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Money for Nothing

The Dire Straits of Medical Practice in Delhi, India [1]

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Abstract

The quality of medical care received by patients varies for two reasons: Differences in doctors' competence or differences in doctors' incentives. Using medical vignettes, we evaluated competence for a sample of doctors in Delhi. One month later, we observed the same doctors in their practice. We find three patterns in the data. First, what doctors do is less than what they know they should do—doctors operate well inside their knowledge frontier. Second, competence and effort are complementary so that doctors who know more also do more. Third, the gap between what doctors do and what they know responds to incentives: Doctors in the fee-for-service private sector are closer in practice to their knowledge frontier than those in the fixed-salary public sector. Under-qualified private sector doctors, even though they know less, provide better care on average than their better-qualified counterparts in the public sector. These results indicate that to improve medical services, at least for poor people, there should be greater emphasis on changing the incentives of public providers rather than increasing provider competence through training.

1 Introduction

Academic and policy discussions regarding health care increasingly focus on the quality of medical care as a crucial determinant of health outcomes (Cutler 2003). Policy levers to address quality disparities in health care must cover a variety of underlying causes (Baicker and others 2004; Kerr and others 2004; Fisher and others 2004). If geographic variation in practice-quality reflects differences in provider competence, the solution lies in geographical incentives for doctors and/or greater movement of patients.[1] If variation in practice quality arises from differing provider effort, stronger performance incentives are called for.

New data on provider competence and effort show that competence and effort both play a role in the quality of medical care received by patients. These data show that what doctors do in practice is very different from what they *know* they should do.[2] This gap reflects the cost of effort relative to reward. And it responds to incentives: Those on a fee-for-service payment scheme are closer to their "knowledge frontier" than those on a fixed salary. Furthermore, effort and competence are complements, not substitutes. More competent doctors spend more time with patients, ask more questions, and do more examinations. Less competent practitioners deliver poorer health care services because of the direct effects of lower competence and the indirect effect of lower effort-in-practice.

This is the second of two papers on the quality of medical care in urban India that stem from a study of medical practitioners in seven neighborhoods of the capital, Delhi. The first paper examined the "competence" or knowledge of practitioners using medical vignettes (Das and Hammer 2005). Vignettes—a set of standardized hypothetical cases—were presented to practitioners and the questions asked, examinations suggested, and treatments recommended were recorded. The performance of practitioners was then aggregated into an index of competence.

In a second phase of the study observers visited the same practitioners in their clinical practice for a whole day, recording what was actually done in practice.[3] The data allow several types of comparisons between what providers know in principal (competence) and what they do in practice. For all observed interactions in the clinic, general competence can be compared with average effort, aggregated over all patients during the day. We can also make this comparison for the same doctor for the same set of patient conditions as appear in the hypothetical vignettes in some cases.

[1] Peabody and others (2000) document variation in competence within two institutions in the US. A recent study by Mattoo and Rathindran (2005) for instance suggests significant gains to trade from higher patient mobility.

[2] That there could be a difference between what doctors know and what doctors do is vividly illustrated in this excerpt from an interview with a provider during the pre-test phase of the research:

Dr. S.: "*Yes, there is a lot of diarrhea and dysentery in this locality—what can they do as well? The water is dirty and people do not know to boil it—that's why their children are always falling sick.*"

DAS: "*So, what do you do for children with diarrhea?*"

Dr. S.: "*What can we do? The usual things—we tell the mother to give water with salt and sugar to the baby and then also give some medicines.*"

DAS: "*Such as?*"

Dr.S.: "*The usual—metrogyl (*metronidazole*), loperamide (an* anticholinergic*), Furoxone (*furazolidone*).*".

DAS: "*But isn't ORS enough?*"

Dr.S.: "*Of course the WHO and others keep saying that we should only give ORS. But if I tell the mother that she should go home and only give the child water with salt and sugar, she will never come back to me; she will only go to the next doctor who will give her all the medicines and then she will think that he is better than me.*"

[3] Our measures of effort reflect what doctors do once they show up for work, abstracting from the number of hours they choose to work. Doctors in the public sector are frequently absent, although less so in urban compared to rural areas (Chaudhury and Hammer 2005, Banerjee, Deaton and Duflo 2004, and Chaudhury and others, 2005)

The observations between what doctors know and what they do reveal differences across institutional settings and geographical locations. Private sector practitioners do more or less what is expected of them by the patient. For poorer patients, the quality of advice is low and such patients spend a fair amount of money for nothing—low-value advice and unnecessary drugs. Wealthier patients get better advice, both because they see more competent providers and because these providers put in greater effort. However, they also spend a fair amount of money for nothing in the form of unnecessary drugs that the provider knows to be unnecessary on the basis of the vignettes.

On average, public sector practitioners spend less time and effort with each patient and do less (relative to the private sector and relative to the fact that they tend to see sicker patients) than they know to do on the basis of the vignettes. This public-private disparity masks some variation within the public sector. Public sector providers in smaller clinics and dispensaries substantially under-perform public sector providers in hospitals; the latter are comparable to private practitioners. Unfortunately the poor do not use public general hospitals. Over a two-year period, a majority (55 percent) of the visits to doctors among poor and middle-income households in a simultaneous survey were to the private sector. Of the remainder, 31 percent were to clinics and dispensaries and only 13 percent to public hospitals. The public sector spends a great deal of money for nothing in the form of salaries for doctors (over 80 percent of the government's health budget) and the heavy subsidy to educate them. This eventually translates into cursory treatment and poorly delivered health care.

The concentration of more competent providers in richer neighborhoods, combined with the low use of public hospitals imply that the poor in the city are particularly under-served for several reasons: (1) competence among the private sector practitioners they visit is low; (2) they receive worse medical care both due to the direct effects of lower competence and the indirect effects of lower effort; and (3) lower incentives in the public sector completely offset the protective effects of higher competence. Thus the poor receive low-quality care from the private sector because doctors do not *know* much and low-quality care from the public sector because doctors do not *do* much. Households in poor areas are *better off* visiting *less-qualified private* practitioners than *more-qualified public* doctors.

We feel the results suggest that improved medical services, at least for poor people, are more a function of a lack of incentives for public providers rather than lack of competence among private providers. India is one of the few countries without any payment incentives for its public sector doctors—richer countries do not pay primary health care physicians through a fixed salary.[4] Even when the system is publicly financed, incentives are in place to make remuneration dependent on the number of patients seen. For the private sector, problems with implementing existing regulations severely limit the number of direct policy interventions. The solution is more likely to come from improving information to consumers and reducing the demand for extensive, inappropriate treatment.

The literature on incentives and performance for doctors includes studies in high-income countries (see the review by Gosden and others 2000 on performance under capitation and fee-for-service regimes) that

[4] Sweden is the exception where local governments hire providers. Even there, dissatisfaction with services has led to experimentation with performance incentives in areas that allow more competition, such as Stockholm.

typically focus on a set of doctors under a common management scheme. Fewer studies relate the performance of specific doctors to the incentives they face. While this may seem innocuous, recent contributions suggest that moral hazard in teams could lead to different results with institutional rather than personal incentives (Gaynor and others 2004).

Another part of the literature examines the link between competence and effort in high-income countries and shows that performance in vignettes is different from that in practice for a sample of 34 doctors in the Netherlands (Rethans and others 1991). However, given the sample size, they do not examine the complementarity (or lack thereof) between effort and competence or the impact of incentives on this gap. Closer to the results presented here on competence and effort is more recent work by Leonard and others (2005).[5] Leonard and others examine a similar problem in Tanzania and obtain similar results. A detailed discussion is postponed for later.

The remainder of the paper describes the health care environment in urban India, how the data were collected and how measures of competence and effort were constructed. It also presents descriptive statistics for these variables in both the public and private sectors (Section 2). Section 3 presents a simple model (and discusses some variants) that could help explain the more salient features of the descriptive statistics. Sections 4 and 5 present an empirical strategy and regression analysis of the determinants of effort. We suggest interpretations of the coefficients given the associated identification problems. Section 6 offers a short, tentative policy discussion and a discussion of further research.

2 The Environment, Data Collection and Description

2.1 The Environment

India is a low-income country and one-third of its population of 1.2 billion lives in urban centers. The capital of the country, Delhi, is a teeming metropolis with over 14 million inhabitants and covers a 1,400 sq. km area. Delhi is rich compared to the rest of the country—in 1995-96, the average per capita income in Delhi at almost Rs. 20,000 was twice as high as the rest of the country. Because Delhi is the capital and one of the richest regions in the country, the availability of health care is no longer an issue. Every household can chose from 80 practitioners within a 15-minute walking radius. The average household visits a doctor once every two weeks. Furthermore, the poor visit doctors *more* than the rich (Das and Sánchez 2004).

Health care in Delhi (and the rest of the country) is provided through a public health system that consists of hospitals and first responder Primary Health Care Centers (PHCs), and a larger number of private providers. Qualifications in the private sector are bewildering. Training periods can range from 6 months to 6 years. For this study, practitioner qualifications are grouped by whether the practitioner holds

[5] Our work, along with Leonard and others (2005) and Barber and Gertler (2005) are the first to measure the quality of health care using vignettes in low-income countries. In many demand studies, the "quality" of a health clinic is measured by the presence or absence of pharmaceuticals in stock or other easily observed physical characteristics of the facility (Collier and others 2003), which are better measures of subsidies, rather than medical care, if public facilities give drugs for free. An accurate diagnosis and prescription can be taken to a pharmacist for filling. What is not measured, but what is both part of the intuition that quality matters and the part of that is specific to the facility, is the accuracy of diagnosis and the appropriateness of treatment

a Bachelor of Medicine and Bachelor of Surgery (MBBS) degree or not. The MBBS is a rough equivalent to a MD in the United States. However, only 52 percent of visits are to MBBS doctors. The remainder are to a wide range of alternatives available in the city. These may include practitioners with formal training in alternative medicine, those with no formal training but with degrees recognized by the government, and those with no formal degrees or government recognition.[6] Providers in the public sector all hold a MBBS degree, but work in two different settings: Public dispensaries or primary health care centers and hospitals. Since hospitals in Delhi historically reflected the highest standard of care in the country, the competence and effort of these two groups may differ substantially.

Although the average public sector provider is more qualified (with an MBBS degree), households overwhelmingly favor private sector practitioners. The private sector accounts for 82 percent of all visits nationwide (Mahal and others 2001); for our sample this is slightly lower at 75 percent. Since there is no medical insurance apart from the provision of government health care, families frequently incur high out-of-pocket expenditures. The World Health Organization estimates that 82 percent of total spending on health care in the country is out-of-pocket spending on primary and in-patient care.

The recently elected government's (2004) promise of a Common Minimum Program guarantees quality education and health for all. One hotly debated topic is the relative quality of providers in the private and the public sector. Some say that private providers are mostly "quacks" with little training and medical competence; others believe that the public sector is full of lazy doctors who do not work. As it turns out, each view has an element of truth.

2.2 Data Collection

Details of the sampling frame and data collection exercise are described in Das and Hammer (2005). Highlights relevant for this paper are as follows. In 2001, the Institute of Socio-Economic Research on Democracy and Development (ISERDD) began a longitudinal study of households in seven neighborhoods of Delhi. Three of the neighborhoods were poor, two middle income and two relatively wealthy. Over two years, 300 households were interviewed once a week for 35 weeks and once a month for another 8 months. Information was collected on health and health-care seeking behavior and demographic, income and consumption modules were administered twice in the two years. Less than 4 percent of the households approached refused to participate and the demographic, educational and expenditure profiles of the households in the study is very similar to representative samples of Delhi residents in the National Sample Survey and the National Family Health Survey (Das and Sánchez 2004).

