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The impact of quality on the demand for outpatient services in Cyprus

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Summary

Health policy reforms in a number of countries seek to improve provider quality by sharpening the incentives they face, for example by exposing them to greater competition. For this to succeed, patients must be responsive to quality in their choice of provider. This paper uses data from Cyprus to estimate the effect of quality on patients' choice between public and private outpatient care. It improves on the existing literature by using a more comprehensive set of quality attributes which allows the dimensions of quality that have the largest effect on patient choice of provider to be identified. We also introduce an innovative way of measuring patients' perceptions of quality in a household survey. We find that patients' choice of provider is sensitive to quality, and that interpersonal quality is more important than either technical quality or system-related factors. Copyright © 2004 John Wiley & Sons, Ltd.

Keywords quality; demand; Cyprus; quality competition

Introduction

Service providers in traditional public health systems have typically faced very weak incentives to respond to patient preferences and their perceptions of quality. One indication of the resulting quality deficiencies is the large number of patients who choose to seek care in the private sector, despite the availability of "free" public sector services.

To respond to these quality problems, health reform policies in a wide range of high and low income countries have sought to introduce reforms that encourage competition between public and private providers. In the early 1990s, the Government of Cyprus proposed the introduction of a National Health Insurance System [1]. A single payer, in the form of a National Health Insurance Agency, would reimburse both public and private providers for care provided under a system of universal coverage. Such a system, it was argued, would be capable of addressing the problems of inefficiency, cost escalation and inequity in utilisation of health services. An additional principle underlying the proposal was that by having a single payer with pluralistic provision, public providers would have to compete with private providers for patients. Such competition, it was argued, would encourage public providers to be more responsive to patient preferences.

The proposition that competition will improve provider sensitivity to patients rests on the assumption that patients are responsive to quality in their choice of provider. While a number of studies have attempted to establish the relative

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importance of price and quality in the demand for health services, they have suffered from a number of weaknesses. First, they have used a narrow range of quality measures that are rooted in providers' rather than patients' perspectives on quality of care, and that do not distinguish between the different aspects of quality of care that patients assess in making their choice of provider. A much clearer understanding is needed of how preferences for different dimensions of quality are reflected in provider choice in order to assist policymakers in designing effective intervention policies.

Second, the measurement of quality has been problematic. Quality measures derived from household surveys are subject to a range of potential sources of bias. The most important of these are: a potential selection bias arising from the need to impute the quality of the providers the respondent did *not choose* with quality responses from those who were chosen; and the cueing effect which results from eliciting responses on quality *after* the respondents are asked about the providers they used during the recall period.

In this paper we empirically estimate the relative impact of price and quality on the demand for outpatient care in Cyprus, using data from the 1996 Cyprus Household Health Utilisation and Expenditure Survey. This study improves on existing analysis in two ways. Quality is measured from the patient's perspective, using a more comprehensive set of quality attributes than is typically available from household surveys. This allows us to distinguish among different dimensions of perceived quality. Second, patients' perceptions of quality are measured through the innovation of asking "*ex ante*" quality questions in the household survey. These questions elicit quality responses to both providers chosen and not chosen by the respondent and therefore avoid the need to impute quality for the non-chosen providers. They also mitigate the cueing effect by delinking the questions on quality valuation and actual visits.

We use a probit regression model to explore the effect of quality on patients' choice between using public and private outpatient care. We investigate the robustness of our results to alternative specifications, including a bivariate probit model with sample selection. We then use the results to simulate the effects on demand of policies to alter quality and prices in the public and private sectors. Our approach is shown to be superior to conventional methods in terms of mitigating selection bias and the cueing effect. We show that patients' choice of provider is sensitive to quality and the effect is strongest for the interpersonal dimension of quality. To the extent that public providers can be encouraged to compete for patients, this suggests that measures to improve interpersonal quality in the public sector will have a substantial impact on utilisation.

The next section discusses the conceptualisation of quality adopted in this study, and presents a brief review of the treatment of quality in the health care demand literature. Key elements of the Cypriot health care system are then presented, followed by a discussion of our empirical model. The data and estimation strategies are described, and the results are presented. The last section concludes with a discussion of the results and the policy implications of our findings.

Literature review

Conceptualising quality

Quality is a multidimensional concept. Donabedian [2] distinguishes three dimensions of quality: technical quality, interpersonal quality and amenities. *Technical quality* relates to the effectiveness of care in producing achievable health gain. *Interpersonal quality* refers to the extent of accommodation of the patient's needs and preferences – for example, communication and respect for patients. The *amenities* of care include features such as comfort of physical surroundings, and attributes of the organisation of service provision for example, appointment systems and waiting times.

Two aspects of health service quality have been distinguished: 'actual' quality and 'perceived' quality, the latter corresponding to 'patient satisfaction' or quality as perceived from the patient's perspective [3,4]. In the analysis that follows, we adopt a perceived quality/patient satisfaction concept of quality. Because institutional purchasers, who might be expected to be more interested in technical quality, are not important in the Cyprus market, it is patients' perceptions of quality which drive their choice of provider.

