Consumer Choice and Public-Private Providers: The Role of Perceived Prices*

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December 3, 2021

Abstract

Governments often encourage health service providers to improve quality of care and reduce prices through competition. The efficacy of competition hinges on the assumption that consumers demand high quality care at low prices for any given health condition. In this paper, we examine this assumption by investigating the role of perceived price and quality on consumer choice for four different health conditions across public and private providers. We use a nationally representative survey in Malaysia to elicit respondents' perception on prices and quality, and their preferred choice of provider. We estimate a mixed logit model and show that consumers value different dimensions of quality depending on the health condition. Furthermore, increasing perceived prices for private providers reduces demand for minor, more frequent health conditions such as flu fever or cough, but increases demand for more complex, severe conditions such as coronary artery bypass graft. These findings provide empirical support for price regulation which differentiates the severity of underlying health conditions.

*Acknowledgements: We thank the Malaysia Health Systems Research (MHSR) project, led by the Ministry of Health Malaysia, and Harvard T.H. Chan School of Public Health Professors Rifat Atun, Peter Berman and William Hsiao. We also thank the Director General of Health Malaysia for valuable contributions to the MHSR project, and the Institute of Public Health for the survey data. We extend our gratitude to Bijetri Bose, Terence Cheng, Hong Qiao Fu, Jonah Goldberg, William Hsiao, Jared Mazzanti, Duo Xu, Roman Xu, and two anonymous referees for valuable comments. All errors remain our own.

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1 Introduction

Provider competition is at the heart of many health systems reforms. In countries with public-private delivery systems, policymakers often encourage private providers to enter the market to intensify competition between public and private providers. Combined with public provider reforms–such as providing greater financial and organizational autonomy to existing public hospitals–policymakers argue that public and private hospitals would compete for consumers seeking care by increasing quality and lowering prices. This argument relies on a crucial assumption: that consumers demand higher quality of care at a given price, or lower prices for a given level of quality. However, consumers may lack the knowledge to assess the value of health care or the more technical aspects of quality, so it is unclear if such reforms would succeed in achieving high quality care at low prices (**?**).

In this paper, we investigate the role of perceived prices and quality on consumer choice of health care provider for four different health conditions, across public and private providers. Our survey design asks consumers how much they would expect to pay for these four health conditions which differ in severity. We also obtain consumers' ratings on quality indicators across technical, interpersonal and systems quality, separately for public and private health care providers (**?**)[1]. We estimate a mixed logit model to account for heterogeneity in tastes for perceived prices. We find that increases in perceived prices lead to lower demand for routine conditions, but higher demand for more severe conditions. These results suggest that regulatory measures may be appropriate for severe conditions rather than for routine conditions. In particular, policymakers may consider regulating prices for more severe health conditions, but not for routine health conditions.

Existing studies that examine the role of prices and quality on the demand for health care services are limited to one or two medical diagnoses, or are limited by the type of ser-

[1]Technical quality typically refers to the effectiveness of care in producing health gains. Interpersonal quality would encompass the patient-provider relationship such as communication and respect for patients. Systems quality include features such as the comfort of the facility, waiting times, choice of provider and availability of tests or specialists.

vice provided (????). Furthermore, these existing studies face methodological constraints concerning the definition of the quality and price variables. Specifically, studies examining consumers' responsiveness to quality mainly use actual quality of care indicators such as adherence to medical guidelines, mortality rates, readmission rates or hospital acquired diseases (????????). Actual measures of quality are limiting, as they do not necessarily represent a consumer's preference for quality, and typically reflect a narrow aspect of quality which is typically limited to technical quality of care. Studies that use subjective or perceived quality in modeling health care demand functions are scarce. ? used quality indicators that closely resemble our indicators and found that consumer's choice of outpatient provider is highly responsive to interpersonal quality. More recently, ? found that hip-surgery patients in the UK value quality measures which reflects patient reported outcomes–such as hip-related functioning and pain–over conventional measures such as mortality rates and readmission rates. ? find that patients in Germany choose maternal health care providers with high patient satisfaction scores, even after controlling for objective measures of quality. Altogether, these findings suggest that perception of quality is an important determinant of a consumer's choice of provider alongside actual quality of care.

Studies on prices often rely on ex-post out-of-pocket spending on health care visits, or price imputation methods to generate prices for alternate provider choices. For instance, if a consumer chose to seek care in the private sector, the price variable corresponding to the choice of the private sector would reflect the actual out-of-pocket spending, but the price corresponding to the choice of the public sector would be imputed based on other consumers who sought care in the public sector. Since the missing price variable is correlated with the choice of provider, this methodology raises concerns that the missing price variable is not missing at random.

With this limitation in mind, empirical studies have yielded two observations: either price has a negative effect on a consumer's probability of choosing a provider, or that the relationship between prices and health care demand is too statistically insignificant to infer

generalizable patterns. Using a nested logit framework, **?** find that user fees and distance to health care facility are important deterrents of health care demand in Côte d'Ivoire and Peru. However, **?** found that price was insignificant in the provider decision choice for outpatient services for the Philippines. Similarly, findings by **?** show that prices were statistically insignificant in consumers' choice for outpatient services in Cyprus. More recent attempts at health care demand modeling use the mixed logit framework. **?** and **?** adopt this modeling framework to investigate the demand for outpatient services in rural India and China respectively. Both empirical strategies involve transforming the income and price variables to a post-medical expenditure variable—which were significant in both findings, but the formulation of the variable prevents any direct interpretation of the role of prices on choice.

Instead of relying on out-of-pocket spending to capture actual prices, we circumvent the associated methodological pitfalls by adopting a different study design. We elicit consumers' perception of prices for a range of health conditions and use their perception of how much they would have to pay instead of actual prices to compute our demand estimates. The hypothesis that consumers infer quality of health care from prices serves as the theoretical motivation for adopting this study design. **?**'s seminal work on price dependent preferences provide a rigorous approach to thinking about the differences between perceived and actual prices. Given that perceived prices are a function of past prices or a complex construct related to past prices and current prices (perhaps from word-of-mouth or social effects), our demand estimates are short-run demand estimates. When perceived prices converge towards actual prices, this produces long-run demand functions. The benefits of such an approach is that we can compute a larger sample size of respondents as opposed to focusing on consumers who actually sought care during the survey reference period.

Our study extends the current literature in several ways. First, we use ex-ante perceived prices instead of imputed prices based on ex-post out-of-pocket spending[2]. Our approach

[2]Perceived prices are ex-ante in the sense that questions regarding perceptions towards prices and quality precede questions on health care utilization in the national morbidity survey, this mitigates cueing effects

circumvents methodological concerns of imputing prices by providing a different approach to investigate if consumers exhibit price dependent preferences. Second, instead of focusing on general outpatient or inpatient visits, we examine the role of perceived price and quality for a range of health care conditions sorted by severity. We demonstrate that consumers value quality dimensions differently depending on the health condition. Third, we provide additional empirical evidence on the role of perceived quality and perceived prices on consumers' choice of health care provider for a middle-income country with a mixed delivery system.

The next section describes the Malaysian health system with a specific focus on public-private provision of health care, quality of care and prices. We then present our model which motivates our empirical specification of using a mixed logit specification. Following that, we describe the nationally representative survey data, and the survey questionnaire used to elicit perception of prices and quality, for four health conditions. We proceed by summarizing our mixed logit results and arc price elasticities of demand for the four health conditions. We then conclude with a discussion of our results, the limitations of our study design, and highlight potential policy implications for similar health care markets.

2 Background and Setting

Malaysia, an upper middle income country, provides an opportune setting to explore consumer choice due to its mix of public and private providers, large out-of-pocket expenditures, and weak private-sector gatekeeping. Although the public sector has been essential for universal health coverage , neither public nor private providers dominate (**?**). In 2015, public providers accounted for only 31 percent of clinics but 78 percent of hospital beds (**?**). Although private providers are concentrated in urban areas, the public share of health financing is modestly larger—51 to 62 percent since at least 1997—than private financing (**?**).

Public healthcare is financed from federal government general revenue. User fees at

which would result if one were to elicit responses on quality and prices after survey respondents are asked about actual health care utilization.

point-of-use are nominal (e.g., US$0.23 for a clinic consultation inclusive of medications and laboratory tests, and US$4 to US$412.5 depending on the ward class and diagnosis), and social health insurance contributions are a fraction of a percent of current health expenditure and limited to work-related disabilities. More than 80 percent of private expenditures are out-of-pocket. A large proportion of consumers' decisions–apart from those with private health insurance–are hence based on the perceived price of health care, with considerations towards their budget constraints. The private health insurance sector is underdeveloped, comprising 15 percent of private financing in 2015, and insured consumers remain exposed to healthcare costs due to service exclusion and caps.

Private clinics are typically small or single practitioner clinics. Private hospitals, often as part of a chain, are owned by private corporations. Some elements of private prices—notably maximum consultation (e.g., US$ 15 for a nonspecialist consultation) and procedures fees chargeable—are regulated by the Private Healthcare Facilities and Services Act 1998, but pharmaceutical prices are not currently regulated. The same act also regulates structural elements of private health facility quality, including infrastructure and staffing. Additional quality elements can be signaled voluntarily through accreditation by, for example, the Malaysia Society for Quality in Healthcare.

Public providers are not formally regulated but are directly controlled by the government. Technical measures of clinical quality in public sector clinics are higher than private clinics (**?**). However, patients in public clinics cannot choose their doctors, have long waiting times, limited hours, and a lack of continuity of care. In terms of secondary and tertiary care, there is evidence showing that public sector hospital case management has been improving given a decline in 30-day mortality rates for acute myocardial infarction, hemorrhagic and ischemic stroke admissions while data for private sector hospitals is sparse (**?**).

3 Data

We use the National Health and Morbidity Survey Malaysia 2015 (NHMS 2015) for our analysis. The survey is a nationally representative, two-stage (states and urban-rural status) stratified randomly sampled household survey in Malaysia. Our final sample consists of respondents aged 18 and above who responded to questions on their choice of provider based on four health conditions: (i) minor health problems (e.g. flu, fever, cough, stomachache), (ii) minor surgery (stitches for a small wound), (iii) major surgery (coronary artery bypass surgery) and (iv) birth deliveries.

The survey asks respondents on hypothetical choice scenarios for the aforementioned four health conditions after sociodemographic questions:

"Which is the main health facility you would go to in the following situations?" "If you have a minor health problem (for example, flu, cough or stomachache), where would you go?".

The respondent could choose exactly one from four possible responses: "government", "private", "traditional/complementary/alternative health facility" and "will not go to any facility". We focus our analysis on respondents who chose either public or private providers and omit those who chose not go to any facility or those who chose to visit traditional health facilities[3].

