WORKING PAPERS IN ECONOMICS

No. 03/06

TOR HELGE HOLMÅS AND ODDVAR M. KAARBØE

IS THERE A DEMAND RESPONSE BY PATIENTS IN PRIMARY CARE?

Department of Economics
UNIVERSITY OF BERGEN

Is There a Demand Response by Patients in Primary Care?

Tor Helge Holmås* and Oddvar Kaarbøe†

March 6, 2006

*Health Economics Bergen (HEB) and Institute for Research in Economics and Business Administration. Email: TorHelge.Holmas@snf.no

†Corresponding author: Health Economics Bergen (HEB), Department of Economics, University of Bergen. Fosswinckelsg. 6, N-5007 Bergen. Norway. Email: oddvar.kaarboe@econ.uib.no
URL http://www.econ.uib.no/stab/oddvar.html
fax: +4755589210

Abstract

We test whether a demand response by patients exists in the Norwegian primary care sector. In Norway, physicians are remunerated either by salary or by incentive contract, and we have access to a large data survey that allows us to study the relationship between consumer satisfaction with primary physician services and the way physicians are paid. In addition, we can identify areas (municipalities) where market demand for primary physicians' services is responsive to effort. When a demand response exists, we expect that patients' benefit is higher and that patients are more satisfied when visiting a contract physician. As expected, we find very small effects of the salary physician density on reported patient satisfaction in municipalities where market demand is nonresponsive to physicians' choice of effort. In municipalities with responsive market demand, we find a negative association between salary physician density and patients' satisfaction with their physician.

JEL classification: I11; M52

Keywords: Physician behavior; Remuneration contracts; Patients' satisfaction

1 Introduction

When patients visit a primary care physician, their benefit from treatment depends on the care or effort that the physician puts into the production of health for them. Following Wedig et al. (1989), we interpret effort as any costly activity that affects patients' valuation of the services they receive, including dimensions of convenience, comfort, communication about medical conditions, as well as some narrowly defined "clinical" quality of care. In the payer's (government's or insurance company's) view, the physician's effort may also be valuable since patients' behavior is affected by how satisfied they are with their physician. Kalda et al. (2003) show that satisfied patients are more likely to continue their physician relationship, and Berkanovic and Marcus (1976) show that satisfied patients are less inclined to abort their treatment programs. Studies have also shown that patients' satisfaction is positively correlated with objective measures of quality, like average consultation time and use of preventive care in primary care (Scott et al. 1995, Kalda et al. 2003).

It is, however, not straightforward for the payer to provide incentives such that physicians are willing to increase the intensity (or quality) of treatments, since these inputs are often nonverifiable and thus cannot be used as a basis for payments. If a physician should be willing to exert (costly) effort, there must be an indirect way of rewarding him/her. One such mechanism may exist if (i) effort is important to patients, and (ii) if patients observe a signal of the physician's choice of effort before choosing their primary care physician so physicians who exert higher levels of effort attract more patients. If in addition (iii) physicians'

income depends on the number of patients seen and (iv) patients can choose among different physicians, there exist incentives for physicians to exert costly effort. From the arguments above, it follows that two sets of conditions must be fulfilled if physicians are to be willing to exert costly effort. First, patients must prefer physicians who exert high effort; and second, the payment regime and the market condition must be such that physicians lose income by exerting low effort.

The idea that patients respond to the treatment they are offered by choosing where or whether to be treated has been identified as an important incentive instrument for increasing the quality of care. Ma and McGuire (1997) and McGuire (2000) model how payments based on the number of patients treated can be used to provide appropriate incentives. They argue that if physicians have long-term relationships with their patients, or if physicians invest in quality to increase or maintain their reputation, a demand response by patients exists, and physicians have incentives to exert high effort.

Many empirical studies have confirmed the effect of form of payment on physician behavior[1], but these studies typically show how physicians' *quantity* decisions depend on the payment system. We do not know of any studies that test empirically whether a potential demand response by patients may induce physicians to exert costly effort that increases the *quality* of care. This is the purpose of the current paper.

The Norwegian case offers a unique opportunity to explore this issue. First,

[1] McGuire (2000, p. 491-2) provides an overview of some of these studies.

primary care physicians are remunerated in two different ways, either by salary or by an incentive contract. Salaried physicians receive a fixed salary. Contract physicians' income consists of a fixed grant, patient fee per visit and revenue from the National Insurance Administration from provision of items of medical treatment. Their income is thus dependent on the number of patients seen. Since the salaried physicians' income is independent of the number of patients seen, only contract physicians have incentives to exert effort if a demand response exists. Second, we have access to a large data survey that allows us to study the relationship between consumer satisfaction with primary physician services and the way physicians are paid. Figure 1 summarizes market conditions and remuneration schemes and physicians' incentives to exert costly effort. Since we expect that patients' benefit is higher the more effort the physician puts into the production of health for the patient, we infer that patients who visit a contract physician are more satisfied.