The effect of quality on demand for health services

The bulk of the literature which examines the role of quality in the demand for health services comes from low and middle-income countries (LMICs). The focus of these studies has been on estimating price elasticities for the purpose of evaluating the likely effects on utilisation and revenue generation of introducing user fees for public health services. Although most studies 'control' for quality in the estimated demand functions, the main interest has been in the price effect.

A number of different approaches to dealing with quality in demand models are taken in the literature. First, there are studies of the impact of user fees on demand in which quality is modelled as an unobservable characteristic of the provider [5–8]. Since quality is not explicitly measured in these studies, this approach sheds no light on how responsive consumers are to quality of providers.

A second group of studies uses quality measures derived from a separate provider survey. The quality of each option faced by the individual is usually imputed as the quality of the nearest facility of that type, or as the average across the accessible facilities of that type [9–16]. Because quality measures are generated for those provider options that were available to the individuals but not chosen, the resulting quality measures are exogenous to the choice of provider, and consequently, will not suffer from selectivity bias. However, because they derive from the provider's perspective, the quality attributes included tend to be limited and may not capture what consumers care about, or what they are able to observe, given their limited technical knowledge. Predominantly structural measures of quality are used, such as drug availability, number and/or type of medical personnel available, physical condition, and per capita facility expenditure. While these are plausibly related to perceived quality, no evidence is provided of the importance of these particular characteristics to patients or the ability of patients to observe or evaluate them.

Conceptually, then, the appropriate measures of quality in a demand study should come from patients themselves. A number of studies in the literature use quality measures derived from household surveys [17,18]. Several potential sources of bias arise from using quality ratings derived from household surveys. First, the quality measure may be sensitive to the location of the questions in the survey instrument. If the questions about quality are asked after the respondents have been asked about their choice of provider (the typical format for these questionnaires) their response may be correlated with service use, leading to a correlation between this variable and the error term. We call this a 'cueing effect'. Using these quality measures as an independent variable to explain patients' choice of provider would bias the estimated coefficient upwards.

Second, because household surveys do not usually collect quality measures for the provider which is *not* chosen, researchers often impute a quality measure using information from those individuals who did choose that particular provider type. This can potentially lead to selection bias: if individuals are assumed to choose the highest quality service available to them, the distribution of user-reported evaluations of a given provider type is likely to differ from that in the general population. We describe below how the Cyprus survey instrument was designed to mitigate both these effects.

Country background

Cyprus[a] is the third largest country in the Mediterranean, with per capita income of \$12 000 in 1998 (current US\$), and life expectancy at birth of 77 years. The health system comprises three main components: the public sector, financed through general taxation; the private sector, financed through out-of-pocket payments and, to a lesser extent, private insurance; and the union sector, funded through contributory employment-based insurance. The overall system is fragmented, with few linkages between the different subsystems.

The public sector is organised along the lines of a traditional National Health Service. Comprehensive health care services are provided through a network of hospitals and rural health centres. The public sector employs approximately 30% of doctors, and accounts for 43% of acute care beds. Primary care is provided by general practitioners deployed in outpatient departments in hospitals and health centres and referral is required to receive care in specialist outpatient clinics. Government services are free for eligible groups which together encompass much of the population. These include: government employees, refugees

from the occupied areas, individuals and households earning less than a set amount per year, and households with more than three dependants.

Public sector health workers, including doctors, are paid by salary. Physicians are not permitted to work privately, though there is some limited contracting of private sector providers by the public sector for certain specialist services. Hospitals receive historically-determined budgets for the services they provide. Any fee revenue collected by the facility from patients who do not qualify for fully subsidised services is returned to Treasury. As such, there is little incentive for quality in the public sector, leading to substantial private sector use even by those who qualify for free care in public facilities.

The private health care system employs approximately 70% of doctors and accounts for 55% of beds. The majority of doctors are in individual solo practices and they provide the bulk of primary care in the private sector. There is no fee schedule in the private sector and doctors can charge any fees.

Table 1 shows the distribution of outpatient visits between the public and private sectors, by income group. While the proportion of visits to private providers increases with income, even in the lowest income quartile where public services can be used free of charge, in excess of 35% of visits are to private providers.[b]

Empirical model

Following the health care demand literature, an individual's choice of provider is modelled as a function of choice-specific characteristics, that is, price and quality, and individual characteristics, such as income. There has been debate as to the appropriate empirical specification of the demand function. Gertler *et al.* [5] argued that for the specification to be consistent with utility maximisation, price (and quality) coefficients ought to be constrained to equality across alternatives. Based on their specification, individual characteristics that do not vary among options cannot be identified.

Recent work by Dow [19] has shown that more flexible forms of specification that allow varying price (and quality) coefficients for each choice alternative, and include individual characteristics, can be derived from plausible forms of utility functions. Others have concurred that this more flexible specification is also preferred in terms of practicality of the model and interpretability of the results [14].