These data on health care were used to construct a universe of relevant providers in the seven neighborhoods of the ISERDD study in two steps. First, all providers that anyone in the 300 households visited during the first year of the survey was included. Second, research teams were sent on a reconnaissance visit in which

[6] Following the Alma-Ata declaration on Primary Health Care in 1978, the Government of India established training courses for providers drawing on different traditions in Indian medicine. These were Bachelors of Ayurvedic Medicine and Surgery (BAMS), Bachelors of Integrated Medicine and Surgery (BIMS) and Bachelors of Unani Medicine and Surgery (BUMS). These providers were to provide basic care and refer serious cases to facilities with MBBS doctors. Further down the pecking order are the Registered Medical Practitioners (paramedics with some rudimentary training). However, given the limited regulatory power of government authorities, some providers have no formal training at all.

all providers with a sign advertising medical care within a 15-minute walking radius around the perimeter of the area of the household survey were noted. This formed a "census" recording the qualifications, age, gender and experience of providers in the universe.

From this set, a sample of 20-25 practitioners were drawn from among those who had been visited (with sampling weights proportional to the number of all visits by households) and 10 from the group that had not been visited by anyone in the household sample in each of the seven neighborhoods.[7] From this sample, 205 providers participated in the study after a 15 percent rate of non-compliance.[8] While most practitioners (163) were in clinics staffed by a single person, we also interviewed practitioners in hospitals (public and private) and public clinics with multiple providers. In these cases, we interviewed at least two providers in every facility; for hospitals, interviews were conducted in the out-patient department that serves walk-in patients.

For each of the 205 providers, we completed a two-stage inquiry. In the first part we administered five "vignettes" or hypothetical cases acted out by two interviewers (the provider was aware of the role playing) to every provider in the sample (Das and Hammer 2005). One of the interviewers acted as the "patient" while the other recorded questions the doctor asked and answered those that the patient would not know the answer to, such as the results of an examination or tests recommended. Diagnoses reached and the treatments prescribed were also noted. This large volume of information was summarized by use of item response theory (IRT) that gave each doctor a score derived as a weighted average of the relevant questions asked and treatments prescribed—the weights being determined via the statistical technique. We call this score the "competence" of the provider.[9]

The main results of that study relevant for this paper were as follows.

- Private providers with MBBS degrees were most competent with average competence one standard deviation higher than their non-MBBS counterparts and a distribution of competence skewed to the left.
- Private practitioners without an MBBS degree were least competent on average but with a distribution skewed to the right (some were quite good).
- The distribution of competence in the public sector was dispersed and distinctly bimodal, a feature that came out clearly with the IRT scoring method. The two parts of the distribution corresponded quite closely to doctors who served in small clinics and dispensaries versus those in large, general hospitals (again, among the most prestigious in the country). This division will continue to be important here.
- Private MBBS doctors were slightly better, on average, than those in the public general hospitals. Private practitioners without an MBBS were somewhat worse, on average, than public MBBS doctors in small clinics, but not by much.

[7] Some neighborhoods had fewer than 25 different providers which is the reason for the range.

[8] Reasons for non-compliance were evenly divided between providers who had left the locality or could not be located (in some cases, a household may have visited the provider a single time and could not remember the address) and those who refused. It is hard to sign the direction of the bias—refusals could either reflect higher quality with a greater opportunity cost of time or lower quality if the provider was scared of personal repercussions from the survey.

[9] IRT can be thought of as principal components or factor analysis properly treating the large number of dichotomous variables. The analogue of the first principle component or factor is our measure of competence.

- Finally, there was considerable sorting across neighborhoods for both private and public sector practitioners. More competent private sector providers were overwhelmingly in richer neighborhoods. Surprisingly, public sector doctors were similarly located. Similar sorting patterns among the public and private providers imply that the difference in competence between public and private sector providers in different localities was quite minimal.

The second stage of data collection was direct observation of the provider's clinical practice. A month after the vignettes were administered, one of the interview team sat with the practitioner for a whole day, recording details of their interaction with each patient.[10] These included some information about the patient such as age, gender, whether s/he was a repeat patient, the number of days sick before seeking treatment for this episode and the symptoms reported. The team also recorded details about the transaction including the number of questions concerning the history of the problem, examinations performed, medicines prescribed and (for the private sector) prices charged. Finally, the medication given (including the names, types and dosage of medicines dispensed or prescribed) was noted. We observed 4,108 doctor-patient interactions for 193 providers, losing 11 doctors from the sample, who participated in the vignettes but refused to allow direct observations.[11]

In addition, for cases where the patient presented with diarrhea or cough without fever, the observer noted if the practitioner asked particular questions and performed particular examinations. Since these cases had also been covered in the vignettes, we could directly compare the questions asked or examinations performed in the vignettes to those asked in practice to estimate the gap between competence and practice. For cases of diarrhea, observers noted whether the practitioner asked about vomiting, the nature of the stool and the patient's history of fever and whether she checked the patient's temperature. Similarly, for patients presenting with cough without fever, the observer noted whether the practitioner asked about chest-pain, nature of the expectorant and history of fever. In addition, the observer also checked if the practitioner examined the patient's temperature and blood pressure. These nine tasks (6 questions and 3 examinations) both received high weights in the IRT methodology and were vetted by panels of physicians as critical procedures for any presentation of these two illnesses. From a medical standpoint, the questions allow the provider to distinguish between viral infections that do not require treatment and bacterial infections that do. We observed 978 such interactions and lost observations on another 35 providers who did not see either of these problems in the days visit.[12]

For the full set of 4,108 visits we construct an index of "effort-in-practice" (henceforth, EIP) for every provider-patient interaction based on the first principal component of the amount of time spent on each patient, numbers of history questions asked, whether or not a physical exam was done, whether there was

[10] Originally we expected to have trained physicians do the observations but ran into the ethical problem that physicians would have to intervene if they were to see dangerous practices (not unlikely). This limits our ability to make fine distinctions on the quality of clinical care.

[11] These providers were on average $\frac{1}{2}$ a standard deviation lower in competence than others. It is possible therefore, that the results here present an optimistic picture of true effort-in-practice. Provider characteristics for different samples are in Table A1.

[12] These 35 doctors are no different from the remainder of the sample in observable characteristics, including competence. Details are in Appendix 1.

advice on follow-up and medication if prescribed. We exclude the number of medicines given from this index since there is substantial concern over poly-pharmacy and, while spending more time diagnosing and advising patients should clearly increase the quality of care delivered, more medicines may not.

Table 1 shows the relationship between the index and several of its component parts. On average, practice among providers in Delhi is worse than in several other countries. Practitioners spend on average 3.80 minutes per patient. Since the practitioner is the first person that the patient sees in her visit (there is no assistant or nurse in public or private clinics or in the OPD wards of general hospitals), this time is spent on asking history questions (on average 3.2 per patient), performing examinations (63 percent did at least one examination) and prescribing medicines (2.63 different medicines per encounter). Practitioners in Delhi stand on the low side of time spent and on the high side of number of drugs prescribed in accordance with the commonly noted problem of poly-pharmacy in medical practice. The effort-in-practice (EIP) index is fairly good at distinguishing among providers. Those in the lowest tercile of effort spent on average 1.9 minutes with each patient and this increases to 6.15 minutes for those in those in the highest, with similar increases in the number of questions asked (from 1.36 to 5.32) and examinations performed (from 14 percent to 98 percent).[13]

2.3 A Summary Description

Four simple figures illustrating the basic data motivate much of the subsequent analysis. Figure 1 is the kernel density estimate for public and private providers of effort-in-practice (EIP). Several features stand out. Public doctors exert much less effort than their private counterparts; the steeply peaked modal value for public doctors is a full standard deviation less than the sample average. Interestingly, there is a hint of a second mode at levels of effort slightly higher than average, a characteristic that resonates with our earlier results on competence which recurs throughout the analysis. Private effort is more dispersed but the modal value is slightly higher than the sample mean. Both distributions are skewed to the right. The private cumulative density function (not shown) exhibits first order stochastic dominance over the public though it is hard to tell if it is significant over the entire range.

Differences in case-mix and severity might account for lower effort in the public sector. Less time with a patient is certainly reasonable if conditions seen in public clinics are much easier to treat and/or less severe than in private. In fact, just the opposite is true: The case mix in public and private venues are almost identical (Figure A1). Further, patients in public clinics are likely to be sicker than those in private, at least as measured by the number of days that symptoms had persisted before the patient sought help—a median of 5 days for private and 7 for public.[14]

A second basic characterization of the data is presented in Figure 2. This picture uses the subset of visits (and providers) in which the patient presented with either diarrhea or cough so that we have both the

[13] We cannot rule out "Hawthorne effects" whereby doctors change their behavior because they knew they were being observed. We feel that, to some extent we mitigated such effects by building a relationship with the providers and hence confidence in the anonymity of our survey over a period of time.

[14] Of course, the argument could go the other way. Serious cases with sudden onset might cause a patient to get treatment more quickly. However, for the types of problems covered in Figure A1, delay in treatment will generally be associated with a worsening of the problem.

vignette from the practitioner and his/her actual practice for the very same condition. The graph compares the proportion of critical questions asked/examinations performed in the vignettes to the proportion asked in clinical observation for these two conditions.[15] Several results are notable. First, while the non-MBBS providers knew fewer of the salient questions to ask/examinations to perform than either public or private doctors, they actually did approximately all they knew. Their practice and their competence are closely aligned. For MBBS doctors, however, the gap between what they know and what they do is large: Private practitioners completed only 59 percent of the tasks (questions/examinations) that they know to be important (we know they know through their performance in the vignettes for the same case presentation).

Public sector doctors did less than a third of what they knew to be important. In fact, the non-MBBS providers ended up providing better care on average, by asking more of the salient questions and performing more of the critical examinations than the public MBBS doctors. Clearly incentives are strong for MBBS doctors to do less than they know, and stronger still in the public sector. These results are consistent with the fact that the average vignette for these conditions took about 15 minutes to complete (without real examinations being done) while the average real visit to an MBBS doctor took two minutes in the public and four minutes in the private sectors (inclusive of real physical examinations).

Figure 3 is a decomposition of competence and overall effort by the average income of the neighborhoods that the provider practices in. Among doctors in the public sector, competence is close to, or higher than average. Providers in the private sector are less competent, especially in poor neighborhoods. Patterns of effort are the opposite—private sector practitioners exert effort that is close to or above the average; all public sector providers put in effort that is (far) below average. The reasons for poor delivered care are thus very different. The constraining factor on the quality of medical advice dispensed in low-income areas among private sector providers is low competence and among public sector providers low effort. This difference underscores the importance of decomposing practice-quality variations into variations in competence and variations in effort.

The fourth depiction of the data is in Figure 4. Here, for the full sample of doctors for which there is both a competence score and the effort-in-practice index (from visits for any reason, not simply those for cough and diarrhea) we show the non-parametric regression line relating effort to competence.[16] Providers in the private sector are separated by whether they had an MBBS degree or not and, public doctors by whether they practice in a hospital or a clinic. We had no priors as to the shape of this function. Highly knowledgeable doctors may need less time to reach a diagnosis than less competent providers. In that case knowledge and effort would be substitutes and the function would be decreasing. The figure clearly shows that knowledge and effort are complementary since the functions are all increasing, and at similar rates for every level of competence.

A second feature is that private doctors with an MBBS degree and public physicians in general hospitals look very similar. It is possible that the private sector puts in a little bit more effort at lower levels of

[15] To recapitulate, we checked whether the provider asked 6 questions and performed 3 examinations across the two cases. The answers to these questions/examinations would have allowed the provider to distinguish between viral and bacterial cases, thus determining the course of treatment.

[16] Since non-parametric regressions are unreliable where data is sparse and can be sensitive to the way data at the ends of the data range are handled, we present only the middle 95 percent of the sample, between the fifth and ninety-fifth percentiles.

competence but since the curves coincide at the high end, they are indistinguishable for at least some range of competence. Third, the private non-MBBS group lines up almost precisely with the MBBS providers. That is, as a function of competence, the degree of effort is unrelated to the type of training the provider has received. Finally, what really stands out is the difference between public doctors in clinics and dispensaries relative to every other type of provider. The amount of time, questions asked, examinations done and advice given is very much lower for public MBBS doctors in primary health clinics than anyone else. This leads us to suspect that the incentive structure—identical for all private providers—is more powerful as an explanation of the effort that providers exert than the qualification (whether MBBS or not) of the provider.

