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SMALL APPLIED RESEARCH PAPER NO. 17

MULTIPLE JOB-HOLDINGS BY GOVERNMENT HEALTH PERSONNEL IN DEVELOPING COUNTRIES

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HEALTH FINANCING AND SUSTAINABILITY (HFS) PROJECT

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ABSTRACT

This paper examines one aspect of public-private linkages in developing countries' health sectors. It has been determined that one effective option in finance and provision of health care is through the promotion of greater involvement of the private sector and labor sharing between both sectors. In this paper, data collection exercises to determine the feasibility of such an arrangement were employed, including data preparation, sampling design, and survey instruments, and their results were analyzed. Health facility staffing patterns, use, and earnings were studied with an eye towards eventual implementation of a greater private sector role. Data on working physicians and patient characteristics, such as their choice of facilities and satisfaction with medical treatment, were examined. Using this information, this paper details ramifications of the private sector's proposed, enhanced role in health services.

Data analysis indicates several facts that will impact the eventual decisions, including: private sector hospitals currently employ fewer physicians and utilize their services more than public sector hospitals; there are many advantages and as many disadvantages to the practice of dual job holdings by physicians, which is commonly practiced; and several factors, such as incentives based on in-house ratings and introducing competition in physicians' primary employment, could be applied to reduce disadvantages and influence physicians' allocation of effort between their public and private employments.

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I alone am responsible for all remaining errors.

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ACRONYMS

AR	Applied Research
GDMO	general duty medical officer
HFS	Health Financing and Sustainability
IMR	Inverse Mills Ratio
LIMDEP	software package
MATLAB	software package
OLS	ordinary least squares
Residents	general physicians
R&T	religious or traditional reasons
SAR	small applied research
STATA	software package

FOREWORD

The Health Financing and Sustainability (HFS) Project provides technical assistance and training, conducts applied research, and disseminates information to developing countries in health economics, health sector policy development, and health services management. The Applied Research (AR) component of the project provides opportunities to increase knowledge of the complex issues underlying health financing problems and augments the supply of qualified individuals who can contribute to policy analysis and reform. HFS has emphasized the following policy areas for applied research activities: cost recovery, productive efficiency, social financing, and private sector development in the health sector.

As part of the project's AR component, HFS will have completed almost 30 small applied research (SAR) activities between 1989 and 1994. These include studies undertaken by developing country researchers, HFS researchers, or academics at universities in the United States. The objectives of the SAR program are to carry out practically-oriented research in developing countries, and to encourage the development of local capacities to undertake research.

Most SAR activities have been initiated through proposals to the HFS Project. The proposals are evaluated by HFS staff, including criteria such as: practical policy orientation, resource and time requirements, and appropriateness to the HFS research agenda. Most proposals for SAR activities accepted by HFS have undergone several revisions, as the researchers refined their research objectives, hypotheses, and methodologies, based on suggestions and comments from the HFS staff. Once approved, SAR activities have been overseen by HFS task managers, who work closely with principal investigators to monitor the timeliness and quality of the work, and facilitate logistics.

Other small applied research studies are done in conjunction with technical assistance or major applied research activities of the HFS Project. In these cases, the SAR contributes to the technical guidance provided to clients or adds to the body of knowledge on topics of health financing and economics.

As with all HFS research, drafts of small applied research reports are reviewed by HFS staff. Drafts are then evaluated by external technical reviewers selected on the basis of area of substantive and/or geographic expertise.

Ricardo Bitran
Director of Applied Research

EXECUTIVE SUMMARY

This paper constitutes an HFS small applied research project in the area of "Public-Private Interactions in the Health Sector in Developing Countries" and concentrates on the issues of multiple Job-holdings in the health sector in developing countries. This paper builds upon an earlier study by Randall P. Ellis and Mukesh Chawla (1993) called "Public-Private Interactions in the Health Sector in Developing Countries," which was carried out as part of a major HFS applied research project.

Of the many options to spread the cost of health care, one is to promote a greater role for the private sector in financing and providing health care. With a large public sector already in existence in most developing countries, one outcome of greater involvement of the private sector would be increasing interactions between the two sectors, especially in terms of sharing of labor resources. This study examines this phenomenon of labor sharing in a developing country setting.

In the absence of any data in the area of sharing labor resources in developing countries, a primary data collection exercise was carried out. This study starts by establishing a data collection protocol in India, the host country, and presents a detailed account of the comprehensive effort that was involved in this exercise.

In the earlier study (Ellis and Chawla, 1993), an analytical model was developed to examine the phenomenon of multiple job holding by health personnel in developing countries. The model derived estimable behavioral equations of the physician's time allocation between the two sectors, and was used to demonstrate five propositions concerning the physicians behavioral responses to changes in policy. This study uses the model and carries out an econometric study to estimate the labor market participation, wages, and hours worked. The propositions set forth in the model are tested and a number of policy implications are drawn.

The study found that the private sector hospitals employ fewer physicians as compared to the government hospitals, relying instead on specialists and consultants. The government hospitals on the other hand seem to rely heavily on full-time tenure track junior level positions. While there are merits in both of these arrangements, there is definitely room for reducing costs in public sector hospitals by cutting down on full-time employment. The study also found that the private sector has a much higher physician utilization rate as compared to the public sector; the private sector hospitals recorded higher discharges per physician than the public facilities.

In a study of the physicians' behavior, it was found that there are many distinct advantages in their practice of dual job holdings. First, the physician-population ratio is considerably improved, with the availability of the physician time going up. Second, the system is found to be efficient in that the patients with higher purchasing power prefer visiting the private clinics, thereby reducing the burden on the resources of public facilities.

One unfavorable consequence of the practice of dual employments by physicians is the near absence of effort put in by the physicians in their primary employment. The study suggests a three-pronged policy to improve health care delivery. First, it is found that reducing the hours worked would reduce the salary burden and not adversely affect the present delivery system. Second, if some measure of competition is introduced in the physician's primary employment, the physician will have a greater incentive to work harder. Finally, the study recommends that a system of rewards should be instituted, recognizing the physicians services in the primary employment. This would provide the physicians the necessary incentive to work, since the secondary employment earnings would be favorably affected.

1.0 INTRODUCTION

In most developing countries, governments are the major providers of health services, which are typically provided at little or no charge to the consumer. Even though many countries at all levels of income have achieved great advances in health in recent years, further gains are becoming increasingly difficult, because many countries are restricted by the limited capacity of health systems to deliver basic services and information to households that are often dispersed over a large area and poor. Moreover, technological advances have made most health care inputs, especially drugs and equipment, more costly. Simultaneously, rising incomes, aging populations and urbanization have raised consumer demands for health care services. These competing needs have put tremendous pressure on health systems at a time when public spending in general cannot be increased; indeed, in many countries it will be challenging enough just to maintain existing spending levels.

At the same time, macroeconomic difficulties have burdened governments with high debts and recession, leading to a situation where public resources for health have either levelled off or declined in most developing countries. These financial constraints have led to a rethinking of major economic and management issues at the policy, program, and implementation levels. Issues like quality of medical services, resource use in facilities, cost containment, efficiency of delivery of health care, and alternative means of provision and finance of health care are rapidly gaining priority, and many options for spreading the cost of care are being considered. The World Development Report (1993) suggests that governments in developing countries should follow a three-pronged strategy, and focus on, first, creating and encouraging an environment in which the households themselves take measures to improve their health; second, channeling government investment toward more cost-effective programs; and third, allowing for greater diversity and competition in the provision and finance of health care by encouraging the private sector. The present study concentrates on the many ramifications of an enhanced role of the private sector in health care production in developing countries.

In most countries, the private health sector has existed much before public health systems were ever organized. In developing countries, however, ensuring that all income groups have equal access to health care, guaranteeing a minimum level of health status for the entire population, and making modern health care accessible have led to public domination of health care delivery. Shifting additional burdens to the private sector would be desirable only if a strong private health care market existed, and would be a superior alternative only if there were reasons to believe that the private sector is generally more efficient than the public sector.

There is little doubt that greater involvement of the private sector would lead to increasing interactions between the public and private sectors. These interactions would in all likelihood be most pronounced in the sharing of often-scarce human resources and infrastructure. Low government budgets, for example, may result in underpaid providers seeking greater opportunities in the private sector, which in turn may lead to inadequate public health services, creating a private demand for health services even in the presence of a free public system. This generates both supply and demand incentives for public doctors to work in the private sector, and for private doctors to use excess capacity in the public sector.

Interaction between the public and private sectors extends beyond the overlapping areas of operation; it encompasses all the various permutations and combinations involving the two sectors in the

delivery of health care, including the production, finance, and regulation of health services. These interactions are as likely to lead to conflicting situations, resulting in inefficiencies, as to efficiency-improving, complementary intersectoral activities. A chief objective of public policy, therefore, is to encourage private sector involvement without adversely affecting the existing public sector health delivery system.

The present study is an attempt to identify and examine the extent and consequences of public-private interactions resulting from sharing of physician time by the two sectors. In the absence of any recorded data relating to this issue, we initiated our own data collection exercise, and chose India as the host country. We examined some facility characteristics of a small sample of selected public and private hospitals, and identified a number of significant similarities and differences in their general operations. From within this group of facilities, we sampled a number of physicians and studied their allocation of time between public and private hospitals. We attempted to identify the significant factors that influenced a physician's time allocation, and, on the basis of this information, proposed policy options that the governments may exercise to remove inefficiencies, if any, from the system. Finally, we sampled a number of patients from within this group of physicians and attempted to obtain an index of patient satisfaction in the health care provided by the public and private sector physicians.

The major research issues of this study were based on the following questions:

1) What evidence points toward existing public-private interactions in the health sector?

2) How do public and private facilities differ in health infrastructure, services provided, fees charged, and patient profiles?

3) What are the factors that influence a physician's decision to allocate time to more than one job?

4) How do public and private sector physicians differ in their time allocations to their primary jobs?

5) What are the characteristics of the physician's secondary employment? Are they in any way related to any characteristics of the primary employment?

6) What are the factors that determine a physician's earnings in her private practice?

7) What are the characteristics of the patient at public and private facilities, and how do they differ?

To address these issues, the study focused on five considerations:

- Public and private health care delivery facilities;
- Physicians working in these facilities;
- The secondary occupations of these physicians, if any;
- The patients visiting these facilities; and
- The patients visiting the secondary market clinics of the physicians.

The rest of the study is organized as follows: the data-collection methodology is described in ***Section 2***. Facility, physician, and patient characteristics are examined in ***Sections 3, 4, and 5***, respectively. We conclude in ***Section 6*** with some policy implications as suggested by the study.

2.0 DATA COLLECTION

The main objectives of this study are to facilitate better understanding of the (a) main characteristics of the public and private sector health care providers, (b) various factors that influence the physicians' allocation of time between public and private employment, and (c) perceived differences of quality of treatment between public and private sectors. India was chosen as the host country for the purposes of data collection. Four weeks in the month of August 1993 were spent in Delhi, India, to organize, collect, and collate information and data on facility characteristics, physicians' time allocation, and patients' perception of quality of treatment. We discuss the data collection methodology in this Section, which is organized as follows: in *Section 2.1*, we state the working definitions used throughout our survey. In *Sections 2.2 and 2.3* we define the sampling frame and sampling units, respectively. Sample design is discussed in *Section 2.4*, and the various stages of our sampling are detailed. *Section 2.5* is devoted to considerations of sample size, and *Section 2.6* describes the survey instruments used to collect the data. Field procedures are discussed in *Section 2.7*, and we conclude with a brief on data preparation in *Section 2.8*.

2.1 DEFINITIONS

The target population consisted of all public and private health facilities, the physicians working in these facilities, the secondary clinics of these physicians, the patients visiting these facilities, and the patients visiting the secondary market clinics of the physicians.

For the purpose of this study, the following working definitions were used to define the target universe.

Health Facility.