Following the hypothetical choice questions, the survey asks individuals about their perceived prices for the four health conditions. The interviewer phrased the question as:

"How much do you think you would have to pay per visit for public and private health care given the following conditions/situation? This includes consultation, medications, tests, etc. This only includes payment made by own money/family/household member and does

[3]While minor health problems has the highest percentage of respondents citing traditional facilities or not to go to any facility, only less than four percent of respondents chose either traditional facilities or not to go to any facility.

not include reimbursement paid by insurance/employer".

The respondent would provide separate answers for government and private providers. The conditions correspond to the same conditions in the provider choice questions. After the questions on perceived price, the survey asks individuals on their perception of quality. We construct perceived quality from respondents' ratings on a 1 to 5 Likert scale, which encompasses 12 different questions of quality for outpatient care and inpatient care, in both the public and the private sector. Answers do not correspond to specific types of health conditions, and instead refers generally to the public and private sector. We phrased our quality questions as: *'Based on your perception or impression, how would you rate the government and private clinic/hospital on the following aspect?'*. These quality indicators encompass technical, interpersonal and systems (or amenities) quality. We provide excerpts from the survey questionnaire in the Appendix: Figure A1, Figure A2, Figure A3 and Figure A4.

We tabulate the key variables from our final sample in Table 1 and Table 2. The number of observations differ by condition because some individuals did not respond to the perceived price question. Table 1 tabulates summary statistics for minor health problems and minor surgeries. Approximately 39 percent of individuals stated that they would prefer seeking care from private clinics when facing a minor health problem and 24 percent for minor surgeries. For comparison, the actual utilization public-private split for outpatient services is 39.9 percent for private clinics and 60.1 percent for public clinics (**?**). Perceived price is also much higher in private clinics compared to public clinics.

For the quality indicators, we observe that individuals rate private clinics higher on every quality indicator except for the convenience of clinic locations. This is expected given that private clinics are largely concentrated in urban areas. The biggest difference in quality comes from the waiting time to see the doctor–on average, individuals rate public clinics with a score of 3.11 and 3.78 for private clinics.

Table 2 provides a summary of our key variables for inpatient services. The share of individuals choosing private hospitals over public hospitals is equal for major surgeries and birth deliveries, at 0.16. For comparison, the actual utilization public-private split for inpatient services is 23.3 percent for private hospitals and 76.7 percent in public hospitals. Perceived prices are also higher for private hospitals for major surgeries and birth deliveries. In terms of quality, we see that public hospitals rate higher than private hospitals on the convenience of location, availability of lab tests, ability to give the correct treatment and clarity of doctor's explanation. The findings on technical quality is within our expectations, given that public hospitals have higher technical quality of care than private hospitals (**?**).

Other covariates in the mixed logit model include income, age, sex, education in years and a dummy variable indicating whether the individual is diabetic, hypertensive or has high cholesterol. Income is proxied by yearly expenditures excluding health care costs. The yearly expenditures variable was constructed based on an itemized list of (i) food, (ii) housing, gas, electricity, water, telephone, and heating fuel bills, (iii) education fees and supplies (iv) insurance premiums or prepaid health plans (v) all other goods and services including payment for meals in restaurants, tobacco and alcohol.

Table 1: Summary Statistics for Outpatient Services

	Minor health problems		Minor surgeries	
	Private	Public	Private	Public
A. Alternate specific variables				
Choice	0.39 (0.49)	0.61 (0.49)	0.24 (0.43)	0.76 (0.43)
Perceived prices (US$)	29.73 (21.9)	1.87 (5.93)	62.2 (142.61)	6.98 (25)
Yearly expenditure - price (Y-P) (US$)	4261.14 (5779.62)	4288.99 (5781.05)	4294.63 (5865.47)	4349.84 (5869.49)
Ln(Y-P)	7.95 (0.91)	7.96 (0.89)	7.94 (0.94)	7.97 (0.9)
Ln(Y-P) squared	63.98 (14.22)	64.19 (14.06)	63.92 (14.57)	64.31 (14.27)
B. Quality indicators (Provider-specific)				
Convenience of clinic location	3.66 (0.76)	3.89 (0.7)	3.65 (0.78)	3.9 (0.71)
Convenience of operating hours	3.82 (0.66)	3.78 (0.7)	3.83 (0.68)	3.79 (0.7)
Comfort of clinic	3.94 (0.63)	3.9 (0.67)	3.95 (0.64)	3.89 (0.68)
Availability of lab tests	3.79 (0.65)	3.82 (0.66)	3.79 (0.67)	3.82 (0.67)
Availability of specialist	3.81 (0.69)	3.79 (0.73)	3.82 (0.69)	3.79 (0.74)
Allowed to choose doctor	3.76 (0.75)	3.34 (0.89)	3.77 (0.76)	3.32 (0.89)
Waiting time to see doctor	3.78 (0.69)	3.11 (0.92)	3.8 (0.7)	3.1 (0.93)
Amount of time spent with patients	3.83 (0.62)	3.7 (0.71)	3.83 (0.63)	3.7 (0.72)
Ability to give the correct treatment	3.9 (0.61)	3.89 (0.64)	3.91 (0.61)	3.89 (0.64)
Clarity of doctor's explanation	3.91 (0.6)	3.9 (0.63)	3.92 (0.61)	3.9 (0.64)
Courtesy and helpfulness of staff	3.98 (0.61)	3.94 (0.67)	3.99 (0.62)	3.93 (0.69)
The outcome of services	3.93 (0.59)	3.9 (0.62)	3.94 (0.59)	3.91 (0.62)
C. Individual specific variables				
Age	42.04 (15.35)		41.92 (15.48)	
Female (=1)	0.52 (0.5)		0.51 (0.5)	
Education in years	9.55 (3.87)		9.55 (3.93)	
Diabetic, hypertensive or high cholesterol (=1)	0.67 (0.47)		0.66 (0.47)	
N	12,184		9,387	

Notes: Data are presented as the mean value per indicator. Standard deviations are in parentheses. Examples of minor health problems include flu, fever and cough. For minor surgeries, the example given is stitching a small wound. Perceived prices refer to how much an individual would expect to pay for the health condition given care by a public or private provider. Quality indicators are derived from a Likert scale where individuals rate public and private providers on outpatient and inpatient services from 1 to 5. 1 is rated as 'very poor' and 5 is rated as 'excellent'.

Table 2: Summary Statistics for Inpatient Services

	Major Surgeries		Birth Deliveries	
	Private	Public	Private	Public
A. Alternate specific variables				
Choice	0.16 (0.37)	0.84 (0.37)	0.16 (0.37)	0.84 (0.37)
Perceived prices (US$)	1446 (2964.17)	328.26 (1145.24)	1249 (1093.31)	99.94 (207.1)
Yearly expenditure - price (Y-P) (US$)	3837.16 (6658.76)	4954.89 (7566.66)	3751.05 (6027.36)	4900.11 (6243.54)
Ln(Y-P)	7.58 (1.51)	8.02 (0.97)	7.63 (1.25)	8.13 (0.83)
Ln(Y-P) squared	59.82 (16.92)	65.33 (15.48)	59.82 (16.71)	66.83 (13.6)
B. Quality indicators (Provider-specific)				
Convenience of hospital location	3.6 (0.84)	3.88 (0.77)	3.55 (0.84)	3.87 (0.74)
Ability to ask for room	3.83 (0.72)	3.45 (0.85)	3.85 (0.71)	3.35 (0.86)
Comfort of hospital	3.99 (0.65)	3.89 (0.7)	3.99 (0.62)	3.84 (0.7)
Availability of lab tests	3.91 (0.63)	3.94 (0.65)	3.89 (0.61)	3.93 (0.61)
Availability of specialist	3.95 (0.67)	3.97 (0.68)	3.93 (0.64)	3.94 (0.65)
Allowed to choose doctor	3.85 (0.71)	3.45 (0.85)	3.85 (0.7)	3.36 (0.86)
Waiting time to see doctor	3.82 (0.72)	3.21 (0.93)	3.83 (0.68)	3.18 (0.9)
Amount of time spent with patients	3.87 (0.64)	3.77 (0.69)	3.87 (0.6)	3.75 (0.67)
Ability to give the correct treatment	3.95 (0.62)	3.95 (0.65)	3.93 (0.6)	3.95 (0.6)
Clarity of doctor's explanation	3.95 (0.61)	3.95 (0.64)	3.93 (0.58)	3.95 (0.6)
Courtesy and helpfulness of staff	4.01 (0.63)	3.98 (0.69)	3.99 (0.61)	3.96 (0.66)
The outcome of services	3.96 (0.61)	3.95 (0.64)	3.94 (0.58)	3.96 (0.6)
D. Individual specific variables				
Age	42.31 (15.6)		42.7 (15.16)	
Female (=1)	0.53 (0.5)		0.53 (0.5)	
Education in years	9.29 (4.04)		9.61 (3.92)	
Diabetic, hypertensive or high cholesterol (=1)	0.67 (0.47)		0.68 (0.47)	
N	9,383		8,111	

Notes: Data are presented as the mean value per indicator. Standard deviations are in parentheses. For major surgery, the example given is coronary artery bypass graft. Perceived prices refer to how much an individual would expect to pay for the health condition given care by a public or private provider. Quality indicators are derived from a Likert scale where individuals rate public and private providers on outpatient and inpatient services from 1 to 5. 1 is rated as 'very poor' and 5 is rated as 'excellent'.

4 The Model

4.1 Setup

Consider the following static utility maximization problem of an ill-stricken individual. Utility is a function of health and consumption goods. An individual seeks to maximize her utility subject to her budget constraint. The improvement in health status varies by health care providers. This implies that individuals are faced with a discrete choice problem, where choices are over health care providers. Conditional on receiving care from provider j, an individual's utility is defined as an indirect utility function:

$$U_j = V(C_j, Q_j) \tag{1}$$

Let C_j denote the consumption of non-medical goods after paying for medical services at provider j, such that $C_j = Y - p_j$. Y is assumed to be the disposable income of an individual, proxied by annual household expenditures in our data. p_j is the perceived price of seeking care from provider j.

Q_j is the quality of care from provider j. Q_j is assumed to be a function of individual characteristics $\mathbf{X}$, observable quality dimensions of a provider Θ_j, and perceived prices p_j. $\mathbf{X}$ is a vector of an individual's characteristics which affects the quality of care from provider j, such as biological determinants and social determinants of health. Observable quality encompasses dimensions that an individual can assess. We measure observable quality using 12 quality indicators which ranges across technical, interpersonal and systems (or amenities) quality. Given that technical aspects of quality such as providing the right treatment and diagnosis may only be observable to a subset of the population, we assume that individuals may infer Q_j from perceived prices p_j. The quality of care from provider j is therefore defined as $Q_j(\Theta_j, \mathbf{X}, p_j)$. Substituting $Q_j(\Theta_j, \mathbf{X}, p_j)$ back to Equation (1) yields:

$$U_j = V\Big(Y - p_j, Q_j(\Theta_j, \mathbf{X}, p_j)\Big) \tag{2}$$

Perceived prices p_j enter the utility function twice–once through the budget constraint and once as a standalone preference variable. This specification is motivated by **?**, where prices influences individuals' preferences through the budget constraint and as a preference indicator[4].