The descriptive figures suggest some basic facts, some a little surprising, most fairly consistent with common knowledge. Medical care providers typically do less than what they know, more so for the public than the private sector. Public doctors in primary clinics in particular put in very little effort relative to their private counterparts. Finally, competence and effort appear to be complements and at rates that do not seem to vary much across the institutional affiliation or qualification of the provider.[17]

Despite the patterns observed in the raw-data, we need to be cautious in interpreting these correlations. There are observable differences among providers and patients along the public/private and the less competent/more competent dimensions explored in these figures (Tables A2 and A3). Doctors in the public sector have practiced in the location they were observed in for fewer years, tend to be female and see more patients every day (almost 3 times as many) than their private sector counterparts. The patients who come to them are more likely be male, repeat clients, and older individuals. The average income of a patient who visits the public sector is lower.

There are fewer observable differences between providers who are more or less competent (although more competent providers tend to be females). However, more competent providers, like the public doctors, see patients who tend to be male, repeat clients and older individuals. Their patients are also richer on average. We need to ensure that these correlations continue to hold once observable differences are accounted for. Further, providers and patients may differ along other, unobserved, dimensions; the next two sections address these issues.

3 Simple Behavioral Models with Alternative Market Closure Rules

Potential hypotheses abound, at least for the difference between public and private sectors. Public providers are paid on salary and, at least in clinics, face little monitoring and no sanctions for less than conscientious work. In the out-patient departments of hospitals(all interviews in hospitals were in the out-patient departments), doctors can be more closely monitored and the prestige of working in hospitals can be put in jeopardy for non-performance. Private sectors are paid on a fee-for-service basis and always have an incentive to cater

[17] Recently, Amartya Sen (The Hindu, 9 January, 2005) characterized the private medical sector in rural areas as full of "quackery and crookery". We only have data on the urban sector but think the phrase might apply just as easily to the public. A measure of "quackery" in the public (non-hospital) sector might be the average value of competence, which is -.5 standard deviations lower than our sample mean (lower than the competence level at which the doctor switches from doing more harm than good (Das and Hammer 2005)). The "crookery" in the public sector might be measured by the difference in the curves at every level of competence between the (non-hospital) doctors and the private sector in Figure 4.

to the patient in order to ensure repeat business (as eloquently described by Dr. S. in footnote 2). Our observations on the difference between the public and private sector are consistent with a simple explanation relating effort to incentives. We know less (both theoretically and empirically) of the relationship between effort and competence. We present a simple model consistent with the basic facts and then explore what we can say about the observed relationships from a deeper econometric analysis.

We first set up a simple bargaining problem for a single transaction between a practitioner,i, and a patient,j. The problem is defined in terms of payoff functions for the provider and the patient and a production function that relates effort and competence to the quality of care.

1. The Practitioners: The competence of a practitioner, i, is θ_i. Let practitioner $i\prime s$ utility be determined by profits π_i net of effort costs for the transaction, so that

$$\pi_i = P_{ij} - \frac{\omega}{2} e_{ij}^2 - \delta(.) \tag{1}$$

   We discuss the role of the $\delta(.)$ function below.

2. The Patient: Every patient,j, is indexed by v_j, which represents the patient's willingness to pay for quality. Patient $j\prime s$ utility is her valuation of quality, $v_j Q_{ij}$, minus the price charged for the transaction.

$$U_j = v_j Q_{ij} - P_{ij} \tag{2}$$

3. The Production Function: The quality of health care, Q_{ij}, depends positively on the doctor's effort and competence. Assuming multiplicative effects, suggested by the complementarity illustrated in Figure 4, the quality of health-care delivered is effort times competence.

$$Q_{ij} = e_{ij}\theta_i \tag{3}$$

For the private sector, P_{ij} in both the provider and the patient's profit/utility functions is the price. For the public sector, the interpretation is less clear, but represents the direct transfer from patient to doctor in the transaction. These may include, for instance, under-the-table payments (which we never observed, possibly because we were watching), affirmation of status or expressions of gratitude. Costs to the doctor that are not borne by the patient are captured in the function $\delta(.)$. Factors that $\delta(.)$ might capture are the degree to which the doctor takes personal satisfaction from the success of the treatment and the degree to which a successful transaction enhances reputation for the development of private practice. This applies to public doctors at least as much as private since many public doctors either anticipate a private practice in the future or are currently engaged in one (even though this is not sanctioned).

We solve for the Nash-bargaining equilibrium of this model. Denoting the bargaining power of the consumer as α, and dropping subscripts, the Nash equilibrium would solve:

$$Max_{P,e}(P - \frac{1}{2}e^2 - \delta(.))^{(1-\alpha)}(ve\theta - P)^{\alpha} \tag{4}$$

The solution is given by an effort and a price equation.

$$e^* = v\theta - \delta(.) \tag{5}$$

and

$$P^* = (1-\alpha)(ve^*\theta) + \alpha(e^*)^2 \tag{6}$$

Optimal effort is increasing in competence and the value placed on practice quality by the patient. The price of the transaction increases both in patient valuation and practice-quality, as well as the effort cost of the provider. The degree to which the price lies between the reservation price of the doctor and the patient for the transaction is determined by the strength of the consumer's bargaining power, α. When α is zero, the doctor extracts all surplus from the interaction, with patient utility also equal to zero. Without worrying about how such bilateral relations would take place in a market, the key expression for e^* can be estimated under reasonable hypotheses regarding private non-monetary costs or benefits of provision included to get at $\delta(.)$. Under this interpretation, the coefficient on effort should be the value placed on cure by the patient.[18]

This basic model illustrates the equilibrium when there is a single doctor and a single patient. To analyze market equilibrium the bilateral model is extended to include two types of doctors, θ_{high} and θ_{low} and two types of patients v_{rich} and v_{poor} with $v_{rich} > v_{poor}$. For simplicity, assume that $\alpha = 0$, so that all bargaining power lies with the doctor (results are unaffected by this assumption). The equilibrium is characterized as follows:

- Both v_{rich} and v_{poor} are indifferent between the two doctors. This follows since they are kept at their reservation utility by both doctors; all differences in the quality provided are fully captured by changes in the price charged.

- Both doctors exert first best effort, but change their effort levels (and their prices) depending on the patient seen. The effort and price equations above are augmented with the appropriate subscripts. In equilibrium,

$$\begin{aligned} e^*_{high,rich} &= v_{rich}\theta_{high} - \delta(.) \\ P^*_{rich,high} &= (v_{rich}e^*\theta_{high}) \end{aligned}$$

  and equivalently for pair-wise combinations of $\{low, poor\}$, $\{low, rich\}$ and $\{high, poor\}$.

- More competent providers continue to exert higher effort and charge higher prices (for both rich and poor patients) than those with less competence.

These results are the analogue of a perfectly price discriminating monopolist—given the assumption of Nash-bargaining, there is no inefficiency in equilibrium. Furthermore, since doctors extract the entire

[18] This requires the assumption of complementarity of effort and ability that the raw data suggests. A more complex function relating health status change to effort and ability could be assumed but would be harder, perhaps impossible, to estimate. Figure 3, which imposes no a priori restriction on the nature of the function relating effort to competence, does suggest that complementarity is a valid assumption.

surplus, individuals are indifferent between which doctors they choose. In empirical estimation, embedding the bargaining model into a market suggests the same estimating equations for effort suggested above. It will be a function of competence and the elements of $\delta(.)$, though the effect of competence would be a mixture of effects from different types of clients. However, perfect price discrimination implies that we need not worry about patients matching themselves to providers (those with higher values of v choose more competent providers).

3.1 The Market with Sorting

A more realistic assumption is that doctors cannot perfectly price discriminate. In this case, it is likely that more competent providers will match with patients with a higher willingness to pay. Their effort levels will thus reflect both their competence and the characteristics of their average patient population. Figure 5 illustrates sufficient conditions for such an equilibrium, with the following characteristics (proofs are omitted, but are straightforward).

- θ_{low} earns zero profits and matches to v_{poor}.
- θ_{low} provides first best effort.
- To construct the equilibrium for $\{high, rich\}$, note that the more competent provider must earn a positive profit; if not, she can always cater only to v_{poor} and earn strictly positive profits. Thus, the allocation for the rich will lie on the indifference curve given by AB.
- θ_{high} may provide first best effort (as Figure 5), or decrease her effort below the first best level to maintain separation in the market. This may happen, for instance, if the tangency between the iso-profit curve for $\theta_{high}$and the indifference curve for v_{rich} occurs at a point between I_1 and I_2. Since θ_{low} might prefer to increase her quality to this tangency point, I_2 may be preferable for θ_{high}, even though first best effort is not exerted. The uncertainty around the level of effort of the high quality provider is due to the fact that effort will depend on how many rich people there are—since the doctors will have to split the market if they pool, the degree of specialization is indeed limited by the extent of the market.

In this equilibrium, if efficient effort is achieved by both doctors, these effort levels are identical to the appropriate pair-wise comparison in the previous case. The difference now is that rich patients strictly prefer to match to more competent providers, and poor patients strictly prefer to match to less competent ones. This will affect our interpretation of the estimated coefficient of competence on effort.

4 Empirical Estimation

To derive an empirical specification, consider the linearized version of Equation (5).

$$e_{ij} = \alpha + \beta_1\theta_i + \beta_2 Public_i + \gamma X_i + \lambda Y_j + (uv_j + \mu_{ij} + \varepsilon_i) \tag{7}$$

Here e_{ij} is the effort exerted by the doctor in the interaction between doctor i and patient j. θ_i is the competence of the practitioner, $public_i$ is a dummy variable that indicates whether the doctor is in the public sector, X_i a vector of other observed provider characteristics, and Y_j a vector of observed patient characteristics. The error term in the parenthesis consists of the patient's (unobserved) willingness to pay, v_j, an interaction specific error μ_{ij} and a doctor specific error term ε_i.

In addition to the effort equation, there is a relationship that specifies the structure of matching in the market.

$$\theta_i = \rho + \sigma v_j + \nu_{ij} \tag{8}$$

This problem is hard to estimate due to the matching of patients to providers. Since the willingness-to-pay is not observed, it enters in the error term of Equation (7). As discussed above, if the doctor is a perfect price discriminator, patients are indifferent between less and more competent providers (the doctor can extract all surplus) so that $\sigma = 0$ in Equation (8) . In this case, the coefficient β_1 reflects the average valuation of cure as per the bargaining model. In all other cases, we have to worry about matching patients to providers. The matching equation implies that the patient's willingness-to-pay for quality is correlated with the competence of the provider. The likely direction of this bias is upward as patients with a higher willingness-to-pay will match with more competent providers. The complementarity between effort and competence may be entirely because better doctors see richer patients and effort depends on the price of the transaction.[19]

Attributing β_2 entirely to incentives in the public sector is also problematic if particular types of providers prefer the public sector. The direction of this bias is difficult to determine—there are arguments that more altruistic doctors or those building up a reputation locate in the public sector, which biases the estimate towards zero (see for instance, Chawla 1997). On the other hand, doctors with higher costs of effort may locate in the public sector, biasing the coefficient upwards.

4.1 Interpreting the Relation between Effort and Competence: The Structure of Sorting

To understand how patients match to doctors, we matched household visits to doctors in the parallel household survey to providers in the doctor survey. We completed this matching for all visits over a 2 year period, during which households were administered surveys on a weekly basis for 35 weeks. This data yielded close to 4,000 doctor visits; in 65 percent of these visits, we were able to match the provider visited to a practitioner in our study (recall the sampling scheme gave greater weight to doctors who were visited more). Since all households were administered a consumption-expenditure survey, we then computed the "average income of a patient" as the average income of households matched to providers, weighted by the number of visits over the 2-year period. By construction, the sample of practitioners also includes those who were never visited.