To address this issue we estimated two models. First, we adopted a flexible form that allows the quality and price coefficients to vary across alternatives. Second, we constrained these coefficients to be the same across choice alternatives. We then conducted a likelihood ratio test to compare the two models. In essence, the latter model can be viewed as a specification test for the former.

Table 1. Distribution of outpatient visits by provider type and income group

Income group (n)	Private (%)	Government (%)
Lowest (<C£6000) ($n=829$)	34.7	65.3
2nd (C£6000–7500) ($n=525$)	55.8	44.2
3rd (C£7500–11 000) ($n=352$)	64.5	35.5
Highest (>C£11 000) ($n=313$)	64.9	35.1

Data and variables

The data used in this analysis are from the 1996 Cyprus Household Health Utilisation and Expenditure Survey, undertaken as part of a study of the costs of introducing national health insurance in Cyprus [20]. The sample was selected using stratified, multistage area probability sampling, so that it is representative of the population. In total 8270 individuals in 2501 households were interviewed, with a parent responding on behalf of children under 15 years.

The survey asked a series of questions about the utilisation of physician services during the preceding four weeks. The survey instrument collected detailed information for up to 6 physician visits in the four-week period. For each visit, the respondent indicated whether they had visited a government, union, or private doctor. Out-of-pocket expenditure was recorded, as was their use of additional diagnostic services and purchase of prescription drugs. The models were estimated over the full set of visits, with multiple users contributing more than one visit.[c] Children were excluded from the analysis because they did not

respond to questions about perceived quality. We also repeated our analysis using only the first visit. The results do not differ substantively and they are not presented here.

Our dependent variable is a binary variable indicating whether a particular outpatient visit was to a private or a public doctor.[d] The independent variables include:

Quality

Quality ratings were elicited for public and private providers along seven different dimensions of the quality of outpatient care, covering technical quality, interpersonal quality and amenities or 'system quality', together with a rating of the overall quality. A rating scale of 1 (very poor) to 10 (excellent) was used. In addition, respondents were asked how much time they expect to wait in the doctor's office. These quality dimensions were chosen based on review of the patient satisfaction survey literature and consultation with key informants in Cyprus.

In designing the quality questions, measures were taken to reduce both the effect of 'cueing' and the potential selection bias from imputing the quality of the options not chosen. Our innovation was to ask about the respondents' evaluation of the quality of services in the public and private sectors in the early part of the questionnaire, before any questions were asked about *use* of specific health services. The question was worded as follows:

> 'Based on your beliefs or experiences, we would like you to compare the services in the public sector with those in the private sector. On this scale of 1 to 10, assess the following aspects of a visit for a minor illness in both the public and private sector.'

Interviewers were instructed to ask the respondent to address these questions even if the respondent had only visited one or none of the sectors. We call the responses to this question the *ex ante* quality measures, where *ex ante* is defined with respect to the questions about actual use of outpatient services during the reference period. By design, the *ex ante* questions correct for the cueing effect, and because respondents are asked to rate the same attributes for both public and private providers, we do not need to predict quality measures of the non-chosen providers.

Following the questions about actual service utilisation, respondents were asked to rate the sectors which they had used in the preceding 4 weeks. We call these questions the *ex post* questions. Table 2 shows the *ex ante* and *ex post* quality measures for users of each sector. For each dimension, the private sector is rated more highly than the public sector. This is true for both the *ex ante* and the *ex post* ratings. In addition, the *ex post* measures are systematically higher than the *ex ante* measures within the same sector (the differences are statistically significant at the 95% level). This is consistent with the biases postulated above.

Three different quality variables were defined. 'Score' is the simple mean of the ratings across all seven quality dimensions. Where a respondent did not provide ratings for all dimensions, the mean is calculated across whichever dimensions they rated, in order to preserve observations. The validity of using the simple mean across dimensions was investigated using Chronbach's alpha and factor analysis.[e] The second quality measure looks separately at the single item that asked about the 'overall impression' of provider quality. The third measure groups individual items into measures of technical quality, interpersonal quality, and system quality, on the basis of the factor analysis results. Table 2 indicates how the items were grouped. The mean of the ratings for particular items is used. Table 3 shows the mean of the quality and price variables for public and private providers. In all cases, private providers are perceived to offer higher quality.