[Figure 1 about here]

A possible problem is that such a relationship might be exaggerated by a selection effect. Contract physicians might, for example, have a lower marginal valuation of leisure, so they are willing to work longer hours compared with salaried physicians. We are, however, able to correct for selection effects by using the fact that a demand response only exists in areas (municipalities) where the market demand for primary care services is responsive to effort.[2] That is, we

[2] The argument is simply that there is no need to exert costly effort in markets where market demand is nonresponsive to physicians' choice of effort.

do not expect patients' satisfaction to depend on how their physician is remunerated in areas where market demand is inelastic. Since we can identify areas (municipalities) with responsive and nonresponsive market demand for primary physicians services, we have all the ingredients needed to test our hypothesis: *contract physicians are exerting more effort in areas where market demand for primary physicians' services is responsive to effort.*

The paper is organized as follows. In section 2, we outline a model of contract physicians' choice of quantity and effort. Section 3 includes a short description of the Norwegian primary care sector, while section 4 presents data and the empirical models. The results are presented in Section 5. Section 6 concludes the paper.

2 Theoretical Framework

In this section, we outline a model of contract physicians' choice of quantity and effort. It is a simplified version of the model in Ma and McGuire (1997), see also McGuire (2000).

Consider a contract physician who is providing two different types of inputs into the production of health for the patient. Let the term "quantity" denote those physician inputs that are verifiable, so monetary remuneration can be provided. Examples of verifiable inputs are diagnostic tests, prescriptions, etc. The other type of inputs we denote as effort. These inputs increase the intensity or quality of treatment but are nonverifiable. From the patient's point of view,

both types of input affect the benefits of receiving health care.

Let $B(e,x)$ denote the (gross) benefit (in monetary terms) of receiving treatment x when the physician exerts effort $0 \leq \underline{e} \leq e \leq \overline{e}$, where $\overline{e}$ is the maximum level of effort the physician can exert (e.g., because of time capacity). $\underline{e}$ is the level of effort that the physician will provide in the absence of any financial reward for exerting effort. For simplicity, we assume $\underline{e} = 0$. Let $B_i > 0$ and $B_{ii} < 0$, $i = e, x$ denote the first and second derivatives of $B(e,x)$, so the benefit of receiving treatment is increasing in both arguments at a decreasing rate. The patient's copayment per unit of treatment x is $p_d \geq 0$. This copayment is determined by the payer and is paid directly to the physician. The patient's net benefit of treatment is $NB(e,x,p_d) = B(e,x) - p_d x$.

The physician is risk neutral and has a utility function that is separable into money and effort. The physician's reservation utility is normalized to zero. The physician's cost per unit of treatment of exerting effort is $c(e)$, where $c(\cdot)$ is strictly convex with $c_{\underline{e}} = 0$, and $c_{\overline{e}} = +\infty$. The payer offers a (fee-for-service) contract to the physician that specifies the price $p_s > 0$ per unit of treatment x. To capture the fact that contract physicians do not receive capitation payments, we assume $p_s + p_d \geq c(e)\ \forall e \in [\underline{e}, \widetilde{e}]$, where $\widetilde{e} < \overline{e}$. From this, it follows that profit per patient is $(p_s + p_d - c(e))x$ and that profit per patient is nonnegative for all $e \in [\underline{e}, \widetilde{e}]$, where $\widetilde{e} < \overline{e}$. In addition, contract physicians receive a fixed payment $R \geq 0$ to cover some of their (fixed) expenses (auxiliary personnel etc.).

Since effort is not contractible and effort (above $\underline{e}$) is costly ($c_e > 0, \forall e > \underline{e}$), contract physicians will exert effort only if higher effort attracts more patients.

Such a demand response will exist if potential patients get information from friends about their valuation of the effort a physician has provided to other patients, and if they are using this information to form beliefs that they will receive the same quality. These beliefs are correct if physicians are interested in maintaining their reputation. Hence, by changing their effort levels, physicians change the information available to potential customers, and this creates a demand response. We do not model this reputation effect formally but simply assume that the number of patients $n \geq 0$ the physician serves depends positively on the benefit offered; $n = n(NB)$, with $n'(NB) > 0$.[3]

Physicians choose effort e and the level of treatment x that maximizes their profit π, where (for simplicity $R = 0$):

$$\pi = n(NB)\left[\left(p_s + p_d - c(e)\right)x\right].$$

The first-order conditions are:[4]

$$\begin{aligned} \pi_e &: \quad n'B_e(p_s + p_d - c)x - nc_e x = 0, \\ \pi_x &: \quad n'(B_x - p_d)\left(p_s + p_d - c\right)x + n\left(p_s + p_d - c\right) = 0. \end{aligned}$$

[3] Ma and McGuire (1997) contains a more extensive discussion of different types of demand response.