[19] Our attempt to address the matching issue differentiates this paper from Leonard's (2005) work. While Leonard (2005) tries to address the selection issue, he does not present a synthesis of how the market operates in equilibrium; as such, it is hard to tell what portion of his results are driven by the selective sorting of patients to doctors. This problem be partially solved with information on patient characteristics. Given the particular environment (crowded urban streets and clinics that consist of a single room open to the outside) both patients and doctors were reluctant to give permission for this exercise and we explore other options for identification purposes.

Of the 193 doctors in our sample, we can construct this variable for 141. Fortunately, there are no differences in observable characteristics between these 141 and the full-sample (Table A1).[20]

As predicted, richer patients match to more competent providers. The most competent providers see patients who are almost twice as rich as the least competent (Table 2, Column 1 and 2). Public sector doctors see poorer patients and the public-private difference increases with competence. Interestingly, this variation is driven almost entirely by differences across neighborhoods (Table 2, Columns 3-8). There are large differences in the income of patients as we move from poor to rich neighborhoods. Within the same neighborhood more competent doctors do see richer patients, but this difference is much smaller. Better doctors receive richer patients because (on average) they are located in richer neighborhoods.

In a regression context, a one standard deviation increase in the competence of the provider results in patients who come from households with average incomes that are Rs.2,000 (0.34 standard deviations) higher. Moreover, the average income of patients who visit private sector doctors is Rs.3,000 (0.5 standard deviations) higher than those who visit the public sector. However, sorting is driven entirely by differences across localities. Once we control for neighborhood effects, there no evidence of sorting on income by competence ($t < 1$), although sorting across the public and private sector continues at an attenuated level (the income of the average public sector patient is Rs.2250 lower).[21]

4.2 Tackling the Matching Problem

4.2.1 Across and Within Neighborhood Comparisons

This suggests two ways of addressing the matching problem. We can either include the average wealth of patients directly in the regression or estimate the equation separately with and without neighborhood fixed effects. In either case, the theory predicts that the estimated coefficient should decline if providers are particularly responsive to prices, conditional on their location choice. Coefficients from this specification, with neighborhood fixed-effects, are robust to the matching problem if location decisions are not correlated to competence and/or do not enter directly into the effort equation. If no different from the OLS estimates, they show that good doctors who *choose* to locate in poor neighborhoods behave no differently from those who *choose* to locate in rich areas (or bad doctors who choose to locate in rich neighborhoods behave no differently from those in poor neighborhoods). This may be unrealistic if, for instance, good doctors who locate in poor neighborhoods are more altruistic—in this case, the independent effect of altruism confounds our interpretation of β_1.[22]

[20] Technically, the exercise is valid as long as the there is payoff-equivalence among the doctors visited and not-visited, the market is competitive, and the observed day was random.

[21] Poor and rich patients visit the same private doctors, conditional on living in the same neighborhood (Das and Hammer 2005b). This could indicate that poor patients are, on average, sicker when they visit the doctor and thus their willingness-to-pay is higher than what their income indicates. All specifications include a full set of patient characteristics (including symptoms reported) as a plausible measure for severity of illness.

[22] This strategy is similar to that pursued by Ackerberg and Botticini (2002) in their study of agricultural contract choices. As in their study, the maintained assumption is that location decisions are exogenous—this is probably too strong an assumption in urban areas.

4.2.2 Facility Fixed Effects

Our final specification tackles the matching problem from a different angle. The key to this specification is the allocation of patients to practitioners in hospitals and smaller clinics. Most private and public sector clinics are manned by a single provider. Thus, when a patient chooses to visit such a clinic, she chooses to match to the provider who staffs the clinic. In contrast, all hospitals are staffed by multiple doctors in the out-patient departments where we observed them. Like most out-patient departments, once a patient chooses to visit the institution, there is no further matching. Patients wait in a single queue and visit the doctor free at the time they come to the front of the line (similar to a queue with multiple counters). When patients visit hospitals they do not count on visiting a particular doctor; consequently *within facilities* patients are randomly matched to providers.

The relationship between competence and observed patient characteristics within the same facility is consistent with the hypothesis of random matching. In a regression context, a test that observed patient characteristics are correlated to provider competence within facilities is rejected at the 5 percent level and is barely significant at the 10 percent level. We exploit this "random-matching" component of hospitals by including facility-level fixed effects in the regression of effort on competence. In comparing effort levels of providers of differing competence who practice in the same facility, we purge the estimated coefficient of biases arising from non-random matching.

4.3 Interpreting the Impact of Institutions on Effort

Estimates of β_2 from Equation (7) confound the effects of selection into the public sector and the adverse impact of incentives. To some extent, the inclusion of clinical competence as an additional explanatory variable is novel and likely controls for the bulk of the selection effects. In addition to including provider competence, we ensure that our estimates are robust to all observed characteristics of providers and patients, both in regression and more flexible matching specifications (propensity score matching). This assumes that there is no selection on unobserved variables. An alternate interpretation is that the estimate coefficient reflects the joint effect of incentives and selection on unobserved characteristics in the public sector. Table 3 summarizes our empirical strategy and the assumptions required for the estimates to be unbiased in Equation (7).[23]

5 Results

Following Table 3, we present results on the relationship between effort and competence and the difference between the public and private sector for three specifications. The first controls for observed doctor and patient characteristics, the second accounts for patient matching by including average patient income or neighborhood fixed effects and the third accounts for patient matching by including facility fixed effects.

[23] We require that competence is strictly exogenous for all the specifications. This may not be true if more motivated/altruistic doctors also seek more training. We are less worried about this source of omitted variable bias, since policy changes that would have to tackle this issue relate to greater training and education for providers. At this point, we stick to the pool of available doctors and look for policies that may affect the distribution of such providers or those that may lead them to exert greater effort-in-practice.

These three specifications are repeated for each of the following dependent variables. The first, the analog of Figure 1, is a variable that indicates whether the doctors asked each of 6 questions or performed each of 3 examinations for patients presenting with diarrhea or cough without fever. As discussed previously, these 9 items were vetted by experts as critical to the management of such cases and all 9 had been covered in the vignettes. We relate the doctor's performance in direct clinical observation to performance in the vignettes. Our measure of competence is the probability of asking the question/performing the examination in the vignettes for each provider-question pair and coefficients are reported for both linear and the random effects probit models (see Appendix 1).

Our second dependent variable is the overall measure of effort presented in the Figures 2 and 4. This variable allows us to make comparisons between effort and competence for the entire sample of doctor-patient interactions, but is less precise since we cannot relate performance in the vignettes to performance in practice for the same set of questions and examinations. The measure of competence used here is the competence index based on the full set of vignettes (Das and Hammer 2005).

Finally, turning to a less benevolent aspect of effort, we also estimate the extent of "poly-pharmacy", measured as the total number of drugs given to the patient.[24] This is important both for the private costs arising from unnecessary expenditure, risk of resistance to drugs in the patient and unpleasant side effects and the distinct social cost of increasing the resistance of infectious agents to first line (relatively cheap) drugs in the population as a whole. This is a major externality.

5.1 Ordinary Least Squares and Propensity Score Estimates

The basic description illustrated in the Figures 1,2 and 4 remains once we account for practitioner and patient characteristics (Table 4). Effort increases with competence so that the joint hypothesis of complementarity of effort and competence along with positive valuation of cure is confirmed, both for the 9 tasks that were graded on the vignettes and in observation (Panel A) and the more general measure of effort (Panel B). Effort is lower in the public sector after accounting for differential workloads, patient populations and observed provider characteristics. Finally, public hospitals and other public health-care centers continue to differ, with the former performing significantly better.

Whether hospitals are better or worse than the *private sector* depends on the dependent variable. For the 9 tasks (Panel A), the performance of hospitals is significantly worse than the private sector—F-tests of significance reject equal performance at 1 percent levels of significance. For the overall measure of effort, there is no difference between hospitals and the private sector, with F-tests accepting the null at 10 percent confidence levels. Finally, 2.6 medicines are prescribed on average per encounter; the private sector prescribes between 20 and 25 percent more medicines than public clinics and hospitals. All results are significant at the 1 percent level.

[24] The World Health Organization as part of its program on promoting "rational drug use" suggests a number of ways to assess drug prescription practices. The extent of poly-pharmacy is the easiest and most widely used indicator in these studies (WHO 1993).

Comparing the questions asked in clinical observation to those asked in the vignettes, the preferred specification suggests that the impact of competence on effort is small (Table 4, Panel A, Column 5). Increasing the probability of performing a task (either a question or an examination) in the vignettes from 0 to 1 increases the probability of the task *actually* being performed in practice by at most 19 percentage points (estimates vary from 0.16 to 0.19). This increase is offset if the doctor is in the (non-hospital) public sector. Put another way, the probability that doctors will perform critical procedures for these two cases increases by 4 percent when competence increases by 1 standard deviation; the difference between the public and the private sector is almost 4 times as high.

The pattern is similar for the overall effort index (Panel B). An increase of one standard deviation in competence leads to an increase of 0.21 standard deviations in the effort index. Practitioners in the (non-hospital) public sector report effort levels that are almost 0.8 standard deviations lower than their private counterparts. A difference of one standard deviation in competence corresponds closely to the difference between practitioners with and without MBBS degrees (Das and Hammer 2005). The adverse effects of the public sector on effort are almost 4 times as high as the beneficial effects of training.

These estimates are robust to a number of controls. Aside from the workload of the practitioner, additional practitioner (qualification, age, experience and gender) and patient (age, gender and symptoms) characteristics have almost no impact on either the estimated coefficient of competence on effort or the estimated difference between the private and public sectors (Columns 1 to 4, Table 4, Panels A and B). In most specifications these additional characteristics are insignificant or mildly significant (not reported). This suggests that effort is determined primarily by incentives and competence, which act almost like sufficient statistics for the broader set of provider-level characteristics.

More flexible matching methods yield similar results (Appendix 1). Using propensity score matching techniques, the difference between the public (both clinics and hospitals) and the private sector is close to 0.5 standard deviations of the effort index. The difference between the non-hospital public and the private sector is substantially higher at 0.90 standard deviations, and in fact, is slightly larger than the OLS results suggest.[25] These differences are significant. The 95 percent confidence intervals are [-0.55 to -0.36] for the difference between the public and the private sector, and [-1.00 to -0.78] for the difference between the public (non-hospital) and private sector.

5.2 Accounting for Practitioner-Patient Matching

Table 5 repeats these specifications with different checks on matching between practitioners and patients—including average patient income, neighborhood fixed-effects and clinic fixed-effects. Panels A, B and C correspond to regression estimates with each of the three dependent variables—performance in practice for the 9 tasks, the general measure of effort, and poly-pharmacy. In each panel, Columns 1 and 2 present the estimated coefficients with the average incomes of patients (Column 1) and neighborhood fixed-effects

[25] Different matching techniques including kernel and local linear matching, yield similar results. Imposing a common-support requirement leads to the loss of 53 out of 3,778 observations in comparisons of the public and private sector and no observations in comparisons between the non-hospital public and private sector

as additional regressors (Column 2). Estimates from a within-clinic specification are presented in Column 3; here attributes (such as public or private) that do not vary within facilities drop-out of the estimation procedure.

The estimated difference in effort between the private and the public sector is somewhat attenuated (Table 5, Panels A and B, Columns 1,2 and 4) but remains significant at the 1 percent level. The average income of the practitioner's patients enters with the expected positive sign, but is small and insignificant in most specifications.

