DRAFT: DO NOT QUOTE WITHOUT AUTHORS' PERMISSION

Trends in Health Care Commissioning in the NHS: an Empirical Analysis

Mark Dusheiko* Maria Goddard Hugh Gravelle* Rowena Jacobs****

* National Primary Care Research and Development Centre, Centre for Health Economics, University of York; emails: mad105@york.ac.uk; hg8@york.ac.uk.
** Centre for Health Economics, University of York; emails: rj3@york.ac.uk; mg23@york.ac.uk.
NPCRDC and CHE receive funding from the Department of Health. The views expressed are not necessarily those of the DH.

Abstract
We use Hospital Episodes Statistics (HES) data from 1997/98 to 2002/03 for elective admissions to track commissioning patterns of three types of commissioner (Health Authorities, Primary Care Organisations and GP practices). We differentiate between fundholder and non-fundholder GP practices, and also analyse separately the 15 HRGs covered by the national tariff used in commissioning agreements for 2003/04. We report the extent to which different types of purchasers make use of a range of alternative providers and whether this changes over time. We calculate the frequency and magnitude of "switching" between providers and the share of admissions with their main provider, highlighting trends over time. Herfindahl concentration indices are presented. We find that holding a budget led fundholders were to be more active commissioners than non-fundholders and that there has been a trend to more concentrated commissioning at all levels.

1. Introduction

In principle, purchasers armed with information about health care needs can shape the market by channelling business only to those providers responsive to their demands. The ability of purchasers to do this effectively is governed by many factors, including the availability of alternative providers. Health care delivery is characterised generally by a substantial degree of geographical monopoly and in publicly funded systems. Research in the UK and elsewhere has focused on measuring market concentration and the scope for competition amongst providers (Dranove & Lindrooth,2003; Appleby et al 1994; Propper 1996; Damiani et al, 2004). However, even where the potential for competition exists, the role of the purchaser is vital because unless they use their leverage, there will be little incentive for providers to respond.

The aim of this paper is to examine the choice of acute provider made by a variety of purchasing organisations in the NHS over a 6 year period to 2002/3. We measure the extent to which purchasers make use of alternative providers; the frequency and magnitude of switching between providers; the share of admissions with their main provider; and measures of concentration, highlighting trends over time. The analysis offers some insights into the impact of alternative purchasing arrangements and provides a baseline for analysing the impact of new policy developments which are intended to alter commissioning patterns from 2003/4 onwards. The work is exploratory and will form the basis for more detailed modelling of purchaser-provider

relationships in future. The next section describes the policy background covering the period of our analysis and recent policy initiatives which are intended to have a fundamental effect on the role and market power of purchasers and providers.

2. Policy Background

2.1. Purchaser/provider relationships

The purchasing role in the NHS has shifted from Health Authorities and GP fundholders to Primary Care Groups, to Primary Care Trusts and most recently back to the GP practice level. In the early days of the English internal market reforms in the early 1990ies, considerable emphasis was placed on shifting the balance of power away from providers towards purchasers (HAs and GP fundholders). Purchasing was seen as the "engine driving the reforms", the contracting process was a means of encouraging provider competition and responsiveness, and purchasers were told: " if a provider does not deliver satisfactory value for money …. consider moving your health care business elsewhere" (NHS Executive 1993). Purchasers were expected to force the pace of change in health care, moving away from services based on historical patterns, service inputs and institutions. However, early evidence suggested that patterns of contracting remaining largely unchanged aside from small shifts of marginal activity in geographical areas where some choice of provider existed for a handful of procedures (Appleby 1994; Bennett and Ferlie 1996; Flynn 1997; Goddard et al, 1997). There were concerns about how much leverage purchasers could have when faced with powerful providers defending historical patterns of service provision (Dawson, 1995). A period of merger activity amongst hospitals created many large providers with powerful vested interests of clinicians who could be unresponsive to demands of purchasers.

GP choice of provider remained influenced by personal knowledge of providers, professional experience and the desire to retain historical relationships (Mahon et al 1994; Baines and Whynes 1996). Studies of referral patterns reported limited evidence of GPs making substantial shifts or switching referrals to out of area providers (French et al 1990; Kennedy & McConnell, 1993; Coulter and Bradlow 1993). Although GP fundholders were initially responsible for commissioning only a limited set of procedures, they were expected to be active purchasers seeking out alternative providers offering higher quality or lower prices. There is some evidence to support this view, especially in terms of the willingness of fundholders to switch contracts in response to variations in waiting times (Glennerster et al 1994; Propper 1996; Propper, Croxson, Shearer, 2002; Strong and Harmer Lloyd, 1997). There is also evidence to suggests that providers were more responsive to GP fundholders than to HAs (Mays et al 2000). However, other studies have suggested that inertia and a reluctance to move away from historical patterns left the overall situation unchanged, especially in some specialist services (Toth et al, 1997; Surender et al 1995; Wright, 1994; Audit Commission, 1996; Fotaki, 1999; Farmer & Chesson, 1998).

With the election of the Labour government in 1997 the policy rhetoric shifted away from a business-orientated focus and towards the establishment of mature relationships and the establishment of trust. The new Labour government wished to foster long-term collaborative arrangements and reduce transaction costs and therefore emphasised longer-term agreements of three to five years and a focus on

"commissioning" rather than purchasing. Commissioning was intended to be strategic and based on the patient experience, rather than on the purchase of individual elements of the service. The development of PCGs and PCTs shifted responsibility for commissioning firmly to primary care and these organisations now spend a large majority of the healthcare budget. Whilst the emphasis is still on developing long-term co-operative relationships with providers, the introduction of patient choice and the new financial mechanisms is seen as an opportunity for PCOs to "look at new models for service delivery rather than committing resources on a historical basis to traditional providers through block agreements" (Department of Health, 2002). However, research suggests that less than a quarter of PCOs feel they have effective leverage over providers of hospital care, with smaller PCOs believing they have less leverage than larger ones (Dowling et al, 2002). There appeared to be very limited switching of contracts in the early days of primary care based commissioning, even where choice of provider existed (Dowling et al, 2002; Dowling & Wilkin, 2003).