A health facility is a unit producing and delivering general preventive and curative health care, and having (i) at least four beds; (ii) at least one out-patient center; (iii) at least one general physician for every 16 beds (called "residents," they hold only a basic qualification in medicine and are usually assigned long shift duty hours in specific wards); (iv) an intensive-care-unit; (v) at least one 24-hour emergency ward; (vi) at least one operating theater; (vii) nursing staff, at least one for every eight beds; and (viii) alternative power supply sources. The only exception to these restrictions was made in the inclusion of colony hospitals, which were overwhelmingly outpatient-oriented.

Public Facility:

A health facility was categorized as "public" if it had (i) 51 percent or more government share-holding; (ii) 51 percent or more government-appointed directors; (iii) government-appointed administrator or managing director; and (iv) a majority of the paramedical staff working under the general employment rules of the government.

Government:

Government included the federal, state, and local self-governments.

Private Facility:

A health facility not categorized as "public" and not overtly religious (e.g., the Christian missionary and Rama Krishna missionary hospitals) was termed "private." The "private" category included trust and charitable hospitals.

Physician:

All qualified and licensed allopathic medical practitioners were categorized as "physicians." Ayurvedic, homeopathic, Unani, and other "traditional" healers were excluded.

Primary Employment:

Employment characterized by a formal contractual arrangement with a third party was termed "primary." In cases where a physician had two such employments, the one which had a larger time commitment prevailed. There were no cases where there was no such time differential.

Secondary Employment:

Any employment not "primary" but related to the practice of medicine was termed "secondary."

2.2 THE SAMPLING FRAME

The sampling frame was the target population of facilities located in the areas under the jurisdiction of the New Delhi Municipal Corporation and the Municipal Corporation of Delhi, India. A list of health facilities and the records maintained by the two municipal corporations was obtained from government sources.

2.3 THE SAMPLING UNIT

The sampling unit was the facility itself. Physicians were selected from the facilities chosen, and patients selected after the decision regarding the physicians was made. The sampling unit included both types of facilities, including those where health personnel were legally permitted secondary employment and those where they were not.

2.4 THE SAMPLE DESIGN

The study design was observational; an attempt was made to describe and understand events without any direct intervention. In the classification used by Lilienfield and Lilienfield (1980), the observational study was both cross-sectional and group comparison in design. It was cross-sectional in that it focused on a single group representative of population of interest.

Data was gathered at a single point in time, and the reference group was asked to recall events of (at most) only one day in the past. The design was descriptive group comparison in that two distinct groups of physicians were compared at a point in time.

So as to collect information on a subset of institutions and individuals that most closely represent the entire target population of interest, an area probability stratified random sampling approach was adopted and designed over several stages.

In the first stage, the demographic and economic aspects of Delhi were considered. On the basis of available information and our knowledge of prevailing conditions, Delhi was divided into four distinct areas: the student-dominated, densely populated old city of Delhi, usually referred to as North Delhi, with 32 percent of Delhi's permanent and migratory population; the newly settled areas across the river Yamuna, known as East Delhi, with only 9 percent of Delhi's population; the relatively less densely populated "posh" areas of South Delhi, with 19 percent of Delhi's population; and the thickly populated early-immigrants-dominated area of West Delhi, accounting for almost 40 percent of the city's people. On the economic front, the residents of South Delhi are by far more prosperous as a group than all other residents of Delhi, with an annual per capita income much higher than the state average equivalent to $480. North Delhi, with its university area, is unique in that it has a high student population and hence a different kind of health care delivery system. East Delhi is relatively sparsely populated and has only recently started attracting settlers. The residents of West Delhi fall in what can be termed as the low to middle income levels of annual per capita income in the range of $450 to $650.

In the first stage, we also compiled a list of all health facilities in Delhi. Of the 86 units qualifying to be in the target universe as per our definition, 6 are in East Delhi, 19 in North Delhi, 37 in West Delhi and 24 in South Delhi. East Delhi, being a relatively newly settled colony and more influenced by the culture, language, and practices of the neighboring state of Uttar Pradesh than of Delhi, was regarded as "non-typical," and excluded from further consideration.

In the second stage, we classified the facilities according to two sizes, small, i.e., less than 100 beds, and big, i.e., 100 or more beds. Further categorizing them as public and private, we obtained the following scenario illustrated by ***Exhibit 2-1***.

EXHIBIT 2-1
DISTRIBUTION OF FACILITIES BY SIZE

AREA AND FACILITY TYPE	"BIG" ≥100 BEDS	"SMALL" <100 BEDS	TOTAL
NORTH DELHI, PUBLIC	2	7	9
NORTH DELHI, PRIVATE	0	10	10
WEST DELHI, PUBLIC	3	9	12
WEST DELHI, PRIVATE	3	22	25
SOUTH DELHI, PUBLIC	3	4	7
SOUTH DELHI, PRIVATE	5	12	17
TOTAL	16	64	80

We used two further pieces of information in deciding the sampling methodology. First, according to the records available with the municipal offices, almost two-thirds of all physicians in Delhi work for the government. This was also ratified by the employment records of the University College of Medicine, one of the four schools of medicine in Delhi. Second, and we found no recorded evidence of this, it was the general impression of administrators and government officers that "almost everybody" pursues a secondary employment in the form of an evening private practice. We chose a more conservative estimate and interpreted "almost everybody" to imply "at least 80 percent."

On the basis of these bits of information and assumptions, we carved out a geographical area in Delhi comprising most of West Delhi, excluding the far western reaches, an area covered by a strip one kilometer deep in North Delhi adjacent to West Delhi, and an area covered by a strip two kilometers deep in South Delhi adjacent to West Delhi. We kept this difference to account for the higher population density in North vis-a-vis South Delhi.

From within this stratum, we finally selected, by random sampling, the configuration illustrated by ***Exhibit 2-2***.

EXHIBIT 2-2
FINAL SELECTION OF FACILITIES

TYPE	BIG FACILITY	SMALL FACILITY	TOTAL
PUBLIC	1	9	10
PRIVATE	1	9	10
TOTAL	2	18	20

A list of these facilities can be found in ***Appendix 1***.

The next stage of sampling concerned the physicians from within these facilities. We obtained a list of all physicians in each of the facilities from the facility questionnaires. For the purpose of the target population of physicians, we included only those physicians who (i) were confirmed, full-time employees of the facility and were not on leave of absence as of August 1993; (ii) were required to attend to patients in the out-patient centers at least one day a week. This procedure excluded very senior physicians, who did not attend to out-patients, and many specialists, who attended only to in-patients. The target physician universe is depicted as 584 public and 399 private for a total of 983.

From this total population, we finally selected, by random sampling, 258 physicians, of whom 180 reported public employment as their primary employment and 78 reported private sector primary employment.

The last phase of sampling was concerned with the patients. The patients were chosen randomly on the day the physician was attending the out-patient center. The day was selected randomly from the two-week period ending August 27, 1993. An effort was made to select 10 patients per physician.

2.5 SAMPLE SIZE

Considerations of sample size are important not only because it is desirable to study a typical sample incorporating most characteristics of the target population, but also because a meaningful econometric analysis can be carried out only if the sample is "sufficiently large."

The issue of selecting a suitable sample of physicians was resolved by examining the known means and variances of pertinent characteristics from previous studies and computing the sample size given the power of the test procedures. If the sample mean is drawn from a normal population, then for a test with 95 percent confidence intervals:

$$\frac{X-\mu}{\sigma/\sqrt{n}} \geq 1.96$$

Ellis et al. (1990) compute objective indicators for facility quality in Kenya, and their findings indicate a mean facility quality level of 8.79 and a standard deviation of 4.68. If we wish to capture a difference of about 15 percent in the means, then the above-mentioned formulation suggests $n=49$. Similarly, 7.5 percent, 10 percent, and 12.5 percent differences in the means give sample sizes of 194, 109, and 70 respectively.

We accordingly decided to select a minimum sample size of about 194 physicians.

Details of several patient demand studies in many developing countries are available in the literature on health issues. We examine three of these and draw inferences of the desirable patient sample size. First, Lewis, Solvate, and La Forgia (1992) analyze medical staff performance in a large public hospital in the Dominican Republic according to the professional levels of physicians and nurses providing care and the time spent attending to patients and conducting supervisory tasks. This study surveys all patients entering emergency and a sample of 1,582 outpatients visiting the hospital during a one-week period. Second, The Egyptian Cost Recovery for Health Project (1992), sponsored by the Egyptian Ministry of Health and supported by USAID, addresses issues of improvements in the quality of services provided, increasing the degree of financing self-sufficiency of hospitals, and ensuring adequate access to care for all. This study relies on a household survey, patient survey, and facility survey. In this analysis, the sample consisted of 1,652 households and 2,042 outpatients. Third, Ellis, Kirigia, and Mwabu (1990), study demographic patterns and health care utilization for a sample of households in South Nyanza, Kenya. This study focused on a sample of 552 households, comprising 3,063 individuals. Of these, 1,014 persons reported illness during the previous month.

Of these, the Lewis et al (1991) study is closest in nature to our proposed analysis, and we decided on a minimum sample size of 1582 patients.

2.6 SURVEY INSTRUMENTS

All data collection was done by arranging personal interviews with the respondents. The survey instruments used were questionnaires administered by trained personnel through interviews. Facility questionnaires were in most cases completed with the assistance of the hospital staff, and took several hours to complete, largely because all the information requested was not readily available. Physician questionnaires took an average of 19 minutes, while the patient questionnaires took approximately 25 minutes.

The facility questionnaire was designed to collect summary information about the facility, and this information was verified from the available licensing records maintained by the municipal and state government offices. Among other issues addressed, the questionnaire contained questions on facility staffing patterns, illness and treatment profiles, costs, and incomes.

The physician questionnaire sought responses to issues like number of hours spent in the facility, number of patients examined, and physician's personal characteristics, like age, experience, specialization, number of dependents, and so on. Questions relating to the physician's behavioral characteristics were repeated in the physician's secondary employment location.

The patient questionnaire elicited information on demographic characteristics of the patient, as well as the patient's choice of provider, satisfaction with services provided, etc.

Copies of all questionnaires used are included in ***Appendices 2 through 4***.

2.7 FIELD PROCEDURES

A number of enumerators were hired and trained to conduct the interviews. We hired university students to carry out the survey. The facility and patient surveys were completed by non-medical students, while the time-motion study in the physician's chamber was conducted by medical students. We hired four physicians to advise us on each step and to supervise the enumerators. The field organization is shown in ***Exhibit 2-3***.

EXHIBIT 2-3
FIELD ORGANIZATION

TYPE	SUPERVISORS		ENUMERATORS		TOTAL
	PHYSICIANS	OTHERS	MEDICAL	OTHERS	
FACILITY	1	1	0	2	4
PHYSICIAN	1	1	3	3	8
PATIENT	4	0	2	8	14
TOTAL	6	2	5	13	26

A pilot survey of one facility was conducted first. No changes were deemed necessary. All facility questionnaires were in English, and addressed to the facility administrators. In three cases, the questionnaires had to be left with the administrator for a few days before all the required information was made available. In all other cases, the administrator assigned one of the hospital's clerical staff to assist the enumerator in completing the questionnaire. In two cases, both private, the hospital administration was not very cooperative; these facilities were dropped from the sample and two other units selected.

A pilot survey of 11 physicians was conducted first. Three revisions were made in the questionnaire:

(i) The order of questions was changed, with questions on personal characteristics being asked first. It was felt by the enumerators that this seemed to put the respondents at ease. Questions about private practice were considered sensitive and were addressed last of all. To our astonishment, however, we found that the physicians were more than willing to speak about their secondary employments, perhaps because they felt that we were supportive of dual employment.

(ii) The issue of the number of hours worked by a physician as opposed to the number of hours required to work continued to be thorny. Whereas we were asking questions about the hours worked by the physician, we often received replies indicating the hours they were required to work. In spite of rephrasing the question, we were unable to resolve this issue; we note, therefore, that the responses regarding hours worked can have an upward bias.