Price

The questionnaire did not ask about prices *ex ante*, unfortunately. The vast majority of Cypriots qualify for free or highly subsidised services in the public sector. Only 8 out of 1252 visits to public providers in our sample resulted in any consultation fee being paid. We have therefore used a public price of zero for all observations. Private price is measured as the actual out-of-pocket expenditure on consultation fees, net of any reimbursement by insurance.[f] Reported expenditures were only available for those who had used the private sector. To impute a private price for those who used a public provider, a log-linear regression was run for those who used private services and the results used to predict prices for those who used the public sector. The predictors include age, sex, education, district and a set of

Table 2. Mean *ex ante* and *ex post* measures of quality

	Ex ante			*Ex post*		
	Private	Gov't	Difference	Private	Gov't	Difference
A. *Technical*						
Ability of doctor to give correct diagnosis and treatment	8.73 (1.29)	8.62 (1.74)	0.11	9.41 (1.00)	9.12 (1.58)	0.29***
Outcome of treatment	8.81 (1.12)	8.51 (1.61)	0.30***	9.32 (1.07)	8.95 (1.49)	0.37***
B. *Interpersonal*						
Amount of time doctor spends with you	8.90 (1.22)	7.80 (1.99)	1.10***	9.44 (0.99)	8.63 (1.82)	0.81***
Doctor explained problem, tests, procedures	9.06 (1.11)	7.88 (2.01)	1.18***	9.54 (0.86)	8.66 (1.86)	0.88***
Courtesy and helpfulness of doctor	9.12 (1.10)	8.06 (1.95)	1.06***	9.56 (0.87)	8.78 (1.81)	0.78***
C. *System*						
Cleanliness and comfort of waiting area and consultation area	9.16 (1.07)	8.65 (1.70)	0.51***	9.57 (0.83)	9.06 (1.39)	0.51***
Ability to choose doctor	9.59 (0.87)	7.05 (2.59)	2.54***	9.74 (0.76)	7.60 (2.84)	2.14***
D. *Overall impression*	9.05 (1.10)	8.36 (1.65)	0.69***	9.51 (0.92)	8.89 (1.56)	0.62***

t-tests are for difference in mean between private and government.
*** = $p<0.01$.
Standard deviation in parentheses.

dummy variables for type of illness. The R^2 of the prediction regression was 0.18. The predicted private price was used for everybody in the sample, irrespective of which sector they used. The predictions were smeared to correct for retransformation bias [21].

To identify the price effect, there must be at least one variable included in the price prediction equation that is excluded from the provider choice equation. We used gender and education as identifying variables for the price equation, partly because in Cyprus, physicians use education as an indicator of income in setting their fees. However, these are likely to be weak instruments, resulting in non-identification of the price effect which may bias the quality coefficient, if indeed price is important in the provider choice equation. We therefore also estimated our provider choice model with and without the price variables in order to shed light on the extent to which this limits the robustness of the quality coefficients, our key variables of interest.

In addition to monetary prices, we also controlled for travel time and waiting time, both as *ex ante* measures. Travel time is used to capture the

Table 3. Measures of quality and price by provider

	Private	Government	*t*-statistic
Quality			
Score	8.99 (0.95)	7.40 (1.91)	31.70
Technical	8.70 (1.21)	7.99 (1.90)	13.93
Inter-personal	8.96 (1.06)	7.11 (2.24)	31.81
System	9.34 (0.89)	7.18 (2.10)	39.82
Overall	8.93 (1.20)	7.59 (2.10)	23.28
Price			
Distance (in minutes)	20.23 (18.80)	19.79 (14.39)	0.89
Waiting time (in minutes)	51.82 (162.03)	178.91 (220.23)	−21.34
Money price (in £)*	10.6 (2.62)	0	

*Predicted price, net of insurance reimbursement.
All measures, except predicted prices, are *ex ante* measures.
Standard deviation in parentheses.
t-test is paired.

opportunity cost of using a provider and similarly, waiting time. However, waiting time can also be interpreted as a quality attribute.

Table 3 shows the predicted prices, waiting time and travel time for public and private providers. The private sector performs better on all measures of quality, including waiting time. The difference in travel time to both types of provider is not statistically significant. The average price for a private consultation is just under £11 (approximately US$18), while the price for public services is set at zero.

Other variables

In addition to price and quality, models were initially estimated with controls for age, education, sex, area of residence (rural vs. urban), household income, number of household members, dummy variables for district of residence to control for supply and demand factors that may influence the choice of public/private providers, and whether the individual has private insurance. The final models exclude sex and education, which were statistically insignificant in all specifications. All models were estimated using robust standard errors, correcting for the effect of clustering on individuals with multiple provider visits during the relevant recall period. Definitions of model variables are shown in Table 4.

Results

Ex ante quality measures

Table 5 presents the results of the probit regression of provider choice on price and quality, for the three different approaches to quality measurement. Using a likelihood ratio test[g] we were able to reject the more flexible specification in which the quality (and price) coefficients were allowed to differ between public and private providers. Our main model therefore constrains these coefficients to be of the same magnitude (and of opposite sign) for public and private providers.

The effect of quality is significant and of the expected sign in all three models. A larger quality advantage of the private sector relative to the public sector increases the probability of choosing a private provider. The greater the waiting time in the public sector, the more likely an individual is to choose a private provider. The coefficients on price are not significant, though travel time has a negative and significant effect in each of the specifications. Those in the two highest income groups are more likely to use a private provider than those in lower income groups. The models perform relatively well overall, with pseudo-R^2 measures of approximately 0.27.

From the results of Model 3 it is possible to infer the influence of different dimensions of quality. The largest coefficient is on interpersonal quality; system quality is also positive and significant. However, the effect of perceived technical quality on choice of provider is statistically insignificant.

