice holds a budget. Our results are generalisable to all fundholders to the extent that fundholders in other health authorities had their budgets based on preparatory year activity.

Our results show clearly that fundholders have responded to financial incentives. But in terms of welfare does this matter? In the absence of detailed outcome data we cannot establish welfare outcomes, but we can speculate as to what might be the impact of the changes in behaviour for patients and for doctors. First, the size of the increase in elective admissions in the preparatory year is very similar to the fall in the year after. This suggests that the increase in referrals in the preparatory year represents a bringing forward of cases who would have otherwise had to wait for treatment. Waiting is one of the main ways in which UK health care is rationed and waiting for treatment has a welfare cost for patients (Propper 1996). So the increase in admissions is beneficial to fundholders' patients. This is a once-off gain to this group. Second, the rise in preparatory year referrals means that fundholders' budgets are inflated upwards for the whole of the period that they are fundholders[16]. Since fundholders' budgets are deducted from the total allocation given to the health authority, larger budgets for fundholders means fewer funds available for non-fundholders. As the rise in referrals in the preparatory year is not negligible (it is in the order of 10%), this represents a real shift of resources away from non-fundholding practices to fundholding practices.

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with earlier studies that have examined only early wave fundholders and found they are different. It also illustrates the issue of selection and the problem of inference from studies of early scheme joiners: as the scheme expanded the later entrants were more like the 'average GP'.

[16] Although the scheme has now been disbanded (from 1999 onwards) following a change of colour of government in the UK, the scheme was introduced as a permanent change. It ran for 8 years, and so for early groups of fundholders, the period of fundholding was several years.

Third, we observe a decline in admissions in the year of becoming a fundholder which means that fundholder patients get less hospital treatment in that year. But this does not necessarily mean fundholders' patients are getting poorer health care. As the rise in referrals the year before is very similar in magnitude to the fall in the first year, it may simply be the case that fundholders brought forward those cases they could, and so had a lower stock of electives to deal with in the first year of being a fundholder. More generally, decreases in hospital admissions are not necessarily welfare decreasing. GPFHs may be substituting treatment in their surgeries for hospital treatment (as suggested by Corney 1994). Or they may be substituting treatment in the private sector for NHS treatment. Provided neither substituted type of treatment is of lower quality than what was given before, fundholder patients have not experienced a welfare loss, and may experience a gain. The withdrawal of fundholders' business from NHS hospitals may have beneficial effects for all patients, including non-fundholders', if it forces the hospitals to become more efficient. Conversely, it may lead to a superior service for fundholders' patients compared with non-fundholders' if the hospitals try to attract back the more mobile fundholder business. There is some evidence of this. Dowling (1997) found that in one area fundholders' patients had shorter waiting times than those of non-fundholders after the practices became fundholding, but did not control for any variables other than fundholding status, or examine if there were 'spill-over effects' to non-fundholder patients at a later date.

Finally, fundholders might simply be retaining the financial surplus resulting from a higher budget and lower admissions for their own gain. In this case the only gain to patients is the once-off increase in admissions, and there has been a transfer from patients and non-funding doctors to fundholder GPs. But it is not possible to examine these issues simply by looking at referrals. Greater information on the production of health care by GP fundholders is needed, and on outputs of health care. Extending the present work to examine such issues remains for future analysis.

In summary, our analysis shows that GPs have responded to the financial incentives in the fundholding scheme. To some extent this may not be a problem: the scheme was designed to alter incentives in order to improve the efficiency with which health care is delivered. We cannot deduce from the fall in admissions to NHS hospitals after a GP practice becomes a fundholder that patient treatment is worse. However, the scheme clearly has had unintended equity consequences. These are not in accord with the popular view - that fundholder patients get more hospital treatment - but that fundholding GPs have been able to increase their budgets for hospital care by bringing referrals forward. The cash constraints on the NHS means that this leaves less money for the hospital care of patients not in fundholder practices. Whether it also means there was better care available for patients in fundholder practices depends on how exactly fundholders used their additional funds.

