ISSN 1503-299X

WORKING PAPER SERIES

No. 18/2006

PRIMARY PHYSICIANS' RESPONSE TO CHANGES IN FEES

Jostein Grytten
Fredrik Carlsen
Irene Skau

Department of Economics

Norwegian University of Science and Technology
N-7491 Trondheim, Norway
www.svt.ntnu.no/iso/wp/wp.htm

12.9 06

Primary Physicians' Response to Changes in Fees

Jostein Grytten [a], Fredrik Carlsen [b] Irene Skau[a]

Running title: financial incentives and physicians' response

Correspondence to:
Jostein Grytten,
University of Oslo,
Box 1052, Blindern,
0316 Oslo,
Norway

Tel: +47 22 84 03 87
Fax: +47 22 84 03 03
E-mail: josteing@odont.uio.no

[a] Dental Faculty, University of Oslo, Norway
[b] Department of Economics, NTNU, Trondheim, Norway

Abstract

The study examines how the service production of primary physicians in Norway is influenced by changes in fees. The data represent about 2 650 fee-for-service physicians for the years 1995-2000. We constructed a variable that made it possible to estimate income effects of fee changes on service levels. Service production was measured by the number of consultations per physician, the number of laboratory tests per consultation, and the proportion of consultations lasting more than 20 minutes. Our main finding is that fee changes have no income effect on service production. Our results imply that fee regulation can be an effective means of controlling physicians' income, and therefore government expenditure on primary physician services.

Key words: Primary physicians, consultations, fees, income effect.

Introduction

Fee-for-service remuneration is an important form of remuneration for physicians who work in primary health services. An important issue with this type of payment system is whether regulation of fee-for-service payments is an effective means of controlling physicians' income and government expenditure. If physicians respond to a reduction in remuneration per item of treatment by a corresponding increase in the amount of treatment provided, then the authorities do not achieve any saving.

A reduction in remuneration per item of treatment has two effects. *The substitution effect* pulls in the direction of lower treatment volume because treatment of patients becomes less remunerative relative to other activities. *The income effect* pulls in the direction of higher treatment volume because the physician tries to compensate for the loss of remuneration. Purely on a theoretical basis, one cannot say which effect will be dominant. Thus to what extent physicians react to a reduction in remuneration per item of treatment by increasing or reducing the amount of treatment provided, becomes an empirical question.

Many studies have been carried out to investigate the relationship between changes in fees and changes in the amount of treatment provided. Most of these studies are from the USA, and were carried out in the 1980s and early 1990s [1-12]. The results of these studies are conflicting. Some of the studies provide evidence for an income effect, others do not. Mitchell et al. (2000) have carried out a critical review of these early American studies, and they point out that the results are unreliable because of methodological weaknesses [13]. The most important weaknesses that they identify are that the price variables are unreliable, that important control variables have been omitted from the analyses, and that the independent variables have poor validity.

The aim of this study was to estimate the income effect of fee changes on service production of primary physicians in Norway. The sample consisted of almost the whole population of primary physicians who have fee-for-service remuneration in

Norway. Fee adjustments in Norway are determined at the national level and differ between the various types of services provided by primary physicians. Changes in fees are therefore exogenous to individual physicians, and the impact of changes in fees on physician revenues vary between physicians. Each year, some physicians benefit from changes in fees, whereas others break even or even have a fall in income. We identified the income effect from changes in fees by exploring how the service levels of individual physicians were affected by income shocks due to changes in the national fee schedule.

Primary physician services constitute an important part of Norwegian health services. Norwegian primary physicians have a gate-keeper function, since non-acute patients require a referral from a primary physician in order to obtain treatment from a specialist or at a hospital. About two-thirds of primary physicians have fee-for-service remuneration, and thus, theoretically, they have the possibility to respond to changes in fees. If the income effect is strong, this will make cost control of primary physician services difficult.

The next section presents a brief review of recent studies. We then describe the institutional framework of our study, the data set and the analytical approach. Finally we present the results and offer a discussion.