[4] The regularity conditions put on the cost and the benefit functions ensure that the second-order conditions are satisfied.

By rewriting these equations, we obtain:

$$\varepsilon_{x,NB} = -\frac{1}{\varepsilon_{n,NB}} \qquad \text{where } \varepsilon_{x,B} = \frac{B_x - p_d}{NB/x}, \text{ and } \varepsilon_{n,B} = \frac{n'NB}{n}, \quad (1)$$

$$\frac{p_s + p_d - c}{c} = \frac{\varepsilon_{c,e}}{\varepsilon_{n,e}} \qquad \text{where } \varepsilon_{c,e} = \frac{c_e e}{c} \text{ and } \varepsilon_{n,e} = \frac{n'B_e e}{n}. \quad (2)$$

Equation (1) describes a physician's choice of x. It shows that the net benefit elasticity of treatment, $\varepsilon_{x,NB}$, is equal to the negative inverse of the demand response of quantity: the change in the number of patients treated with respect to a change in the benefit provided. Since the RHS of (1) is negative, $B_x - p_d < 0$, and we obtain the well-known result that fee-for-service payments give the physician incentives to push the quantity of treatment beyond the point the patient would prefer. The physician is, however, restrained by market demand. If, for example, market demand becomes more responsive (i.e., the demand response elasticity of quantity increases so the LHS becomes a smaller negative number), the physician must respond by reducing x (and thus increasing B_x) to retain LHS = RHS.

From equation (2), it follows that the physician trades off the average fee over cost to the ratio of two elasticities when determining the optimal choice of effort.[5] The cost elasticity of effort ($\varepsilon_{c,e}$) and the demand response elasticity ($\varepsilon_{n,e}$). First, we note that the payer can induce more effort by paying more for services. To see this, note that the RHS is increasing in e since $B_{ee} < 0$ and $c_{ee} > 0$. More importantly, *the physician's choice of effort is higher the*

[5] Since effort cannot be rewarded directly, the physician takes average profitability into account when determining effort.

more responsive market demand is to effort. To see this, note that the RHS is decreasing in n', and effort has to increase to maintain optimality. This is the empirical implication we will test in the next sections of the paper.

3 The Norwegian Primary Care Sector

In Norway, primary care is the responsibility of the municipalities, which constitute the lowest level of government. Municipalities are required by law to offer services for disease prevention and health promotion, diagnosis and treatment of illness, rehabilitation, and long-term care. There are no defined minimum standards (e.g., physician–patient ratios) regarding level or quality of health services. The primary health care sector is financed through grants from municipalities, fee-for-service reimbursement from the National Insurance Scheme (NIS) for services supplied, and out-of-pocket payments by patients.

Two main groups of physicians provide primary health services: physicians employed by the municipality, and self-employed physicians contracted to the municipality. Both employed and contract physicians work separately from hospital services and provide the first contact between patients and health services. Salaried physicians' income is independent of the number of patients, and their working hours and tasks are generally determined by the municipality. They have, however, the possibility of part-time posts and overtime. Contract physicians have a contract with the municipality to cover some expenses (about 30 per cent of physicians' gross income, (Statistics Norway, 1996). As well, they

obtain income from patient fees and a fixed fee reimbursement scheme from the National Insurance Administration. Patients pay a fixed fee per consultation, and these fees contribute about 30% of contract physicians' gross income (Statistics Norway, 1996). The payment for provision of treatment from the National Insurance Administration contributed about 40% of the contract physicians' gross income (Statistics Norway, 1996). Apart from contracted minimum opening hours, contract physicians can make their own decision about the number of hours worked.

4 Data and Empirical Models

The data for the empirical analysis are taken from a large data survey collected by the Norwegian Gallup Institute (TNS Gallup) in 1998. In this survey, a random sample of respondents is asked to rank their satisfaction with various aspects of the primary physician services in their municipality. 24 764 respondents (out of a total of 50 433) returned the questionnaire. The survey contains information about respondents and their families. To get information on municipal characteristics, we use data from the Norwegian Social Science Data Services (NSD). This data source contains statistics for all municipal units of administration in Norway including variables describing supply of physicians and other health services, hospitalization and mortality rates.