We also account for individual unobserved endogeneity by using a control function approach (**?**). The main concern here is endogeneity in the form of omitted variable bias. For example, unobserved attributes of the provider are expected to be positively correlated with price. The canonical form of price endogeneity in demand estimation–where prices are simultaneously determined by demand and supply–poses less of a concern because it is unclear how an individual's hypothetical choice affect market prices and, subsequently, how market prices shape perceived prices[5].

We provide a table comparing the mixed logit estimates with and without the control function in the Appendix Table A1. Our results show that omitted variable bias is of significant concern. Specifically, we find that our price coefficients are either positive or biased upwards when we ignore endogeneity. As **?** noted, without correcting for endogeneity, demand curves may be spuriously upward sloping as a result of providers' unobserved attributes. The size of the difference highlights the importance of accounting for omitted variable bias, and we choose to use the control function approach for our main mixed logit estimates. We formalize the control function approach by rewriting Equation (2) to incorporate two error terms. The first error term ε_j^1 is the type-1 extreme value error, while ε_j^2 is normally distributed:

$$U_j = V\Big(Y - p_j, Q_j(\Theta_j, \mathbf{X}, p_j)\Big) + \varepsilon_j^1 + \varepsilon_j^2 \tag{3}$$

We follow **?** by using Hausman instruments (**?**). We calculate the perceived price instruments for individuals within a given state (indexed by m) in Malaysia as the average perceived price

[4] **?** denotes prices that influence preferences as normal prices P^N, and prices which enter the budget constraint as P^M. Much of the author's analysis focuses on the distinction between short-run and long-run demand function, and convergence between the normal and market prices.

[5] See **?** for a discussion price endogeneity and demand estimation.

in other states. These instruments are appropriate if perceived prices of public and private providers in other states reflect a common driver, but do not share state-specific shocks[6]. Perceived price for provider j is assumed to be a linear function of Hausman instruments plus an additively separable error:

$$p_j = \gamma z_{mj} + \mu_j \tag{4}$$

Suppose ε_j^2 and μ_j are jointly normal. By the properties of normals, the expection of ε_j^2 conditional on μ_j is simply μ_{ij} scaled by a coefficient λ[7]. Utility is then expressed as:

$$U_j = V\Big(Y - p_j, Q_j(\Theta_j, \mathbf{X}, p_j, T_j)\Big) + \lambda\mu_j + \varepsilon_j^1 \tag{5}$$

Suppose an individual faces two choices, with $j = 1$ being a public provider and $j = 2$ being a private provider. The unconditional utility maximization problem for an individual is simply:

$$U^* = \max(U_1, U_2) \tag{6}$$

where U^* is the highest utility an individual can attain. The solution to Equation (6) yields a set of demand functions which contains probabilities of specific alternatives an individual chooses. The highest probability alternative represents the highest utility for an individual. The functional form of the demand function depends on the utility function conditional on selecting an alternative and the distribution of observable variables and the distribution assumed for the error term. We assume a log-linear functional form for the indirect utility function V for Equation (5):

$$U_j = \mathbf{X}\beta + \Theta_j\psi + \alpha_1 \ln(Y - p_j) + \alpha_2 \ln(Y - p_j)\ln(Y - p_j) + \alpha_3 p_j + \lambda\mu_j + \varepsilon_j^1 \tag{7}$$

[6]We find a strong first stage for the regression of perceived prices on Hausman instruments. The F-statistic ranges from 36.16 to 926.51.
[7]see **?** for derivation.

Following **?**, we adopt a parameterization that does not impose a second order restriction on the marginal rates of substitution of health and income. We do this by specifying a log squared form of income after paying for medical care, $\ln(Y-p_j)\ln(Y-p_j)$. Next, we allow individuals to have random coefficients with regards to perceived prices p_j. After including individual subscripts i, this transforms the utility of individual i to:

$$U_{ij} = \mathbf{X}_i\beta + \Theta_{ij}\psi + \alpha_1 \ln(Y_i - p_{ij}) + \alpha_2 \ln(Y_i - p_{ij})\ln(Y_i - p_{ij}) + \alpha_{3i}p_{ij} + \lambda\mu_{ij} + \varepsilon_{ij}^1 \tag{8}$$

The conditional probability that an individual i chooses provider j can be succinctly expressed as:

$$\pi_{ij} = \int L_{ij}(\beta, \psi, \lambda, \alpha) f(\alpha_3)\, d\beta\, d\psi\, d\lambda\, d\alpha \tag{9}$$

where the logit probability evaluated at parameters β, ψ, λ and α is

$$L_{ij}(\beta, \psi, \lambda, \alpha) = \frac{e^{U_{ij}}}{\sum_{j=1}^{J} e^{U_{ij}}} \tag{10}$$

We choose to adopt a mixed logit model over other choice models for two reasons. First, the mixed logit model is able to approximate any random utility model (**?**). Second, it allows for random taste variation in our study sample. In comparison to the nested logit or the multinomial logit model, the mixed logit model does not impose an a-priori decision structure for individuals nor does it restrict substitution patterns. These two reasons ensure that we are approximating individuals' utility of seeking care from providers more accurately.

In our model specification, we assume that the coefficient of perceived price is random and follows the normal distribution. The normal distribution allows for a flexible model of taste heterogeneity. An individual with a negative coefficient is evidence against price dependent preferences, while a positive coefficient is suggestive that this individual uses price as a preference indicator. We do not impose any constraints on the coefficient values for perceived price, and allow individuals to have negative or positive coefficients.

4.2 Estimation

The first order condition of Equation (9) does not lead to a closed form solution, so assuming that $f(\alpha_3)$ follows a normal distribution, the probabilities can be approximated through simulation for any given value of mean and covariance of β. For illustrative purposes, let $r = 1$ denote the first draw, suppose we draw a value of $\beta^{r=1}$ from the assumed normal distribution $f(\beta)$, with mean and covariance estimated from our data. Second, we calculate Equation (10) with this draw of β. We use $r = 100$ Halton sequence draws from $f(\beta)$ to calculate an unbiased estimator of $\hat{\pi}_{ij}$. The simulated probabilities are then inserted into a log-likelihood function, yielding a simulated log-likelihood (SLL) in the form:

$$\text{SLL} = \sum_{i=1}^{I} \sum_{j=1}^{J} d_{ij} \ln \hat{\pi}_{ij} \tag{11}$$

where $d_{ij} = 1$ if i chose j and zero otherwise. The maximum simulated likelihood estimator (MSLE) are the moments (mean and standard deviation) of the normal distribution $f(\alpha)$ that maximizes the SLL[8].

4.3 Identification

We refer to identification as whether our model and estimation procedure are able to recover unique values of α, β and γ, given the joint distribution of observables in our data. Our goal is to capture differences in utility attributed to perceived quality and price across alternative providers. As summarized in **?**, the identification of choice models can be summarized by two statements: "only differences in utility matter" and "the scale of utility is arbitrary". Capturing the differences in utility attributed to price and quality would thus require sufficient variation in perceived prices and perceived quality for each of the four health conditions. For perceived prices, our rich survey data provides sufficient variation within p_{ij} with regards to each of the four conditions studied (see Figure A9 and A10 for perceived price histograms).

[8]We implement the simulated maximum likelihood estimation based on the R-written package by Yves Croissant (**?**)

For perceived quality Θ_{ij} however, we do not observe perceived quality for each of the four conditions. Rather, we observe perceived quality at the level of clinics and hospitals, in the public and private sector separately. That is, we observe how individuals rate (public or private) hospitals and clinics, but do not ask about specific conditions within hospitals and clinics. This limitation implies that we are unable to distinguish within-provider, across-condition differences in quality, i.e. conditional on public or private providers, individuals valuing birth deliveries as high quality but diabetes treatment as low quality is observationally equivalent to individuals valuing diabetes as high quality but birth deliveries as low quality. Perceived quality should be interpreted with this limitation in mind.

5 Results

5.1 Mixed Logit Results

We summarize our mixed logit estimates in Table 3 and Table 4. We also provide a table on the random coefficients' normal distribution moments in Table 5. We use these moments to estimate the percent of individuals with negative coefficients for prices across the four health conditions. Our variables are categorized into alternate-specific variables and individual-specific variables. For alternate-specific variables, a negative coefficient implies that an increase in a variable leads to a lower probability of an alternative chosen. The alternatives are public or private providers. For example, individuals are more likely to choose providers (public or private) with better ratings on waiting time for outpatient services. Individual-specific variables should be interpreted with the private option as the baseline. For example, individuals with more years of education are more likely to choose the public sector for birth deliveries.

Across the four conditions, the coefficients on perceived price, log post-medical consumption and log post-medical consumption squared are mostly statistically significant, which implies that price and income play a crucial role in consumer choice. But these coefficients

are not directly interpretable for two reasons. First, price enters the estimation equation twice: as a standalone variable and as post-medical care variable. Second, given that individuals have a unique coefficient on perceived prices, our interpretation on the coefficients from Table 3 and Table 4 would only represent the average consumer, but not the entire sample. For this reason, we derive arc elasticities assuming that perceived prices increase arbitrarily by 5 percent in the following simulation and arc elasticities subsection. Nevertheless, the coefficients on log post-medical care expenditures and log post-medical care expenditures squared are of the expected sign.

It is worth reiterating that our quality indicators correspond to public or private, inpatient and outpatient services. Therefore, when interpreting our quality results, the assumption is that individuals choose providers based on their perception of quality at the provider level, and not by services. We suspect that for outpatient services, this assumption is less problematic, but for inpatient services where health conditions are likely to be differentiated products, it is less tenable.

For minor health problems, individuals value accessibility and systems quality-related questions more than technical and interpersonal quality. Accessibility is captured by the convenience of locations and hours, while systems quality include availability of tests, specialists, choice of physician and waiting times. For individual-specific variables, older individuals are more likely to choose public providers. Individuals with more years of education and private insurance are much less likely to choose public providers, which is in line with our expectations.

For minor surgeries, we see that individuals value more dimensions of quality compared to minor health problems. While individuals still value accessibility and systems quality, individuals now value technical quality indicators such as the outcome of treatment and the ability of the provider in correctly providing the right treatment. We also find that individuals value some aspects of interpersonal quality such as the time physicians spent with patients, but do not value the clarity of explanation provided by physicians or the courtesy

of staff members at the facility. Females and individuals with diabetes, hypertension or high cholesterol are more also more likely to choose public providers.

For major surgeries such as a coronary artery bypass graft, we find that individuals again prioritize accessibility, followed by interpersonal and technical quality indicators. The quality indicators ranked from largest to smallest coefficients are: the comfort of the hospital, followed by the location, courtesy of staff, ability to correctly diagnose, time spent with patients, outcome of treatment, and finally the availability of specialists. Again, accessibility is a significant factor influencing individuals' choice of provider, followed by technical quality.