2.2. Recent policy initiatives

Recent policy initiatives have been designed to strengthen the role of Primary Care Organisations (PCOs) as purchasers of health care services. First, a prospective payment regime is being introduced so that payments to providers follow the patients they treat (Department of Health, 2002a). Second, by April 2006 patients must be offered a choice of location for their first out-patient appointment at the time of referral by their GP (Department of Health 2002, 2003). The development is not unique to the English health service. Experience in Europe and elsewhere has been well documented and used as evidence to justify the policy initiative. Patients may well value choice as an end in itself, but the expectation is that providers will become more responsive to patients: those that continually fall short of the requirements of patients and purchasers will lose income and eventually fail, whilst more responsive providers will flourish. Third diversity in the supply of health care will be encouraged by allowing entry of private and public providers such as the new independent diagnostic and treatment centres. Fourth, from April 2005, the reintroduction of practice led commissioning (a variant of fundholding) with practices holding budgets for commissioning secondary care aims to alter the nature of purchasing, with the hope that a greater variety of services will be purchased from a greater number of providers (Department of Health, 2004; page2). There are expectations that practice based commissioning will change the dynamic again, enabling practices to seek out the best providers, giving patients a wider choice of services provided in a variety of different settings (Lewis, 2004).

In principle, the position of purchasers will be strengthened and they will have the opportunity to actively shape the health care market. Although the specific policy focus is new, GPs (and also other commissioning agents such as health authorities) in the NHS have always had a degree of freedom when deciding where to refer patients or where to place contracts for the provision of care for their local population. Over the last 15 years, the extent to which NHS purchasers have been allowed, or encouraged, to deliberately shift contracts or referrals between providers has varied according to the political and organisational context.

Using a newly created data set, described in the next section, we present some of the features of the NHS elective admissions market over period just before the most recent set of initiatives. We thereby provide a baseline for assessing some of the effects of the recent initiatives. Since the period (1997/8 to 2002/3) covered by the data set also saw some major policy changes (the abolition of fundholding and the introduction of primary care commissioning organisations) our data may also show some of the effects of these changes.

3. Data and methods

3.1. Data sources

Data were collated from three main sources: Hospital Episodes Statistics for admissions, General Medical Statistics for practice characteristics and the database assembled for the AREA project (Sutton et al, 2002) for socio-economic characteristics and provider characteristics. Data sources are described more fully in Dusheiko et al (2004). Table 3 gives summary statistics for the set of variables included in the final models.

We use the admissions for elective hospital care to construct variables describing commissioning patterns. Gatekeeping general practices have always had discretion in their choice of provider, even when the budget for secondary care was held by the higher level commissioning organisations to which they belong. Thus it is of interest to construct measures of commissioning patterns at both practice level and at the more aggregated level of the organisations (HAs and PCTs) which held budgets and had formal responsibility for commissioning.

From Hospital Episodes Statistics (HES) data for the six-year period 1997/98 to 2002/03 we obtained first Finished Consultant Episodes (FCE)s for elective (non-emergency) admissions which finished in each year. Finished consultant episodes were assigned to the patient's registered general practice and the NHS provider code where the treatment took place. We included practices for which there was a valid GP practice code in 1997/98; new codes created subsequently were not included.

Practice-level variables were constructed to control for factors influencing GP purchasing decisions. These included practice-level mean waiting time data derived from HES. Data on practice populations were taken from the PCT database at the National Primary Care Research and Development Centre (NPCRDC). Demographic effects are allowed for by including the age and sex proportions of the practice population as explanatory variables in the models. The fundholding status for each practice was derived from lookup tables from the Prescription Pricing Authority and the Organisational Codes Service of the Department of Health. We had data on practice characteristics, based on the Department of Health's General Medical Statistics, from the NPCRDC website. We also had information on the socio-economic characteristics of the practice populations for 1999. We used data on supply factors including distance from practice populations to NHS Trusts, private hospitals, residential and nursing homes, numbers of beds and consultants at NHS Trusts.

To create the HA and PCT commissioning variables we aggregate the FCEs for practices within the HAs they belonged to in 1997/8 and the PCTs they belonged to in

2002/3. The measures we construct, for example the number of providers used by a commissioning organisation, are sensitive to the size of the higher level unit to which practice admissions are aggregated. We are mainly interested in describing trends over time and there were marked changes in the numbers of higher level units over this period because of mergers amongst HAs and more especially because of the change from Primary Care Groups to PCTs (491 to 304). Hence we use frozen higher level commissioners to construct the higher level measures. This provides a description of trends in commissioning patterns which is not affected by mergers in commissioners. Note that the levels of the HA level commissioning variables for 1997/8 and the PCT variables for 2002/3 will related to the actual higher level commissioners at those dates. Table 1 shows the descriptive statistics for the purchasing patterns of HAs and PCTs over the six-year period. Table 2 shows the descriptive statistics for the purchasing patterns of standard fundholders and non-fundholders over the six years for the 15 HRGs covered by the national tariff used in commissioning agreements for 2003/04.

3.2. Commissioning variables

We constructed five variables for every purchaser to describe their commissioning patterns:

$provnum_{it}$: the number of providers used by purchaser i in period t

$herfindl_{it}$: the Herfindahl index for purchaser i in period t: $herfindl_{it} = \sum_j (x_{ijt} / \sum_k x_{ikt})^2$

where x_{ijt} is the number of FCEs from commissioner i at provider j in period t.

$mainshare_{it}$: the share of admissions at the provider which took the most FCEs from commissioner *i* in period *t*: $mainshare_{it} = \max(x_j / \sum_k x_{ikt})$

$switchers_{(t+1)-t}$: the number of providers added or dropped from one period to the next which are not the result of a provider merger

$switchfcepop_{(t+1)-t}$: the number of FCEs per 1000 population at the providers who were added or dropped from one period to the next:

The first three variables are calculated over six years and the two switching variables are calculated over five periods.

3.3. Regression models

We estimated regression models to explain changes in the practice level commissioning variables. We are interested in whether the fact that fundholders held a budget led to changes in commissioning behaviour which was reflected in our commissioning variables, for example whether fundholders switched more frequently than non-fundholders. We use difference in difference (DID) methods comparing the change in fundholding practice commissioning before and after the abolition of fundholding in April 1999 with the change in commissioning by non-fundholding practices. In order to increase the precision of the tests for a fundholder effect we include a wide range of practice level covariates whose effects may also be of interest in their own right.