(iii) The question regarding the number of patients seen in an hour was changed to the number of patients seen in a day. It was felt that the physicians were more comfortable in answering this question. All physician questionnaires were in English, a language all physicians understand very well, even though the language used in practice varies with location of the clinic and the predominant language of that area.

The physician survey was spread over two locations and administered in three phases. The two locations were the physician's two workplaces, the primary employment facility and the secondary employment clinic in the case of physicians who have private clinics. Most of the questions in the physician questionnaire were addressed to the physician in the primary facility. Questions on time spent by the physician with the patient and her attitude toward the patient were addressed in a time-motion study, which was conducted by having a medical student-enumerator in the physician's facility chamber. In all cases, we obtained the permission of the physician before introducing the enumerator in the physician's chamber. To account for possible Hawthorne effect, the enumerator was instructed to begin recording her observations at least half an hour into the physician's out-patient center time.

In the private clinic of the physician, however, we were not permitted to enter and make notes. All physicians, without exception, were of the opinion that our mere presence may give their patients the impression that the physician was under some kind of "scrutiny." The physicians offered to keep a record of the time they spent with the patients, but this was not acceptable. In these locations, the enumerators were stationed outside and entrusted the task of recording the time spent by the patient inside the clinic. The enumerators noted the time the patient went into the clinic and the time that patient left the clinic. Since most clinics in India are one-room offices, open onto the street level, and usually keep the front door open, it was not difficult to estimate the time the patient had to wait inside the clinic. Inferring the actual time the physician spent with the patient was then quite simple.

This method is obviously not without its flaws. First, since most patients were accompanied by attendants, it often was unclear who the patient was. Second, all clinics we attended functioned during the evening hours only, and it was not always easy, in the fading light of the day, to spot the patient both entering and leaving the clinic. Third, the waiting time was measured by sending in an enumerator about an hour into the physician's clinic time to estimate the approximate waiting time. And finally, the process was very slow, since one enumerator could not possibly cover more than four patients in one evening. In spite of these shortcomings, we feel that we have as good a representative sample as we could get, given the circumstances

A pilot survey of nine patients was conducted, partly to determine the time required to conduct one interview. No changes were made in the questionnaire, and no consensus was reached regarding time spent on the interview, which ranged from 14 minutes to over 40 minutes, depending on with whom we were speaking. The patient questionnaires were mostly in Hindi. English copies were also available with the enumerators, should they be requested by the patient.

The patient survey was an "exit survey" and the patients were interviewed as soon as they left the physician's chamber. The enumerators were stationed in the waiting hall of the facility. A similar arrangement was made at the physician's private clinic, though we were unable to interview all the patients, largely because most of these private clinics operated only in the evening and the patients were unwilling to remain and speak with our enumerators. Thus, all patients in the public facilities were interviewed, as compared to only a few in the private sector.

2.8 DATA PREPARATION

We obtained data on a sample of 20 facilities, 258 physicians, and 2,093 patients. Data entry was done on a free-floating format on various worksheets and then transferred to MicroSoft Excel for data cleaning and tabulation. This data was analyzed using the STATA software package. For matrix manipulation as required in the specification tests, we used MATLAB software. The sample selection models were estimated on LIMDEP.

3.0 FACILITY STATISTICS

We obtained data on 20 facilities, of which 10 are in the private sector and 10 in the public sector. In each category, we selected one big facility (100 beds or more) and nine small facilities (less than 100 beds). In this section, we present some descriptive statistics and comparisons of these facilities. In *Section 3.1*, we examine the staffing patterns, and in *Section 3.2* utilization and earnings patterns.

3.1 STAFFING PATTERNS

In this section, we examine and compare staffing patterns of facilities and look at the statistics obtained on physicians, nurses, and paramedical staff.

All hospitals in Delhi employ at least one general duty medical officer (GDMO), who typically holds a graduate degree in medicine and surgery. The GDMO is usually the point of first contact for the patient, who may then be referred to specialists for further consultation. The GDMO on duty in the in-patient wards is usually referred to as a resident doctor. All facilities require, by law, to have at least one resident doctor on duty at any point of time. Many facilities have their own team of specialist physicians. The specialists usually hold a higher degree than the GDMO, and are more concentrated in their area of knowledge and expertise. The specialists need not be on the payroll of the hospitals; they can be on a case contract, or brought in by the patient. These physicians are referred to as consultants.

EXHIBIT 3-1
STAFFING PATTERN: RATIO OF PHYSICIAN-TYPE TO TOTAL NUMBER OF PHYSICIANS

TYPE	PERCENT GDMO	PERCENT RESIDENTS	PERCENT SPECIALISTS	PERCENT CONSULTANTS	TOTAL
PRIVATE	0	31.76	0.23	68.02	100
PUBLIC	23.79	48.10	26.03	2.07	100
OVERALL	13.48	41.02	14.84	30.66	100

As we see from ***Exhibit 3-1***, most of the physicians working in the private sector are not on the regular pay-roll of these facilities. This is perhaps one way the private hospitals cut down on costs; more than two-thirds of all physicians working in the private hospitals are either on a case contract or brought in by the patient themselves. On the other hand, the government hospitals employ almost all the physicians working in government hospitals. At the same time, the private sector utilizes the services of specialists and consultants far more than the public hospitals: 68 percent of all physicians working in the private facilities are specialists, as compared to only 28 percent in the public sector hospitals. If quality of care is related to the qualifications and experience of the provider, then the probability of receiving

better treatment is certainly higher in the private sector. Nurse and staff ratio to physicians is illustrated in *Exhibit 3-2*.

EXHIBIT 3-2 STAFFING PATTERN: RATIO OF NURSES AND PARAMEDICAL STAFF TO TOTAL NUMBER OF PHYSICIANS		
TYPE	PERCENT NURSES	PERCENT PARAMEDICS
PRIVATE	158.56	102.93
PUBLIC	167.59	119.48
OVERALL	163.67	112.30

Both the private and public facilities maintain an almost similar ratio of nurses and paramedical staff to total number of physicians. The ratio of nurses to doctors for India is 150.81, which reassures us that we do have a fairly representative sample.

3.2 UTILIZATION AND EARNINGS

In this section, we look at the utilization of services and revenue generated in private and public facilities. An appealing starting point for this analysis is to examine the distribution of physicians across different specializations, for that is the utilization pattern that can be expected.

EXHIBIT 3-3 DEPARTMENT-WISE DISTRIBUTION OF PHYSICIANS AS PERCENTAGE OF TOTAL PHYSICIANS		
DEPARTMENT	PRIVATE	PUBLIC
MEDICINE	28.38	32.24
GYNECOLOGY	16.22	12.93
SURGERY	17.79	22.93
PEDIATRICS	10.59	10.52
ORTHOPEDICS	11.49	13.45
EYE	6.53	3.10
E. N. T.	7.21	3.79
OTHER	1.	1.
TOTAL	100	100

In *Exhibit 3-3*, we do not see any major variations in the availability of physicians by department. Public sector utilizes more physicians in medicine, surgery and orthopedics departments, though the differences are not very significant. We therefore look at the number of in-patients treated per physician (in the month of July 1994) for some common treatment cases for which comparative data could be collected.

EXHIBIT 3-4
NUMBER OF IN-PATIENTS TREATED PER PHYSICIAN

TREATMENT	PRIVATE	PUBLIC	RATIO (public as % of private)
GENERAL MEDICINE	2,614.36	1,685.00	64.45
D & C	166.22	106.74	64.19
DELIVERIES	86.71	74.19	85.56
HYSTERECTOMY	13.30	10.32	77.59
CAESAREANS	12.99	4.73	36.41
HERNIA	86.08	34.61	40.22
LIPOMA	100.75	9.68	9.61
APPENDECTOMY	49.55	22.22	44.84
GOITER	21.05	3.23	15.34
KIDNEY STONES	58.66	18.06	30.79
ABSCESS	89.50	262.37	293.15
GASTROENTERITIS	673.54	908.56	134.88
FRACTURES	22.75	9.68	42.55
CATARACTS	69.57	10.93	15.71
DETACHED RETINA	25.26	3.44	13.62
TONSILLECTOMY	11.44	1.72	15.03
POLYP REMOVALS	10.32	4.73	45.83

Exhibit 3-4 depicts the higher utilization rate of physicians in the private sector and seems to be an indicator of the general cost-efficiency with which the private sector is usually associated. We note, however, that there are many categories of treatments for which we do not have comparative data; *Exhibit 3-4* is at best only indicative, and no conclusive inferences can be drawn from it.

We find more evidence supporting the private sector's emphasis on in-patients, as we look at the ratios of physicians and nurses to hospital beds shown in ***Exhibit 3-5***.

EXHIBIT 3-5 PHYSICIANS AND NURSES PER BED			
TYPE	PHYSICIANS PER BED	NURSES PER BED	PARAMEDICS PER BED
PRIVATE	.7487	1.1872	.7707
PUBLIC	.4140	.6938	.4946
OVERALL	.5135	.8405	.5767

Patients thus have a higher probability of being attended to by a physician and nursing staff in private hospitals than they have in the public facilities.

The picture changes dramatically when we look at the out-patient category, as illustrated in ***Exhibit 3-6***.

EXHIBIT 3-6 OUT-PATIENT VISITS PER PHYSICIAN (JULY 1993)			
TYPE	OPD VISITS PER PHYSICIAN (ALL)	OPD VISITS PER PHYSICIAN (GDMO+RESIDENT)	PERCENT FREE CARE
PRIVATE	103.6239	326.3050	38.36
PUBLIC	304.8690	424.0384	100.00
RATIO (public as % of private)	294.21	129.95	260.69

Public hospital physicians examine more out-patients than their private sector counterparts, as a result of which perhaps the government hospital physicians spend very little time on each patient visit. Patients still frequent the public facilities, probably because of the free services offered there.

We have no data on earnings in the public sector hospitals. Various explanations were offered to us when we asked for the revenue figures. One common reason for absence of these figures was that the hospital accounts were centralized and not available with any one unit. Another reason was that the accounts were not maintained the way they traditionally are in the private hospitals, because profit-making is not an objective of the public hospital. And in one case it was suggested that the hospital earnings were very low since all services were provided free of charge to the patients.

For the private sector we do have some indicators of earnings.

EXHIBIT 3-7 DEPARTMENT-WISE EARNINGS (IN THE PRIVATE FACILITIES SAMPLED)		
DEPARTMENT	TOTAL EARNINGS IN JULY 1994 (RS '000)	PERCENT OF TOTAL EARNINGS
MEDICINE	5,956.7	35.28
GYNECOLOGY	3,182.8	18.85
SURGERY	3,070.6	18.19
PEDIATRICS	3,060.0	18.12
ORTHOPEDICS	89.0	0.53
EYE	1,379.0	8.17
E. N. T.	145.5	0.86

We do not have any break-down of earnings from in-patient and out-patient services, and the figures in ***Exhibit 3-7*** are total earnings. They do indicate that most of the earnings of the private facilities come from procedures on patients in the medicine, gynecology, surgery, and pediatrics departments. Earnings per physician in the private sector total Rs.2,808.00 in the month of July, while the earnings per bed were Rs.2,138.00. We do not, however, have any comparison points with the public sector.

4.0 DATA ANALYSIS

A major problem of health care delivery in developing countries is the near total inability of the government to monitor and influence the effort put in by the physician in her job in the public hospital. As discussed earlier, physicians take advantage of their collective bargaining position, which, when taken together with the general shortage of physicians in most developing countries, makes it almost impossible for the governments to implement any standard regimen of rules and procedures governing work input. At the same time, most physicians continue to enjoy their better-paying private practices, in what we will henceforth refer to as the secondary market. We believe, however, that a greater understanding of the physician's labor supply behavior, specifically the physician's secondary employment behavior, will indicate possible approaches toward workable solutions. Accordingly, in this Section we examine the factors that influence a physician's decision to seek secondary employment, and the magnitude of the time devoted to the second job. We use the data collected on physicians to estimate two equations: a "participation equation," i.e., the probability that the physician engages in primary as well as the secondary market employment, and the secondary market labor supply equation.