For birth deliveries, individuals largely value accessibility and interpersonal quality. Specifically, the coefficients for convenience of hospital location, the courtesy of staff and time spent with patients have the largest coefficients. There are also three quality indicators which yielded negative coefficients–this includes clarity of explanation, whether a patient is allowed to choose doctors and the correct diagnosis and treatment. We suspect that these quality dimensions do not matter as much for birth deliveries, given that the process of birth delivery is usually well-known and the diagnosis (of birth deliveries) is often very clear.

Table 5 tabulates the mean and standard deviation of the normal distribution for the random coefficients[9]. We use the mean and standard deviation to estimate the percent of individuals with negative coefficients in the sample. The proportion of individuals exhibiting negative price coefficients decreases as health conditions become more severe. For minor health problems, we see that 100 percent of individuals have a negative price coefficient. This makes sense given that individuals are unlikely to exhibit price dependent preferences for routine health conditions such as a flu, fever or cough. For the more severe health condition (major surgeries), only 51 percent of individuals have a negative price coefficient, even after controlling for quality indicators and addressing endogeneity. We also observe a high proportion of individuals with positive coefficients for birth deliveries.

[9]The standard deviation estimates correspond to the standard deviation of the assumed normal distribution for the random parameter on perceived prices. This is different from the standard errors of the point estimate shown in parentheses for Table 3 and Table 4.

Table 3: Mixed Logit Estimates for Outpatient Services

	Minor health	Minor surgeries
	(1)	(2)
Alternate-specific variables		
Perceived Price	−0.035***	−0.027***
	(0.004)	(0.004)
$\ln(Y-P)$	−11.232***	−21.836***
	(1.077)	(1.061)
$\ln(Y-P)\cdot\ln(Y-P)$	2.103***	4.645***
	(0.176)	(0.160)
Convenience of location	0.430***	0.657***
	(0.027)	(0.049)
Convenience of hours	0.092***	0.251***
	(0.031)	(0.053)
Comfort of clinic	−0.003	−0.024
	(0.037)	(0.066)
Availability of tests	0.088**	0.065
	(0.038)	(0.065)
Availability of specialists	0.075**	0.133**
	(0.037)	(0.065)
Allowed to choose doctor	0.071***	0.034
	(0.027)	(0.048)
Waiting time	0.129***	0.164***
	(0.025)	(0.046)
Time spent with patient	0.070*	0.228***
	(0.039)	(0.066)
Correct diagnosis/treatment	0.064	0.025
	(0.046)	(0.077)
Clarity of explanation	0.055	−0.113
	(0.049)	(0.083)
Courtesy of staff	0.015	0.037
	(0.044)	(0.072)
Outcome of treatment	0.027	0.298***
	(0.045)	(0.077)
Control function: $\lambda\mu_{ij}$	0.049***	0.041***
	(0.004)	(0.004)
Individual-specific variables		
Age: Public	0.004**	0.007**
	(0.002)	(0.003)
Female (=1): Public	0.050	0.213***
	(0.041)	(0.075)
Education (years): Public	−0.066***	−0.050***
	(0.006)	(0.011)
DM/HTN/HCL: Public	−0.046	0.180**
	(0.047)	(0.083)
Private insurance: Public	−0.997***	−1.759***
	(0.053)	(0.094)
Observations	12,184	9,387
Log Likelihood	-7,102.820	-4,429.918

Notes: *p<0.1; **p<0.05; ***p<0.01. Minor health refers to minor health problems such as a flu, fever, cough or stomachache. Minor surgeries are small surgeries such as stitches for a small wound. Standard errors are in parentheses. The control function μ_{ij} is the residual from the regression of perceived prices on exogenous characteristics and the Hausman instruments.

Table 4: Mixed Logit Estimates for Inpatient Services

	Major Surgeries	Birth
	(1)	(2)
Alternate-specific variables		
Perceived Price	-0.003^{***}	-0.004^{***}
	(0.0001)	(0.0003)
$\ln(Y-P)$	-0.752^{***}	-0.280^{***}
	(0.047)	(0.044)
$\ln(Y-P)\cdot\ln(Y-P)$	0.109^{***}	0.094^{***}
	(0.006)	(0.005)
Convenience of location	0.599^{***}	1.129^{***}
	(0.091)	(0.101)
Ability to ask for private rooms	0.020	0.182
	(0.100)	(0.133)
Comfort of hospital	0.664^{***}	-0.107
	(0.123)	(0.117)
Availability of tests	-0.040	0.534^{***}
	(0.138)	(0.167)
Availability of specialists	0.191^{*}	0.576^{***}
	(0.113)	(0.144)
Allowed to choose doctor	-0.010	-0.642^{***}
	(0.101)	(0.141)
Waiting time	-0.177^{*}	-0.115
	(0.091)	(0.100)
Time spent with patient	0.400^{***}	1.006^{***}
	(0.138)	(0.159)
Correct diagnosis/treatment	0.440^{***}	-0.776^{***}
	(0.158)	(0.180)
Clarity of explanation	-1.016^{***}	-1.012^{***}
	(0.163)	(0.177)
Courtesy of staff	0.510^{***}	1.180^{***}
	(0.137)	(0.127)
Outcome of treatment	0.390^{**}	0.841^{***}
	(0.154)	(0.165)
Control function: $\lambda\mu_{ij}$	0.003^{***}	0.004^{***}
	(0.0001)	(0.0003)
Individual-specific variables		
Age: Public	0.036^{***}	0.156^{***}
	(0.005)	(0.008)
Female (=1): Public	1.398^{***}	3.439^{***}
	(0.175)	(0.280)
Education (years): Public	0.107^{***}	0.101^{***}
	(0.018)	(0.029)
DM/HTN/HCL: Public	0.504^{**}	1.735^{***}
	(0.200)	(0.286)
Private insurance: Public	-3.629^{***}	-8.708^{***}
	(0.204)	(0.345)
Observations	4,076	8,111
Log Likelihood	-2,390.667	-4,671.553

Notes: *p<0.1; **p<0.05; ***p<0.01. Major surgery refers to coronary artery bypass graft. Standard errors are in parentheses. The control function μ_{ij} is the residual from the regression of perceived prices on exogenous characteristics and the Hausman instruments.

Table 5: Random Coefficients Moments and Estimated Percent of Individuals With Negative Coefficients

	Mean	SD of Random Coefficients	Estimated % Negative Coefficients
Minor Health Problems			
Perceived Price	-0.035	0.007	100.00%
Minor Surgeries			
Perceived Price	-0.027	0.04	75.02%
Major Surgeries			
Perceived Price	-0.003	0.101	51.18%
Birth Deliveries			
Perceived Price	-0.004	0.102	51.56%

Notes: The 'Estimated % Negative Coefficients' is the estimated percentage of individuals with negative coefficients for price calculated from the mean and standard deviation of random coefficients, assuming a normal distribution.

5.2 Arc Elasticities

Because perceived price enters twice into the estimation equation, we provide an intuitive interpretation on prices by calculating arc elasticities associated with a 5 percent increase in perceived prices. We estimate predicted probabilities π_{ij} to calculate arc price elasticities for all four health conditions using the mixed logit estimates from Table 3 and 4. We calculate arc elasticities using the following formula:

$$\epsilon = \frac{\pi_{ij}(1.05 \cdot p_{ij}) - \pi_{ij}(p_{ij})}{\Big(\pi_{ij}(1.05 \cdot p_{ij}) + \pi_{ij}(p_{ij})\Big)/2} \cdot \frac{\Big(1.05 \cdot p_{ij} + p_{ij}\Big)/2}{1.05 \cdot p_{ij} - p_{ij}} \tag{12}$$

We tabulate our estimates of predicted probabilities and arc elasticities associated with a 5 percent increase in perceived prices across the four health conditions for both public and private providers in Table 6. The base scenario is the status quo probability of choosing providers for specific health conditions.

For minor health problems, increasing perceived prices by 5 percent for private providers reduces the probability that individuals would choose private providers by $0.3928 - 0.3777 = 0.0151$. This produces an arc price elasticity for the private sector of -0.803 and a cross-

price arc elasticity for the public sector of 0.503. In contrast to the private sector, the arc price elasticity for increasing perceived prices for the public sector is only -0.034. Indeed, our results on increasing perceived prices for the public sector indicates that the arc price elasticity of demand is largely inelastic compared to the private sector. This is within our expectations. In Malaysia, prices in the public sector are subsidized and individuals need only pay a flat rate of approximately $ 0.23 for an outpatient visit which is inclusive of drugs and medications, and approximately $ 80 for an inpatient admission–though the price varies by ward class. Given this context, it is not surprising that demand for public hospital care is inelastic relative to the private sector.

For minor surgeries, the arc price elasticities are more elastic compared to minor health problems and are of the expected sign. Specifically, the own price elasticity of increasing perceived prices for the private sector is -0.956 while the cross price elasticity is 0.281. Again for the public sector, we find that the arc price elasticity of demand is inelastic.

In contrast to minor health problems and minor surgeries, we find that individuals respond positively to perceived prices for major surgeries and birth deliveries. For birth deliveries, the arc elasticity in response to a 5 percent increase in perceived private sector prices is 0.057. The same arc elasticity for major surgeries is 0.255 and the cross-price arc elasticity is -0.120. This indicates that individuals would substitute away from public hospitals to private hospitals for CABG, due to increasing prices in the private sector.

Following our results on aggregate arc elasticities, we examine if different income groups respond differently to increases in perceived prices. Specifically, we conduct subgroup analyses of arc price elasticities by income quintiles. Table 7 tabulates arc elasticities of prices for the private sector across four income quintiles in Malaysia.

For minor health problems, poorer income groups are more price elastic compared to richer income quintile groups. Specifically, the arc price elasticity of demand ranges from -0.33 from the poorest income group to -0.13 for the richest income group. Similarly for minor surgeries, poorer income groups are also more price elastic compared to richer income

groups, with a range of -0.53 to 0.15. For major surgeries, arc elasticities for every income quintile are positive, and range from 0.11 to 0.04 across income quintiles. For birth deliveries, the arc price elasticity of demand for the poorest income quintile is 0.02, followed by -0.02, -0.01, 0.03 and 0.02.

Table 6: Simulated Probabilities and Arc Elasticities of Prices

	Predicted Probabilities		Arc Elasticity	
	Private	Public	Private	Public
A. Flu, fever, cough, stomach ache				
Base scenario	0.3928	0.6072		
Increase perceived prices for private sector by 5%	0.3777	0.6223	- 0.803	0.503
Increase perceived prices for public sector by 5%	0.3938	0.6062	0.052	- 0.034
B. Stitches for small wound				
Base scenario	0.2326	0.7674		
Increase perceived prices for private sector by 5%	0.2220	0.7780	- 0.956	0.281
Increase perceived prices for public sector by 5%	0.2345	0.7655	0.168	- 0.051
C. Cardiac bypass surgery				
Base scenario	0.3184	0.6816		
Increase perceived prices for private sector by 5%	0.3224	0.6776	0.255	- 0.120
Increase perceived prices for public sector by 5%	0.3187	0.6813	0.020	- 0.010
D. Birth deliveries				
Base scenario	0.3492	0.6508		
Increase perceived prices for private sector by 5%	0.3501	0.6499	0.057	- 0.029
Increase perceived prices for public sector by 5%	0.3485	0.6515	- 0.044	0.022

Notes: Predicted probabilities estimated based on mixed logit coefficient estimates. Perceived prices are assumed to increase by 25 percent, and arc elasticities are calculated based on the percentage increase.