A number of alternative specifications of the models were tested. First, because of concerns about weak identification of the price variable, we re-estimated all three models excluding price, recognising that this may cause an omitted variable bias (Table 6). The quality effects were virtually unchanged from the base models in

Table 4. List of variables

Variable name	Definition
Score	Mean of responses to all seven quality dimensions
Technical	Mean of responses to questions about ability of doctor, outcome of treatment
Inter-personal	Mean of responses to questions about time spent by doctor, explanation provided by doctor, courtesy and helpfulness of doctor
System	Mean of responses to questions about cleanliness and comfort of office environment, ability to choose doctor
Overall impression	Response to question about overall impression of quality
Travel time	Response to *ex ante* question about time required to travel to provider (in minutes)
Waiting time	Response to *ex ante* question about expected time spent waiting for consultation (in minutes)
Money price	Money cost of care, net of any insurance reimbursement
Rural	Household located in rural area
Insured	Member of household has private insurance

Table 5. Probit model: probability of choosing private provider

	Model 1	Model 2	Model 3
Score	0.269 (0.028)***		
Overall impression		0.233 (0.025)***	
Technical			0.033 (0.037)
Inter-personal			0.138 (0.036)***
System			0.081 (0.030)***
Travel time	−0.009 (0.003)***	−0.009 (0.003)***	−0.010 (0.003)***
Waiting time	−0.002 (0.0004)***	−0.002 (0.0004)***	−0.002 (0.0004)***
Money price	0.017 (0.048)	0.018 (0.049)	0.014 (0.048)
Income (£6000–7500)[a]	0.012 (0.130)	−0.004 (0.130)	0.017 (0.130)
Income (£7500–11 000)	0.309 (0.150)**	0.261 (0.152)*	0.324 (0.151)**
Income (>£11 000)	0.316 (0.151)**	0.240 (0.153)	0.325 (0.151)**
Age	−0.010 (0.003)***	−0.012 (0.003)***	−0.010 (0.003)***
Rural	−0.161 (0.104)	−0.163 (0.104)	−0.163 (0.104)
Household size	0.005 (0.039)	0.0006 (0.039)	0.009 (0.039)
Nicosia[b]	0.109 (0.171)	0.166 (0.173)	0.098 (0.175)
Limassol	0.165 (0.175)	0.250 (0.178)	0.138 (0.180)
Larnaca	0.118 (0.220)	0.174 (0.218)	0.111 (0.225)
Famagusta	0.499 (0.249)**	0.495 (0.255)*	0.487 (0.256)*
Insured	0.270 (0.154)*	0.198 (0.154)	0.266 (0.155)*
Wald χ^2	321.8	297.25	337.53
Pseudo R^2	0.27	0.26	0.26
N	1508	1500	1495

Robust standard errors in parentheses, adjusted for clustering on individuals with multiple visits.
*$p<0.10$; **$p<0.05$; ***$p<0.01$.
[a]Omitted group is <£6000.
[b]Omitted group is Paphos.
All models include dummy variables for type of illness.

Table 6. Probit model: probability of choosing private provider (excluding money price variable)

	Model 1	Model 2	Model 3
Score	0.268 (0.028)***		
Overall impression		0.231 (0.025)***	
Technical			0.033 (0.037)
Interpersonal			0.139 (0.035)***
System			0.078 (0.030)***
Travel time	−0.009 (0.003)***	−0.008 (0.003)***	−0.010 (0.003)***
Waiting time	−0.002 (0.0004)***	−0.002 (0.0004)***	−0.002 (0.0004)***
Income (6000–7500)[a]	−0.003 (0.131)	−0.012 (0.130)	−0.0001 (0.132)
Income (7500–11,000)	0.291 (0.150)*	0.248 (0.151)	0.307 (0.151)**
Income (>11,000)	0.275 (0.57)*	0.211 (0.158)	0.281 (0.156)*
Wald χ^2	335.20	305.14	348.86
Pseudo R^2	0.27	0.26	0.27
N	1508	1500	1495

Robust standard errors in parentheses, adjusted for clustering on individuals with multiple visits.
*$p<0.10$; **$p<0.05$; ***$p<0.01$.
[a]Omitted group is <£6000.
All models include dummy variables for type of illness, and control for age, rural, household size, district, and whether privately insured.

Table 5. Second, we re-estimated all three models excluding the sub-sample of those with private insurance, on the grounds that those with private insurance coverage (6.8% of the sample, results not shown) may have systematic differences in preferences or face different constraints in their

choice of provider. Again, this produced no material change to our findings.