In our analysis, we exclude all respondents (6506) living in municipalities

classified as least central by Statistics Norway.[6] Rural municipalities are characterized by high turnover and vacancy rates, and they typically use fixed salary contracts as a means to recruit and retain physicians (Carlsen and Grytten, 2000). We have no information on physician turnover in our data, and the number of employed physicians may therefore pick up the impact of turnover on patients' user satisfaction in our analysis. Furthermore, in rural municipalities, patients' choice of physicians is quite limited because of the few physicians. As our main objective is to isolate the incentive effects of different payment schemes, we exclude rural municipalities from the sample. We further restrict our sample to respondents who visited a physician during the last 12 months. After dropping respondents with missing information on individual or municipality characteristics, our final sample contains 15 920 individuals.

An important implication of the theoretical model is that the more responsive market demand is to effort, the higher a contract physician's choice of effort is. The reason is simply that the benefit of maintaining a good reputation is higher when the cost of losing patients (and thus income) is greater. There is no way we can observe the market condition directly, and thus we need to approximate the market responsiveness to effort. We infer that patients' demand is more responsive when the physicians are competing for patients. Some studies (e.g., Grytten and Sørensen, 2001) use physician density (physicians per capita) as a measure of competition. However, high physician density might be the result of a high demand or a sparsely populated area and does not necessarily

[6] This classification is based on the municipality's geographical position relative to the nearest center with central functions, the number of inhabitants, etc.

reflect patients' opportunities to choose where to be treated. An alternative measure of patients' opportunities to choose where to be treated is the number of vacant physician positions in a municipality. A vacant position is defined as a position that has been unoccupied for more than four months. We note that if a physician is filling a position on a temporary basis, the position is not defined as vacant. The number of vacant positions can thus be interpreted as a measure of how responsive market demand is to effort. The hypothesis is that the more vacant positions there are in a municipality, the more responsive market demand is to effort.

We define municipalities where market demand is responsive to effort as municipalities with the number of vacant physician positions higher than the average vacancy level.

[Insert Table 1 and Table 2 about here]

Variable descriptions are given in Table 1, and descriptive statistics for the total sample and for municipalities with and without responsive market demand are given in Table 2. Looking first at the dependent variables, we notice that patients are quite satisfied with their physicians. The respondents are asked to rank their satisfaction on a scale from 1 (very dissatisfied) to 6 (very satisfied). For *general satisfaction*, *friendliness*, *professional skills*, and *outcome and information*, the average satisfaction rating varies between about 4.6 and 5. Patients are less satisfied with their access to physician services. On questions regarding *waiting time* and *general access*, the average satisfaction levels are 3.7 and 3.8,

respectively. Comparing our two subsamples, we further notice that respondents living in municipalities with nonresponsive market demand for physician services are somewhat less satisfied than others.

As explanatory variables, we use both individual and municipality characteristics. The former include age, gender, marital status, education and family income. The municipality characteristics include three variables describing the supply of physicians (physician density, wage physician density and junior physician density). Supply of other health services may affect the demand for physician services, and to control for this, we include the number of other personnel in primary health care, total expenses in primary health care and whether there is a hospital in the municipality. To control for differences in demand due to differences in health status, we include mortality rates and hospitalization. Lastly, to control for differences in accessibility to physician services, we include population size as a variable.

To take account of the ordinal scaling of our dependent variables, we estimate ordered probit models. As patients' user satisfaction is expected to depend both on individual characteristics and on municipality characteristics, a multilevel framework seems appropriate. The ordered probit model is commonly presented as a latent variable model. We define Y^* as a latent variable ranging from $-\infty$ to $+\infty$, and assume that Y^* is determined by:

$$Y_{ij}^* = \sum_{h=1}^{H} \beta_h x_{hij} + \sum_{k=1}^{K} \gamma_k z_{kj} + \varepsilon_j + u_{ij}. \tag{3}$$

In this specification, x_{hij} are H variables characterizing the patient (age, gender, etc.), z_{kj} are K variables characterizing the municipality where the patient lives (number of physicians, mortality, etc.), ε_j is the unobservable municipality effect, and u_{ij} is the unobservable individual effect. We assume that the observed response variable Y is related to Y_{ij}^* as follows:

$$Y_{ij} = \begin{cases} 1 \text{ if } -\infty < Y_{ij}^* \leq \theta_1 \\ 2 \text{ if } \theta_1 < Y_{ij}^* \leq \theta_2 \\ 3 \text{ if } \theta_2 < Y_{ij}^* \leq \theta_3 \\ 4 \text{ if } \theta_3 < Y_{ij}^* \leq \theta_4 \\ 5 \text{ if } \theta_4 < Y_{ij}^* \leq \theta_5 \\ 6 \text{ if } \theta_5 < Y_{ij}^* \leq +\infty, \end{cases}$$

where θ_i, $i = 1, 2, ..., 5$ are the unknown cut-off points to be estimated together with β_h and γ_k.