Table 7: Arc Elasticities by Income Quintiles

Quintile	Minor Health	Minor Surgery	Major Surgery	Birth Delivery
Poorest	- 0.33	- 0.53	0.11	0.02
Q2	- 0.25	- 0.35	0.04	- 0.02
Q3	- 0.21	- 0.27	0.05	0.01
Q4	- 0.17	- 0.20	0.06	0.03
Richest	- 0.13	- 0.15	0.08	0.02

We now examine the key variables driving the positive price elasticities. For simplicity, consider the following static example for one individual. From Equation (8), we see that utility is a function of regular coefficients, and a random coefficient α_{3i} for prices. Suppressing the subscript for individuals and providers, and assuming that individuals maximize utility, the envelope theorem states that the total derivative with respect to prices yields:

$$\frac{dU^*}{dp} = -\frac{\alpha_1}{Y-p} - 2\alpha_2 \frac{\ln(Y-p)}{(Y-p)} + \alpha_3 \tag{13}$$

Where the second order condition of Equation (13) is

$$\frac{d^2U^*}{dp^2} = -\frac{2\alpha_2 \ln(Y-p) - 2\alpha_2 + \alpha_1}{(p-Y)^2} \tag{14}$$

Evaluating the second order condition using our mixed logit estimates across the four conditions, where $\alpha_1 < 0, \alpha_2 > 0, Y > p$, suggests that $\frac{d^2U^*}{dp^2} < 0$. This confirms that p^* is a local maximizer[10].

A positive price elasticity (equivalent to increased probability of choosing a good as prices increases) requires the following necessary condition: $\frac{dU^*}{dp} > 0$ for some individuals in our data. Rewriting Equation (14) yields the following necessary condition to explain positive price elasticities:

$$\alpha_3 > \frac{\alpha_1}{Y-p} + 2\alpha_2 \frac{\ln(Y-p)}{(Y-p)} \tag{15}$$

For this individual to choose the provider with increased prices, α_3 must be sufficiently larger than $\frac{\alpha_1}{Y-p} + 2\alpha_2 \frac{\ln(Y-p)}{(Y-p)}$. That is, some individuals must have a positive price coefficient (and thus, price dependent preferences) if the observed arc price elasticity of demand is positive. Indeed, using our mixed logit estimates, we find that all individuals have $\frac{\alpha_1}{Y-p} +$

[10]For a sufficiently small value of $Y-p$, p^* is no longer a maximizer. Specifically, if $Y-p$ is less than 0.025 for minor health problems, 0.035 for minor surgeries, 0.011 for major surgeries and 0.08 for birth deliveries. However, the values for $Y-p$ is greater than these cut-off values for all individuals, across health conditions in our data.

$2\alpha_2 \frac{\ln(Y-p)}{(Y-p)} > 0$ in our sample.

5.3 Robustness Checks

In this section, we describe a series of robustness checks we conducted to ensure that our results are not dependent on our functional form assumptions or model choice. In terms of model choice, we use the mixed logit model over models such as the nested logit model or multinomial logit model because of our theoretical motivation. We hypothesize that individuals within the population respond differently with regards to perceived prices due to unobserved heterogenous factors and thus exhibit random taste variation in their choice of provider. Nevertheless, we compared the goodness-of-fit of our mixed logit model with the multinomial logit model using a likelihood ratio test which we report in Table A2. Our test suggest that the mixed logit model fits the underlying data better than the multinomial logit model across the four health conditions.

Next, we examine several assumptions regarding the mixed logit model specification itself. One concern we have is that the unrestricted model with the price variable as a standalone variable does not differ significantly from the restricted model without the price variable. To test for this, we examined conduct a likelihood ratio test to compare the two models across the four health conditions (Table A2). Our tests conclude that the unrestricted model with the price variable fits the underlying data better than the restricted model.

6 Discussion

In this paper, we study the role of perceived quality and prices on individuals' choice of health care provider for four types of health conditions: minor health problems such as flu, fever and cough; minor surgeries such as small wound stitches; major surgeries such as cardiac bypass surgeries; and birth deliveries. Using a mixed logit model, our findings suggest that individuals are indeed responsive to higher perceived quality. This is in line with the broader literature which emphasizes that consumers respond more to subjective variants of quality when choosing health care providers (**??????????**).

Our quality indicators correspond to outpatient or inpatient services and not to specific conditions. Assuming that individuals' perceived quality do not vary by condition, we find that individuals are responsive to different dimensions of quality depending on the severity of health condition. For instance, we find that individuals demand higher technical quality for major surgery such as cardiac bypass surgery. In contrast, individuals value interpersonal quality relative to technical or systems quality for birth deliveries. Our results highlighting the significance of interpersonal quality for birth deliveries support the conclusions by **?**, who found that individuals seeking maternal care in Germany respond to interpersonal quality, even after controlling for rich objective measures of quality. These results imply that individuals are responsive to dimensions of quality across different severities of health conditions, and meets the precondition for competition policies to improve quality. However, the link between perceived quality and actual quality remains ambiguous.

Quality dimensions such as interpersonal and systems quality are observable to patients but it is unclear how perceived technical quality would affect actual technical quality. Indeed, **?** find that Indian providers are able to charge higher prices for observable quality dimensions such as effort, but not for unobservable quality dimensions such as the efficacy of treatment. This suggests that intensifying competition may not lead to improvements in technical quality.

Moving on to perceived prices, our unique dataset on individuals' perception of prices

allows us to investigate to what extent individuals use prices as a signal of quality. With the mixed logit model, we estimate the proportion of individuals who exhibit a negative coefficient for prices across the four health conditions. We find that 100 percent of individuals seeking care for minor health problems exhibit a negative price coefficient, but the proportion of individuals with negative price coefficients decreases as the severity of health conditions increases. We interpret this heterogenous response to prices as evidence that some individuals exhibit price-dependent preferences. Specifically, some individuals would choose providers with higher perceived prices even after controlling for various quality indicators.

We then calculate arc price elasticities of demand for the four health conditions. Our results indicate that for major surgeries and birth deliveries, individuals exhibit a positive arc price elasticity of demand. For minor health problems and minor surgeries, increasing private sector prices leads to lower demand for private sector providers as expected. This implies that intensifying competition may lead to unintended effects for more severe health conditions compared to less severe health conditions.

We offer several hypotheses that may be useful for future research. As **?** noted, under certain circumstances, it is rational for a consumer who faces large uncertainties about the quality of a product to judge the product's quality by its price. Another explanation is that for more severe health conditions, individuals may simply value unobserved quality more, which is captured by the price variable. Alternatively, our findings could indicate that information diffuses at a faster rate for minor health problems, minor surgeries and birth deliveries but less so for major surgeries such as cardiac bypass surgeries. As outpatient services are generally less specialized than inpatient services, individuals are exposed repeatedly to the same provider or fewer providers. Exposure to fewer providers reduces information asymmetries, so price plays a smaller role as a preference indicator compared to more severe conditions.

We also examine arc elasticities of demand across income quintiles. We hypothesized that richer individuals would be more price inelastic compared to poorer individuals. Our

simulations for minor health problems and minor surgeries support this hypothesis. However, arc elasticities are positive across income quintiles for major surgeries and birth deliveries–except the second poorest quintile for birth deliveries. Further, the price elasticity is larger for major surgeries compared to birth deliveries. The estimated elasticities for birth deliveries is similar in magnitude to **?**.

Our findings of individuals demanding higher priced services for health conditions that are rare and higher stakes is consistent with the recent literature. **?** find that employees of a large self-insured firm in the United States found no evidence that consumers price-shopped for cheaper providers after two-years of exposure to a high-deductible coverage plan, even though these same consumers were willing to forego potentially valuable care such as preventive services in exchange for keeping higher priced care such as cancer treatments.

Policy interventions to disseminate the availability of technical quality information–such as individual surgeon and physician outcomes–would be a prerequisite to improve technical quality for more severe health conditions (**?**). Guided by actual technical quality indicators, individuals would be able to make informed choices on providers. Combined with transparent pricing for more severe health conditions, this would further mitigate the information asymmetry between patients and providers. Quality and price transparency may be less necessary for less severe and routine conditions that are characterized by repeated sampling, and lower degree of asymmetric information between patients and providers. While the findings in this paper provides suggestive evidence that quality and price transparency are essential for improving quality at lower prices, it should not be treated as a panacea to guiding consumers towards informed choices. For example, **?** finds that patients are heavily influenced by their referring physicians. Specifically, on average, patients bypassed 6 lower-priced providers between their homes and treatment locations.

Our study design has several limitations. First, our study focuses on the perception of quality and prices from the patient's perspective, and thus does not investigate how patients' perceptions affects actual prices and quality. For quality, a deeper question remains on

whether responding to patients' preferences would yield better quality of care. For instance, providers may choose to focus on quality dimensions that generate higher marginal profits with small marginal costs–such as interpersonal quality–that may not improve quality of care as compared to focusing on improving technical quality (**?**). Second, our quality indicators may be weakly identified, as these quality indicators correspond to provider type (public or private) for general outpatient or inpatient visits instead of being tied to specific health conditions. Third, we are unable to identify factors which influence individuals' perceived quality or prices, which may be more relevant for policy design. A review conducted by **?** found that individuals' perception of quality is often shaped by interactions with their health care provider or is a function of social interactions with other users of health care. For example, **?** found that neighbourhood social interactions significantly influenced the choice of provider, presumably by altering individuals' perception of quality. Given our data limitations, we are unable to disentangle these underlying social constructs. Fourth, our simulation exercise is an out of equilibrium prediction that assumes the private sector collectively raises its prices, and the public sector does not raise its prices or change its quality in response to the increase in prices for the private sector. Finally, no welfare analysis can be conducted given that our simulation omits supply side responses from health care providers.