Comparison of *ex ante* and *ex post* estimation results

The conventional approach to measuring quality is to use '*ex post*' questions, asked after the questions eliciting recent use of health services, which may lead to upward biased estimates. To shed light on how our '*ex ante*' approach may be an improvement over the conventional approach, we re-estimated the model using the *ex post* quality measures. However, since these measures were only available in the instance where the sector was actually chosen, it was necessary to impute quality measures for the sector not chosen. Selection bias may arise because the *ex post* quality assessments of the users may not be representative of those of the entire sample. We attempted to correct for this selection bias by using a two-step Heckman selection model to impute the *ex post* quality measures. In practice, this approach is challenging because there are very few variables available in the dataset that satisfy the identification restriction. We chose to focus on Models 1 and 2, because insufficient instruments were available to impute separate measures for the three different sub-components of quality used in Model 3. Location (district, rural/urban) and illness type, assumed to be correlated with choice but not with quality assessment, were used as the identifying variables. The imputed quality measures, entered as differences, were used for all individuals in the probit estimation. Because we are mainly interested in the estimation of the quality effect, we chose to leave distance and travel time as measured *ex ante*.

The results of this model are shown in Table 7. For comparison with the *ex ante* results, the baseline models in Table 5 were re-estimated excluding location and illness dummies, since these two variables were used for identification in the Heckman selection model in predicting quality. Compared with the *ex ante* models, the estimated quality coefficients in the *ex post* models are larger, and are only statistically significant in Model 2. The more positive coefficient estimates could be due to the selection bias or the cueing effect, or both. Recognizing the problem in identifying variables for implementing the Heckman selection correction, our estimation here is for comparison purposes only, and we do not claim that our estimation using the *ex post* measures of quality is satisfactorily cleansed of selection bias. Nonetheless, our results show that, compared to conventional methods of estimating the effect of quality on choice, the *ex ante* measures are superior.

Sensitivity analysis: including and excluding the non-user sample

The policy question that we want to address in this paper is how quality and price affect patients'

Table 7. Probit model: probability of choosing private provider, using selection-corrected *ex post* quality ratings

	Model 1: *ex post*	Model 2: *ex post*	Comparison (*ex ante*): Model 1	Comparison (*ex ante*): Model 2
Score	0.372 (0.304)		0.250 (0.025)***	
Overall impression		0.441 (0.249)*		0.210 (0.022)***
Travel time	−0.009 (0.003)***	−0.009 (0.003)***	−0.009 (0.003)***	−0.008 (0.003)***
Waiting time	−0.003 (0.0004)***	−0.003 (0.0004)***	−0.002 (0.0003)***	−0.002 (0.0004)***
Price	−0.010 (0.048)	0.010 (0.051)	−0.005 (0.017)	−0.006 (0.017)
Income (£6000–7500)[a]	−0.099 (0.236)	−0.189 (0.230)	0.043 (0.119)	0.037 (0.121)
Income (£7500–11 000)	0.326 (0.167)*	0.164 (0.211)	0.303 (0.140)**	0.248 (0.142)*
Income (> £11 000)	0.227 (0.213)	0.088 (0.239)	0.300 (0.149)**	0.247 (0.147)*
LR χ^2	244.02	244.92	217.62	191.68
Pseudo R^2	0.20	0.20	0.20	0.20
N	1544	1544	1530	1522

Robust standard errors in parentheses, adjusted for clustering on individuals with multiple visits.
*$p<0.10$; **$p<0.05$; ***$p<0.01$.
Ex post quality predicted using location (rural, district) and type of illness as instruments.
Comparison models are the same models as Table 4, but exclude location and type of illness.
[a]Omitted group is <£6000.

choice of public versus private provider, conditioning on choosing to make a visit. Therefore, we have used the sample of users for estimation. This is not the same as an unconditional estimation of factors affecting the choice of provider. Such estimates could suffer from selectivity bias if health service users have a systematically different price-quality trade-off from those in the general population. To investigate whether there were substantive differences between the two samples, we estimated a bivariate probit model with selection, using the whole sample of users and non-users. Variables capturing the health state of the respondent were used as the identifying variables assumed to affect the probability of use but not choice of provider. These were self-assessed health status, whether the individual had taken time off normal activities because of illness, and whether they had any chronic illness or infirmity. Because all relevant independent variables need to be observed for both users and non-users, the bivariate probit model excludes illness dummies which were only available for users, and which were jointly significant in the baseline choice model. For the purpose of comparison, we re-estimated the baseline model excluding the illness dummies so that the same potential omitted variable bias will apply to the baseline model and the bivariate probit model. The results appear in Tables 8(a) and 8(b). Although the exclusion of the illness dummies appears to lead to a slight downwards bias in the quality coefficients compared with the baseline model, these results suggest that the coefficients of the models estimated over the whole population and the sample of users are very similar in magnitude and significance, suggesting that this is not an important source of bias. Interestingly, the price variable becomes negative and significant in the full sample specification, which may suggest that the effect of price on

Table 8. Bivariate probit with sample selection (whole sample)