The multilevel model is estimated using the *gllamm* command in Stata (Rabe-Hesketh et al. 2001), via a Newton–Raphson algorithm with adaptive Gaussian quadrature.

5 Results

Our main purpose is to analyze the effect of two different payment schemes on physicians' choice of effort: fee-for-service and fixed salary contracts. As we showed in the theoretical section, physician's choice of effort is higher the more

responsive market demand is to effort. To isolate the incentive effect from a possible selection effect, we divide the sample into two subsamples: municipalities with and without responsive market demand for physician services. In markets where demand is responsive to physicians' effort, physicians must compete for patients, and contract physicians have an incentive to provide more effort than otherwise. Wage physicians, on the other hand, have fixed salaries and no incentives to provide extra effort. In municipalities with responsive market demand for physician services, we expect patients to be less satisfied when the wage physician density is higher. In municipalities having nonresponsive market demand, there are no reasons why patients should be less satisfied if the wage physician density is higher. In these municipalities, we expect patients to look for the physicians with the shortest waiting time. Hence, in equilibrium, all patients should have the same waiting time irrespective of the way their physician is paid. Note that this is in accordance with the descriptive statistics in Table 2, where we saw that the average satisfaction level was lower in municipalities with nonresponsive market demand, especially for satisfaction with general access with physician services.

[Table 3 about here]

In the analysis, we represent physician supply as the total number of physicians per 10 000 inhabitants, the number of wage physicians per 10 000 inhabitants and, finally, the number of junior physicians per 10 000 inhabitants. As an alternative specification, we tried to use the proportion of wage physicians (the

number of wage physicians divided by the total number of physicians) instead of the number of wage physicians. Since the results seemed to be less reliable using this specification (for example, a negative effect of physician density in several models), we chose to focus on physician densities.

The parameter estimates for the full sample are presented in Table 3. Focusing first on the individual characteristics, we notice that on all dimensions of physician satisfaction, males are less satisfied than females, and married people are more satisfied than unmarried ones. There is also a clear tendency for the satisfaction level to increase with age and to decrease with education and family income. Turning to the effect of physician density, we find a positive and significant effect on general satisfaction, general access, information and professional skills. A high wage physician density is negatively associated with general satisfaction, waiting time and professional skills. As expected, a high density of junior physicians seems to have a negative effect on all aspects of reported satisfaction.

A possible problem with this analysis is that market conditions are quite different among the municipalities in the sample. We therefore estimate the same ordered probit models as above on the two subsamples: municipalities with and without responsive market demand for physician services. The results are shown in Table 4 (only the results regarding supply of physicians are shown; other results are available from the authors). Except for a negative effect of wage physician density on professional skills, we find no effects of the wage physician density on reported patient satisfaction in municipalities with nonresponsive

market demand. The total physician density has a positive effect on patient satisfaction on all dimensions except waiting time and outcome, while the junior physician density has a negative effect on all dimensions except waiting time.

[Insert Table 4 about here]

The results for municipalities with responsive market demand are shown in the lower part of Table 4. In these municipalities, we find a negative association between wage physician density and three of the dimensions of patient satisfaction (general satisfaction, general access, waiting time). That is, patients are more satisfied in municipalities with a higher density of contract physicians. Our interpretation of this result is that there is a shortage of patients in these municipalities such that a possible demand response exists. Contract physicians thus exert more effort to attract more patients, and this (extra) effort raises patients' benefits from receiving treatment.

We conclude this section by noting that it might be the case that physicians on performance contracts increase effort at the cost of quality; for example, fee-for-service physicians might provide shorter consultations and pay less attention to their patients. If this were the case, we would expect patients to be more satisfied with wage physicians than contract physicians on dimensions like information, professional skills and outcome. However, such a hypothesis finds very limited support in our results.

6 Conclusion

The purpose of this paper is to test whether a demand response by patients exists in the Norwegian primary care sector. The Norwegian case offers a unique opportunity to explore this issue since primary care physicians are remunerated in two different ways: either by salary or by an incentive contract. Furthermore, we have access to a large data survey that allows us to study the relationship between consumer satisfaction with primary physician services and the way physicians are paid. Since we expect that the patient's benefit is higher the more effort the physician puts into the production of health for the patient, we infer that patients who visit a contract physician are more satisfied. This inference is, however, only valid if contract physicians gain from exerting extra (costly) effort. This is the case if there is a shortage of patients. We therefore split our sample and estimate different models for municipalities with and without responsive market demand for physician services.