Brief review of recent studies

Nearly all of the recent studies that have investigated the relationship between changes in fees and changes in the amount of treatment provided are from the USA. The services that have been studied are specialized health services, such as internal medicine, cardiology, ophthalmology, orthopaedic surgery, radiology, gynaecology and urology. Mitchell et al. (2000) studied how ophthalmologists and orthopaedic surgeons responded to large reductions in Medicare fees for their services in 1994 [13]. They found a weak negative income effect for the number of cataract operations, but a positive income effect for the number of joint procedures. The

result for orthopaedic surgeons suggests that a reduction in fees does not lead to a compensatory change in behaviour. The study by Mitchell et al. (2000) seems to be the first contribution where the income effect is estimated directly, as earlier studies considered the total effect of fee changes (the income effect and the substitution effect) on supply of services.

The results of two studies indicate that the substitution effect is strong [14, 15]. Hadley et al. (2003) found that an increase in Medicare's fees for breast surgery led to a significant increase in the number of operations [14]. Gruber et al. (1999) studied the relationship between Medicaid's fees for caesarean delivery, and the number of caesarean deliveries [15]. They also found that an increase in fees led to a large increase in the number of caesarean deliveries. However, in an earlier study, Keeler and Fok (1996) found that a change in fees had little effect on the number of caesarean deliveries [16]. A Canadian study, that included specialists in internal medicine and general surgery, also found that changes in fees had only a negligible effect on supply of specialized health services [17].

Nguyen [18] and Nguyen and Derrick [19] studied how a Medicare fee control imposed in 1990 influenced the service production of specialists in surgery, radiology, internal medicine and pathology. They found a volume response of about 40 %. Thus a reduction in price of 1 % led to an increase in treatment volume of about 0.40 %. Zuckerman et al. [20] found similar results based on data from nearly all physicians who received payments from Medicare, but in their study the unit of observation was geographic area. These findings suggest a relatively strong income effect, which may indicate that it is difficult for Medicare to control costs only by freezing fees.

There are few studies that have investigated how changes in fees influence service production of physicians in European countries. In a study from Norway, using a sample of 44 primary physicians, Carlsen et al. (2003) found that changes in fees had little or no effect on four types of laboratory tests [21]. However, the sample in that

study was small, so the results should be interpreted with caution. The study presented here is a continuation of the study of Carlsen et al. (2003) using a much larger sample of fee-for-service primary physicians. In addition, we have now also included in the analyses most of the services primary physicians provide.

Primary physician services in Norway

In Norway, the municipalities (n=431 in 2006) have responsibility for planning, organizing and running primary health services, including primary physician services. The Norwegian Government has not defined any legal minimum standards with respect to the level of quality of services. Until 1 June 2001 primary physician services were mainly provided by two types of physician, both of which worked separately from hospital services, and provided the first contact between patients and the health services. The two types of primary physician were community physicians and contract physicians[1]. Community physicians, who represented about 19 % of all primary physicians, were employed by the municipalities and received a salary [22].

Contract physicians represented about 67 % of all primary physicians [22]. They were self-employed, but had a contract with the municipality to cover some of their expenses (auxiliary personnel etc). The size of the grant which covered some of the expenses of contract physicians was regulated by the "Normal tariff", an agreement which is negotiated annually between the Norwegian Medical Association and the Ministry of Government Administration. The fixed local government grant contributed about 30 % of the gross income of contract physicians [23].

Contract physicians obtained additional income from patient fees and from payments

[1]There are also two other types of primary physician: self-employed physicians and junior physicians. Self-employed physicians are independent and have no contract with the municipality. About 7 % of all primary physicians are self-employed, and the majority are located in central cities. Junior physicians are medical students who have completed their studies, but who are not fully registered. They become fully registered after having worked under supervision in a municipality and in a hospital for one year. They are mainly located in small municipalities where there are problems to recruit community physicians or contract physicians [22].

from the National Insurance Administration. Patient fees contributed about 30 % of the gross income of contract physicians [23]. Patients paid a set fee for every consultation with the physician, whereas items of treatment were free. Payments received from the National Insurance Administration contributed about 40 % of the gross income from practice for contract physicians. The major items which incurred a payment from the National Insurance Administration were laboratory tests and consultations lasting more than 20 minutes [24]. The latter payment is used for patients who are time-consuming to treat, and this was introduced so that primary physicians should not avoid patient groups with special needs. The level of patient fees and the level of payments from the National Insurance Administration were regulated by the normal tariff.