This Section is organized as follows. First, we discuss the sample characteristics. The data on working physicians is analyzed in *Section 4.2*. Sample selection models are discussed in *Section 4.3*, and the full-sample data analysis is presented in *Section 4.4*.

4.1 SAMPLE CHARACTERISTICS

Our sample consists of 258 physicians between the ages of 25 and 65 in August[1] 1993, of whom 201 had two employments at the time of data collection. Basic descriptive characteristics for our sample of physicians are presented in ***Exhibits 4-1 through 4-3***.

[1] The month of August usually experiences heavy monsoon rains all over northern India, including Delhi. This year was, however, relatively mild, and there was no rise in rain-related diseases.

EXHIBIT 4-1
MEANS OF THE DATA
(Standard Deviation in Parenthesis)

VARIABLE NAME	FULL SAMPLE N=258 (100%)	SINGLE EMP. N=57 (22%)	DUAL EMP. N=201 (78%)	T-TEST (P-VALUE)
AGE	42.4 (7.892)	47 (7.169)	41.11 (7.612)	4.43E-08
DEPENDENTS	3.6 (1.255)	3.85965 (1.398)	3.6 (1.208)	.041292
HOURS (DAILY) (PRIMARY)	6.3 (1.401)	7.482451 (.401)	6.0 (1.408)	7.77E-16
HOURS (DAILY) (SECONDARY)	2.1 (1.345)	..	2.7 (.845)	..
PATIENT VISITS (PRIMARY, DAILY)	37.5 (22.132)	23 (17.332)	41.3 (21.694)	1.09E-09
PATIENT VISITS (SEC'DRY, DAILY)	8.6 (8.601)	..	11.0 (8.259)	..
SALARY (PRIMARY, RUPEES MONTHLY)	11918 (5227.7)	13579.65 (7438.99)	11395 (4287.5)	.001169
EARNINGS(SEC'DRY, RUPEES MONTHLY)	8273 (4186.0)	..	13746 (3413.6)	..
PRIMARY EMPLOYMENT: PUBLIC SECTOR	69%	59.6%	71%	.020853
PRIMARY EMPLOYMENT: PRIVATE SECTOR	31%	40.4%	29%	..
SPECIALTY: FAMILY MEDICINE	33.7%	14.04%	39.4%	6.86E-05
SPECIALTY: SURGERY	25.2%	42.10%	20.4%	.000173
SPECIALTY: CHEST DISEASES	9.7%	17.54%	7.5%	.005576
SPECIALTY: GYNECOLOGY	7.4%	1.75%	8.9%	.016362

EXHIBIT 4-2
MEANS OF THE DATA
(Standard Deviation in Parenthesis)

VARIABLES	PRIMARY: PUBLIC N=178	PRIMARY: PRIVATE N=60	T-TEST (P VALUE)
DUAL EMPLOYMENT	80.89%	71.25%	.021172
AGE	41.8 (7.764)	43.7 (8.069)	.01963
DEPENDENTS	3.5 (1.245)	3.7 (1.273)	.061267
HOURS IN PRIMARY (DAILY)	6.83 (.785)	5.15 (1.735)	0
HOURS IN SECONDARY (DAILY)	2.12 (1.3,005)	2.01 (1.449)	.174383
PATIENT VISITS PRIMARY (DAILY)	42.93 (22.531)	24.74 (15.001)	1.27E-11
PATIENT VISITS SECONDARY (DAILY)	9.33 (9.082)	6.9 (7.187)	.008418
FEES CHARGED PER VISIT, SECONDARY	37.25 (32.044)	38.00 (33.954)	.215886
SALARY PRIMARY (MONTHLY)	9,921 (3,285.22)	16,360 (5,980.424)	0
EARNINGS SEC'DRY (MONTHLY)	9,036 (3,780.193)	6,817 (4,932.612)	1.8E-05
TOTAL EARNINGS (MONTHLY)	18,957 (5,262.161)	23,177 (8,099.972)	1.86E-07
SPECIALTY: FAMILY MEDICINE	32.58%	36.25%	.141839
SPECIALTY: SURGERY	24.157%	27.5%	.142518
SPECIALTY: CHEST DISEASES	10.11%	8.75%	.183538
SPECIALTY: GYNECOLOGY	7.86%	6.25%	.162076

EXHIBIT 4-3 MEANS OF THE DATA (Standard Deviation in Parenthesis)				
VARIABLE	FAMILY MEDICINE	SURGERY	CHEST DISEASES	GYNECOLOGY
SALARY, PRIMARY (MONTHLY)	11,585	13,772	11,572	10,789
FEES PER VISIT, SECONDARY	30	51	20	46
PATIENT VISITS, PRIMARY (DAILY)	52	20	50	38
PATIENT VISITS, SEC'DRY (DAILY)	14	4	6	10
HOURS WORKED, SEC'DRY (DAILY)	2.72	1.65	1.42	2.45

In our sample, the majority (78 percent) of the physicians hold more than one job. About 81 percent of the physicians who work in the public sector in their primary employment hold more than one job, and about 71 percent of the private sector physicians, which we believe approximates the field reality. There are many measured differences between physicians holding only one job and those holding multiple jobs, and between public and private sector physicians.

In the following text, we discuss details of the data previously presented.

(i) AGE:

The average age of physicians with single employment is 47, as compared with the average age of 41 for physicians with dual employment. This difference turns out to be very significant, as indicated by a very low p-value of the t-test. The average age of physicians in public and private primary employment is 41.8 and 43.7 respectively, the difference of which is also significant at 2 percent level. This suggests that age may be important in secondary market participating decisions. We include age as an independent variable in the participating equation as well as the hours worked equation.

(ii) DEPENDENTS:

The average number of dependents for the entire sample is 3.6. The difference between average number of dependents of physicians with single and with dual employment is significant only at about 4 percent, while that between public and private sector physicians is only 6 percent level. Since the number of dependents can influence the participation decision and the secondary market effort level, we include it as an independent variable in both these equations.

(iii) HOURS WORKED:

Physicians with only one employment work an average of 7.5 hours in their primary employment, which is significantly different from the six hours put in by physicians with dual employment and the total sample average of 6.3 hours. The number of hours worked in the primary employment is significantly different across public (6.83) and private (5.15) physicians as well. The number of hours worked in the primary employment is included as an independent variable in both the participating equation as well as the hours worked equation. In the secondary employment, the average number of hours worked is only 2.7, and there is not much difference between hours worked in the secondary market between private and public sector physicians.

(iv) PATIENT VISITS:

On average, physicians with dual employment record significantly more patients (41 per day) than those who only have one job (23 per day). Similarly, public sector physicians examine significantly more patients (43 per day) as compared to the private sector physicians (25 per day). Patient visits in the secondary market are much lower on average, but there is a difference between the public sector physicians (more than nine per day) and the private sector physicians (less than seven per day), significant at the one percent level. This suggests that there is a strong association between patient visits in both primary and secondary markets, and between the secondary market participation decision and the hours worked in the secondary market equation. Both these variables are therefore included as regressors.

(v) SALARY IN PRIMARY EMPLOYMENT:

Physicians with dual employment earn significantly less (Rs.11,395) than physicians with just one job (Rs.13,580). Similarly, salaries of private sector physicians (Rs.16,360) are much higher than the salaries of public sector physicians (Rs.9,921). Primary employment salary is therefore included as a regressor in both the participation as well as the hours worked equations.

(vi) EARNINGS IN SECONDARY MARKET:

Public sector physicians earn significantly more (Rs.9,036) than the private sector physicians (Rs.6,817) in the secondary market.

(vii) SPECIALTY-FAMILY MEDICINE:

33 percent physicians in the full sample specialized in family medicine. Of the physicians with two employments, 39 percent are family physicians, which is significantly different from 14 percent family physicians in the single employment category. Among all family physicians 91 percent have dual employment. Among the public sector physicians, 33 percent are family physicians, as compared to 36 percent who are private sector family physicians. All this suggests that this specialty does pay an important role in participation decisions. We include specialty in the hours worked equation also, since some specialties can reasonably be expected to work longer hours.

(viii) SPECIALTY-SURGERY:

25 percent physicians in the full sample specialized in surgery. Of the physicians with two employments, 20 percent are surgeons, which is significantly different from 42 percent family physicians in the single employment category. Among all surgeons 63 percent have dual employments. Among the public sector physicians, 24 percent are family physicians, as compared to 27 percent who are private family physicians, a difference which is not significant. All this suggests that this specialty does play an important role in participation decisions. We include specialty in the hours worked equation also, since some specialties can reasonably be expected to work longer hours.

(ix) SPECIALTY-CHEST DISEASES:

10 percent physicians in the full sample specialized in chest diseases. Of the physicians with two employments, 8 percent are chest specialists, which is significantly different from 18 percent chest doctors in the single employment category. Among all chest specialists 40 percent have dual employments. Among the public sector physicians, 10 percent are chest specialists, as compared to 9 percent of the private physicians. All this suggests that this specialty does pay an important role in participation decisions. We include specialty in the hours worked equation also, since some specialties can reasonably be expected to work longer hours.

(x) SPECIALTY-GYNECOLOGY:

7 percent physicians in the full sample specialized in gynecology. Of the physicians with two employments, 9 percent are gynecologists, which is significantly different (at 2 percent level) from 2 percent gynecologists in the single employment category. Among all gynecologists, 95 percent have dual employments. Among the public sector physicians, 8 percent are family physicians, as compared to 6 percent of the private physicians, a difference which is not significant. All this suggests that this specialty does play an important role in participation decisions. We include specialty in the hours worked equation also, since some specialties can reasonably be expected to work longer hours.

We begin the analysis by focusing on a simple model of labor supply behavior of physicians in the secondary market. We suppose that the physician holds a regular job in a government health facility that requires a fixed number of hours of work per working day at a fixed salary, and refer to this as the physician's primary employment. We further assume that the physician seeks another employment in the non-primary employment hours, i.e., establishes her own private practice. We refer to this as her secondary employment. Salary in the public facility is assumed fixed, for a fixed number of hours the physician is supposed to work in the facility. In the secondary market, the physician sees patients for a fee, and we assume that the product of the number of patients and fees charged can be expressed as the product of average hourly wages and the number of hours worked in the secondary employment.

Labor supply in the secondary market clearly depends on earnings, varying with wage rates and the relative strength of the income and substitution effects. The physician's hours of work in this model are therefore made dependent on earnings in both employments. Age is included as a regressor. On the one hand, age is proxy for seniority; on the other hand, younger persons are more likely to put in more work, either because of presumed better fitness conditions, because of lesser responsibilities elsewhere, or both. Specialization influences hours worked in the secondary market to the extent that certain specialties (like surgery and gynecology) demand a more exacting block-time commitment than others.

Contractual agreement, or unwritten "rules" of primary employment terms and conditions, may affect secondary market labor supply; the choice of primary employment is therefore included as an explanatory variable. In a regime of fixed salaries varying at predetermined rates, and time-bound promotions, an argument for seniority is introduced as an interaction variable between age and primary employment salary. A family variable of number of dependents is included, since it may conceivably influence both the need for higher earnings, and hence more secondary work-hours, as well as the availability of time in the post-primary market hours. One hypothesis of this paper is that the physician self-refers primary sector patients to her own private practice; the log of patients seen in the primary employment is accordingly included as a regressor.