As expected, we find no effects of the wage physician density on reported patient satisfaction in municipalities without a responsive market demand. In municipalities where market demand is responsive, we find a negative association between wage physician density and patients' satisfaction with their physician. Our interpretation of this result is that contract physicians exert more effort to attract patients when a demand response exists, and this (extra) effort raises patients' benefits from receiving treatment.

The fact that a demand response by patients can mitigate the effects of moral hazards is well known in the literature (see, e.g., Ma, 1994; Ma and McGuire,

1997; Chalkley and Malcomson, 1998). In a recent paper, Chalkley and Khalil (2005) show theoretically that demand effects also help to align incentives by reducing provider rent due to asymmetric information. More precisely, they compare payments based on treatment (input measures) and payments based on health outcomes (improvement in health status). Their main result is that when demand is responsive to quality of care, payment schemes based on outcome reduces the overall cost to the purchaser relative to payment schemes based on treatment. The mechanism is simply that it is more costly to a physician to misrepresent one type of patient as a different type of patient when services have to be tailored to patient type such that the outcome is consistent with what is claimed, and patients are responsive to the type of services with which they are provided. What we show is that a demand response exists in primary care. One challenge for future work is therefore to consider how payment systems that are in accordance with recent theoretical work can be implemented in the health care sector.

Acknowledgements

The paper has benefited from comments by Fredrik Carlsen and by discussions after presentation at the University of Bergen.

References

[1] Berkanovic, E. and A. Marcus (1976). Satisfaction with Health Services: Some Policy Implications. Medical Care, 14, pp. 873–78.

[2] Carlsen F. and J. Grytten (2000). Consumer Satisfaction and Supplier Induced Demand. Journal of Health Economics, 19, pp. 731–53.

[3] Chalkley, M. and J.M. Malcomson (1998). Contracting for Health Services with Unmonitored Quality. Economic Journal, 108(449), pp. 1093–1110.

[4] Chalkley, M. and F. Khalil (2005). Third Party Purchasing of Health Services. Patient Choice and Agency. Journal of Health Economics. Forthcoming.

[5] Grytten J. and R.J. Sørensen (2001). Type of Contract and Supplier-Induced Demand for Primary Physicians in Norway. Journal of Health Economics, 20, pp. 379–93.

[6] Kalda R., K. Polluste and M. Lember (2003). Patient Satisfaction with Care is Associated with Personal Choice of Physicians. Health Policy, 64, pp. 55–62.

[7] Ma, C-t.A. (1994). Health Care Payment Systems. Cost and Quality Incentives. Journal of Economics & Management Strategy, pp. 725–53.

[8] Ma, C-t.A. and T. McGuire (1997). Optimal Health Insurance and Provider Payment. American Economic Review, 87(4), pp. 685–704.

[9] McGuire, T.G., (2000). Physician Agency. In P. Newhouse and A.J. Culyer (eds.), Handbook in Health Economics, Volume 1 (Elsevier Amsterdam), pp. 461–536.

[10] Marquis, S. A. Davies and J. Ware (1983). Patient Satisfaction and Change in Medical Care Provider: A Longitudinal Study. Medical Care, 21, pp. 821–29.

[11] Rabe-Hesketh, S., A. Skrondal, and A. Pickles (2002). Reliable Estimation of Generalized Linear Mixed Models using Adaptive Quadrature. The Stata Journal 2, pp. 1–21.

[12] Rice, N. and A.M. Jones (1997). Multilevel Models and Health Economics. Health Economics, 6, pp. 561–75.

[13] Scott, R., E. Stone, A. Green, P. Mitchell, S. Nessim, H. Huang and R. Krisoppaitis (1995). A Study of Patient Satisfaction and Adherence to Preventive Care Practice Guidelines. American Journal of Medicine, 99, pp.590–96.

[14] Statistics Norway (1996). Inntekts- og Kostnadsundersøkelse for Privatpraktiserende Leger, 1995. Leger med Driftstilskudd har Best Driftsresultat. Ukens Statisikk 37, pp. 3–4.

[15] Sørensen, R.J. and J. Grytten (2003). Service Production and Contract Choice in Primary Physician Services. Health Policy, 66, pp. 73–93.

[16] Wedig G., J.B. Mitchell and J. Cromwell (1989). Can Optimal Physician Behavior Be Obtained Using Price Controls? Journal of Health Politics, Policy and Law, 14(3), pp. 601–20.

Remuneration scheme / Market condition	Salaried physicians	Contract physicians
Responsive to physicians effort	No incentives	Positive incentives
Non-responsive to physicians effort	No incentives	No incentives

Figure 1. Market conditions and remuneration schemes and physicians' incentives to exert costly effort

Table 1. Variable descriptions.