	Ex ante (full sample)	*Ex ante* (users only)[c]
(a) Model 1: Average quality score		
Score	0.240 (0.028)***	0.242 (0.025)***
Travel time	−0.002 (0.002)**	−0.008 (0.002)***
Waiting time	−0.001 (0.0004)***	−0.002 (0.0004)***
Price	−0.121 (0.047)**	0.004 (0.018)
Income (£6000–7500)[a]	0.035 (0.122)	0.012 (0.122)
Income (£7500–11 000)	0.244 (0.138)*	0.251 (0.144)*
Income (> £11 000)	0.261 (0.140)*	0.190 (0.161)
χ^2	123.79	238.19
N	5218	1530
Rho[b]	0.326 (0.119)**	
(b) Model 2: Overall impression		
Overall impression	0.199 (0.025)***	0.201 (0.023)***
Travel time	−0.002 (0.0008)**	−0.007 (0.002)***
Waiting time	−0.002 (0.0004)***	−0.002 (0.0004)***
Price	−0.100 (0.047)**	0.001 (0.018)
Income (£6000–7500)[a]	0.080 (0.121)	0.015 (0.123)
Income (£7500–11 000)	0.228* (0.137)	0.213 (0.146)
Income (> £11 000)	0.241 (0.141)*	0.154 (0.160)
χ^2	108.77	206.59
N	5210	1522
Rho[b]	0.333 (0.120)**	

Robust standard errors in parentheses, adjusted for clustering on individuals with multiple visits.
*$p<0.10$; **$p<0.05$; ***$p<0.01$.
(Models control for age, education, sex, rural, district, insured, and type of illness).
[a] Omitted group is <£6000.
[b] Rho is the correlation between two parts of the selection correction model (the probability of use and probability of choosing a private provider conditional on use).
[c] Disease dummies excluded.

choice of provider and the decision to seek/not seek care are not entirely independent, as partly reflected in the value of rho (p-value <0.05). Again, we do not claim that we have ideal instruments to identify the seek/not seek care decision and the results presented here are only to check for the robustness of our model.

Simulation results

The effects of changes in different quality dimensions in the public and private sector were simulated, and presented as arc-elasticities based on Model 3 in Table 5. Simulation results are presented in Table 9. In the baseline scenario, variables are set at their sample means (see Table 3). Improving all three quality dimensions in the public sector to the level of the private sector, holding all else constant, would result in a shift in the private sector share of patients from 45 to 30%.

The demand for private services is more quality-elastic than the demand for public services. Similar quality elasticities have been estimated in Egypt, though the Egypt study found greater responsiveness to access than to either interpersonal or amenity aspects (0.49 for convenience of clinic hours, 0.23 for interpersonal and 0.30 for amenities). (Yip, W.C., *Choice of outpatient provider in Egypt: does patient satisfaction matter for low-income countries' residents?* 2001, Harvard School of Public Health, Boston, MA, unpublished mimeo.)

Since waiting and travel time are part of the user cost of services, and therefore interpretable as contributing to the price effect, it appears that demand is more responsive to quality than to price. Both own- and cross-price effects are smaller in absolute magnitude than nearly all of the quality effects.

Discussion and conclusions

Our baseline results indicate clearly that the demand for outpatient care in Cyprus is highly responsive to quality relative to price as measured in travel and waiting time. Of particular interest is that compared with technical or system aspects of quality, patients appear to be most sensitive to interpersonal quality, measured here as the amount of time spent by the doctor with the patient; the extent to which the doctor explains tests, procedures, results; and the courtesy and helpfulness of the doctor. This result has never been demonstrated in the literature and could have major policy implications.

We have also shown that our *ex ante* measures of quality are superior to conventional *ex post* measures for use in the demand estimation. While it may still be argued that the *ex ante* variables are contaminated by the past experience of users, and therefore not fully exogenous, it is nonetheless the case that prior use is only one source of information that a patient uses in making a choice of provider. Provider reputations based on reports

Table 9. Predicted probabilities and arc elasticities

	Predicted probabilities		Arc elasticity	
	Private	Government	Private	Government
Base Scenario[a]	0.450	0.550		
Increase private technical by 25%	0.472	0.528	0.196	−0.160
Increase private inter-personal by 25%	0.541	0.459	0.809	−0.662
Increase private system by 25%	0.506	0.494	0.498	−0.407
Increase private travel time by 25%	0.438	0.562	−0.107	0.087
Increase private wait time by 25%	0.448	0.552	−0.018	0.015
Increase public technical by 25%	0.433	0.567	−0.151	0.124
Increase public interpersonal by 25%	0.385	0.615	−0.578	0.473
Increase public system by 25%	0.411	0.589	−0.347	0.284
Increase public travel time by 25%	0.466	0.534	0.142	−0.116
Increase public wait time by 25%	0.468	0.532	0.160	−0.131

[a]Baseline scenario is evaluated with all variables set at their mean value (See Table 3).

from others' experience are also likely to form part of the patient's information set. To the extent that our estimates using the *ex ante* measures are endogenous, the coefficients will be biased upwards. Yet, our main estimates are consistently lower than those using the selection-corrected *ex post* measures. The larger coefficients using the *ex post* measures may reflect the cueing bias, but also selection. Our use of location and illness to identify the Heckman model was constrained by the availability in the data of appropriate instruments. While the selection correction may not be completely satisfactory, it serves to demonstrate the comparison between our method and the usual *ex post* method. In practice it is difficult to find instruments that are correlated with the choice of provider but not with quality and, indeed, with price.