The selection of covariates was made taking into account variance inflation factors to test for multi-collinearity (Fox, 1997). We used STATA Version 8 to estimate a variety of panel data models: pooled OLS, fixed effects, random effects and

generalised estimation equation (GEE) models (Liang & Zeger, 1986). The estimated effects of the fundholding regime were qualitatively insensitive to the estimation method. We report only the results from the GEE models. Robust standard errors were employed throughout.

We include Health Authority dummy variables for 1997/98 to 1999/00, PCG dummy variables for 2000/00, PCG and PCT dummy variables for 2001/02 and PCT dummy variables for 2002/03 in all models to allow for unobserved effects from socio-economic factors, higher level purchasing policies, and variations in provider supply conditions across these purchasing areas. The results were not greatly affected by the use of these dummies.

We dropped practices whose 3-year moving average practice population size was ever less than 1000 patients. We also dropped observations where the rate of switching FCEs was greater than 200 per 1000 patients.

Since waiting times may be affected by the choice of provider but also affect the number of admissions and hence possibly our commissioning variables we ran models with and without the mean practice-level waiting time. The waiting variable made little difference to the results and we report results for reduced form models without waiting times.

Since the commissioning variables are jointly determined we also estimated seemingly unrelated regressions (SUR) models with all three purchasing dependent variables (number of providers used, Herfindahl index, share of admissions at main provider). Similarly, we ran SUR models for the two switching dependent variables (number of providers switched, rate of admissions switched). The correlation matrices of the residuals from the two SUR models showed correlations in the errors between share at main provider and Herfindahl, but not the number of providers used. The DIDs for the SUR models were similar to those from the separate panel data regressions. showed similar results to the regressions above.

We chose the functional forms for the equations by inspecting the distributions of the dependent variable using Box-Cox transformations of the dependent variable, and PE tests of the linear versus log linear models (Greene, 2000). Figure 1 shows the histograms for the dependent variables in levels in 2002/03. The three dependent variables (number of providers used, Herfindahl index, share of admissions at main provider) all appear approximately normal and were estimated in levels as a result of the PE tests. The number of switchers was also estimated in levels. The distribution of the rate of admissions switched was highly right skewed and was run as a log-linear model.

4. Results

4.1. Higher level commissioning trends

Table 2 reports descriptive statistics for frozen 1997 health authority and frozen 2002 PCT organisation codes from 1997/98 to 2002/03 for the commissioning variables. We expect the commissioning variables to be affected by whether admissions are aggregated to HA or to PCT level. Since the number of providers is held constant in a

year the fact that HAs had larger populations than PCTs suggests that in any given year the number of providers will larger, the share of main provider smaller, the Herfindahl smaller and the number of providers switched higher when calculated using frozen HAs than when using frozen PCTs. Trends in the commissioning variables are not affected by whether they are calculated from frozen HAs or frozen PCTs.

On average the number of providers used at frozen HA and PCT level increased over time. In 1997/98 HAs used on average 85.7 (confidence interval 81.9, 89.60) different providers. This had increased by 6% to 91 (87.8, 95.2) by 2002/03, although the increase was not statistically significant at the 5% level. At frozen PCT level there was an increase of 11% in the average number of providers used from 54.3 (52.7, 55.8) to 60.2 (58.6, 61.8) which was statistically significant at the 5% significance level.

The purchaser Herfindahl indices of provider concentration indicate that the use of providers has become more concentrated over time. For frozen HAs, the average Herfindahl index increased significantly from 0.35 (0.32, 0.39) in 1997/98 to 0.43 (0.39, 0.47) by 2002/03. This is equivalent to purchasers dividing their patients equally between 2.9 providers in 1997/8 and 2.3 in 2002/03. Likewise at the frozen PCT level the Herfindahl index increased significantly from 0.48 (0.45, 0.50) (or patients equally distributed across 2.1 providers) to 0.55 (52.5, 0.57) (or 1.8 providers) over the same time period.

The average proportion of a frozen HA's total number of first FCEs treated by their main provider in 1997/98 was 0.49 (0.46, 0.53). In 2002/03 this had risen significantly to 0.57 (0.54, 0.61), an increase of 16 %. For frozen PCT purchasers, the use of their main provider increased significantly by 10.3% between 1997/98 and 2002/03 from 0.63 (0.61, 0.65) to 0.69 (0.67, 0.71).

There does not appear to be any systematic trend over time in the number of new providers added and old providers dropped from year to year. For frozen HAs, the estimated number of providers either added or dropped between the years 1997/98 and 1998/99 was on average 54 and for PCTs, the number was 36.5.

4.2. Practice commissioning patterns: description for selected electives

Table 3 presents descriptive statistics for the commissioning variables calculated at individual practice level and differentiated between fundholding and non-fundholding practices. The variables are calculated using admissions for the 15 HRG groups for which the new prospective payment national tariff was introduced in 2003/4.

The time period covers the two years prior to the abolition of GP fundholding (1997/98 and 1998/99) and the four years post-fundholding. There is a significant difference in the number of providers used by fundholders and non-fundholders prior to the abolition of fundholding with fundholders using on average 4.4 (4.37, 4.50) providers compared to 3.6 (3.55, 3.64) by non-fundholders or a 22% difference. The number of providers used by both GP fundholders and non-fundholders increased between 1997/98 and 2002/03 (11% for fundholders and 12% for non-fundholders).

There was a significant difference in the concentration of patient admissions between GP fundholding and non-fundholding practices prior to the abolition of fundholding. Fundholding practices had a less concentrated pattern of admissions: their mean Herfindahl was 0.58 (0.57, 0.59) in 1997/98 compared to 0.61 (0.61, 0.62) for non-fundholders. Following the abolition of fundholding and introduction of PCO purchasing, the practice Herfindahl indices for fundholders and non-fundholders increased significantly (12% for fundholders and 8.2% for non-fundholders between 1997/98 and 2002/03). For fundholding practices this was equivalent to changing the number of equal sized providers from 1.7 in 1997/98 to 1.5 providers in 2002/03. By 2000/01 there was no significant difference in the Herfindahl indices between fundholder and non-fundholder practices.

Prior to the abolition of fundholding, the average proportion of GP fundholder patients sent to their main provider was 0.69 (0.69, 0.70), which was significantly less (2.8%) than non-fundholding practices 0.71 (0.71, 0.72). By 2000/01 fundholder practices had increased their share of patients to their main provider by 6.6% compared to an increase of 3.5% for non-fundholders.