Data and Variables

We studied only contract physicians, as community physicians do not receive fees for consultations and items of treatment. We used data for the years 1995-2000. During this period, there was a significant increase in fees for the most commonly used procedures in primary physician services in Norway. A summary is given in Table 1. For example, during the whole period, the fees for a consultation increased by 32.5 %, with the greatest increase from 1996 to 1997, and from 1997 to 1998. The mean increase in fees for laboratory tests was 24.3 % from 1995 to 2000, with the greatest increase at the beginning of the period, from 1995 to 1996.

Data about individual physicians were obtained from the National Insurance Administration. The National Insurance Administration obtains its data primarily for administrative purposes. The data are used to monitor physicians' activities, treatment patterns and level of expenses [25]. The information is collected for one month: i.e. the content of all patient consultations during one month is registered on data. All contract physicians in Norway have to participate in this registration. For each year, the National Insurance Administration makes data from a sample of the physicians available for research.

Not all the physicians were present in all the six years. However, a relatively large number of physicians were present in two consecutive years[2]. These physicians were identified and the independent variable that was used to estimate the income effect was constructed in the following way. We calculated the income of each physician from all production in year t-1, that is to say from all consultations and items of treatment. We then calculated the predicted income in year t, that is, what their income would be in year t with the same production as in year t-1, but with fees in year t. The difference between these two levels of income can then be interpreted as the component of change in total physician income which is due to changes in the national fee schedule. Formally, this can be written as:

$$\Delta \text{ INCOME}_{it} = [\text{CONSULTATIONS}_{it-1} \cdot \text{FEE}_{t} + \sum_{j=1}^{J} \text{ITEMS}_{jit-1} \cdot \text{FEE}_{jt}]$$

$$- [\text{CONSULTATIONS}_{it-1} \cdot \text{FEE}_{t-1} + \sum_{j=1}^{J} \text{ITEMS}_{jit-1} \cdot \text{FEE}_{jt-1}]$$

where $\text{CONSULTATIONS}_{it}$ is the number of consultations in year t for physician i, FEE_{t} is the fee for consultations in year t, ITEMS_{jit} is the number of treatments of type j provided by physician i in year t, j = 1, J, and FEE_{jt} is the fee for treatment j in year t, j = 1, J.

Our main explanatory variable is relative change in income ($\Delta \text{ INCOME}_{it} / \text{INCOME}_{it-1}$), denoted INCOMEREL_{it}. INCOMEREL_{it} is physician specific because relative fees vary over time and the composition of consultations and items of treatment varies across physicians. Moreover, INCOMEREL_{it} does not depend on $\text{CONSULTATIONS}_{it}$ and ITEMS_{jit}, and is therefore exogenous to physician responses to fee changes.

We carried out the analyses on the following three services: consultations, laboratory

[2]The numbers of physicians who were present in two consecutive years (in brackets) were: 896 (1995 and 1996), 545 (1996 and 1997), 375 (1997 and 1998), 334 (1998 and 1999) and 513 (1999 and 2000). These data are representative for the total population of primary physicians in Norway [26].

tests and consultations lasting more than 20 minutes. To simplify the exposition, we did not introduce separate symbols for each of these services. Let Y_{it} denote the number of consultations provided by physician i in year t, the number of laboratory tests per consultation of physician i in year t and the proportion of consultations lasting more than 20 minutes of physician i in year t. The following regression model was estimated for each of the services:

$$\Delta Y_{it} / Y_{it-1} = \alpha_i + \alpha_t + \beta_1 \text{ INCOMEREL}_{it} + \beta_2 \text{ MUNICIPALITY}_{it} + \beta_3 Y_{it-1} + \varepsilon_{it}.$$

α_i are physician effects included to control for trends in practice style that are specific to each physician. Previous research has shown that there are large variations in practice profiles for different physicians, and that these variations are fairly stable over time [27, 28]. α_t are year effects included to take account of events that can vary from year to year, but which affect all physicians equally (for example epidemics). ε_{it} is an identically and independently distributed error term. MUNICIPALITY_{it} is a vector of variables at the level of the municipality that can have an influence on the service production of physicians. The relative changes from t-1 to t were calculated for the following variables: the proportion of the population 6 years and younger, the proportion of the population 80 years and older, the proportion of women, and the number of primary physicians per 10 000 inhabitants.