Dependent variables	*How satisfied are you with:*
General satisfaction	The primary care physician
General access	The access to physicians in the municipality
Waiting time	Waiting time to get an appointment
Professional skills	The physician's professional skills
Outcome	The outcome of the treatment
Communication	Information about diagnoses and treatment
Independent variables:	
Municipality characteristics	
Physicians	Number of physicians per 10000 inhabitants (in person years)
Wage physicians	Number of employed physicians per 10000 inhabitants (in person years)
Junior physicians	Number of junior physicians per 10000 inhabitants (in person years)
Vacant physicians	Number of vacant physicians per 10000 inhabitants (in person years)
Total employment	Number of other personnel in primary health care (in person years)
Hospital	1 if there is a hospital in the municipality
Hospitalization	Mean length of stay in hospital
Mortality	Number of deaths per 1000 inhabitants
Health expenses	Total public expenses on primary health care
Population	Number of inhabitants
Individual characteristics	
Age	Respondent's age
Male	1 if male
Married	1 if married
Education 1	1 if high school
Education 2	1 if college or university
Income	Respondent's family income

Table 2. Descriptive statistics.

	All municipalities	Municipalities without a responsive market demand	Municipalities with a responsive market demand
Dependent variables			
General satisfaction	4.60 (1.23)	4.53 (1.27)	4.63 (1.22)
General access	3.82 (1.35)	3.62 (1.36)	3.90 (1.34)
Waiting time	3.70 (1.58)	3.63 (1.60)	3.73 (1.57)
Friendliness	4.62 (1.18)	4.55 (1.18)	4.65 (1.17)
Professional skills	4.91 (1.01)	4.86 (1.03)	4.94 (1.00)
Outcome	4.66 (1.20)	4.61 (1.23)	4.69 (1.18)
Communication	4.75 (1.19)	4.71 (1.21)	4.77 (1.18)
Independent variables			
Municipality characteristics:			
Physicians	7.83 (1.26)	7.71 (1.22)	7.88 (1.28)
Wage physicians	1.04 (1.28)	1.20 (1.08)	0.97 (1.35)
Junior physicians	0.23 (0.62)	0.25 (0.86)	0.22 (0.48)
Vacant physicians	0.22 (0.51)	0.67 (0.76)	0.02 (0.07)
Total employment	15.87 (3.26)	15.46 (3.63)	16.06 (3.07)
Hospital	0.62 (0.49)	0.69 (0.46)	0.59 (0.49)
Hospitalization	2.07 (0.43)	1.90 (0.44)	2.14 (0.41)
Mortality	9.51 (1.93)	8.85 (1.86)	9.80 (1.89)
Health expenses	1.18 (0.53)	1.08 (0.21)	1.22 (0.62)
Population	7.52 (11.90)	7.74 (6.08)	7.43 (13.66)
Individual characteristics:			
Age	47.36 (17.42)	45.60 (16.74)	48.12 (17.65)
Male	0.47 (0.49)	0.46 (0.50)	0.47 (0.50)
Married	0.62 (0.49)	0.59 (0.49)	0.63 (0.48)
Education 1	0.46 (0.50)	0.43 (0.49)	0.48 (0.50)
Education 2	0.35 (0.48)	0.42 (0.50)	0.32 (0.47)
Income	3.30 (1.61)	3.44 (1.70)	3.24 (1.56)

Table 3. Ordered probit model on patient satisfaction, full sample.