To investigate the presence of bias in the quality estimates arising from examining only the price-quality trade-offs of users we also estimated the choice model over the full sample of users and non-users, using a bivariate probit model with selection. This approach addresses a different question from our main model, but the resulting quality coefficients are not substantively different, confirming that this source of bias is not a problem in our data.

A limitation of our results is that due to the lack of instruments, our monetary price effect is at best, weakly identified. We therefore tested the robustness of our results by including, and excluding a (weakly identified) monetary price. Fortunately, our key results of interests remain robust. Indeed, from an intuitive perspective, it is not clear what further source of variation in prices could be used to identify the price effect at a given point in time, after controlling for locality, quality and time costs.

The travel and waiting time effects were both negative and statistically significant. Nonetheless, when measured as elasticities, these price effects were smaller in magnitude than any of the quality elasticities, suggesting that patients are relatively more responsive to quality than to prices.

From our results it is possible to estimate the changes in patient flow which might arise from the introduction of a single-payer national health insurance system in Cyprus, if public providers could be encouraged to improve the perceived quality of their services. Our results show that raising quality in the public sector to the level currently observed in the private sector, *ceteris paribus*, would increase the public sector share of patients from approximately 55 to 70%. However, the goal posts are unlikely to remain fixed, and private providers can also be expected to increase their own quality in response to a competitive challenge from the public sector.

From a policy perspective, it is useful to consider how quality in the public sector could be improved. We suggest that policymakers can look to the level of quality in the private sector as a guide to what would be feasible to achieve in the public sector. In the case of system quality, some of our results suggest specific measures for improvement, for example, the introduction of organisational changes that would allow patients greater choice of provider. Clearly, this might be more feasible in the case of primary care providers than specialists, who will be in shorter supply. Strengthening systems of monitoring and accountability could help contribute to improved physical conditions, such as cleanliness and comfort.

Influencing the way that providers behave towards their patients is potentially more complex, as it is likely to involve a combination of changes in organisational culture and incentives (Yip WC *Choice of outpatient provider in Egypt: does patient satisfaction matter for low-income countries' residents?* 2001, Harvard School of Public Health, Boston, MA, unpublished mimeo). Part of the problem is related to the availability of information about the quality that is provided in different facilities. Public facilities have rarely been motivated to collect meaningful information about users' perceptions of quality. The signals provided by the market behaviour of patients, particularly if they are permitted a greater role in their choice of provider, would help to fill this information gap. However, improving interpersonal quality might also require changes to remuneration systems, such as introducing an element of performance-related pay. Such measures would no doubt raise political issues, such as challenge by civil service unions.

Our findings also have relevance for the broader range of countries that are considering introducing measures to increase provider responsiveness to patients, whether by altering the flow of funds to providers so that funding more closely follows patient loads, or by other means to encourage competition among providers. For competition to positively affect quality, consumers must be sensitive to quality in making their health care choices, but health providers will also need to

respond to those dimensions of quality that are most valued by patients, and will need ways of gathering this market intelligence. Our results confirm that patients' choices are influenced in an important way by their perceptions of quality, and add quantitative empirical evidence that interpersonal aspects of quality matter most to patients.

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Notes

a. Refers to the Greek part of Cyprus.
b. For outpatient visits people are only slightly more likely to visit a specialist in the private sector than the public sector, with 41% of specialists visited in the public sector vs 59% in the private sector. However, there is no evidence that the products provided in the two sectors are very different, at least at the outpatient level. For inpatient care, the public sector has considerably more sophisticated technology and facilities than most private facilities, which tend to be very small and provide only basic inpatient services.
c. Approximately 75% of the visits in the sample are by people who only visited one provider; the remaining 25% reported visiting two or more providers for that episode during the preceding 4 weeks.
d. Visits to union doctors (5% of total visits) were excluded from the analysis because of concerns that workers' choices are restricted by their insurer/employer.
e. Using the principal factor method, a single eigenvector was found to account for a large proportion of the total variance in the seven items in the scale. Factor loadings on the individual items for this first factor were very similar. Using the single factor with its approximately equal loadings is conceptually equivalent to using the arithmetic mean of the items, but the mean has the advantage of allowing the inclusion of observations for which not all quality dimensions were rated. Full results are available from the first author.
f. Of 1051 visits to private providers, 154 were reimbursed some positive amount (14.7%). The mean reimbursement was £8.5 (s.d. 9.0).
g. The LRT tested the unconstrained model (in which the quality and price effects are allowed to differ by provider type) against a constrained model in which the effects are entered as a difference. Using a 95% criterion, the unconstrained model performs better only in Model 2 ($p = 0.03$). Since our primary interest is in Model 3 which allows for the effects of different quality dimensions to be distinguished, we retained the constrained model as our preferred main model.

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