Accounting for practitioner-patient matching has little impact on the estimated relationship between effort and competence (Table 5, Panels A and B, Columns 1,2 and 3). Consistent with the theory, estimates in Panel A suggest some attenuation in the coefficient on competence with little difference across the three alternatives. Surprisingly, there is a small *increase* in the coefficient on competence for the general measure of effort,although the coefficient is well within the standard-error bounds of other specifications. The estimated coefficient suggests that a one standard-deviation increase in competence leads to a 0.27 standard-deviation increase in clinical effort. The three different ways of accounting for patient matching yield very similar results on the estimated relationship between effort and competence.

Finally, the poly-pharmacy results (Panel C, Table 5) show greater differences in prescribing patterns between the private and public sector when patient-matching is accounted for. Furthermore, richer patients actually receive *fewer* medications. This is interesting and counter-intuitive since richer patients can pay for more medicines. However, the actual quality of advice may well increase so much for richer patients that this particular form of responsiveness of service to income overcomes the effect via the ability-to-pay.

Practitioners sitting a desk-length apart in the same clinic and facing the same patient population replicate the effort-competence relationship observed in the entire sample. This is puzzling since the model predicts that the estimated impact of competence on effort should decline once matching is properly accounted for. That the coefficient is virtually unchanged regardless of practitioner and patient characteristics as well as corrections for sorting within neighborhoods leads us to believe that it is the location decision of doctors that drives our results. We tend to see doctors developing a "style" of treatment appropriate to the location of their practice and dependent on their own competence but not on the specific characteristics of each patient. Better doctors overwhelmingly locate in richer areas, but for those that are in poorer areas, the relationship between competence and effort is unchanged (Das and Hammer 2005). Future work is needed on determining these decisions—why is it that good non-MBBS providers are in rich neighborhoods if there is no sorting within neighborhoods?[26]

[26] Less competent providers in richer areas report higher tenures and more competent providers in poorer areas report lower tenures. This is consistent with large transaction costs of changing locations and building up reputations. It is likely that the distribution of competence will continuously improve in richer areas as older (and less competent) providers retire, but young doctors seeking to build a reputation could continue along the same lines: They would start off in poorer areas and then move to richer neighborhoods. The small size of our sample does not permit further investigation.

6 Discussion

Health policy in India is determined by different states (most of which are heavily rural), so any general discussion is limited by the urban nature of the study. There are a couple of clear hypotheses to pursue. First, the typical solution for low-quality service, more training, is unlikely to be effective, particularly given the cost of additional training. The difference in effort between non-MBBS and an MBBS doctor (a difference of up to $8,000 per student in training costs) while significant, is smaller than the difference between a fully trained MBBS doctor in a public primary health clinic and all other MBBS holders.[27] A difference in conscientious effort is a more likely explanation for the difference between low-quality public and private providers.

We need to look more carefully into the motivations, career path and expectations for doctors at elite public hospitals. The extra visible effort by providers in these institutions may well be associated with closer monitoring and the desire to be retained. However, because effort also increases with competence, a complementary hypothesis may be that doctors in public hospitals are looking for careers in the private sector and are developing reputations.

For the poor who visit low-quality public doctors and even somewhat lower-quality private practitioners, there are few easy solutions. Making public doctors in such areas more responsive to patient needs may be possible through compensation schemes other than fixed salaries, although both capitation and fee-for-service programs could be corrupted without investments in administration and monitoring. Unfortunately low quality in the private sector cannot be addressed through incentives. The greater use of medications among the private providers suggests that doctors (like most professionals) are sensitive to their patient desires; perhaps overly so. Ways to influence patient expectations regarding drug treatments is a difficult but urgent topic for further research. It could be as simple as public service announcements cautioning against the use of too many drugs or it might be as complicated as improving patients' abilities to search for reliable and trustworthy care.

More data, a larger sample or a modified sampling strategy could have addressed the lack of information on patient attributes (matched to practitioner effort) and selection into the public sector. We explored using "standardized patients" (fake patients), who would mitigate the matching problem but discarded this possibility for ethical reasons. Because the doctor would need to be informed prior to sending such patients, it was unlikely that permission to carry on would have been approved. A second option, conducting exit surveys of patients on the day of the observation, turned out to be operationally difficult given the urban scenario and the crowded clinics. Concurrent work in Paraguay implements the matching exit survey (Das and Sohnesen 2005). The preliminary results are very much in line with what we find here—practice patterns vary considerably across doctors, but very little across patients for the same doctor.

The differences between the public and private sector are the joint effects of selection and moral hazard. (altruistic doctors are in the public sector versus lazy doctors are in the public sector). A number of

[27] MBBS degrees are offered mostly by public institutes where the budget is not itemized. Our figure of $8,000 is based on the fee for the MBBS degree in a private institute (Manipal Academy of Higher Education). This overestimates the true cost if governments operate as non-profits. It underestimates the true cost if (a) efficiency is lower in the government sector and/or (b) the quality of training is higher in the private sector.

solutions could address this selection problem. With a sufficiently large sample, one could use supply shocks such as hiring freezes to instrument for the choice of sector across different age cohorts. Another alternative is a sampling strategy that exploits dual practices by observing the same doctor in both her public and private practice. This would control for unobserved provider characteristics and better isolate the impact of incentives on performance.

A better understanding of the medical marketplace in low-income countries is critical for policies towards the private sector. Simultaneously, evidence of a more experimental nature on the design and implementation of incentive schemes for public sector doctors and the impact of such schemes on health outcomes would go a long way in addressing a tricky issue.

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7 Appendix: Empirical Notes

7.1 Estimating the Relationship between Practice and Competence

The dependent variable for comparing performance in the vignettes to performance in practice is an indicator that takes the value 1 if one of 9 tasks were completed for patients presenting either with diarrhea or cough without fever. Our measure of competence in this case is the probability that the practitioner would have asked the question when presented with the same patient in the vignettes. To derive this measure we used the predicted probabilities from the Item Response Scoring method (Das and Hammer 2005). The Item Response (IRT) method estimates the "competence" of the provider along with the characteristics of every question using maximum likelihood techniques. The particular parametric form we used was the 3-parameter logistic, so that for a set of vignettes with M items administered to N providers, the method will estimate 3M + N parameters. We then used the estimated competence and item-parameters to predict the probability of asking each of the 9 questions for every provider in the sample. Let θ_i be the competence of provider i, and a_j, b_j and c_j the item-parameters, one for every question j. The 3-PL logistic form relates the probability to competence and item-parameters through the following equation:

$$P_j(\theta_i) = c_j + (1 - c_j)\{\frac{1}{1 + \exp[-a_j(\theta_i - b_j)]}\}$$

Our measure of competence is then $P_j(\theta_i)$ for every question $j$and provider θ_i.

The estimating equation is given by

$$\Pr ob(j = 1)_{i,observation} = \alpha + \beta_1 P_j(\theta_i) + \beta_2 Public_i + \gamma X_k + \varepsilon_i + \mu_{jk}$$

where i is a doctor, k a patient and i the item. $P_j(\theta_i)$ takes a unique value for every item-provider combination, X_k is a matrix of patient characteristics and there is a provider and patient-item specific error term. Thus, there are 4 observations (one for each question) for every patient presenting with diarrhea and 5 observations for every patient presenting with cough without fever. To account for the structure of the data, we present results both with errors clustered at the provider-case level and with random-effects using a latent index model (probit).

7.2 Propensity Score Matching

The propensity score estimates are based on Rosenbaum and Rubin (1983). For the results presented here, we model the selection of doctors and patients into the public sector based on their competence, workload, age, gender, experience in the current job and a full set of patient characteristics including age, gender and symptoms. Formally,

$$P(Z_{ij}) = E(Public\ Sector_{ij}|Z_{ij})$$

where i and j index the doctor and the patient and Z_{ij} is the matrix of patient and doctor characteristics. We estimate this probability using a logit specification. Under the assumption that (a) matches between public sector doctor and patients are independent over all i and j and (b) outcomes are independent of matching in the public sector conditional on Z_{ij}, the outcomes will also be independent of matching in the public sector conditional on $P(Z_{ij})$. Put another way, if all information about doctors and patients is subsumed in Z_{ij}, the estimated difference between the public and private sector is unbiased.

As expected, a match is more likely to occur in the public sector if the provider is more competent, female, older and has a greater workload or patients are repeat clients, older or female. Estimates are presented for kernel and local linear matching and standard errors are computed using the bootstrap. Formally, the estimated difference between the public and the private sector is given by

$$\sum_{j=1}^{K}(Eff_j - \sum_{i=1}^{L} W_{ij} Eff_{ij})$$

where K is the total number of visits to the public sector, Eff_j is the effort for every interaction and L are visits to the private sector. W_{ij} is the weight given to each visit and depends on the particular matching scheme implemented. Finally, the common-support requirement imposes that comparisons between the public and private sector are restricted to visits where $P(Z_{ij})$ shares a common support between the two sectors.

Tables and Figures

Table 1: What Does Effort Measure

Sample	Effort Categories or Country	The Effort measure	Time Spent	Questions asked of Patient	% Who do Physical Exams	Poly-pharmacy (Total number of medicines given)
Delhi	Doctors who exert low effort	-1.1	1.9	1.36	14	2.13
	Doctors who exert medium effort	-0.03	3.36	2.94	78	2.72
	Doctors who exert high effort	1.13	6.15	5.32	98	3.05
	All Doctors	0.00	3.80	3.20	63	2.63
International Comparisons	Paraguay[a]	N/A	8.15	7.71	N/A	1.58
	Tanzania[b] (2003)	N/A	6.95	3.57	N/A	N/A
	Tanzania[c] (1991)	N/A	3.0	N/A	N/A	2.2
	Nigeria[c]	N/A	6.3	N/A	N/A	2.8
	Malawi[c]	N/A	2.3	N/A	N/A	1.8
	UK[d]	N/A	9.4	N/A	N/A	N/A

Notes: The data for Delhi is based on 4,108 direct clinical observations of doctor-patient interactions. The effort variable is constructed as the principal component score of the time spent with the patient, the number of questions asked, the examinations performed and two questions related to explanations. The variable is standardized with mean 0 and variance 1. For the effort categories, we divided every interaction into one of 3 categories (low, medium or high effort) so that there were equal numbers of interactions in every category. The data for other countries are based on similar observations from numerous sources, detailed below.

[a]: Das (2005)

[b]: Ken Leonard, Private Communication

[c] Hogelzeir and others (1993)

[d]: Deveugele and others (2003)

Table 2: The structure of Sorting by Income

Competence	All Neighborhoods		Low Income Neighborhoods		Middle Income Neighborhoods		High Income Neighborhoods	
	Private (1)	Public (2)	Private (3)	Public (4)	Private (5)	Public (6)	Private (7)	Public (8)
Lowest Competence	5420 (2614)	5259 (2447)	4887 (2576)	4258 (1641)	6418 (3278)	5190	11254 (2583)	9170 (4864)
Average competence	9576 (6475)	5179 (1362)	4600 (1708)	5004 (1496)	6120 (2192)	5257 (1087)	16940 (7436)	5925 (1408)
Highest competence	10,296 (7954)	7353 (3670)	5603 (2485)	6200 (58)	5823 (2741)	5356 (804)	16176 (9400)	8935 (4689)

Notes: Standard Deviations in parenthesis. The table shows the average expected income of patients (in Indian Rupees) who visit different types of providers in different localities. The average expected income was computed by matching data between households and providers and using the average consumption expenditure (using the abbreviated NSS schedule) of households who visited each doctor over a two year period, weighted by the number of visits. Thus, the average income of households who visited less competent private providers in low income areas was Rs.4,887 compared to Rs.11,254 for those who visited less competent providers in high-income areas. As usual, competence refers to the vignettes measure of clinical competence (Das and Hammer 2005).