Ever since Mincer (1962), perhaps the most frequently encountered functional form in economic literature on wage determination is log-linear, or the semi-log, formulation. This specification is useful in estimating relationships where the explanatory variable is exponentially related to the dependent variable, or where interest lies predominantly in estimating the growth rate of the dependent variable. With a statistical earning function of this type, the resultant labor supply function is also semi-log, of the type specified in (1). The linearity in the parameters permits simple estimation methodologies[2]. We assume that the supply of labor in the secondary market is given by:

$$(1) \quad hrws_i = \alpha_0 + \alpha_1 \ln(hrwage_{is}) + \alpha_2(salprim_{ip}) + \alpha_3'\Omega + \epsilon_i$$

The dependent variable, $hrws_i$, is the *i*th physician's hours of work in the secondary employment during a given day, which is the hours of work put in by the physician in her private practice on the day of measurement.[3] Of the independent variables, $lhrwage_{is}$ is the natural logarithm of the *i*th physician's secondary market hourly earnings, computed by dividing the ith physician's secondary market earnings by his or her hours of work, and taking the natural logarithm; $nsalprim_{ip}$ is the *i*th physician's fixed salary (in 000s) in the primary employment, Ω is a vector of control variables, ϵ_i is a stochastic disturbance, and α_0, α_1,... are the parameters of the labor supply function. The vector Ω includes the physician's age, specialization, choice of primary employment, a "seniority" variable constructed as the interaction between age and salary in the primary employment, number of dependents including dependent parents and children below 21 years of age, and a "contact" variable indicating number of patients seen in the primary employment. We note that if there is a random error in measuring hours worked, a spurious negative correlation will result between hours worked and the wage rate measure, given the manner in which the wage rate is computed.

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[2] See Stern (1986) for details.

[3] Physicians in Delhi typically practice six evenings a week, Sunday being the usual day off. Higher turn-out of patients could therefore be expected on Mondays. On verification, however, no significant differences were found.

4.2 ANALYSIS OF WORKING PHYSICIANS ONLY

For a base case estimation, we choose a simple procedure in which the hours worked equation is estimated by ordinary least squares (OLS) using data only on physicians with secondary employment. We estimate four models total. ***Model 1*** estimates the parameters of the hours worked equation. Keeping ***Model 1*** as the baseline specification, we next control for possible correlation between the regressors and the disturbance term in ***Eq. (1)***. In particular, we treat ln(hrwage) as an endogenous variable, and use different variables as instruments in ***Models 2 through 4***. The respective wage equations are as follows.

MODEL 1: hrws $=f\left(\text{hrwage primary salary, age, specialty, primary employment, seniority, experience, dependents, primary patients}\right)$

MODEL 2: $ln(\text{hrwage})=f\left(\text{salary in primary employment, age, specialty, primary employment, seniority, experience, experience squared}\right)$

MODEL 3: $ln(\text{hrwage})=f\left(\text{salary in primary employment, age, specialty, primary employment, seniority, experience, experience squared, age squared}\right)$

MODEL 4: $ln(\text{hrwage})=f\left(\text{salary in primary employment, age, specialty, primary employment, seniority, age squared}\right)$

Detailed regression results are presented in ***Exhibit 4-4***.

The results of ***Model 1*** imply that the uncompensated wage and income elasticities, computed at two hours worked in the secondary market and INR5000 salary in the primary employment, are both negative (the elasticities are $\Delta\ln(\text{hrws})/\Delta\ln(\text{hrwage})=\alpha_1/\text{hrws}=-0.23723$, and $\Delta\ln(\text{hrws})/\Delta\ln(\text{nsalprim})=\alpha_2\text{nsalprim/hrws}=-.147085$ respectively). The negative OLS estimated elasticity is not surprising, since as we noted earlier, there may be a random error in measuring hours worked. Further, these estimates imply that the presence of dependents increases supply of labor in the secondary market, while age tends to reduce hours worked. Both these results appear to be reasonable and expected.

The last three rows of ***Exhibit 4-4*** capture the sensitivity of the parameters to different specifications regarding the instruments. The results imply major variations in computed elasticities, and indicate use of caution in the choice of instruments. We present, in ***Exhibit 4-5***, some results on elasticities implied by these estimates. To make comparisons meaningful, we derive the elasticities at dependents=3, age=40, and hours in primary employment=6, in addition to hours in secondary employment=2 and primary salary=INR5000.

EXHIBIT 4-4
REGRESSION RESULTS: DEPENDENT VARIABLE:HOURS WORKED (SECONDARY)
(Standard errors[4] in parenthesis)

VARIABLES	MODEL 1	MODEL 2	MODEL 3	MODEL 4
WAGES	-.47447 (.094400)	2.883317 (1.183638)	1.730177 (.757159)	-2.808956 (1.53698)
DEPENDENTS	.08968 (.025544)	-.2513501 (.157266)	-.1342239 (.116308)	.3267779 (.228629)
AGE	-.023213 (.009414)	-.052067 (.0991612)	-.04421578 (.0991577)	-.003152 (.131361)
SALARY (PRIMARY)	-.058834 (.048384)	-.046558 (.3792883)	-.0507739 (.3546508)	-.0673688 (.315492)
HOURS (PRIMARY)	-.23667 (.12391)	-.2038112 (.8772997)	-.2150997 (.8468885)	-.2595345 (.750425)
PATIENTS (PRIMARY)	.541338 (.127609)	-.2879479 (.3264483)	-.0031522 (.3545606)	1.117895 (.876609)
SENIORITY	.002183 (.000839)	-.0009048 (.0084244)	.0001557 (.0080509)	.00433 (.008333)
PRIMARY OCC: PUBLIC	.2660792 (.537329)	-.3669864 (3.565614)	-.1495772 (3.46075)	.706215 (3.1280)
GYNECOLOGY	.144023 (.142895)	-.4769803 (.8144532)	-.2637137 (.710353)	.5757723 (.587039)
FAMILY MEDICINE	.28075 (.252452)	.328946 (4867848)	.3123926 (.4948052)	.247233 (.604249)
CHEST DISEASES	-.362447 (.106085)	.3077318 (.6762764)	.077577 (.5927062)	-.8283857 (1.07067)
SURGERY	.378009 (.069109)	-.2423182 (.4476593)	-.0292836 (.4615712)	.8092891 (.695315)
CONSTANT	4.239976 (1.19732)	-4.064264 (3.575826)	-1.212398 (3.815016)	10.01346 (7.48752)

[4] The standard errors in this, and all subsequent regressions, are corrected for cluster-induced and arbitrary forms of heteroskedasticity, using the Huber procedure in the statistical software package STATA.

EXHIBIT 4-5 ELASTICITY ESTIMATES FOR DIFFERENT VARIABLES				
VARIABLES	MODEL 1	MODEL 2	MODEL 3	MODEL 4
WAGES	-.237235	1.441659	.8650889	-1.404478
DEPENDENTS	.13452	-.377025	-.2013358	.4901668
AGE	-.464426	-1.04134	-.8842057	-.06205
SALARY, PRIMARY	-.147085	-.116395	-.1269347	-.168422
HOURS, PRIMARY	-.698922	-.6094536	-.63517923	-.6587032
PATIENT VISITS, PRIMARY	.270669	-.14397395	-.0015761	.5589475

We note that the 2SLS estimates of the wage response are positive and highly significant once the experience variables are included as instruments in ***Models 2 and 3***. The coefficient on wages, however, becomes negative and insignificant once the experience variables are excluded in ***Models 1 and 4***. The income effect remains very small and insignificant, irrespective of the choice of instruments. The coefficients on age also remain negative and insignificant, while those on dependents and patients seen in primary occupation change sign when the experience variables are dropped, though remaining insignificant. The coefficients on hours in primary employment remain negative across all specifications of instruments.[5]

Besides highlighting the sensitivity of the model to assumptions made about the regressors, another purpose served by ***Exhibit 4-5*** is to assist in selection of an appropriate set of baseline instrumental variables. Following Mroz (1987), we conduct tests for overall goodness-of-fit of the wage equation, and of restrictions that overidentify an econometric model. The "best" wage equation is determined as the simplest model not rejected in favor of the model containing the next higher-order terms.

The adjusted R^2 values and Wald test statistics for the three different specifications of the instruments in the wage equation are presented in ***Exhibit 4-6***. These tests do not give any reason to prefer any model over the other.[6]

[5] We note that the disturbance term in Eq. (1) (p.22) may reflect, at least in part, the unobservable preferences, including attitude toward work (Nakamura and Nakamura, 1983). In this case, the experience variables might also be correlated with the disturbance term, and not be good representative instruments.

[6] We note that the coefficient on the choice of employment dummy in the wage equation in Model 4 is highly significant and positive implying a strong positive impact on the secondary market wage rate of physicians who have public sector primary employment. This probably explains, at least partially, why physicians prefer government jobs over private sector in spite of lower base salaries: not only is there a greater sense of job security in the public sector, the secondary market earnings are also more.

EXHIBIT 4-6 GOODNESS-OF-FIT TESTS FOR THE WAGE EQUATION			
STATISTIC	MODEL 2	MODEL 3	MODEL 4
Adj. R^2	.3069	.3034	.3012
WALD TEST	F(10,190) = 9.9	F(11,189) = 8.9	F(9,191) = 10.6
Prob > F	0.0000	0.0000	0.0000

For testing the overidentifying restrictions, we conduct the Lagrange multiplier test proposed by Hausman (1983), as well as a likelihood ratio test based on the Basmann's (1960) variant of the Anderson-Rubin (1950) test. We note that identification of an equation requires that "the number of excluded exogenous variables be at least as large as the number of included endogenous variables in the equation" (Greene, 1993).

Operationally (Greene, 1993), the Lagrange multiplier test requires computation of TR^2, where the R^2 is the unadjusted R^2 in the regression of

$$(2) \qquad \hat{\epsilon}_j = y_j - Z_j\hat{\delta}_j$$

on all the exogenous and predetermined variables in the model. The statistic is distributed as chi-squared. This test requires that the parameters be estimated using any efficient estimator, and since our instrument variables estimation need not be efficient, we also conduct the Basmann test.

The Basmann test[7] was conducted in two steps. The model was first estimated by 2SLS, and the sum of squares of residuals was computed and saved as W_1. A new variable B was constructed as

$$(3) \quad \mathbf{B = hrws\text{-}(est)\alpha_1 ln(hrwage)}$$

In the next step B was regressed on all the variables in the instrument set and on all the exogenous variables in the labor supply equation, and the sum of squares of residuals was computed and saved as W_2. The Basmann test was set up as

$$(4) \qquad F[K_j^* - M_j, T-K] = \frac{T-K}{K_j^* - M_j}(\lambda_j - 1)$$

[7] The use of Basmann's test presupposes homoskedastic normal disturbances. We assume normality, and conduct White's test for arbitrary forms of heteroskedasticity. The null hypothesis of homoskedastic errors is not rejected at 5 percent level of significance.

where

$$!(5) \quad \lambda_j = \frac{[1, -\hat{\alpha}_1] W_2 [1, -\hat{\alpha}_1]}{[1, -\hat{\alpha}_1] W_1 [1, -\hat{\alpha}_1]}$$

The results of these likelihood ratio tests at 5 percent level of significance indicate that when the experience variables are included as regressors in the wage equation, there is evidence of invalid overidentifying restrictions. The null hypothesis is not rejected, however, when the experience variables are not included. The "best" results, therefore, appear to be when the experience terms are excluded from the instrument set.[8]

All this seems to encourage the use of abundant caution in the choice of instruments. To make this choice less arbitrary, we conduct a specification test, where the null hypothesis is that the experience instruments are uncorrelated with ϵ_t, and the alternative is that they are, in fact, correlated. In particular, if the variable x_t is in question, the test is based on the existence of two estimators, b and b*, such that

Under H_0: x_t is exogenous.

Under H_1: x_t is endogenous.

In Hausman's version of the test, b is a 2SLS estimator and b* a 3SLS estimator. Since 3SLS estimators are asymptotically efficient, the Hausman formulation could use the result that the covariance of an efficient estimator with its difference from an inefficient estimator is zero. This simplifies the algebra quite a bit. In our case, however, the estimators, being instrumental variable estimators, need not be asymptotically efficient. We follow Mroz (1987) and use the asymptotic variances and covariances formulae derived by him, and compute the Wald statistic (W) generated by the Hausman-White method[9]. Under the null hypothesis, the Wald statistic is asymptotically distributed as chi-squared with K degrees of freedom, where K is the number of regressors excluding the constant term. Our results, W=41.7903, reject the null hypothesis at any reasonable level of significance, and conclude that experience is not exogenous in the labor supply equation, and that it is therefore an invalid instrument[10]. The appropriate responses are therefore indicated by *Model 4*.