	General satisfaction	General access	Waiting time	Information	Professional skills	Outcome
Physicians	0.0691**	0.1719**	0.0427	0.0566**	0.0534**	0.0148
	(0.0330)	(0.0476)	(0.0380)	(0.0277)	(0.0275)	(0.0243)
Wage physicians	-0.0512**	-0.0457	-0.0515*	-0.0125	-0.0417**	-0.0165
	(0.0250)	(0.0358)	(0.0284)	(0.0212)	(0.0209)	(0.0120)
Junior physicians	-0.1818***	-0.1928***	-0.0500	-0.1764***	-0.1159***	-0.0763*
	(0.0505)	(0.0702)	(0.0558)	(0.0449)	(0.0454)	(0.0466)
Total employment	0.0009	-0.0016	-0.0184	-0.0092	0.0048	-0.0071
	(0.0122)	(0.0178)	(0.0140)	(0.0103)	(0.0101)	(0.0090)
Hospital in municipality	0.2942***	0.3087*	0.4279***	0.2234***	0.2127***	0.1535**
	(0.1091)	(0.1647)	(0.1337)	(0.0835)	(0.0786)	(0.0631)
Hospitalization	-0.1710	-0.6395***	-0.1987	-0.0507	-0.2128**	-0.0967
	(0.1166)	(0.1739)	(0.1351)	(0.0950)	(0.0927)	(0.0799)
Mortality	-0.0166	-0.0127	0.0133	-0.0235	0.0078	0.0052
	(0.0242)	(0.0342)	(0.0274)	(0.0207)	(0.0207)	(0.0185)
Health expenses	0.0618	-0.0092	0.0743	0.0165	-0.1541	-0.0582
	(0.1837)	(0.2641)	(0.2284)	(0.1681)	(0.1614)	(0.1407)
Population	-0.0096	-0.0189	-0.0008	-0.0073	-0.0018	-0.0024
	(0.0106)	(0.0169)	(0.0120)	(0.0084)	(0.0080)	(0.0065)
Individual characteristics						
Age	0.0226***	0.0155***	0.0148***	0.0187***	0.0168***	0.0135***
	(0.0011)	(0.0011)	(0.0010)	(0.0011)	(0.0011)	(0.0011)
Education 1	-0.1977***	-0.1453***	-0.0941**	-0.1314***	-0.1885***	-0.1513**
	(0.0466)	(0.0462)	(0.0454)	(0.0471)	(0.0488)	(0.0474)
Education 2	-0.2123***	-0.1646***	-0.0350	-0.0865*	-0.2791***	-0.1466***
	(0.0505)	(0.0504)	(0.0496)	(0.0512)	(0.0528)	(0.0516)
Income household	-0.0834***	-0.0638***	-0.0197*	-0.0430***	-0.0810***	-0.0172
	(0.0118)	(0.0118)	(0.0116)	(0.0119)	(0.0123)	(0.0120)
Married	0.0956***	0.0236	-0.0203	0.1178***	0.1098***	0.0281
	(0.0374)	(0.0375)	(0.0368)	(0.0380)	(0.0392)	(0.0384)
Male	-0.3015***	0.0115	0.0560*	-0.2756***	-0.3080***	-0.1846***
	(0.0335)	(0.0335)	(0.0329)	(0.0340)	(0.0352)	(0.0344)
Variability in municipality intercepts	0.1233	0.4197	0.2091	0.0463	0.0352	0.0107
	(0.0307)	(0.0600)	(0.0389)	(0.0191)	(0.0149)	(0.0077)
Observations	12323	12043	12182	12080	11603	11630
Log likelihood	-18152.18	-19375.24	-20992.41	-17274.78	-15030.15	-17002.49

Table 4. Ordered probit models on patient satisfaction.

Municipalities without a responsive market demand.

	General satisfaction	General access	Waiting time	Information	Professional skills	Outcome
Physicians	0.1238**	0.1786**	-0.0868	0.0838**	0.1046**	0.0518
	(0.0566)	(0.0840)	(0.0775)	(0.0411)	(0.0450)	(0.0440)
Wage physicians	-0.0479	-0.0205	0.0763	-0.0233	-0.0838*	-0.0035
	(0.0543)	(0.0791)	(0.0521)	(0.0434)	(0.0447)	(0.0436)
Junior physicians	-0.2388***	-0.2369**	-0.0697	-0.2021***	-0.1353**	-0.1166*
	(0.0748)	(0.1072)	(0.0739)	(0.0622)	(0.0644)	(0.0625)
Observations	3730	3595	3665	3624	3519	3496
Log likelihood	-5605.44	-5863.32	-6370.78	-5224.94	-4641.36	-5187.09

Municipalities with a responsive market demand.

	General satisfaction	General access	Waiting time	Information	Professional skills	Outcome
Physicians	0.0496	0.1218**	0.1017**	0.0489	0.0411	0.0089
	(0.0378)	(0.0591)	(0.0436)	(0.0351)	(0.0377)	(0.0333)
Wage physicians	-0.0706***	-0.0749**	-0.0934***	-0.0178	-0.0351	-0.0288
	(0.0251)	(0.0392)	(0.0287)	(0.0231)	(0.0247)	(0.0225)
Junior physicians	-0.0901	-0.0130	0.1275	-0.1632**	-0.0980	-0.0720
	(0.0748)	(0.1111)	(0.0845)	(0.0713)	(0.0763)	(0.0681)
Observations	8593	8448	8517	8456	8084	8134
Log likelihood	-12520.40	-13483.89	-14594.65	-12027.57	-10370.36	-11798.39

Department of Economics
University of Bergen
Fosswinckels gate 6
N-5007 Bergen, Norway
Phone: +47 55 58 92 00
Telefax: +47 55 58 92 10
http://www.svf.uib.no/econ