Fundholders added or dropped 22% more providers than non-fundholders between the years 1997/98 and 1998/99. There was also an significant increase in the number of providers being added or dropped over time by fundholders (4%), but no significant change for non-fundholders.

Figure 1 plots the frequency distributions the practice level commissioning measures for 2002/03 for all elective first FCE. The number of providers used is positively skewed. The distribution of the share of admissions to the main provider suggests more dispersion at the lower end of the distribution.

4.3. Practice level commissioning: regression models

Table 4 reports estimates of the panel data models. The coefficients on the variables *Diff in diff 1999/00 - 2002/03* indicate the difference in differences estimates of the effect of the fundholding scheme compared to the baseline year 1998/98 when fundholding was still in effect. We report regression models for three dependent variable: the number of providers used (column 1), the proportion of first FCE patients admitted to a practice's main provider (column 2) and the practice Herfindahl index (column 3). Table 5 reports the estimates of the difference between fundholder and non-fundholder practices holding all other factors in the regressions in Table 4 constant. Figure 2 plots these changes.

The results for the effect of fundholding on the number of providers used by practices (column 1, Table 4 and Table 5) indicate that there was no significant effect of fundholding on the number of providers used by fundholders. Fundholders used significantly more providers than non-fundholding practices but that this difference was not affected by the abolition of fundholding.

There was a significant effect of the fundholding scheme on the concentration of practice admissions at providers as measured by the proportion of patients sent to a practice's main provider and the Herfindahl index. During the fundholding regime fundholders had a significantly smaller share of admissions at their main provider

Their Herfindahl was also smaller. Following the abolition of fundholding these differences disappeared. The effect of the fundholding regime on fundholders is 0.016 for use of main provider and 0.019 for the Herfindahl index. There is no significant difference between fundholder and non-fundholder main provider shares and practice Herfindahl indices in the post fundholding period 1999/00 – 2002/03 (see Figure 1).

We find no significant effect for the fundholding scheme on switching of providers. Fundholders added or dropped significantly more providers from one year to the next but there was no significant change in their switching relative to non-fundholders when fundholding was abolished.

Table 4 also gives the estimated effects of other practice and attributed patient characteristics on the use of alternative providers. Some of the effects, particularly the effects of distance, are intuitively plausible. We find that practices with larger practice lists and with more patients per GP use more providers in total, but practices with larger populations have a higher Herfindahl concentration index. Practices with a greater distance to their five nearest providers use fewer providers and send a higher proportion to their main provider. However, practices with better acute access scores and whose main provider has more consultants use fewer providers and have more concentrated admission patterns. GP practices further away from private hospitals use more NHS providers. Single handed GP practices and practices with a higher proportion of elderly GPs use fewer providers. Dispensing practices send a smaller proportion of their patients to a main provider and have smaller Herfindahl concentration indices. Practices in areas with more nursing home places send a higher proportion of their patients to their main provider. We find that practices with poorer educated patients use fewer providers, and have more concentrated admissions. Practices with a higher proportion of the population claiming incapacity benefit or severe disability allowance use more providers, but send more of their patients to their main provider. Practices in areas with more inward migration send patients to more providers and distribute their admissions across more providers. The higher the proportion of a practice's population claiming job seekers allowance, the fewer providers used by a practice. Practices with larger standardised illness ratios use fewer providers and admit a larger share of their patients to their main provider. Higher mortality amongst a practices' population is associated with the use of more providers, and practice populations with higher levels of unemployment are associated with less concentrated admission patterns.

5. Discussion and Conclusions

Our findings suggest that despite some major changes to the structure and processes of the purchasing arrangements over the past 6 years, there has been a remarkable degree of stability in the purchasing patterns for elective secondary care. Whilst the number of providers used by both HAs and PCTs has increased over time, the increase has been fairly modest and has been accompanied by a trend towards greater concentration of purchasing in their main provider and limited changes in switching behaviour.

The analysis of fundholder versus non fundholder practices produces results in line with previous evidence that suggests fundholders were more active purchasers, using a greater number of providers and having a less concentrated pattern of referrals.

However, following the abolition of fundholding, these differences became less pronounced and the behaviour of ex-fundholders converged with that of non fundholders.

The quality and effectiveness of the commissioning role cannot be assessed solely in terms of observed purchasing patterns. Although we might expect purchasers that are actively seeking out better value services and more appropriate care for their patients to use a wider range of providers or to switch between providers, this is not necessarily the case. Instead, purchasers may have been successful using "contestable collaboration" to strike better deals with their existing local providers rather than shifting their business elsewhere (Smith and Goodwin 2002). There may be good reasons for developing long-term relationships with local providers, especially if purchasers are using their professional expertise to assess the expertise of clinical services as they will always be more informed about those that are local to them. Relative stability may also reflect patient preferences if there is a general reluctance to travel to more distant providers and our results indeed suggest that practices further away from their 5 nearest acute providers use fewer providers than other practices and send a higher proportion of patients to their main provider. Whilst we might expect to see some shifts in future as the supply-side of the market alters and purchasers take advantage of new entrants to the healthcare market (eg treatment centres), it is also possible that new primary-care based services will be developed to provide effective substitutes for some types of secondary care. This suggests that the purchasing patterns we observe in secondary care may fail to capture the full impact of practice-led commissioning.

Most of the results relating to the influence of practice and patient characteristics on purchasing behaviour accord with our expectations, although some may be worthy of further discussion. For example, do practices with higher proportions of patients that are poorly educated, elderly, or in receipt of job seekers allowance, use fewer providers because their patients are less well informed about their choices and less demanding?

Whether or not anything substantial will change in secondary care as a result of the latest round of policy shifts related to expansion of choice and practice-led commissioning, remains to be seen. A recent review of the evidence of the impact of primary care-led commissioning concluded that there was little evidence to suggest it had made a significant impact on secondary care services (Health Foundation, 2004). However, evidence from the UK and elsewhere suggests that a whole range of factors will influence the success of alternative commissioning arrangements, including the degree to which there is control over the budgets, timely and accurate information, adequate management support and clinical ownership (Health Foundation, 2004). Our results will provide a baseline for evaluating the impact of new policies.