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[8] These results are somewhat similar to those obtained by Mroz (1987).

[9] See Appendix 5 for derivation of the covariance matrix and setting up the test.

[10] We also examine other variables for possible endogeneity, but find no a priori reasons to be suspicious. Salary in the primary employment is fixed and predetermined. In India the decision of the number of children one should have is certainly not dependent on characteristics of employment or income. Similarly, one's choice of specialization is quite certainly dependent upon school performance. None of these variables could therefore be correlated with the disturbance term, in the Nakamura and Nakamura (1983) sense.

4.3 SAMPLE SELECTION MODEL

A major problem with the procedures used so far is that they are based on a subsample of physicians with dual employments, and therefore do not control for self-selection into the secondary market labor force. Only population subsamples of working physicians were used and equations were fit by OLS results in a nonrandom selection of the error term, since by formulation of *Eq. (1)* a physician will be included in the estimation subsample if and only if hrws > 0, i.e.,

$$(6)\ \epsilon_i > -\{\alpha_0 + \alpha_1 \ln(\mathrm{hrwage}_{ij}) + \alpha_2(\mathrm{salprim}_{if}) + \alpha_3{}'Æ_i\}$$

Hence the data on hrws is censored, and ϵ is necessarily correlated with ln(hrwage), salprim, and Æ.[11] Since observations are systematically selected into the estimation subsample according to the criterion (6), OLS estimates do not provide consistent estimates. The correct specification is to first determine the corner solution in which participation in the secondary market is determined, and then, given participation, look at the interior solutions in which hours of work are then determined.

The first step involves analysis of a model where the dependent variable of participation is dichotomous. A relatively simple approach would be to use a variant of the Goldberger (1964) linear probability model. Under this specification, a probit regression is employed to model the participation decision, and then a linear regression model is used to estimate the factors related to hours of work, taking into account only the subsample of working physicians. This approach, however, is not adjusted for selectivity problems, since the observed data is randomly sampled only from the sub-population of physicians associated with the selected value of positive participation.

We address this problem using a technique first suggested by Heckman (1979). The model is estimated in two stages that account for the fact that part of the sample is observed only when the participation index exceeds some threshold. In the first stage, the factors related to the participation decision are estimated. In the second stage, factors related to hours of work are estimated. Also included in the second stage regressors is a variable, derived from the first stage, which represents the conditional expectation of the error term of the regression. Inclusion of this term, referred to as the Inverse Mill's Ratio, accounts for the correlated or non-random portion of the regression error term. What remains is a random error term that theoretically solves the bias problem.

More formally, let the wage equation be of the form

$$(7)\ \mathrm{W}_i = \mathrm{X}_i\Gamma + \epsilon_{wi}$$

where X is a vector of variables observed for all physicians with secondary employment, and ϵ_{wi} is a normally distributed error term with mean zero. The hours worked equation is of the form

$$(8)\ \mathrm{H}_i = \mathrm{Z}_i\beta + \mathrm{u}_{Hi}$$

[11] Unless, of course, the coefficients are zero, or all physicians have dual employment. As it turns out, neither of these is correct.

Compute a Z^* matrix by taking the Xi matrix of *Eq. (8)* and adding an additional column vector, that of hours worked. At $H=0$, therefore, the reservation wage equation becomes

$$(9)\ W_{ri}=Z^*\Omega+\epsilon_{Ri}$$

The hours worked equation, therefore, is

$$(10)\ H_i=b(W_i-W_{ri})\ \text{iff}\ (W_i-W_{ri})>0;\ H_i=0$$

otherwise, assuming linear labor supply. This can be written as

$$(11)\ H_i=b[X_i]^*(est)\Gamma-Z^*\Omega+\epsilon_{Di}\ \text{iff}\ (W_i-W_{ri})>0;\ H_i=0\ \text{otherwise,}$$

$$\text{where}\ \epsilon_{Di}=\epsilon_{Wi}-\epsilon_{Ri}$$

Given these assumptions, we know that ϵ_{Di} is normally distributed and hours worked can never be negative. A probit likelihood function can be specified as

$$(12)\ L=\pi_{i\epsilon\Omega}[1-F(-J_i/\sigma_D)]\pi_{i\epsilon\Omega'}[F(-J_i/\sigma_D)]$$

$$\text{where}\ Ji=X_i\Gamma-Z^*\Omega$$

In the next stage, we use the probit parameter estimates of the Inverse Mills Ratio, $IMR=f(-J_i/\sigma_D)[1-F(-J_i/\sigma_D)]$, and then append the estimated IMR as an additional regressor to the wage equation (7), and obtain OLS selection bias corrected parameter estimates using data on physicians with secondary employment only.[12] Finally, we employ instrumental variables and selectivity bias corrected techniques to estimate parameters of *Eq. (8)*. We do so by adding Inverse Mills Ratio (IMR) to the hours worked equation, and undertake instrumental variable estimation with the actual wage rates in the secondary market replaced by fitted values derived from the second stage selectivity bias-corrected wage equation estimates.

4.4 ESTIMATION OF SAMPLE SELECTION MODELS

We used the full sample of 258 physicians and estimated a number of probit models of secondary market participation. The first model we estimated, ***Model 1*** in ***Exhibit 4-8***, uses number of dependents, age, salary in primary employment, and hours worked in primary employment as the regressors. We find that the number of dependents and salary in primary employment have no impact on labor supply. The coefficients on age and hours worked in primary employment are negative and highly significant, indicating that the probability of secondary market participation decreases as the hours spent in the primary employment increase and as ages of the physicians increase.

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[12] The entire procedure is carried out using the statistical software package LIMDEP, in which the Heckitt two-step procedure is executed in a one-step FIML approach.

The second regression, ***Model 2*** in ***Exhibit 4-7*** includes patient visits in the primary employment as an additional regressor, on the supposition that as the physician's circle of patient contact and influence increases, the likelihood of secondary market participation also increases. We find that the coefficient on patient visits is positive and highly significant, while other coefficients stay more or less as in ***Model 1***.

EXHIBIT 4-7
PROBIT REGRESSION RESULTS: DEPENDENT VARIABLE: HOURS WORKED (SECONDARY)
(Standard errors in parenthesis)

VARIABLES	MODEL 1	MODEL 2	MODEL 3	MODEL 4
DEPENDENTS	.0909268 (.125532)	.0799376 (.1301127)	.0702255 (.132049)	.17006 (.1778)
AGE	-.063503 (.0251304)	-.0415268 (.0255571)	-.0287462 (.041463)	.032578 (.06138)
SALARY (PRIMARY)	-.0389498 (.0475482)	-.0504065 (.0429128)	.0284143 (.205456)	1.321501 (.489811)
HOURS (PRIMARY)	-3.572714 (.6469151)	-3.29681 (.66682)	-3.295744 (.664922)	-2.8626 (.606939)
PATIENTS (PRIMARY)		.8452803 (.2077802)	.8563216 (.209999)	1.70891 (.34559)
SENIORITY			-.0014412 (.003689)	-.021443 (.008055)
PRIMARY OCC:PUBLIC				4.6834 (1.07182)
GYNECOLOGY				1.1959 (.55039)
FAMILY MEDICINE				-.90240 (.6102)
CHEST DISEASES				-1.4301 (.5682)
SURGERY				.600000 (.44000)
CONSTANT	28.79488 (4.735482)	23.23845 (4.952134)	22.52205 (5.24449)	5.3351 (2.5029)
-2(LOG L1-LOG L2)[13]	153.838	172.568	172.619	211.256
PSEUDO R2	.5646	.6333	.6339	.7753

[13] L1 is the likelihood for the model containing only the intercept (-2log likelihood is 136.25); L2 is the likelihood for this particular model.

Addition of seniority as an independent variable, ***Model 3*** in ***Exhibit 4-7*** does not change the picture much. All the other variables remain more or less as before, and the coefficient on seniority itself is found to be negative and insignificant.

The physician's specialty may also influence her decision of participating in the secondary market, since different specialties have different time requirements and earnings potential. The physician's primary occupation also can influence the participation decision, since contractual and ethical obligations vary across jobs. The fourth regression, ***Model 4*** in ***Exhibit 4-7***, therefore, includes the physicians' specialty and primary occupation as additional regressors. We see that dependents and age coefficients continue to remain insignificant, though the age coefficient is now positive. The coefficient on hours worked in the primary employment continues to remain negative and significant. Salary in primary employment now matters significantly, as does the number of patients the physician sees in the primary sector. This seems to suggest two types of links between the primary and secondary markets. First, the physicians suppose that their higher salaries indicate higher expertise levels to the patients; physicians with higher salaries are more likely to have their own private practices. Second, the more patient visits a physician records in the primary occupation, the higher the probability of secondary market participation, perhaps because of the larger contact circle.

Among the specialties, gynecology and chest specialization have a significant impact on the physician's decision-making process. As it turns out, gynecologists have a higher probability of secondary market participation, while chest specialization has a negative impact. One probable explanation is that most chest specialists in India primarily examine tuberculosis cases and are more commonly known as tuberculosis specialists. Tuberculosis, as is understood in India, is a "poor man's disease," primarily striking the undernourished living in congested and unhygienic conditions. These patients typically do not have the resources to support a private practice. The coefficient on family medicine is weakly significant, but negative. This is surprising because one would expect family medicine specialists to have a high probability of participating in the secondary market, given a usually high demand for their services. Similarly, the coefficient on surgery is only weakly significant, though positive.

Primary occupation does matter, as is emphasized by a highly significant and positive coefficient on public sector primary employment. This confirms the general impression of most observers that government physicians are more likely to have their own private practices as compared to physicians working in private hospitals. This could be the result of a variety of reasons: salaries in public facilities are lower than in private hospitals, government physicians see more patients than the physicians in private hospitals, and public hospitals impose weaker restrictions on private practice by their physicians than the private facilities.

A log likelihood test comparing the four models, depicted in ***Exhibit 4-7***, shows that the inclusion of the additional variables in ***Model 4*** significantly improves the model's predictive power. Some of the signs of the coefficients also seem to confirm our hypotheses.

We now compute the effect of a change in some of the regressors on the probability of the physician participating in the secondary market. This "marginal effect" is given by the derivative of the choice probability, i.e., by f(P)*est β_i, where P is the probability of secondary labor force participation, and est β_i is the estimated coefficient on the ith explanatory variable.[14] We evaluate the estimated derivatives

[14] See Maddala (1983) or Train (1986) for details.

using the sample secondary market participation rate of 201/258 = .7791. We also measure responses by elasticities rather than just derivatives, since elasticities are normalized for the variable's units. The elasticities and derivatives are presented in ***Exhibit 4-8***.