Appendix A: Additional Tables and Figures

Table A1: Mixed Logit Estimates for Perceived Prices With and Without Control Function

	Minor Health	Minor Surgeries	Major Surgeries	Birth
A. Without Control Function				
Perceived Price	0.017***	0.002***	0.0001***	-0.003***
	(0.001)	(0.0002)	(0.00002)	(0.0002)
ln(Y-P)	-24.389***	-20.733***	-0.188***	-0.265
	(0.077)	(0.041)	(0.078)	(0.191)
ln(Y-P)ln(Y-P)	4.171***	3.517***	0.048***	0.254***
	(0.077)	(0.004)	(0.007)	(0.023)
B. With Control Function				
Perceived Price	-0.035***	-0.027***	-0.003***	-0.004***
	(0.004)	(0.004)	(0.0001)	(0.0003)
ln(Y-P)	-11.232***	-21.836***	-0.752***	-0.280***
	(1.077)	(1.061)	(0.047)	(0.044)
ln(Y-P)ln(Y-P)	2.103***	4.645***	0.109***	0.094***
	(0.176)	(0.160)	(0.006)	(0.005)

Table A2: Likelihood ratio tests

	Minor health	Minor surgery	Major surgery	Birth deliveries
Test of mixed logit vs multinomial logit				
Log-likelihood of mixed logit (Df = 22)	-7102.8	-4429.9	-2390.7	-4671.6
Log-likelihood of multinomial logit (Df = 21)	-7105.6	-4295.7	-1462	-2831.9
χ^2 statistic	5.5825*	268.4686***	1857.417***	3679.235***
Test of model with and without price variable				
Log-likelihood of original model (Df = 22)	-7102.8	-4429.9	-2390.7	-4671.6
Log-likelihood of model without price variable (Df = 21)	-7138.2	-4379.7	-1518.2	-2927.1
χ^2 statistic	70.711***	100.351***	1744.932***	3488.875***

AC : PERSEPSI TERHADAP PENYAMPAIAN SISTEM KESIHATAN / *PERCEPTION ON HEALTHCARE DELIVERY SYSTEMS*

Hanya untuk responden 18 tahun dan ke atas sahaja. Untuk responden kurang daripada 18 tahun terus ke Soalan A2300 / *Only for respondent 18 years old and above. For respondent below 18 years old go to question A2300*

PILIHAN BERDASARKAN PENYAKIT AM BERLAINAN
CHOICE OF PROVIDER BASED ON DIFFERENT GENERAL ILLNESS

Sekarang saya akan bertanya tentang pilihan pengamal kesihatan untuk beberapa jenis masalah kesihatan.
Now I will ask you about your choice of healthcare provider for several different health conditions.

Dalam situasi-situasi berikut, ke manakah **tempat paling utama yang akan anda pergi**?
*Which is the **main health facility you would go** to in the following situations?*

Tunjukan kod D untuk contoh fasiliti kesihatan tradisional / komplementari / alternative

AC101	Jika anda mengalami **masalah kesihatan ringan** (cth. selsema, demam, batuk, sakit perut, dll.), ke mana anda akan pergi? *If you have **minor health problem** (e.g. flu, fever, cough, stomach ache, etc.), where would you go?*	1. Kerajaan / *Government* 2. Swasta / *Private* 3. Fasiliti kesihatan tradisional / komplementari / alternatif / *Traditional / complementary / alternative health facility* 4. Tidak akan ke mana-mana fasiliti / *Will not go to any facility* (-7) TT (-9) EJ
AC102	Jika anda menghidapi **masalah kesihatan serius** (cth. kanser, diabetis, masalah jantung, dll.), ke mana anda akan pergi? *If you have **major health problem** (e.g. cancer, diabetes, heart problem, etc.), where would you go?*	1. Kerajaan / *Government* 2. Swasta / *Private* 3. Fasiliti kesihatan tradisional / komplementari / alternatif / *Traditional / complementary / alternative health facility* 4. Tidak akan ke mana-mana fasiliti / *Will not go to any facility* (-7) TT (-9) EJ
AC103	Jika anda memerlukan **pembedahan kecil** (cth. jahitan luka kecil, dll.), ke mana anda akan pergi? *If you need **minor surgery** (e.g. stitches for small wound, etc.), where would you go?*	1. Kerajaan / *Government* 2. Swasta / *Private* 3. Fasiliti kesihatan tradisional / komplementari / alternatif / *Traditional / complementary / alternative health facility* 4. Tidak akan ke mana-mana fasiliti / *Will not go to any facility* (-7) TT (-9) EJ
AC104	Jika anda memerlukan **pembedahan besar** (cth. pembedahan pintasan jantung, dll.), ke mana anda akan pergi? *If you need **major surgery** (e.g. cardiac bypass surgery, etc.), where would you go?*	1. Kerajaan / *Government* 2. Swasta / *Private* 3. Fasiliti kesihatan tradisional / komplementari / alternatif / *Traditional / complementary / alternative health facility* 4. Tidak akan ke mana-mana fasiliti / *Will not go to any facility* (-7) TT (-9) EJ

Figure A1: NHMS 2015 Questionnaire on Choice, Perceived Price and Quality Page One

AC105	Jika anda **memerlukan rawatan pergigian** (cth. tampal gigi, cabut gigi, cuci gigi, dll.), ke mana anda akan pergi? *If you need **dental treatment** (e.g. filling, tooth extraction, scaling, etc.), where would you go?*	1. Kerajaan / *Government* 2. Swasta / *Private* 3. Fasiliti kesihatan tradisional / komplementari / alternatif / *Traditional / complementary / alternative health facility* 4. Tidak akan ke mana-mana fasiliti / *Will not go to any facility* (-7) TT (-9) EJ
AC106	Sekiranya untuk **melahirkan anak**, nak pergi mana? *For birth delivery, where would you go?*	1. Kerajaan / *Government* 2. Swasta / *Private* 3. Fasiliti kesihatan tradisional / komplementari / alternatif / *Traditional / complementary / alternative health facility* 4. Tidak akan ke mana-mana fasiliti / *Will not go to any facility* (-7) TT (-9) EJ **Sekiranya responden lelaki, tujukan soalan sekiranya isteri beliau mahu melahirkan anak**

Sekarang, saya nak tanya, **berapa anda rasa perlu bayar** bagi **setiap lawatan** ke kerajaan dan swasta untuk keadaan / situasi berikut? Ini termasuklah kos rawatan, ubat-ubatan, ujian dan lain-lain.
(Hanya bayaran dengan wang sendiri / keluarga / ahli isirumah dan tidak termasuk bayaran balik insurans / majikan)
*Now, i want to ask you, **how much do you think you have to pay per visit** for public and private health care given the following conditions/situations? This includes consultation, medications, tests etc.*
(Only payment made by own money / family / household member and does not include reimbursement paid by insurance / employer)

(-7) TT **(-9) EJ**

Pastikan ada jawapan untuk kerajaan DAN swasta		Kerajaan *Government*	Swasta *Private*
AC111	Jika anda mengalami selesema, demam atau batuk? *If you have flu, fever or cough?*	RM	RM
AC112	Jika anda menghidap diabetis, darah tinggi? *If you have diabetes, hypertension?*	RM	RM
AC113	Jika anda perlukan jahitan luka kecil? *If you need stitches for small wound?*	RM	RM
AC114	Jika anda memerlukan pembedahan pintasan jantung? *If you need cardiac bypass surgery?*	RM	RM
AC115	Jika anda **memerlukan rawatan** pergigian (cth : tampal gigi, cabut gigi, cuci gigi, dll.)? *If you need **dental treatment** (e.g. filling, tooth extraction, scaling, etc.)?*	RM	RM
AC116	Sekiranya untuk melahirkan anak? *For birth delivery?* **Sekiranya responden lelaki, tujukan soalan sekiranya isteri beliau mahu melahirkan anak**	RM	RM

Figure A2: NHMS 2015 Questionnaire on Choice, Perceived Price and Quality Page Two

PERSEPSI TERHADAP PENYAMPAIAN SISTEM KESIHATAN
PERCEPTION ON HEALTHCARE DELIVERY SYSTEMS

Sekarang saya akan bertanya tentang pandangan anda atas sistem kesihatan. Sila pilih jawapan yang sesuai untuk anda, dengan menggunakan skala (1-5) di bawah. Tiada jawapan yang betul atau salah / *Now I will ask you about your views on healthcare delivery systems. Please choose the answer that applies to you, using the scale (1-5) below. There is no right or wrong answer.*

Sangat tidak bagus *Very Poor*	Tidak bagus *Poor*	Sederhana *Fair*	Bagus *Good*	Sangat bagus *Excellent*
1	2	3	4	5
	(-7) TT	(-9) EJ		

Berdasarkan tanggapan atau kepercayaan anda [kepada penemuramah: sekiranya responden menghadapi masalah, anda boleh bantu dengan mencadangkan, e.g. Daripada perkhabaran/pengalaman keluarga, rakan-rakan anda, pengalaman anda sendiri], bagaimana anda menilai **KLINIK** kerajaan dan swasta (pesakit luar) pada aspek berikut *Based on your perception or impression [to interviewer: if respondent has trouble answering, you can help them by suggesting, e.g. What you hear from your relatives and friends, other's experience, own experience], how would you rate the government and private **CLINIC** (outpatient) on the following aspect …*

Tanya semua soalan berkenaan fasiliti Kerajaan dahulu, diikuti dengan Swasta.

		Klinik / *Clinic*	
		Kerajaan *Government*	Swasta *Private*
AC201	Kesesuaian lokasi klinik / *Convenience of clinic location*		
AC202	Kesesuaian waktu operasi / *Convenience of operating hours*		
AC203	Keselesaan klinik (cth: kebersihan, susun atur kerusi, ruang, dll.) / *Comfort of clinic (e.g. cleanliness, setting of chairs, space, etc.)*		
AC204	Adanya ujian makmal / *Availability of laboratory tests*		
AC205	Adanya doktor pakar di klinik pakar *Availability of specialist (s) at the specialist clinic*		
AC206	Dibenarkan memilih doktor / *Allowed to choose the doctor*		
AC207	Tempoh menunggu untuk berjumpa doktor sebaik tiba di klinik *The waiting time to see a doctor once arrived at the clinic*		
AC208	Masa yang diluangkan oleh doktor untuk pesakit *The amount of time the doctor spends with a patient*		
AC209	Kebolehan doktor memberi diagnosis dan memberi rawatan yang betul / *The ability of the doctor to give you the correct diagnosis and treatment*		
AC210	Kejelasan penerangan doktor berkenaan penyakit, ujian dan prosedur / *Clarity of doctor's explanation regarding the illness, test and procedure*		
AC211	Budi bahasa dan kesediaan doktor, penolong pegawai perubatan & jururawat untuk membantu / *Courtesy and helpfulness of doctor, assistant medical officer and nurse*		
AC212	Keberkesanan perkhidmatan / rawatan *The outcome of services / treatment*		
AC213	Caj rawatan / *Treatment charges*		
AC214	Pandangan anda secara keseluruhan *Your overall impression*		

Figure A3: NHMS 2015 Questionnaire on Choice, Perceived Price and Quality Page Three

Sangat tidak bagus *Very Poor* 1	Tidak bagus *Poor* 2	Sederhana *Fair* 3	Bagus *Good* 4	Sangat bagus *Excellent* 5
	(-7) TT	(-9) EJ		

Berdasarkan tanggapan atau kepercayaan anda [kepada penemuramah: sekiranya responden menghadapi masalah, anda boleh bantu dengan mencadangkan, e.g. Daripada perkhabaran/pengalaman keluarga, rakan-rakan anda, pengalaman anda sendiri], bagaimana anda menilai **HOSPITAL** kerajaan dan swasta (pesakit dalam) pada aspek berikut ... / *Based on your perception or impression [to interviewer: if respondent has trouble answering, you can help them by suggesting, e.g. What you hear from your relatives and friends, other's experience, own experience], how would you rate the government and private **HOSPITAL** (inpatient) on the following aspect …*

Tanya semua soalan berkenaan fasiliti Kerajaan dahulu, diikuti dengan Swasta.