Table 3: Empirical Strategy and Specifications

Specification	**β_1 is consistent if**	**β_2 is consistent if**
Linear Specification with provider and patient characteristics	No matching between providers and patients	No matching; No selection on unobserved provider characteristics into the public sector.
Neighborhood Fixed Effects/Including average income of patients as additional regressor	Provider location decisions uncorrelated to competence and/or do not enter in the effort equation	No selection on unobserved provider characteristics into the public sector.
Facility Fixed Effects	Robust to matching and endogenous location by providers. To interpret the estimates as relevant for the entire population requires that β_1 is the same in single and multiple staff clinics.	NA
Propensity Score Matching		No selection on unobserved characteristics. Allows for flexible matching and restricts sample to those on common-support.

Table 4: Practice, Competence and Institutional Affiliation

	(1)	(2)	(3)	(4)	(5)
Panel A: Dependent Variable is Questions asked/examinations performed for diarrhea and cough in observation					
Public Doctor	-0.160	-0.160	-0.165	-0.138	-0.153
	[0.014][a]	[0.014][a]	[0.015][a]	[0.023][a]	[0.023][a]
General Hospital	0.052	0.042	0.038	0.027	0.066
	[0.015][a]	[0.015][a]	[0.015][b]	[0.016]	[0.029][b]
Vignettes Performance		0.190	0.188	0.173	0.159
		[0.025][a]	[0.025][a]	[0.026][a]	[0.023][a]
Constant	0.202	0.153	0.159	0.204	
	[0.010][a]	[0.011][a]	[0.018][a]	[0.041][a]	
Observations	4766	4766	4607	4394	4394
R-squared	0.04	0.06	0.06	0.06	
Panel B: Dependent Variable is Effort-in-Practice					
Public Doctor	-0.809	-0.845	-0.757	-0.759	
	[0.179][a]	[0.167][a]	[0.156][a]	[0.177][a]	
General Hospital	0.841	0.708	0.655	0.661	
	[0.189][a]	[0.163][a]	[0.155][a]	[0.176][a]	
Ability (MLE Estimate)		0.210	0.206	0.210	
		[0.040][a]	[0.037][a]	[0.052][a]	
Constant	0.379	0.426	0.212	0.142	
	[0.080][a]	[0.077][a]	[0.077][a]	[0.228]	
Observations	3985	3985	3848	3778	
R-squared	0.20	0.24	0.35	0.35	
Panel C: Dependent Variable is Poly-Pharmacy					
Public Doctor	-0.476	-0.582	-0.539	-0.625	
	[0.211][b]	[0.209][a]	[0.205][a]	[0.220][a]	
General Hospital	0.344	0.279	0.180	0.191	
	[0.158][b]	[0.156]	[0.147]	[0.169]	
Ability (MLE Estimate)		-0.023	-0.020	-0.091	
		[0.072]	[0.070]	[0.072]	
Constant	2.386	2.819	2.210	2.457	
	[0.102][a]	[0.104][a]	[0.112][a]	[0.385][a]	
Observations	4307	4009	3860	3789	
R-squared	0.01	0.03	0.08	0.09	
Additional Patient Controls			X	X	X
Additional Practitioner Controls				X	X

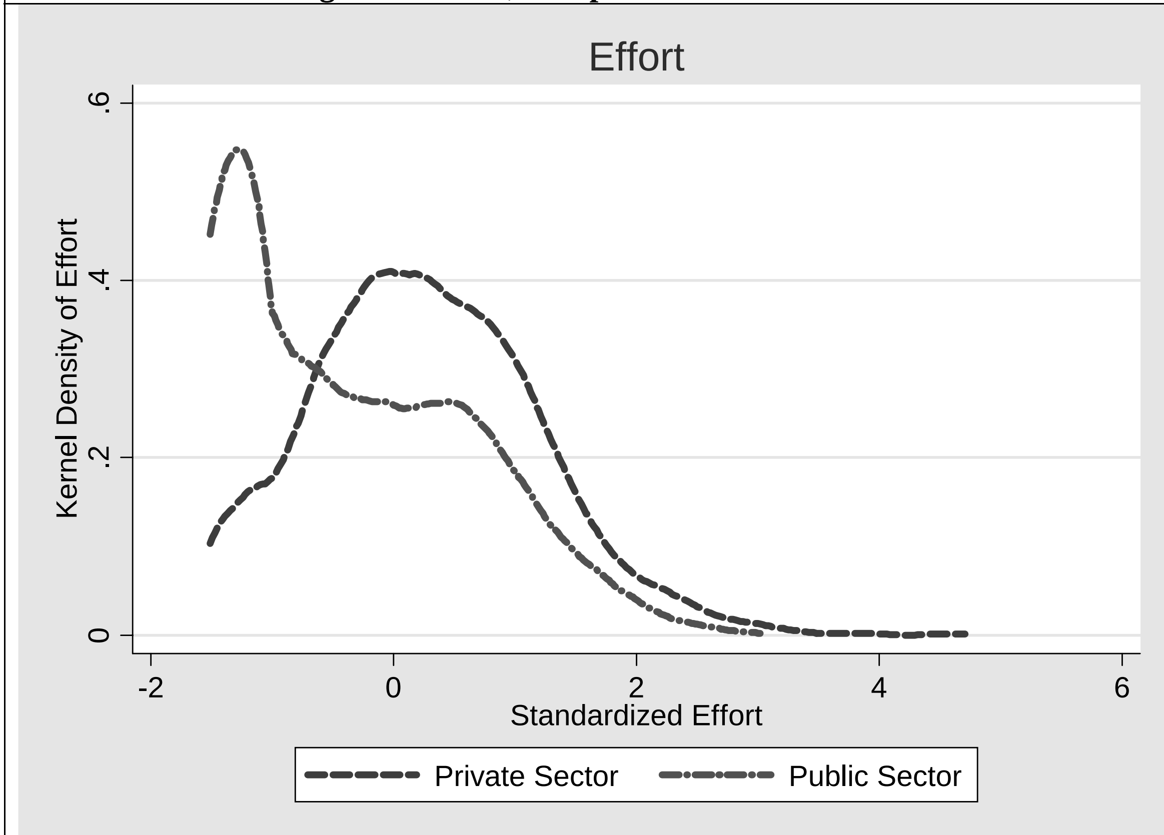
Notes: For Panel A, we use whether the provider performed each of 9 important tasks for patients presenting with diarrhea and cough without fever as the dependent variable (see text). Panel B uses Effort-in-Practice, constructed as the principal components score based on 6 variables (see text). Panel C uses the total number of medicines given (either through direct dispensation or prescription) as the dependent variable. For Panel A, we use the predicted probability of asking each of these tasks in the vignettes as the measure of competence (see Appendix 2 for details). The first 4 specifications are linear; the last is a random effects probit model. For Panels B and C, competence is the IRT score from the vignettes and all specifications are linear (Das and Hammer 2005). For all panels patient characteristics include whether the patient is a repeat client and the age and gender of the patient. Provider characteristics include gender, age, qualifications and tenure in the current location. Finally, all specifications include a measure for the case-load, which is taken from the following question asked in a census of all providers completed previously "On average, how many patients do you see at this location every day?" Regressions in Panel A are clustered at the provider-patient level and in Panels B and C at the provider level. Standard errors are in brackets.
(b): Significant at 5%; (a): Significant at 1%

Table 5: Practice, Competence and Institutional Affiliation Revisited

	(1)	(2)	(3)	(4)
Panel A: Dependent Variable is whether each of 9 tasks were performed in observation				
Public Doctor	-0.105	-0.095		-0.108
	[0.027][a]	[0.028][a]		[0.028][a]
General Hospital	0.019	0.031		0.066
	[0.018]	[0.022]		[0.031][b]
Vignettes probability correct	0.121	0.125	0.149	0.116
	[0.025][a]	[0.025][a]	[0.025][a]	[0.023][a]
Log of average income	0.032	0.053		0.043
	[0.016]	[0.020][a]		[0.018][b]
Constant	-0.009	-0.199	-0.058	-2.821
	[0.133]	[0.164]	[0.091]	[0.844][a]
Observations	3783	3783	4394	3783
R-squared	0.06	0.06	0.15	
Panel B: Dependent Variable is Effort-in-Practice				
Public Doctor	-0.661	-0.661		
	[0.181][a]	[0.172][a]		
General Hospital	0.583	0.765		
	[0.175][a]	[0.196][a]		
Ability (MLE Estimate)	0.259	0.249	0.276	
	[0.064][a]	[0.062][a]	[0.090][a]	
Log of average income	0.104	0.069		
	[0.093]	[0.109]		
Constant	-0.794	-0.757	-0.315	
	[0.783]	[0.925]	[0.310]	
Observations	3259	3259	3778	
R-squared	0.37	0.39	0.53	
Panel C: Dependent Variable is poly-pharmacy				
Public Doctor	-0.724	-0.788		
	[0.217][a]	[0.235][a]		
General Hospital	0.242	0.371		
	[0.163]	[0.244]		
Ability (MLE Estimate)	0.045	0.017		
	[0.066]	[0.064]		
Log of average income	-0.273	-0.236		
	[0.133][b]	[0.139]		
Constant	4.549	4.084		
	[1.191][a]	[1.213][a]		
Observations	3269	3269		
R-squared	0.10	0.11		
Patient Controls	X	X	X	X
Provider Controls	X	X	X	X
Neighborhood Fixed-Effects		X		X

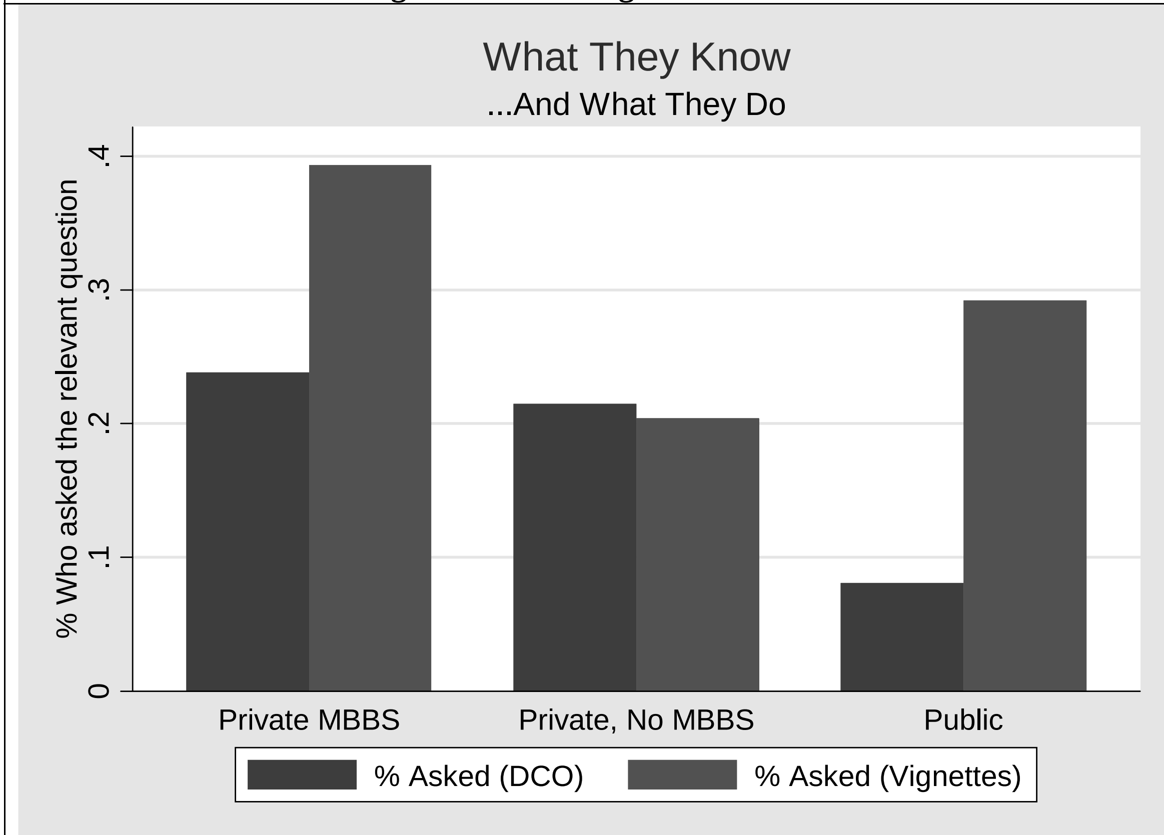
Notes: The dependent variables are identical to those in Table 4. The first 3 specifications in Panel A are linear, the last is a random-effects probit model. For Panels B and C, competence is the IRT score from the vignettes and all specifications are linear. For all panels patient characteristics include whether the patient is a repeat client and the age and gender. Provider characteristics include gender, age, qualifications and tenure in the current location. As in Table 4, we include a measure for the case-load. Columns (2) and (4) introduce additional neighborhood fixed effects. Column (3) reports coefficients from a within-clinic specification. Regressions in Panel A are clustered at the provider-patient level and in Panels B and C at the provider level. Standard errors are in brackets. (b): Significant at 5%; (a): Significant at 1%