EXHIBIT 4-8 MARGINAL EFFECTS AND ELASTICITIES OF SELECTED REGRESSORS		
VARIABLE	DERIVATIVE	ELASTICITIES
DEPENDENTS	.0028022	.01079
AGE	.0005368	.02756
SALARY IN PRIMARY EMPLOYMENT	-.0003533	-.0022673
HOURS IN PRIMARY EMPLOYMENT	-.047168	-.381412
PATIENT VISITS IN PRIMARY EMPLOYMENT	.028157	.134804

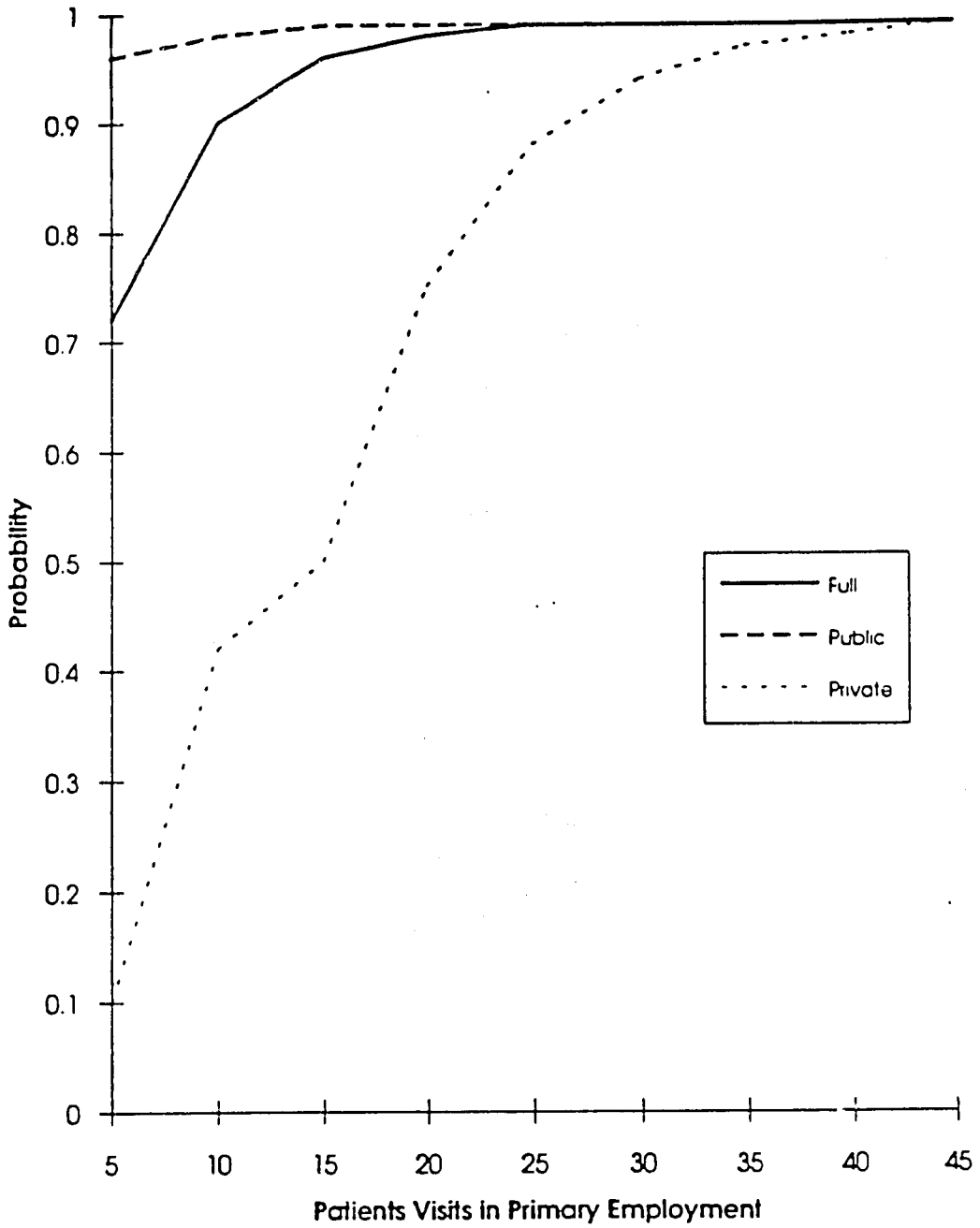
We see that both hours worked and patient visits in primary employment have a considerable impact on the physician's probability of participating in the secondary market, while the number of dependents, age, and primary salary have only a weak impact.

Next, we illustrate a few simulation exercises to analyze the impact of changes in selected regressors on the physician's probability of working in the secondary market. In particular, we examine how this probability changes when certain characteristics of primary employment, like hours worked, salary, and patient visits, change. We present these results in ***Graphs 4-1 through 4-3***.

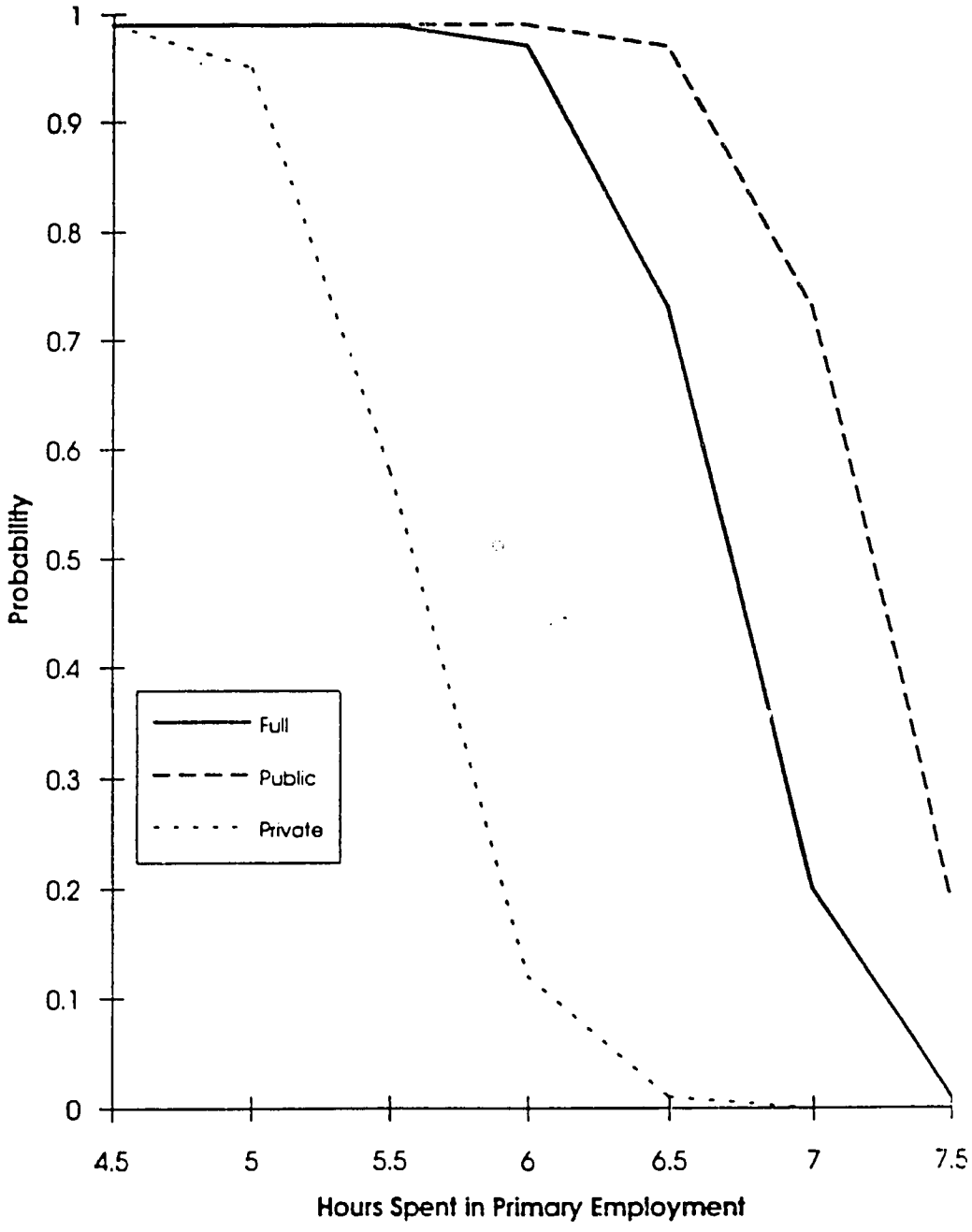
We now estimate the physician's labor supply in the secondary market using the Heckitt two-stage procedure. As discussed earlier, this involves the estimation of the Inverse Mills Ratio (IMR), which is then appended to a wage determination equation. In the final stage, the fitted value from the wage determination equation is used as an instrument in a 2SLS estimation of the hours worked equation, but with IMR added as a regressor.[15] We present the results in ***Exhibit 4-9***.

[15] We use STATA and LIMDEP software packages for this estimation. The standard errors are corrected automatically in this procedure.

Probability of Holding Two Jobs as a Function of Patients Visits in Primary Employment



Probability of Holding Two Jobs as a Function of Hours Spent in Primary Employment



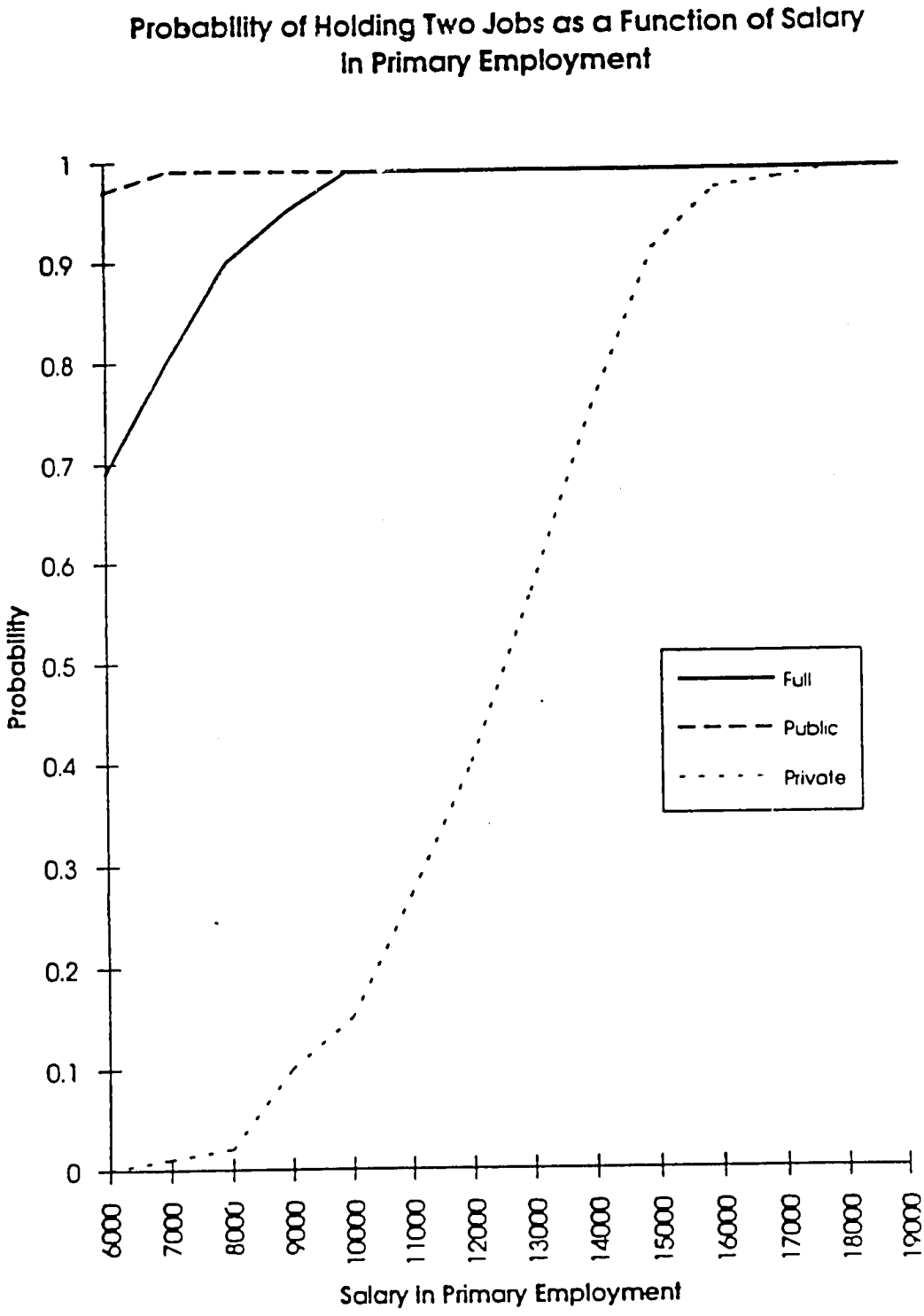

Probability of Holding Two Jobs as a Function of Salary
in Primary Employment
Probability
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
17000
18000
19000
Salary in Primary Employment
Full
Public
Private