References

Appleby J, Smith P, Ranade W, Little V and Robinson R. Monitoring managed competition, in R Robinson and J Le Grand (eds), *Evaluating the NHS Reforms*. London: King's Fund Institute, 1994

Audit Commission. *What the Doctor Ordered: a study of GP fundholders in England and Wales*. London: HMSO, 1996

Coulter A and Bradlow J. Effect of NHS reforms on general practitioners' referral patterns. *British Medical Journal*, 1993; 306: 433-7

Damiani M., Dixon J. and Propper C. Mapping Choice in the NHS: Analysis of routine data. *CMPO Working Paper Series* No 04/095, March 2004

Dawson, D. Regulating competition in the NHS. *Centre for Health Economics Discussion Paper* 131, University of York. 1995

Department of Health, *Reforming NHS Financial Flows: Introducing payment by results*. Department of Health: London. 2002

Department of Health, *Delivering the NHS Plan: next steps on investment, next steps on reform*. Command Paper 5003. London: The Stationery Office, 2002a

Department of Health, *Choice of Hospitals: guidance for PCTs, NHS Trusts and SHAs in offering patients a choice of where they are treated*. Department of Health, 2003

Department of Health. *Practice based commissioning – engaging practices in commissioning*. Department of Health, October 2004.

Dowling, B. and Wilkin, D., Shifting the balance between secondary and primary care. In: Dowling, B. and Glendinning, C. (eds) *The New Primary Care: Modern, Dependable*, *Successful*? Open University Press: Maidenhead. 2003

Dowling, B., Coleman, A., Wilkin, D. and Shipman, C. (2002). Commissioning. In: Wilkin, D., Coleman, A., Dowling, B. and Smith, K. (eds) *The National Tracker Survey of Primary Care Groups and Trusts 2001/2002: Taking Responsibility?* University of Manchester: Manchester.

Dranove D, Lindrooth R Hospital consolidation and costs: another look at the evidence. *Journal of Health Economics* 2003; 22(6), 983-97.

Dusheiko, M., Gravelle, H. & Jacobs, R. The effect of practice budgets on patient waiting times: allowing for selection bias, *Health Economics*, 2004;13:941-58.

Farmer J and Chesson R. GP fundholding and purchasing: evidence-based decision making? *Health Bulletin* 1998; 56: 476-82

Fotaki M. The impact of market oriented reforms on choice and information: a case study of cataract surgery in outer London and Stockholm. *Social Science & Medicine* 1999; 48: 1415-32

Fox, J. *Applied Regression Analysis, Linear Models and Related Methods*. Sage: London. 1997

French JA, Stevenson CH, Eglinton J and Bailey JE. Effect of information about waiting lists on referral patters of general practitioners. *British Journal of General Practice* 1990; 40: 186-9

Glennerster H, Matsaganis M and Owens P. *Implementing GP fundholding: wild card or winning hand?* Buckingham: Open University Press, 1994

Goddard, M., Mannion, R. and Ferguson, B. Contracting in the UK NHS: Purpose, Process and Policy. *Centre for Health Economics Discussion Paper* 156, University of York. 1997

Greene, W. *Econometric Analysis*, Fourth Edition, Prentice Hall, New Jersey. 2000

Health Foundation. *A review of the effectiveness of primary care-led commissioning and its place in the NHS*. Health Foundation, September 2004.

Kennedy F and McConnell B. General practitioner referral patterns. *Journal of Public Health Medicine* 1993; 15: 83-7

Lewis R. *Practice-led commissioning. Harnessing the power of the primary care frontline*. Kings Fund, London. June 2004.

Liang, K. Y., Zeger S. L., Longitudinal data analysis using generalized linear models. *Biometrika* 1986,73,13-22.

Mahon A, Wilkin D and Whitehouse C. Choice of hospital for elective surgery referrals: GPs' and patients' views, in R Robinson and J Le Grand (eds), *Evaluating the NHS Reforms*. London: King's Fund Institute, 1994

Mays, N., Mulligan, J. and Goodwin, N. (2000). The British quasi-market in health care: a balance sheet of the evidence, *Journal of Health Services Research and Policy*, 5(1): 49-58.

Propper C, Croxson B and Shearer A. Waiting times for hospital admissions: the impact of GP fundholding. *Journal of Health Economics* 2002; 21: 227-52

Smith J, Goodwin N. Developing effective commissioning by primary acre trusts: lessons from research evidence. HMSC, Birmingham, 2002.

Strong C and Lloyd SH. An application of Keaveney's model of service switching behaviour to GP fundholders. *Public Money and Management* 1997; July-Sept 47-51

Surender R, Bradlow J, Coulter A, Doll H and Brown SS. Prospective study of trends in referral patterns in fundholding and non-fundholding practices in the Oxford region, 1990-4. *British Medical Journal* 1995; 31: 1205-08

Sutton, M., Gravelle, H., Morris, S., Leyland, A., Windmeijer, F., Dibbin, C., Muirhead, M. (2002) Allocation of Resources to English Areas: Individual and Small Area Determinants of Morbidity and Use of Health Care, Report to Department of Health. www.show.scot.nhs.uk/isd/isd_services/info_consult_AREAReport.htm

Toth B, Harvey IM and Peters TJ. Did the introduction of general practice fundholding change patterns of emergency admission to hospital? *Journal of Health Services Research and Policy* 1997; 2: 71-4

Wright J. Fundholding in General Practice: early experiences in one region, in S Harrison and N Freemantle (eds). *Working for patients: early research findings*. Leeds: Nuffield Institute for Health, 1994