		Hospital / *Hospital*	
		Kerajaan *Government*	Swasta *Private*
AC215	Kesesuaian lokasi hospital *Convenience of hospital location*		
AC216	Boleh memohon bilik persendirian / tidak berkongsi dengan ramai pesakit lain / *Ability to ask for a private room / sharing with less people*		
AC217	Keselesaan hospital (cth: kebersihan, susun atur kerusi, ruang, dll.) / *Comfort of hospital (e.g. cleanliness, setting of chairs, space, etc.)*		
AC218	Adanya ujian/ peralatan perubatan *Availability of investigations/ medical equipment*		
AC219	Adanya doktor pakar di hospital pakar *Availability of specialist (s) at the specialist hospital*		
AC220	Dibenarkan memilih doktor *Allowed to choose the doctor*		
AC221	Tempoh menunggu untuk berjumpa doktor sebaik tiba di hospital *The waiting time to see a doctor once arrived at the hospital*		
AC222	Masa yang diluangkan oleh doktor untuk pesakit *The amount of time the doctor spends with a patient*		
AC223	Kebolehan doktor memberi diagnosis dan memberi rawatan yang betul / *The ability of the doctor to give you the correct diagnosis and treatment*		
AC224	Kejelasan penerangan doktor berkenaan penyakit, ujian dan prosedur / *Clarity of doctor's explanation regarding the illness, test and procedure*		
AC225	Budi bahasa dan kesediaan doktor, penolong pegawai perubatan & jururawat untuk membantu / *Courtesy and helpfulness of doctor, assistant medical officer and nurse*		
AC226	Keberkesanan perkhidmatan / rawatan *The outcome of services / treatment*		
AC227	Caj rawatan *Treatment charges*		
AC228	Pandangan anda secara keseluruhan *Your overall impression*		

Figure A4: NHMS 2015 Questionnaire on Choice, Perceived Price and Quality Page Four

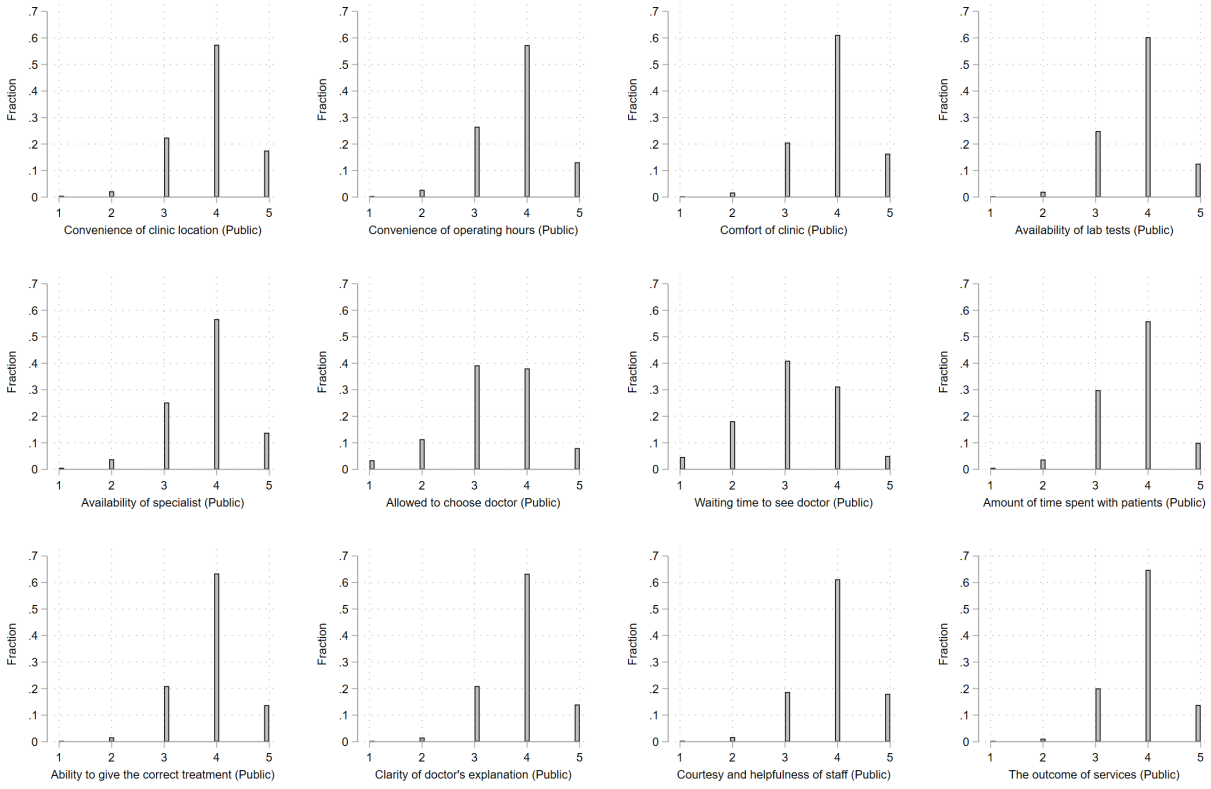


Figure A5: Perceived Quality For Public Clinics (Outpatient)

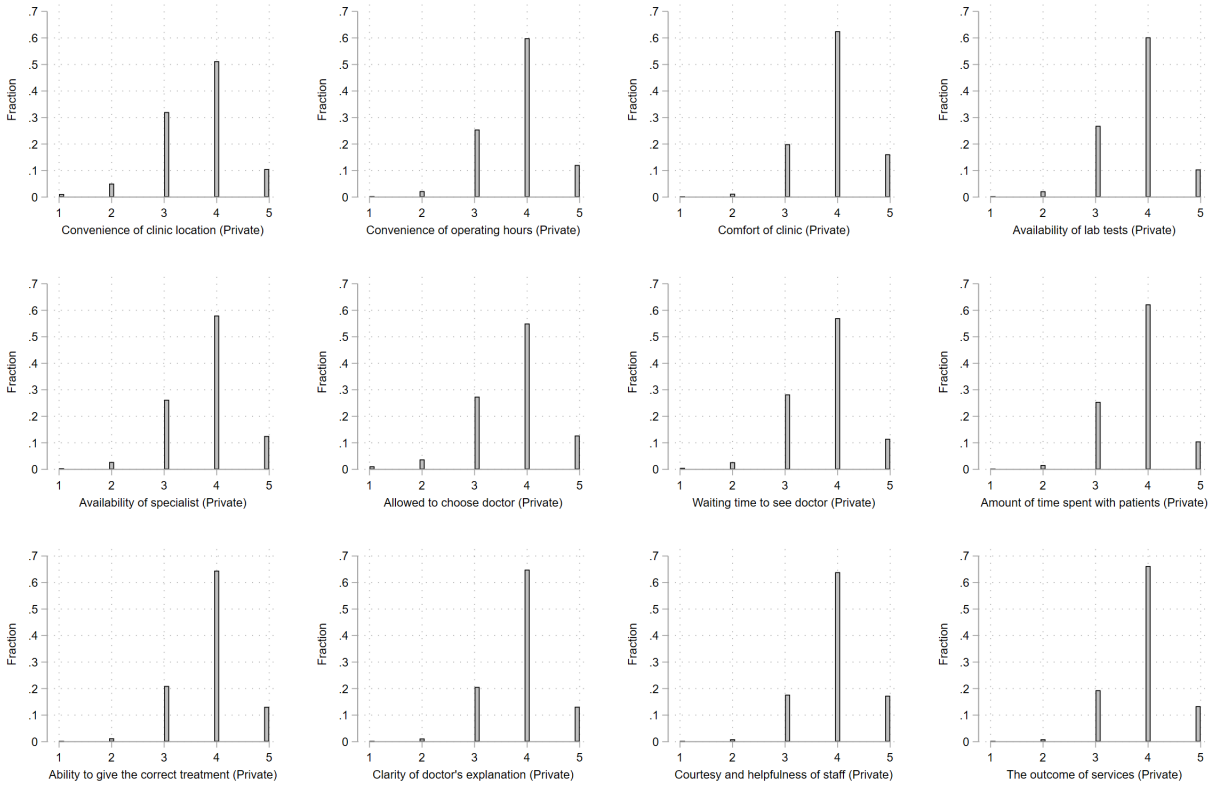


Figure A6: Perceived Quality For Private Clinics (Outpatient)

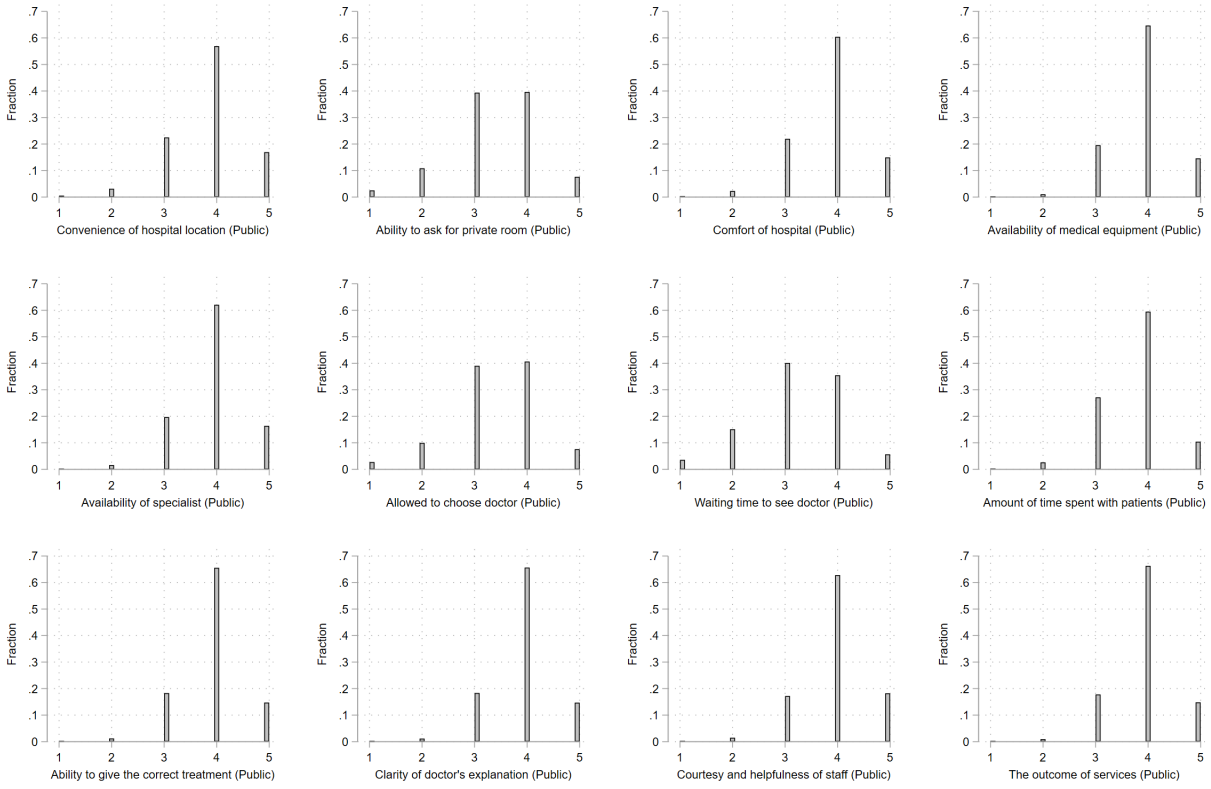


Figure A7: Perceived Quality For Public Hospitals (Inpatient)