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APPENDIX

Table A1. Admissions in the NWA CMDS data set

	Number of records
All records (all Finished Consultant Episodes)	349,887
All admissions (First episode Finished Consultant Episodes)	323,955
All admissions April 1 1993 - March 31 1997	322,826
Admissions with Registered GP defined	303,218
Admissions to PH and KL	263,001
Admissions to PH and KL by NWA GPs	257,174
Admissions to hospitals other than PH and KL by NWA GPs	38,135
Admissions to PH and KL by non-NWA GPs, for NWA residents	5,827
Admissions of NWA residents to hospitals other than PH and KL by non-NWA GPs	2,082

The characteristics of NWA

The district covers about 1200 square miles, and includes three urban centres, Peterborough, King's Lynn, and Wisbech, as well as a number of small towns and substantial rural area. Population characteristics also vary considerably within the district. Using the Jarman index as a measure of deprivation, some electoral wards appear very deprived: seven wards fall within the 10% most deprived electoral wards in England using the Jarman index, contributing to NWA's position as the least affluent area in the Anglia and Oxford Region. Comparing conditions in the four areas wards in central Peterborough are very deprived, and the Peterborough area overall is significantly more deprived than the other three areas. Housing conditions are also worse in Peterborough than in the other areas: a survey undertaken by local authorities in NWA found that 20% of all private sector dwellings in Peterborough were "unfit", compared with 13% in Breckland (which covers the Swaffham area) and 4% in Fenland and King's Lynn & West Norfolk. One of the legacies of Peterborough's status as a "new town" is a relatively high number of older people living alone, isolated from community support networks, a factor that has been linked with rising emergency admissions in other areas.

The definition and construction of the variables

The NHS financial year runs for the twelve months from 1 April. Admissions are recorded in the Contract Minimum Dataset (CMDS) only after a patient has been discharged: this means that, in any one financial year, there will be records for patients admitted before its start but discharged during that year, and patients admitted but not recorded as discharged will not be included. We controlled for this by excluding from the dataset patients discharged after 1 April 1993 but admitted before that date, and by including records for patients who were discharged after 31 March 1997 but admitted earlier.

Data in the CMDS is recorded by episodes (called Finished Consultant Episodes), and any one admission might have associated with it a number of different episodes, as a patient is passed between different hospital consultants. We used only the records associated with first episodes to focus on admissions.

Independent variables.

The information used to construct the variables was derived from the CMDS, the census, and from other information held at the health authority. Median GP age was constructed using the GP's date of birth. The number of GPs in each practice is derived from a daily count at each practice. Distance is calculated using the logarithm of the distance (in kilometres) from the GP surgery to the nearest district general hospital, calculated as straight-line from ordnance survey grid references (derived from practice postcodes).

Dependent Variables

Analyses in levels use the log of the number of (emergency or non-emergency) admissions per practice, financial year, speciality, hospital and admission method. Observations of zero counts were created where there were no admissions. This was divided by list size where list size is the smallest of the 4 quarterly list sizes for the year in question. Where analyses of the ratio of emergency to total admissions is analysed the dependent variable is the ratio of admissions (emergency or non-emergency depending on value of admission method) to total admissions for that practice-year-speciality combination.