Preliminary investigations suggested that service levels do not follow a random walk; high service levels in one year are typically followed by lower production the next year. To handle mean reversion, we included the service level lagged one year, Y_{it-1}, as explanatory variable in the regression equations.
Since both the dependent variable and INCOMEREL are measured in relative terms, the regression coefficient β_1 can be interpreted directly as an elasticity.

A priori, we cannot rule out the possibility that the effect of income shocks on service levels is non-linear. For example, it is possible that only the physicians who experience an absolute fall in income compensate by supplying more services. In

order to test for non-linearity, we constructed ten dummy variables in which observations (an observation is a given physician in a given year) were grouped according to the size of relative change in income. This was done by dividing the continuous variable that measures relative change in income into 10 parts. Observations with physicians who had the smallest relative change in income (closest to zero) were used as the reference category; this turned out to be the 10-20 % fractile. For each of the services, regressions were estimated with the dummy variables as regressors instead of relative change in income.

Results

Table 2 presents descriptive statistics. The mean values for the key variables are reported for each of the 10 sub-samples.

In the whole sample, physician's mean monthly income from fees was NOK 54 270 in the baseline year (t-1). In the following year (t), physicians' mean income had increased by NOK 1 383 due to changes in fees, representing an increase of 2.5 %. The physicians who were in the lowest 10 % fractile, had a mean reduction in income of 0.7 %. The physicians who were in the highest 10 % fractile, had a mean increase in income of 6.8 %.

In the whole sample, the mean number of consultations per physician per month in the baseline year was 244. This increased to 256 the following year, which represents an increase of 4.9 %. There appears to be no clear relationship between relative change in income and relative change in number of consultations. For example, for the 10 % of physicians who had the greatest reduction in income the number of consultations increased by 10 %. For the 10 % of physicians who had the greatest increase in income, the number of consultations increased by 7.7 %. The main pattern is that the proportion of consultations increased from year t-1 to year t for all the ten sub-samples.

In the whole sample, the mean number of laboratory tests per consultation in the baseline year was 1.05 (Table 2). The mean number of laboratory tests decreased to 1.03 the following year, which represents a reduction of 1.9 %. For most of the sub-samples, there was a reduction in the number of laboratory tests. For example, for the physicians who had the largest reduction in income, the number of laboratory tests per consultation fell from year t-1 to year t by 8.8 %. There was an increase in the number of laboratory tests for only three sub-samples (60-70 %, 80-90 %, and 90-100 % fractiles). Among other things, the number of laboratory tests increased by 6 % for the 10 % of physicians who had the greatest increase in income due to fee changes.

For the whole sample, the mean proportion of consultations lasting more than 20 minutes was 0.33 in the baseline year. This proportion fell to 0.32 in the following year. With the exception of one sub-sample (the 80-90 % fractile), there was a reduction in the number of consultations lasting more than 20 minutes from year t-1 to year t in all the sub-samples. The reduction was greatest for the 30-40 % fractile. For this sub-sample, the proportion of consultations lasting more than 20 minutes fell by 7.6 % from year t-1 to year t.

Table 3 presents the results of the regression analyses. In this table, the variable that measures the relative change in income (INCOMEREL) was included in a continuous form. One of the main findings is that relative change in income does not have a statistically significant effect on any of the dependent variables at the conventional level of significance ($p<0.05$).

In one specification, the municipality variables have significant effects. The number of consultations lasting more than 20 minutes increased when the proportion of women increased. In several of the specifications, the dummies for year have statistically significant effects. In each equation, the service level lagged one year has negative and very significant effects. Hence, service levels are also characterized by mean reversion when we controlled for possible determinants of service

production.

Table 4 presents the results of the analyses with dummy variables. The control variables are the same as in Table 3, but the results for these variables are not reported. With one exception, none of the dummy variables had statistically significant effects on the dependent variables. The sizes of the regression coefficients were also low in absolute values.