Table 1: Descriptive statistics for GP practice level variables

Variable	Definition	Data Source	Obs	Mean	Std. Dev.	Min	Max
provnum	Number of providers used by GP practice	HES	55956	12.426	5.874	1	39
mainshare	Share of elective admissions at main provider	HES	55956	0.711	0.173	0.111	1
herfindl	Herfindahl concentration index	HES	55956	0.574	0.202	0.084	1
switchers	Number of providers switched (added and dropped) between years	HES	48558	7.654	4.375	0	41
switchfcepop	Rate of switching of FCEs per 1000 patients	HES	47134	10.643	24.863	0	199.206
stanfund	Standard GP fundholder	PPA	58284	0.377	0.485	0	1
migr10v1	Proportion migrants from outside LA	AREA project	52824	0.040	0.021	0.007	0.237
unem12v1	Unemployment rate	1991 census/AREA project	52824	0.102	0.050	0.017	0.394
scoreeduc	DETR index of education deprivation (ward level attributed to practices)	ID/AREA project	52824	0.268	0.757	-2.285	2.792
acc_acute2	Beds weighted distance to secondary care	OCS/AREA project	52824	0.0028	0.0008	0.0004	0.0055
acutbedsn5	Average beds at 5 nearest acute providers	OCS/AREA project	52824	504.788	134.486	173.789	997.256
acc_priv2	Beds weighted distance to private health care	OCS/AREA project	52824	0.0004	0.0002	0.0000	0.0011
acutdistn5	Average distance from GP practice to 5 nearest providers	OCS/AREA project	52824	24.727	10.824	11.757	109.095
privdistn5	Mean distance to nearest 5 private hospitals	OCS/AREA project	52824	22.697	9.843	10.313	98.989
privbedsn5	Accessibility to private beds	OCS/AREA project	52824	39.324	16.152	8.406	124.781
jsa_bip	Proportion eligible population claiming job seekers allowance	AREA project	52824	4.979	3.358	0.265	20.550
pcnotuni	Percentage of the population aged 17 not going to University	ID/AREA project	52824	85.134	6.662	44.814	98.327
r_ibsda	Incapacity/Severe disability allowance claimants	AREA project	52824	101.422	52.658	13.772	434.157
rsdadla	Proportion population with attendance allowance/Disability living allowance claims	AREA project	52824	94.732	38.307	21.283	300.460
sir75v	Standardised illness ratio (0-74)	1991 census/AREA project	52824	103.925	27.916	46.061	235.247

pr_lbw	Percentage of low birthweight babies	ID/AREA project	52824	7.540	1.478	2.421	12.973
pr_aadla	Proportion of population with attendance allowance/Disability living allowance claims	ID/AREA project	52824	5.431	2.066	1.237	16.614
pr_insda	Proportion population claiming incapacity benefit/sever disability allowance	ID/AREA project	52824	6.475	3.209	0.949	26.165
eldal6v2	Proportion population pensionable age living alone	1991 census/AREA project	52824	0.338	0.045	0.179	0.552
dep7v1	Proportion of single carer households	1991 census/AREA project	52824	0.202	0.051	0.082	0.393
ssrv	Standardised permanent sickness ratio	AREA project	52824	102.442	47.193	18.605	382.774
aa_ov60	Attendance allowance claimants aged over 60	ID/AREA project	52824	0.103	0.027	0.033	0.224
isc_ov60	Proportion of population over 60 years old claiming income support	ID/AREA project	52824	0.159	0.070	0.034	0.524
cmf74	Comparative mortality factor	ONS/AREA project	52824	105.067	23.132	55.404	213.648
smr74	Standardised permanent sickness ratio (0-74)	ONS/AREA project	52824	105.144	23.341	52.101	214.895
hospconsults	Mean number consultants at acute providers	OCS/AREA	52824	130.905	57.071	38.262	391.35
newplacerate	Residential places per person over 75	DoH/AREA project	52824	0.008	0.007	0	0.168
newethmin	Proportion population from ethnic minority	AREA project	52824	0.107	0.159	0	0.953
totpopma	Total practice listsize 3-yr moving average	GMS statistics (1998)	45843	5874.84	3671.49	1001.50	34218.33
listwtegpma	List size per wte GP 3-yr moving average	GMS statistics (1998)	45843	2064.81	507.42	541.60	9347.00
contragpsl	Proportion GPs providing contraceptive services	GMS statistics (1998)	45903	0.129	0.259	0	1
dispprac	Practice has dispensing status	GMS statistics (1998)	45620	0.149	0.356	0	1
gps61	Proportion of GPs over 60	GMS statistics (1998)	45970	0.075	0.227	0	1
deputgps	Proportion of GPs permitted to use deputy	GMS statistics (1998)	45970	0.759	0.399	0	1
ukgps	Proportion GPs qualified in UK	GMS statistics (1998)	45970	0.688	0.412	0	1
singlegp	Practice is single handed	GMS statistics (1998)	45919	0.277	0.447	0	1
outhourgps	Proportion of out of hours GPs	GMS statistics (1998)	45940	0.991	0.072	0	1
mmr2prac	Proportion of GPs doing MMR2	GMS statistics (1998)	45940	0.313	0.346	0	1
mnelecwait	Mean elective waiting time for GP practice	HES	47621	89.361	25.488	1	692

Table 2: Commissioning patterns 1997/8 – 2002/3

	Frozen 1997/8 Health Authorities n = 100				Frozen 2002/3 Primary Care Trusts n = 302			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
provnum1997	85.720	19.338	44	134	54.268	13.465	25	110
provnum1998	88.100	18.765	46	130	55.709	13.982	23	106
provnum1999	89.450	19.298	43	136	57.338	13.683	23	107
provnum2000	87.740	18.499	44	127	57.235	14.052	25	105
provnum2001	88.310	18.902	48	136	57.616	13.307	20	97
provnum2002	90.960	21.103	39	140	60.192	13.744	21	113
herfindl1997	0.354	0.168	0.143	0.845	0.475	0.193	0.111	0.935
herfindl1998	0.369	0.175	0.136	0.847	0.501	0.197	0.132	0.965
herfindl1999	0.378	0.184	0.119	0.848	0.510	0.190	0.122	0.896
herfindl2000	0.387	0.176	0.122	0.831	0.522	0.187	0.119	0.941
herfindl2001	0.409	0.186	0.171	0.818	0.533	0.190	0.168	0.944
herfindl2002	0.428	0.189	0.164	0.817	0.546	0.188	0.180	0.937
mainshare1997	0.494	0.175	0.242	0.918	0.629	0.180	0.193	0.967
mainshare1998	0.508	0.180	0.242	0.919	0.650	0.182	0.223	0.982
mainshare1999	0.516	0.189	0.216	0.920	0.661	0.175	0.205	0.946
mainshare2000	0.527	0.183	0.218	0.911	0.672	0.172	0.188	0.970
mainshare2001	0.553	0.190	0.267	0.904	0.681	0.173	0.273	0.971
mainshare2002	0.574	0.192	0.253	0.901	0.694	0.168	0.295	0.968
switchers9798	54.090	10.846	27	75	36.480	9.469	12	69
switchers9899	54.900	12.254	27	88	38.046	9.612	15	68
switchers9900	50.120	11.136	26	82	34.732	8.879	18	71
switchers0001	51.880	9.969	30	77	36.692	8.855	16	65
switchers0102	50.620	9.065	30	71	36.649	8.237	14	61