Table A2: Emergency and Non-Emergency Admissions

	Emergency Admissions Robust Regression	Non-Emergency Admissions Robust Regression
Constant	-9.517 (0.099)	-9.400 (0.108)
1994/95	0.034 (0.059)	0.083 (0.691)
1995/96	-0.025 (0.059)	0.088 (0.691)
1996/97	-0.005 (0.059)	0.113 (0.699)
2nd Qtr	0.036 (0.059)	-0.003 (0.069)
3rd Qtr	0.030 (0.059)	0.019 (0.070)
4th Qtr	0.001 (0.059)	0.040 (0.070)
Peterborough Hospital	0.260 (0.042)	0.678 (0.049)
Specialties		
ENT	-2.033 (0.101)	-0.888 (0.116)
Gynaecology	-0.966 (0.109)	-0.416 (0.116)
Integrated Medicine	0.585 (0.124)	-0.873 (0.118)
Obstetrics	-3.337 (0.090)	-0.402 (0.122)
Ophthalmology	-3.006 (0.093)	-1.133 (0.115)
Oral Surgery	-3.219 (0.091)	-0.776 (0.114)
Orthopaedics	-0.542 (0.111)	-0.437 (0.113)
Other Specialties	-1.764 (0.105)	-0.022 (0.123)
Paediatrics	-0.338 (0.116)	-2.401 (0.106)
GP effects	Yes (significant)	Yes (significant)
R^2 N	0.190 18560	0.057 18560

Standard errors in parentheses

Table 1. Number of Fundholders, 1993/4 to 1996/7

	1993/94	1994/95	1995/96	1996/97
Total number of fundholders	12 (20.34%)	14 (23.73%)	17 (28.81%)	25 (42.37%)
Number becoming fundholders in year	8 (13.56%)	2 (3.39%)	3 (5.08%)	8 (13.56%)
Number of fundholders in their preparatory year	2 (3.39%)	3 (5.08%)	8 (13.56%)	5 (8.47%)

Table 2. Characteristics of Fundholding and Non-fundholding practices

	Fundholders (n=30)	Non-fundholders (n=29)
Variable	Mean (se)	Mean (se)
List Size per GP	1865 (370)	1662 (383)
Median age of GP	45.5 (6.2)	43.1 (5.3)
Distance to nearest hospital (King's Lynn or Peterborough)	9.4 (9.2)	16.8 (11.1)
Deprivation (Jarman) score for practice	17.7 (14.8)	7.76 (18.3)
Ratio of male patients to all patients	.49 (.02)	.49 (0.2)

Table 3. Means of regressors

Variable	Mean	Std. Dev	Min	Max
List Size	6714.00	4475.43	1127.75	17823.75
Number of GPs	3.71	2.34	0.75	10.00
List Size / # GPs	1846.34	418.92	793.23	2769.13
Distance to nearest hospital (King's Lynn or Peterborough)	10.77	9.66	0.10	31.20
Deprivation(Jarman) score for practice	12.89	17.21	-17.75	62.59
Ratio of male patients to all patients	0.50	0.02	0.45	0.56

Table 4. Estimates pooled across specialties: Robust regressions

Dependent variable	(1) Emergency Admissions/List Size	(2) Non-Emergency Admissions/List Size	(3) Non-emergency elective subset Admissions/List Size	(4) Non-Emergency Admissions/List Size	(5) Emergency / total Admissions
Fundholder at some point	0.026	0.017	-0.058*	0.038	0.002
	(0.028)	(0.025)	(0.028)	(0.024)	(0.004)
Fundholder in preparatory year	-0.044	0.113**	0.147**	0.125**	-0.014*
	(0.047)	(0.041)	(0.044)	(0.041)	(0.007)
Became a Fundholder this year	-0.109*	-0.143**	-0.109*	-0.134**	0.008
	(0.044)	(0.038)	(0.044)	(0.039)	(0.006)
List size*100 per GP	-0.001	-0.006*	-0.007**	-	0.001*
	(0.003)	(0.002)	(0.003)		(0.0005)
Median GP age	-0.003	-0.007**	-0.006*	-	0.0004
	(0.003)	(0.002)	(0.003)		(0.0004)
Log Distance to nearest NWA hospital (KL or PHT)	0.001	-0.039**	-0.048**	-	0.004
	(0.015)	(0.013)	(0.015)		(0.002)
Deprivation (Jarman) score of practice	0.012**	0.005**	0.003*	-	0.001**
	(0.001)	(0.001)	(0.001)		(0.0004)
Ratio of male patients to total	0.276	-0.540	-0.038	-	0.055
	(0.813)	(0.704)	(0.813)		(0.112)
Area					
Fenland	-0.427**	-0.198**	-0.082	-0.221**	-0.029**
	(0.046)	(0.040)	(0.046)	(0.032)	(0.006)
Peterborough	-0.289**	-0.30**	-0.166**	-0.182**	0.01
	(0.039)	(0.034)	(0.039)	(0.033)	(0.005)
Swaffham	-0.149**	-0.101**	-0.046	-0.10**	0.002
	(0.045)	(0.039)	(0.045)	(0.037	(0.006)
Constant	-4.397**	-3.128**	-3.362**	-3.868**	-0.293**
	(0.373)	(0.323)	(0.327)	(0.041)	(0.052)
Year effects	Yes	Yes	Yes	Yes	Yes
Specialty effects	Yes	Yes	Yes	Yes	Yes
R^2	0.893	0.795	0.611	0.79	0.934
N	2070	2070	2070	2070	2070