Figure 1: Effort, Competence and Incentives



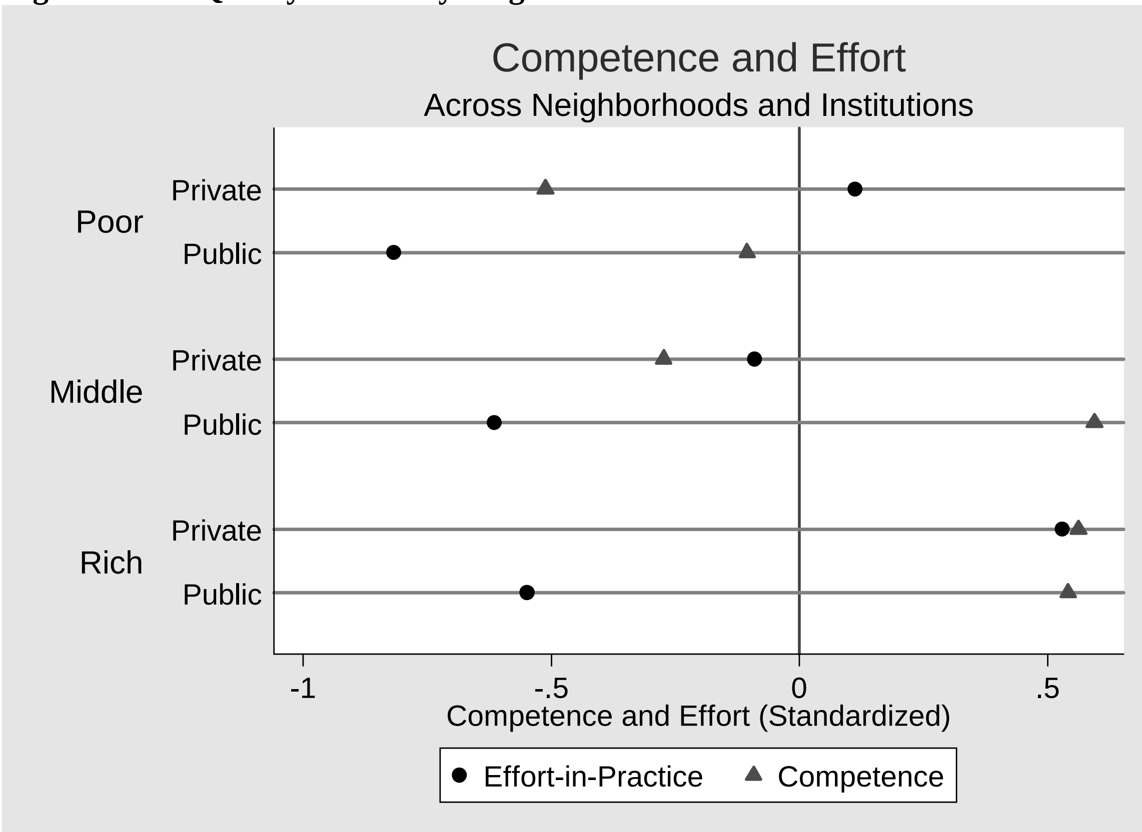
Notes: The shows a smoothed frequency distribution of effort across the public and the private sector based on observations of 4,108 observations of doctor-patient interactions. Effort-in-practice or EIP is the principal components score based on the time spent with the patient, the number of history questions asked, the examinations performed and two questions related to information given.

Figure 2: Knowledge and Practice



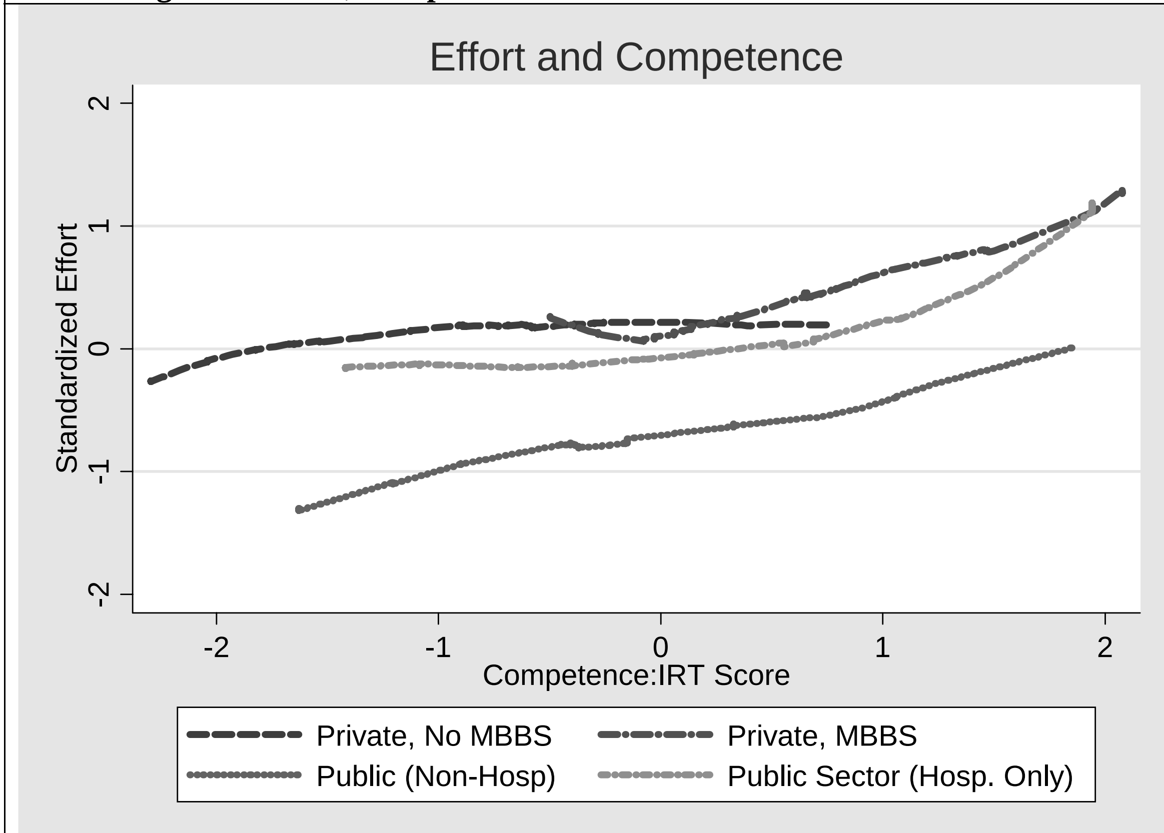
Notes: The figure compares questions asked in practice to those asked in the vignettes for patients reporting with diarrhea or cough without fever. The comparison is presented separately by the sector the doctor practices in and whether she holds an MBBS degree. The sample is restricted to those doctors who either saw a case of diarrhea or cough without fever during the observation (see Appendix 1 for details of this sample). For cases of diarrhea, questions were (a) Has the patient had any vomiting; (b) The nature of the stool and (c) whether the patient had a temperature. For cough with fever, the questions were (a) experience of chest-pain; (b) the nature of the expectorant and (c) the history of fever. In addition, for both cases we checked whether the doctor took the temperature of the patient, and for the cough case whether the doctor checked the blood-pressure of the patient. These two cases and the 9 specific tasks were covered in the vignettes previously.

Figure 3: The Quality of Care by Neighborhood Income and Institutional Affiliation



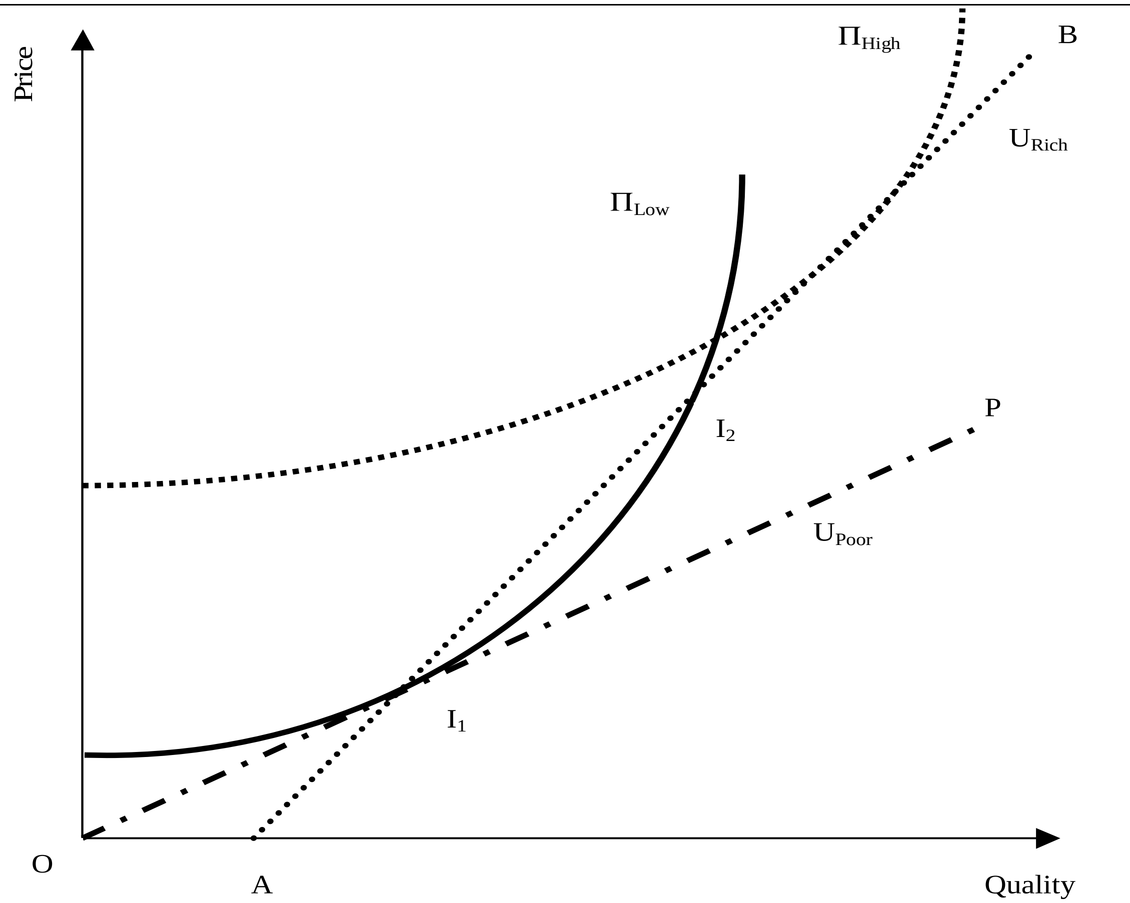
Notes: The figure compares effort in practice to competence in the vignettes. The comparison is presented separately by the sector the doctor practices in and the average income of the neighborhood that she practices in. Both the competence and the effort index are standardized with mean 0 and variance 1, and therefore cannot be compared to each other. The figure shows that among the private sector, competence tends to be lower than average, but effort tends to be higher. In the public sector, competence is higher, but effort is (much) lower than average. The income measure is based on a consumption expenditure module administered to 40 randomly selected households in every neighborhood.