Table 3: Practice level commissioning patterns 1997/8 – 2002/3: 15 Healthcare Resource Groups covered by the national tariff in 2003/04

	Fundholding GP practices					Non-fundholding GP practices				
	n	Mean	Std. Dev.	Min	Max	n	Mean	Std. Dev.	Min	Max
provnum1997	3615	4.434	2.077	1	17	5240	3.596	1.802	1	13
provnum1998	3605	4.529	2.112	1	13	5152	3.825	1.918	1	15
provnum1999	3584	4.504	2.090	1	14	5065	3.795	1.847	1	14
provnum2000	3574	4.628	2.127	1	13	5027	3.908	1.941	1	13
provnum2001	3599	4.607	2.123	1	13	5322	3.744	1.892	1	13
provnum2002	3566	4.900	2.306	1	15	4961	4.040	2.017	1	14
herfindl1997	3615	0.580	0.216	0.128	1	5240	0.613	0.230	0.133	1
herfindl1998	3605	0.607	0.223	0.136	1	5152	0.625	0.230	0.161	1
herfindl1999	3584	0.622	0.217	0.156	1	5065	0.636	0.225	0.160	1
herfindl2000	3574	0.633	0.213	0.134	1	5027	0.639	0.223	0.147	1
herfindl2001	3599	0.644	0.211	0.160	1	5322	0.659	0.225	0.160	1
herfindl2002	3566	0.650	0.208	0.166	1	4961	0.653	0.223	0.146	1
mainshare1997	3615	0.694	0.194	0.182	1	5240	0.714	0.204	0.205	1

mainshare1998	3605	0.716	0.198	0.200	1	5152	0.726	0.202	0.192	1
mainshare1999	3584	0.728	0.193	0.231	1	5065	0.735	0.199	0.209	1
mainshare2000	3574	0.740	0.188	0.217	1	5027	0.739	0.197	0.188	1
mainshare2001	3599	0.751	0.185	0.200	1	5322	0.756	0.195	0.167	1
mainshare2002	3566	0.757	0.181	0.245	1	4961	0.753	0.194	0.200	1
switchers9798	3615	2.884	1.848	0	11	5240	2.347	1.670	0	11
switchers9899	3615	2.837	1.924	0	12	5240	2.348	1.697	0	11
switchers9900	3615	2.815	1.973	0	16	5240	2.198	1.722	0	12
switchers0001	3636	2.927	1.940	0	12	5538	2.319	1.746	0	11
switchers0102	3636	3.013	1.998	0	12	5550	2.365	1.811	0	14
switchfcepop9798	3636	1.317	2.296	0	23.233	5550	1.262	2.359	0	21.905
switchfcepop9899	3636	1.170	2.168	0	22.690	5550	1.311	2.427	0	21.313
switchfcepop9900	3636	1.228	2.338	0	21.380	5550	1.004	2.015	0	17.308
switchfcepop0001	3636	0.489	1.475	0	20.440	5550	0.633	1.888	0	27.063
switchfcepop0102	3636	1.499	2.893	0	25.919	5550	1.646	3.128	0	27.063

Table 4: GP commissioning patterns: all elective admissions

	provnum	mainshare	herfindl
Standard fundholder	0.2682	-0.015	-0.0169
	[3.62]**	[4.42]**	[4.58]**
1998/99	0.2973	0.0137	0.016
	[6.80]**	[7.86]**	[8.13]**
1999/00	0.5589	0.0173	0.0199
	[11.26]**	[7.97]**	[8.12]**
2000/01	5.0374	-0.0735	-0.1445
	[7.11]**	[4.35]**	[6.64]**
2001/02	4.903	-0.0643	-0.1349
	[6.90]**	[3.78]**	[6.17]**
2002/03	5.5249	-0.0567	-0.1268
	[7.77]**	[3.32]**	[5.80]**
Diff in diff 1998/99	-0.1215	0.0068	0.0091
	[1.71]	[2.63]**	[3.14]**
Diff in diff 1999/00	-0.0753	0.0105	0.0125
	[0.95]	[3.34]**	[3.55]**
Diff in diff 2000/01	0.0468	0.0164	0.0192
	[0.59]	[5.79]**	[6.24]**
Diff in diff 2001/02	0.0422	0.0132	0.0174
	[0.53]	[4.64]**	[5.64]**
Diff in diff 2002/03	0.0639	0.0178	0.0225
	[0.78]	[6.03]**	[7.00]**
totpopma	0.0008		0.0000
	[72.70]**		[6.00]**
scoreeduc	-0.264	0.0201	0.0215
	[3.34]**	[5.73]**	[5.88]**
acc_acute2	-588.4574	35.3623	38.6885
	[6.84]**	[9.10]**	[8.04]**

acc_priv2	1,781.78		7.9448
	[2.74]**		[0.23]
acutdistn5	-0.0483	0.0046	0.006
	[4.66]**	[9.53]**	[11.12]**
privdistn5	0.0771	-0.0028	-0.0042
	[7.57]**	[6.72]**	[7.97]**
migr10v1	8.5915	-0.1863	-0.1782
	[3.82]**	[1.56]	[1.39]
jsa_bip	-0.0911		
	[4.59]**		
pcnotuni	-0.0196		
	[2.33]*		
sir75v	-0.0177	0.0007	0.0012
	[4.65]**	[3.09]**	[4.89]**
pr_insda	0.0789	0.0022	-0.0658
	[3.00]**	[1.13]	[8.62]**
cmf74	0.0185		
	[6.19]**		
hospconsults	-0.0117	0.0007	0.0008
	[9.13]**	[10.31]**	[11.27]**
listwtegpma	0.0006		
	[11.55]**		
contragpsl	-0.2353		
	[2.98]**		
gps61	-0.2886		
	[3.95]**		
singlegp	-1.3075		
	[20.25]**		
outhourgps	0.9613		
	[3.36]**		
mmr2prac	-0.2109		
	[4.10]**		
unem12v1		-0.3375	-0.6291
		[4.01]**	[6.31]**
deputgps		0.0116	0.0121
		[2.67]**	[2.58]**
dispprac		-0.0259	-0.0276
		[6.73]**	[6.52]**
acutbedsn5		-0.0001	-0.0001
		[3.20]**	[3.87]**
pr_lbw		0.0061	0.0062
		[3.89]**	[3.75]**
pr_aadla		-0.0074	0.0239
		[2.76]**	[5.10]**
privbedsn5			0.0003
			[1.96]*
r_ibsda			0.0046