Standard Errors in parentheses * p<0.05 ** p<0.01

Table 5. Heckman two step estimator

	Probit estimate of Ever a fundholder	Non-emergency admissions/List size with IMR term (fundholders only)	Non-emergency admissions/List size, no IMR term (fundholders only)
Fundholder in preparatory year	-	0.111** (0.04)	0.111** (0.04)
Became a Fundholder this year	-	-0.109** (0.038)	-0.109** (0.038)
List Size*100 per GP	0.004 (0.005)	-0.0039 (0.003)	-0.0039 (0.003)
Median GP age	0.067** (0.005)	-	-
Distance to nearest NWA hospital (KL or PHT)	-0.432** (0.027)	-0.005 (0.024)	0.0000 (0.018)
Deprivation(Jarman) score of practice	-0.004* (0.002)	0.008** (0.001)	0.008** (0.001)
Ratio of male patients to total	-15.533** (1.58)	-1.336 (0.91)	-1.17 (1.20)
IMR	-	-0.016 (0.0692)	-
Area effects	Yes	Yes	Yes
Specialty effects	No	Yes	Yes
Year effects	No	Yes	Yes
Constant	5.067** (0.707)	-3.077** (0.463)	-3.145** (0.52)
R^2		0.819	0.819
N	4140	1062	1062

Standard Errors in parentheses. *p<0.05 **p<0.01

Table 6. Non-Emergency Admissions by Specialty, Robust regression

	Elective specialties / Specialties with more GPFH procedures					Non-elective
	ENT	Gynaecology	Ophthal-mology	Orthopaedics	General Surgery	Integrated Medicine
Fundholder in preparatory year	0.077	0.123*	0.174*	0.292**	-0.037	-0.017
	(0.069)	(0.06)	(0.081)	(0.063)	(0.049)	(0.058)
Became a Fundholder this year	0.01	-0.01	0.138	0.076	-0.10*	-0.19**
	(0.080)	(0.056)	(0.075)	(0.058)	(0.045)	(0.054)
GP effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.734	0.87	0.902	0.77	0.83	0.94
N	230	230	230	230	230	230

Standard errors in parentheses *p<0.05 ** p<0.01

Table 7. Emergency Admissions by Specialty, Robust regression

	Elective specialties / Specialties with more GPFH procedures					Non-elective
	ENT	Gynaecology	Ophthal-mology	Orthopaedics	General Surgery	Integrated Medicine
Fundholder in preparatory year	-0.04	0.07	-0.149	-0.057	-0.017*	-0.046
	(0.142)	(0.094)	(0.166)	(0.062)	(0.054)	(0.04)
Became a Fundholder this year	-0.07	0.17	-0.187	0.118*	-0.105*	-0.43
	(0.132)	(0.09)	(0.154)	(0.057)	(0.051)	(0.037)
GP effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.90	0.87	0.93	0.87	0.82	0.88
N	230	230	230	230	230	230

Standard errors in parentheses *p<0.05 ** p<0.01

Figure 1 Non-emergency admissions to KL and PH, by fundholding wave ar

(no shading indicates year before becoming a fundholder; dark shading indicates year of