As a robustness test, we examined the relationship between absolute changes in service levels and absolute changes in income. All the main conclusions remain unaltered. The coefficient of the continuous income variable was positive for all three dependent variables, and almost all dummy variables remained insignificant, thus confirming the absence of compensatory behaviour by physicians.

As a second robustness test, we excluded physician fixed effects from the equations. This caused a large drop in the explanatory power of the estimated relationships, as physician specific trends in service levels are quantitatively important. However, even without physician specific trends, there was hardly any evidence of income effects.

Discussion

We found no income effects for the services we studied. As in the study of Mitchell et al (2000), we constructed a separate variable that measured the exogenous effect of a change in fees on physician revenues [13]. Our findings are consistent with the results of Mitchell et al. (2000) for orthopaedic surgeons, the results of Hadley et al. for breast surgery, and the results of Gruber et al. for caesarean delivery [14, 15]. Our results are also consistent with the findings from an earlier panel data study of primary physician services in Norway [21]

The findings are also consistent with the results of other studies of primary physician

services in Norway in which cross-sectional data have been used [29-32]. A main finding in these studies is that increased competition (more physicians per capita) leads to lower physician income. Grytten et al. [31] studied the income effect by exploring the relationship between non-practice income and the number of treatment items per consultation using a cross-sectional data set, which encompassed nearly the whole population of contract physicians in Norway. They found that non-practice income had no effect on the number of treatment items per consultation. The results from the present study, which employs panel data rather than cross-sectional data, support the results from the study of Grytten et al. [31].

Our results imply that regulation of the level of fees can be an effective means of controlling the income of primary physicians, and therefore government expenditure on primary physician services. When the income effect is equal to nought, a reduction in fees will lead to a corresponding reduction in the expenditure of the National Insurance Administration, if the substitution effect is also equal to nought. Alternatively, if the substitution effect is positive, a change in remuneration per item of treatment will lead to a greater reduction in the expenditure of the National Insurance Administration on primary physician services.

Our sample included many physicians. However, only about 10 % of physicians experienced a negative development in income from year t-1 to the following year t (Table 2). It is possible that it is primarily the physicians who experience a great reduction in income as a result of changes in fees who respond by increasing their service production. This group of physicians is not heavily represented in the sample. We should therefore be cautious when drawing conclusions about what may happen if physicians experience a substantial fall in income. When interpreting the results we should also take into account the fact that the increase in income resulting from an increase in fees was relatively moderate for most of the physicians (Table 2). Therefore the possibility cannot be excluded that we could have observed behaviour in the direction of lower service production if the increase in income had been larger.

Conclusion

We studied the income effect of changes in fees on service production using a sample of contract physicians in Norway. We found no income effects for the services we studied, which were: number of consultations per physician, number of laboratory tests per consultation, and proportion of consultations lasting more than 20 minutes. This finding suggests that regulation of patient fees and payments from the National Insurance Administration can be an effective means of controlling physicians' income and government expenditure on primary physician services.

Acknowledgements

We wish to thank Linda Grytten for translating the original manuscript to English.