			[9.34]**
rsdadla			-0.0022
			[7.87]**
newplacerate		0.3313	
		[1.37]	
Constant	9.6905	0.9775	0.8452
	[1.56]	[4.10]**	[3.13]**
Observations	44914	44887	44887
Number ofpractices	7669	7669	7669

z statistics in brackets. * significant at 5%; ** significant at 1%. All regressions also included age and sex proportions of practice populations and higher level purchaser dummy variables

Table 5: Practice commissioning patterns: difference between fundholders and non-fundholders, all elective HRGs

	provnum	mainshare	herfindl	switchers	switchfcepop
Difference in 1997/8	0.2682	-0.015	-0.0169		
	[3.62]**	[4.42]**	[4.58]**		
Difference in 1998/9	0.1466	-0.0082	-0.0078	0.2111	0.0023
	[2.06]*	[-2.58]*	[-2.25]*	[2.98]**	[0.09]
Difference in 1999/00	0.1929	-0.0045	-0.0044	0.2259	-0.1018
	[2.67]**	[-1.44]	[-1.27]	[3.16]**	[-4.08]**
Difference in 2000/1	0.3149	0.0013	0.0022	0.0858	-0.0372
	[4.45]**	[0.47]	[0.71]	[1.20]	[-1.81]
Difference in 2001/2	0.3104	-0.0018	0.0005	0.1437	-0.1064
	[4.50]**	[-0.65]	[0.15]	[1.98]*	[-4.46]**
Difference in 2002/3	0.3320	0.0027	0.0055	0.2470	-0.0194
	[4.69]**	[1.00]	[1.84]	[3.46]**	[-0.92]

z statistics in brackets. * significant at 5%; ** significant at 1%. Fundholder minus non-fundholders.

[1] Switching measure for fundholder for 1998/9 minus switching meausure for non-fundholder, both switching measures calculated from change 1998/9 relative to 1997/8. Other switching coefficients similarly defined.

Figure 1: Histograms of commissioning measures for practices, all electives 2002/03

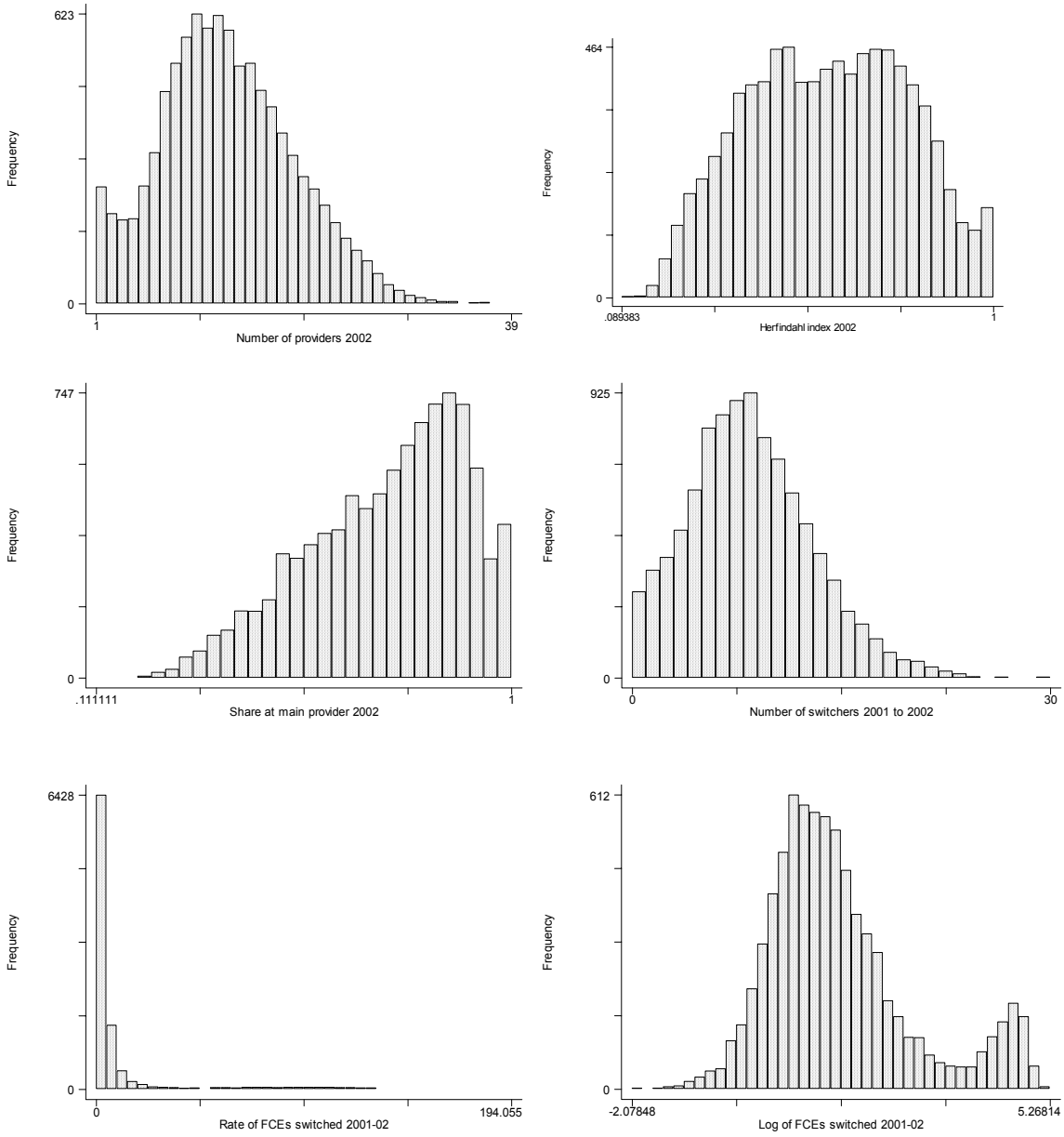

Figure 2: Differences between fundholder and non-fundholder commissioning measures