Figure 4: Effort, Competence and Institutional Affiliations Revisited



Notes: The figure plots the (non-parametric) relationship between effort-in-practice and competence for practitioners in the private and public sector and practitioners with and without an MBBS degree (the rough equivalent of an MD in the US). Effort-in-practice or EIP is the principal components score based on the time spent with the patient, the number of history questions asked, the examinations performed and two questions related to information given. Competence refers to the Item Response score obtained in the vignettes administered previously (Das and Hammer 2005).

Figure 5: A Sorting Equilibrium



Notes: Note that the problem in the text is easily transformed into {Q,P} space. U_{rich} and U_{poor} are the indifference curves of the rich and poor and are increasing in the SW direction (note that U_{poor} also defines the Individual Rationality constraint for the poor). Π_{high} and Π_{low} are iso-profit curves for the doctors, given by P=(Q/θ)2 and these are increasing in the NE direction. In equilibrium, U_{poor} is on her IR constraint and θ_{low} produces first best effort, given by the tangency at I_1. Note that any allocation to the left of AB is strictly worse than I_1 for the rich, so that in a separating equilibrium, the contract for the rich must lie (weakly) in the SW direction to AB and the rent earned by the rich type is (at least) OA. In fact, it will be exactly OA, since we assumed that the doctor has all bargaining power in the middle. All that is left to determine is the allocation for the rich, and this is given by the tangency between Π_{high} and AB. In cases where this tangency occurs between I_1 and I_2, the high type may still want to separate the market by decreasing effort to a second-best level and provide the contract given by point I_2. Technically, the difference with the standard problem is that now *two* single-crossing conditions are required—that for the doctors, and that for the patients. This is satisfied for the particular forms of preferences considered in the text.

Appendix: Tables and Figures

Table A1: Description of the Sample

	A Full Sample	B No DCO Sample	C No DCO/No HH sample	D No DCO or no diarrhea-fever case	Difference (A-B)	Difference (A-C)	Difference (A-D)
Clinical Competence	-0.03 (1.10)	-0.50 (1.07)	-0.07 (1.10)	0.12 (1.07)	NS	NS	NS
% Male	0.79 (0.41)	0.89 (0.33)	0.82 (0.39)	0.73 (0.45)	NS	NS	NS
% Public	0.21 (0.41)	0.11 (0.33)	0.02 (0.13)	0.21 (0.42)	NS	<.01	NS
% with MBBS	0.55 (0.50)	0.33 (0.50)	0.35 (0.48)	0.58 (0.50)	<.01	<.01	NS
Age	44.12 (10.74)	39.89 (12.25)	43.07 (11.71)	44.79 (12.94)	NS	NS	NS
Experience in current location	12.71 (9.37)	9.89 (12.07)	11.65 (9.29)	12.45 (11.14)	NS	NS	NS
Observations (Doctors)	205	11	64	35			
Observations (Doctor-Patient Interactions)	NA	4,108					

Notes: This table compares the observable characteristics of providers in the different samples used for our estimations. The final 3 columns test for significant differences across the columns. Differences are reported as “Not Significant” (NS) if the hypothesis of equality of means cannot be rejected at a 10 percent level of confidence.
(A) Sample that completed the vignettes
(B) Sample that refused to complete DCO
(C) Sample that did not complete DCO *or* were not visited by households
(D) Sample that did not complete DCO *or* did not see a diarrhea/fever case
NS: Not significant at 10% level of confidence

Table A2: The Public and the Private Sector

Category	Characteristics	Private	Public	Both Sectors	Difference Significant?[a]
Doctor Characteristics	Age	44.48 (11.31)	43.76 (8.04)	44.32 (10.65)	NS
	Tenure in this location	13.69 (9.16)	9.88 (9.00)	12.85 (9.24)	<.05
	% Male	83% (37)	0.62 (0.49)	79% (41%)	<.01
	Average Patients	27.15 (24.02)	77.13 (35.65)	38.17 (33.99)	<.01
	% with an MBBS degree	0.43 (0.50)	1.00 (0.00)	55% (50%)	<.01
	Competence	-0.12 (1.12)	0.37 (0.95)	-0.01 (1.10)	<.01
Patient Characteristics	% Repeat Clients	37% (48%)	42% (49%)	39% (49%)	<.01
	% Not young	45% (49%)	63% (48%)	53% (50%)	<.01
	% Male	52% (50%)	47% (50%)	50% (50%)	<.01
	Days patient has been sick (median)	3.00	7.00	3	<.01
	Average Income of Patients who visit	Rs.8042 (6026)	Rs.5934 (2755)	Rs.6979 (4796)	<.01
Outcome Variables	Average Effort Exerted	0.25 (0.93)	-0.34 (0.99)	0 (1)	<.01
	Poly-Pharmacy (Total number of medicines given)	2.84 (1.43)	2.36 (1.39)	2.63 (1.43)	<.01

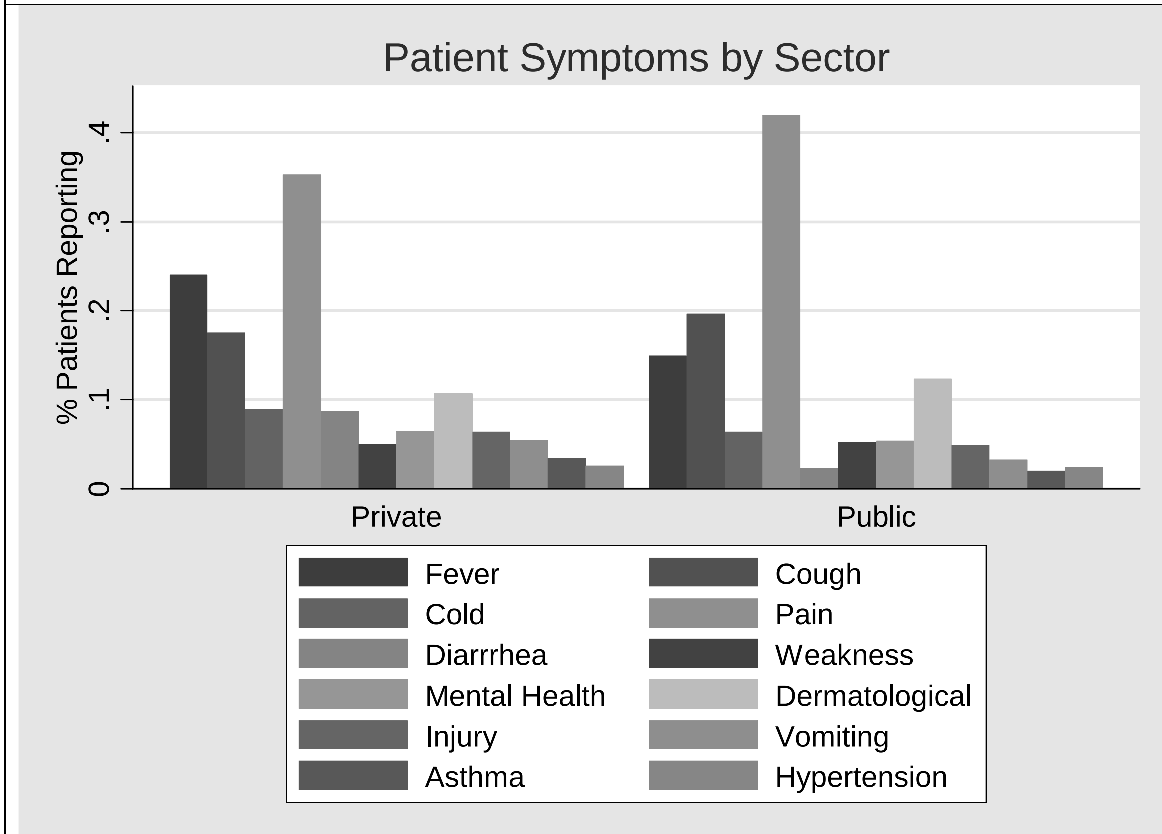
Notes: The table shows characteristics of patients and providers as well as outcome variables separated across the public and private sector. Doctor characteristics are based on a census of providers carried out before the vignettes and direct clinical observation. Note, that "average patients" is the answer to a question in the census "*On average how many patients do you see in a day in this location*" and not the patients seen on the day of the observation (the census was always done in the same location as the observation). Age and tenure are both included since the doctor may have practiced in other locations before coming to the present clinic. Patient characteristics and outcome variables are interaction specific and based on the 4,108 observations of the clinical observation data. Care should be taken in interpreting the number of days question, since in 60% of cases, the doctor did not ask this question of the patient and the observation is missing. The "*average income of patients who visit*" is computed from the matched household-doctor data and represents the average per-capita annual consumption expenditure (using the abbreviated NSS schedule) of households who visit the specific doctor, weighted by the total number of visits over a 2 year period.
[a] NS: Difference not significant at 10% level. <.05: difference is significant at 5% and <.01 difference is significant at 1% levels of confidence.

Table A3: More and Less Competent Providers

Category	Characteristics	Low Competence	High Competence	Both	Difference Significant?[a]
Doctor Characteristics	Age	44.5 (12.13)	44.14 (9.03)	44.32 (10.65)	NS
	Tenure in this location	13.76 (9.40)	11.91 (9.03)	12.85 (9.24)	NS
	% Male	85% (35%)	72% (45%)	79% (41%)	<.05
	Average Patients	39.67 (36.68)	36.60 (31.07)	38.17 (33.99)	NS
	% with an MBBS degree	30% (46%)	80% (40%)	55% (50%)	<.01
	Competence	-0.96 (0.61)	0.90 (0.57)	-0.01 (1.10)	<.01
Patient Characteristics	% Repeat Clients	36% (48%)	43% (49%)	39% (49%)	<.01
	% Not young	51% (50%)	56% (50%)	53% (50%)	<.01
	% Male	52% (50%)	46% (50%)	50% (50%)	<.01
	Days patient has been sick (median)	3	4	3	
	Average Income of Patients who visit	Rs.6313 (4274)	Rs.7747 (5231)	Rs.6979 (4796)	<.01
Outcome Variables	Average Effort Exerted	-0.18 (0.94)	0.22 (1.03)	0 (1)	<.01
	Poly-Pharmacy (Total number of medicines given)	2.65 (1.42)	2060 (1.46)	2.63 (1.43)	NS

Notes: The table shows characteristics of patients and providers as well as outcome variables separated across providers who are less and more competent. Competence is constructed using Item Response Theory as described in Das and Hammer (2005) and has mean 0 and variance 1. Doctors are separated into high and low competence so that the sample is evenly divided between the two categories. Doctor characteristics are based on a census of providers carried out before the vignettes and direct clinical observation. Note that "average patients" is the answer to a question in the census "*On average how many patients do you see in a day in this location*" and not the patients seen on the day of the observation (the census was always done in the same location as the observation). Age and tenure are both included since the doctor may have practiced in other locations before coming to the present clinic. Patient characteristics and outcome variables are interaction specific and based on the 4,108 observations of the clinical observation data. Care should be taken in interpreting the number of days question, since in 60% of cases, the doctor did not ask this question of the patient and the observation is missing. The "*average income of patients who visit*" is computed from the matched household-doctor data and represents the average per-capita annual consumption expenditure (using the abbreviated NSS schedule) of households who visit the specific doctor, weighted by the total number of visits over a 2 year period.
[a] NS: Difference not significant at 10% level. <.05: difference is significant at 5% and <.01 difference is significant at 1% levels of confidence.

Figure A1: Symptoms Reported in Public and Private Sectors



Notes to Figure 2: This figure compares the symptoms of patients who report to the public and the private sector based on 4,108 observations of doctor-patient interactions. Note that patients may have multiple symptoms, and will be counted multiple times in such cases.