References

1. Holahan J, Scanlon W (1978) Price controls, physician fees, and physician incomes from Medicare and Medicaid. The Urban Institute: Washington DC
2. Holahan J, Dor A, Zuckerman S (1990) Understanding the recent growth in Medicare physician expenditures. J Am Med Assoc 263:1658-1661
3. Rice TH (1983) The Impact of changing Medicare reimbursement rates on physician-induced demand. Med Care 21:803-815
4. Christensen S (1992) Volume responses to exogenous changes in Medicare's payment policies. Health Serv Res 27:65-79
5. Mitchell JB, Wedig G, Cromwell J (1989) The Medicare fee freeze: What really happened? Health Aff 8:21-32
6. Rochaix L (1990) Joint price quantity regulation in the market for physicians' services: The Quebec experiment. In Incentives in health systems. Springer Verlag, New York
7. Rice T, McCall N (1982) Changes in Medicare reimbursement in Colorado: Impact on physicians' economic behavior. Health Care Financial Rev 3: 67-86
8. Schwartz M, Martin S, Cooper D (1981) The effect of a thirty percent reduction in physician fees on Medicaid surgery rates in Massachusetts. Am J Public Health 71: 370-375
9. Hurley J, Labelle R, Rice T (1990) The relationship between physician fees and the utilization of medical services in Ontario. In Scheffler R, Rossiter L (eds) Advances in health economics and health services. JAI Press, Greenwich, Conn
10. Levy JM, Borowitz MJ, Jencks SF, Kay TL, Williams DK (1990) Impact of the Medicare fee schedule on payments to physicians. J Am Med Assoc 264: 717-722
11. Escarce JJ (1993) Medicare patients' use of overprices procedures before and after then Omnibus Budget Reconciliation Act of 1987. Am J Public Health 83: 349-355
12. Escarce JJ (1993) Effects of lower surgical fees on the use of physician services under Medicare. J Am Med Assoc 269: 2513-2518
13. Mitchell JM, Hadley J, Gaskin DJ (2000) Physicians' responses to Medicare Fee Schedule reductions. Med Care 38: 1029-1039
14. Hadley J, Mandelblatt JS, Mitchell JM, Weeks JC, Guadagnoli E, Hwang YT, OPTIONS Research Team (2003) Medicare breast surgery fees and treatment received by older women with localized breast cancer. Health Serv Res 38: 553-73
15. Gruber J, Kim J, Mayzlin D (1999) Physician fees and procedure intensity: the

case of caesarean delivery. J Health Econ 18: 473-490
16. Keeler EB, Fok T (1996) Equalizing physician fees had little effect on caesarean rates. Med Care Res Rev 53: 465-471
17. Hurley J, Labelle R (1995) Relative fees and the utilization of physicians' services in Canada. Health Econ 4: 419-438
18. Nguyen N (1996) Physician volume response to price controls. Health Policy 35:189-204
19. Nguyen N, Derrick F (1997) Physician behavioural response to a Medicare price reduction. Health Serv Res 32:283-298
20. Zuckerman S, Norton S, Verrilli D (1998) Price controls and Medicare spending: assessing the volume offset assumption. Med Care Res Rev 55:457-478
21. Carlsen F, Grytten J, Skau I (2003) Financial incentives and the supply of laboratory tests. Eur J Health Econom 4: 279-285
22. Statistics Norway (2006) Årsverk av legar med ulike avtaleformer i kommunehelsetenesta. Sentralitet. 1994-2004. http://www.ssb.no/emner/03/02/helsetjko/tab-2005-12-02-12.html (31.5.2006)
23. Statistics Norway (1996) Inntekts- og kostnadsundersøkelse for Privatpraktiserende leger 1995. Leger med driftstilskuddsavtale har best driftsresultat. Ukens Statistikk 37:3-4
24. Skau I (1998) Folketrygdens refusjoner til allmennlegehjelp. En beskrivelse avkontaktmønster, takstbruk og trygderefusjoner. Research Report 1/1998. BI Norwegian School of Management: Sandvika
25. Økonomi & Helse (1997) 1:1-2
26. Grytten J, Sørensen RJ, Skau I (2005) Fastlegeordningen – marked, legedekning og tilgjengelighet. Research Report 4/2005. BI Norwegian School of Management: Sandvika
27. Phelps CE, Mooney C (1993) Variations in medical practice use: causes and consequences. In Arnould RJ, Rich RF, White W (eds) Competitive Approach to Health Care Reform. The Urban Institute Press, Washington DC, pp 139-178
28. Grytten J, Sørensen R (2003) Practice variation and physician-specific effects. J Health Econ 22: 403-418
29. Carlsen F, Grytten J (1998) More physicians: improved availability or induced demand? Health Econ 7:495-508
30. Grytten J, Carlsen F, Sørensen R (1995) Supplier inducement in a public health care system. J Health Econ 14: 207-229
31. Grytten J, Carlsen F, Skau I (2001) The income effect and supplier induced demand. Evidence from primary physician services in Norway. Appl Econ

3:1455-1467
32. Sørensen R, Grytten J (1999) Competition and supplier induced demand in a health care system with fixed fees. Health Econ 8: 497-508