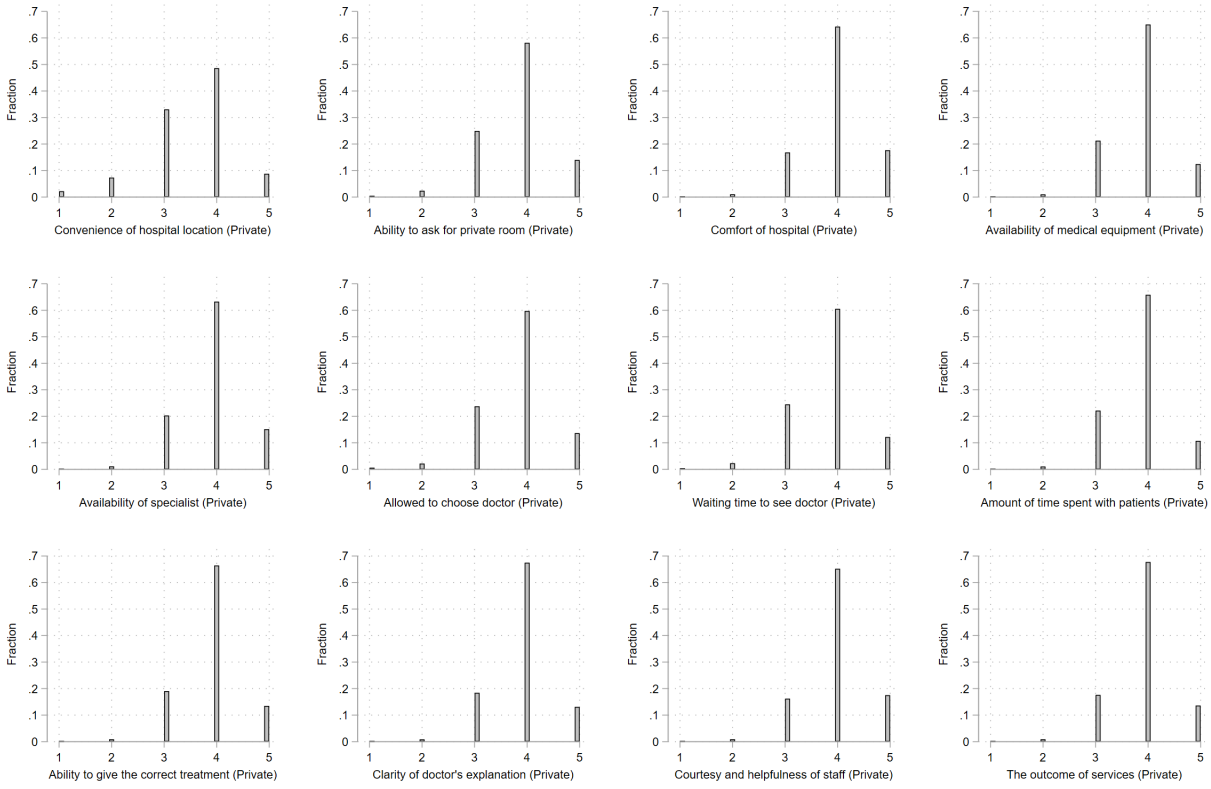


Figure A8: Perceived Quality For Private Hospitals (Inpatient)

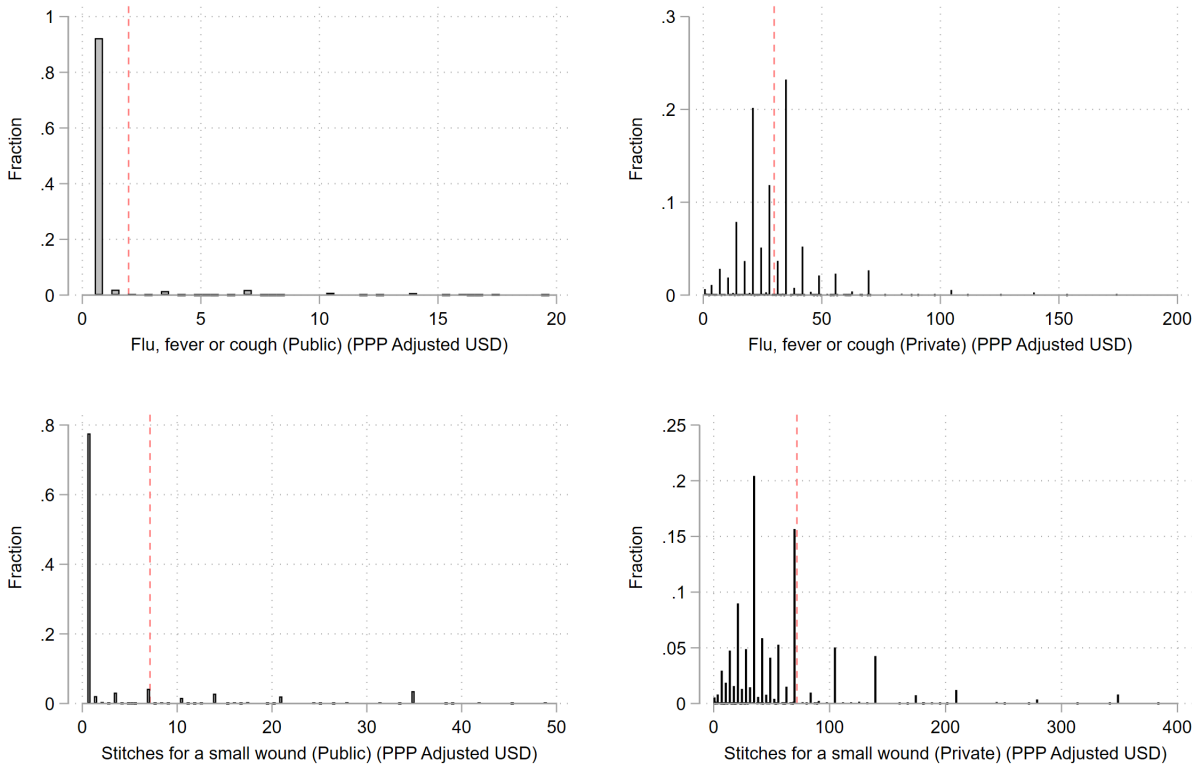


Figure A9: Perceived Price For Minor Health Problems and Minor Surgery

Notes: Red line depicts the mean for each perceived quality indicator. Values truncated at 95th percentile.

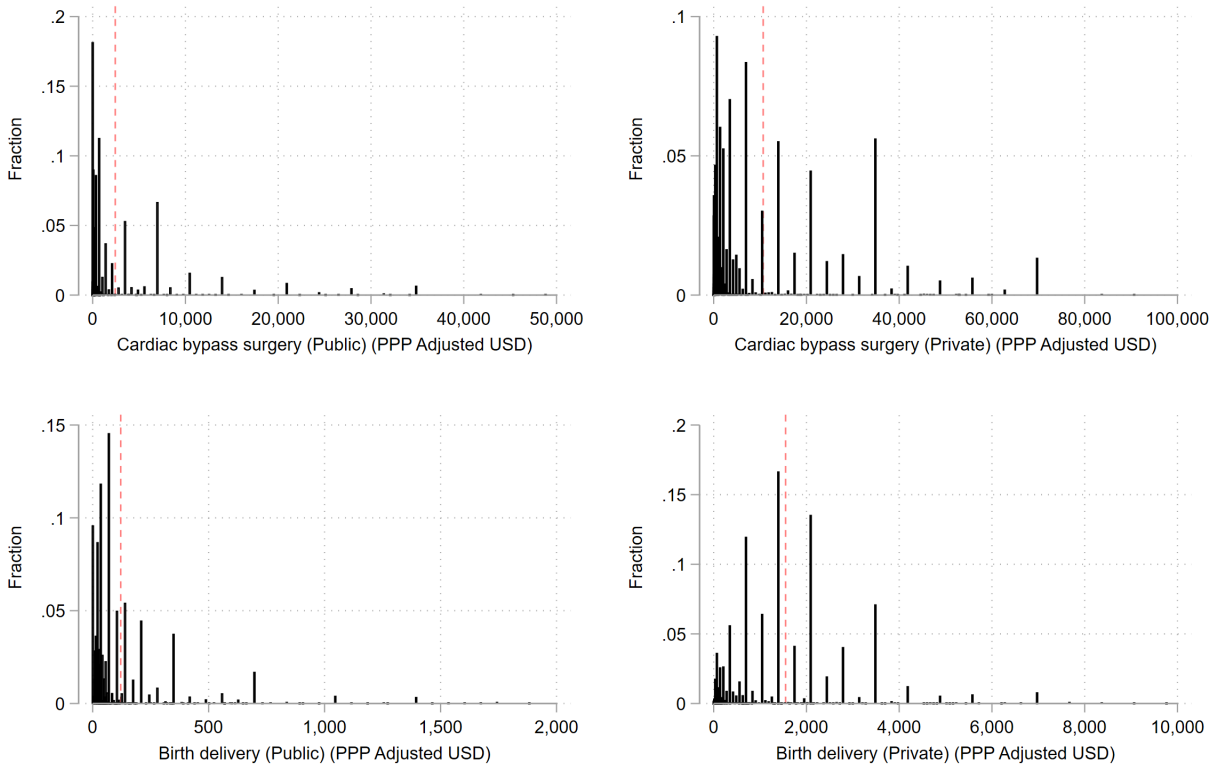


Figure A10: Perceived Price For Major Surgery and Birth Deliveries

Notes: Red line depicts the mean for each perceived quality indicator. Values truncated at 95th percentile.