EXHIBIT 4-9 DEPENDENT VARIABLE: HOURS WORKED; ESTIMATION METHOD: HECKITT TWO-STAGE: PROBIT (Standard Errors in Parenthesis)	
VARIABLES	COEFFICIENTS
WAGES	-2.6139 (3.086)
DEPENDENTS	.30388 (.2528)
AGE	-.0050331 (.04373)
SALARY (PRIMARY EMPLOYMENT)	-.070436 (.1347)
HOURS WORKED (PRIMARY)	-.25076 (.1426)
PATIENT VISITS (PRIMARY)	1.0545 (.5761)
SENIORITY	.0042329 (.004842)
PRIMRY OCC:PUBLIC	.66758 (.7910)
GYNECOLOGY	.53535 (.6392)
FAMILY MEDICINE	.25785 (.2563)
CHEST DISEASES	-.78380 (.6369)
SURGERY	.76931 (.5476)
CONSTANT	9.5719 (8.397)
INVERSE MILLS RATIO	-.074018 (1.182)

We note that the coefficients on hours worked and patient visits in the primary employment are significant, implying that the hours worked in the secondary employment decrease as hours in primary employment increase, and increase with patient visits in the primary employment. This is suggestive of externalities that the physician enjoys in her primary employment, perhaps due to the widening contact circle, self-referrals, or both. The coefficients on dependents and the specialties of family medicine, chest diseases, and surgery are weakly significant. Of particular interest is the weakly significant negative coefficient on chest diseases specialty, which confirms our prior impressions of chest specialists working fewer hours in the secondary employment, perhaps because of the limited purchasing power of most of their patients. The coefficient on surgery specialization is positive but insignificant. One possible explanation is that relatively few people can afford the high costs of private surgery. This is in conformity with our a priori understanding also: the facility of choice of any non-minor surgery is always public facility.

We present, in ***Exhibit 4-10*** some results on elasticities implied by these estimates. To make comparisons meaningful, we derive the elasticities at dependents=3, age=40, and hours in primary employment=6, hours in secondary employment=2, and primary salary=INR5000.

5.0 PATIENT CHARACTERISTICS

In our survey, we collected some information about the patients visiting the public and private sector hospitals. So as to better understand the profiles of patients attending the two types of facilities, and identify any specific areas of significant differences. We obtained data on 2,093 patients, and devoted this Section to a brief study of descriptive characteristics of this sample of patients. ***Section 5.1*** looks at some of the socio-economic background variables. In ***Section 5.2***, we examine the factors influencing a patient's choice of facility type. We conclude in ***Section 5.3***, where we examine our findings on patient satisfaction.

5.1 BACKGROUND VARIABLES

In this section, we discuss some of the background socio-economic characteristics of the patients visiting public and private hospitals. In ***Exhibit 5-1***, we examine the characteristics of the patients across the two types of facilities.

EXHIBIT 5-1
PERCENT OF PATIENTS AGE-WISE

TYPE	0-5	6-14	15-29	30-45	OVER 46	TOTAL
PRIVATE	12.1	13.8	26.9	22.2	25.0	100
PUBLIC	14.7	18.6	24.8	22.2	19.7	100
OVERALL	13.1	15.6	26.1	22.2	23.0	100

About a quarter of patients visiting the private facilities are over 45 years of age, whereas about one-fifth of those visiting the public facilities are in this age group. At the same time, about a third of patients visiting public hospitals are less than 15 years of age, as compared to a quarter of the private sector patients.

We next look at the distribution by sex and marital status in ***Exhibit 5-2***.

EXHIBIT 5-2
PERCENT OF PATIENTS BY SEX AND MARITAL STATUS

TYPE	MALE	FEMALE	TOTAL	SINGLE	MARRIED	TOTAL
PRIVATE	73.7	26.3	100	49.6	50.4	100
PUBLIC	67.6	32.4	100	53.5	46.5	100
OVERALL	71.4	28.6	100	51.1	48.0	100

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There are no significant differences between the patient profile by sex and marital status across the two types of facilities. (What is interesting, however, is that, overall, less than 30 percent are females.) This confirms our impressions that women are more likely to receive home treatment rather than hospital treatment.[17]

Another important descriptive variable is level of education depicted in ***Exhibit 5-3***. We expect that the more educated will know where they can obtain "better" care, if for no other reason that they are generally better informed.

EXHIBIT 5-3
PERCENT OF PATIENTS BY LEVEL OF SCHOOLING

TYPE	NO SCHOOL	PRIMARY SCHOOL	SECONDARY SCHOOL	HIGH SCHOOL	TOTAL
PRIVATE	2.6	7.2	28.2	62.1	100
PUBLIC	3.5	12.6	30.3	53.7	100
OVERALL	2.9	9.2	29.0	59.0	100

We find that of all the patients visiting private hospitals, 62 percent have at least a high school level of formal schooling, which is higher than the comparative figure for the public facilities. Though this by no means is a conclusive indicator, we do find that private hospitals attract more highly educated patients than the public sector, probably because the quality of care provided by the private sector hospitals is perceived to be better than that of the public sector. We also note, however, that the literacy rate of Delhi, 94 percent, is much higher than the country's average, which is 49 percent.

Closely related to education is the type of occupation, which we examine in ***Exhibit 5-4***.

EXHIBIT 5-4
PERCENT OF PATIENTS BY TYPE OF OCCUPATION

TYPE	UNEMPLOYED	STUDENT	PUBLIC SECTOR	PRIVATE SECTOR	SELF EMPLOYED	TOTAL
PRIVATE	5.4	7.0	43.4	26.4	17.7	100
PUBLIC	8.4	6.4	49.9	28.9	6.3	100
OVERALL	6.6	6.8	45.9	27.4	13.5	100

[17] There may be at least two reasons for this. First, it is often argued that the status of women is lower than that of men in the Indian society. For this reason, it is not so important for women to seek health care as soon as the first symptoms of illness become evident. Second, there are traditional and orthodox reasons which may prevent a woman from submitting to an examination by a stranger, even if the stranger happens to be a physician.

One surprising result is that a large proportion of public sector employees visit the private hospitals in spite of the fact that for them even the in-patient services in government hospitals are free. An expected result is that a significant percentage of patients visiting the private sector are self-employed, a group of persons in India usually associated with high incomes.

If the private facilities do in fact provide better quality services, we would expect that the patients whose regular income is affected during illness would prefer the private sector hospitals so as to get better faster and minimize the number of sick days. In the same category would be the daily wage-earning patients. We accordingly collected information on these variables, and present it in ***Exhibits 5-5 and 5-6***.

EXHIBIT 5-5
PERCENT OF PATIENTS BY FREQUENCY OF RECEIVING INCOME

TYPE	DAILY	WEEKLY	MONTHLY	PIECEMEAL	TOTAL
PRIVATE	10.7	3.4	81.9	4.0	100
PUBLIC	6.4	2.8	87.4	3.3	100
OVERALL	9.1	3.2	84.0	3.8	100

EXHIBIT 5-6
PERCENT OF PATIENTS WHOSE REGULAR INCOME IS AFFECTED DURING ILLNESS

TYPE	REGULAR INCOME	NO REGULAR INCOME	TOTAL
PRIVATE	43.4	56.6	100
PUBLIC	53.3	46.7	100
OVERALL	44.6	55.4	100

Both these tables seem to indicate that patients perceive the quality of treatment to be superior in private facilities as compared to public hospitals, and the more adversely affected patients prefer private facilities in spite of higher costs.

5.2 PATIENTS CHOICE OF FACILITIES

In this section, we examine some of the factors that influence a patient's choice of facility type. There are many reasons why a patient prefers visiting a particular facility: (1) the patient normally visits this facility; (2) the treatment cost in this facility is low; (3) the medical personnel are capable; (4) drugs and supplies are usually available; (5) the waiting time is short; (6) there are religious or traditional reasons (R&T); and (7) the facility is close to home.

EXHIBIT 5-7 PRINCIPAL REASONS FOR CHOOSING A SPECIFIC FACILITY							
TYPE	HABIT	LOW PRICE	CAPABLE STAFF	DRUGS	WAITING TIME	R&T	NEAR HOME
PRIVATE	7.7	17.9	65.4	1.5	1.4	0.1	6.1
PUBLIC	15.1	20.3	52.1	6.2	0.3	0.1	5.9
OVERALL	10.5	19.9	59.2	3.3	1.0	0.1	6.0

As shown in ***Exhibit 5-7***, the patients' choice seems to be governed largely by quality of medical personnel and partly by expenditure on treatment and force of habit. Surprisingly, availability of drugs, waiting time, and proximity to home are not major considerations. One reason drugs do not play an important role in the decision-making process perhaps is that neither private nor public sector facilities dispense drugs freely. Time is not a major factor, perhaps because people are used to waiting and therefore do not attach a high premium to time. Finally, proximity to home is not an important factor in a city like Delhi where there are many facilities of both types, and where there is an extensive and relatively inexpensive public transportation system.

Another surprising feature of this finding is that a large proportion of persons visiting the private hospital find it inexpensive. This may be because of variations within the category of private facilities, which our sample is not able to capture easily.

We note that many more patients visiting private hospitals state good quality of medical personnel as the principal reason for making their choice of facilities.

One feature common to both types of facilities in Delhi is that nearly all facilities provide more than one service under one roof. For instance, it is not uncommon for one hospital to provide consultation, radiological services, pathological tests, drugs, and other supplies as demonstrated. The patients have over time come to prefer such facilities for costs saved in time searching for these services.

EXHIBIT 5-8 PERCENT OF PATIENTS PROVIDED ONE OR MORE SERVICE			
TYPE	ONLY ONE SERVICE	MULTIPLE SERVICES	TOTAL
PRIVATE	10.2	89.8	100
PUBLIC	9.4	90.6	100
OVERALL	9.9	90.1	100

Both types of facilities provide at least more than one service, and there is not much distinction between the public and private facilities in this regard.

5.3 PATIENT SATISFACTION

We note that patients' choice of facility is largely governed by their impression regarding its quality of medical personnel. Of more interest, however, is the quality of treatment the patients actually receive. Estimating quality, however, is a difficult task, since it involves a very detailed investigation into the patient's medical history, present illness, treatment protocol, recovery stage, and so on. Instead, we chose a measure of patient's "satisfaction" as a proxy for perceived quality treatment. On the basis of our understanding of the general psyche of the patients in Delhi, we formulated a "patient satisfaction index" on the responses received to the following questions.

(1) Did the physician greet the patient?

(2) Did the physician check the patient's pulse, use a thermometer or any other instrument?

(3) After the patient told the physician the initial description of the symptoms, did the physician ask additional questions regarding the illness?

(4) Was the physician looking and/or speaking with someone else while carrying out the examination?

(5) Were the dosages clearly explained and indicated in the prescription?

(6) Generally, was the physician polite?

(7) How much time did the physician spend with the patient?

These questions were addressed to the patients in the physician's primary employment. A score of one was given for every response in the affirmative for the first six questions, while in the seventh question, a score of one was given if the physician spent more than five minutes with the patient. At least five patients were interviewed for each physician, and the average score received by the physician computed as the "patient's satisfaction index."

As it turned out, only 644 patients were interviewed, and all these were public facility patients. On the basis of these responses, we computed a satisfaction index for 64 physicians, all of whom have multiple employment.

We ran a few simple regressions to examine the impact of this index on some characteristics of secondary employment. First, we estimates the effect of patient satisfaction with the physician fees in the secondary employment. The regression results are presented in ***Exhibit 5-9***.

We note that the coefficients on the index, age, and some specializations are significant. This seems to indicate that the public sector physicians use their reputation in the primary employment to set higher fees in their private practice. Surgeons typically have higher fees than other specializations, which is also indicated by our results. Family physicians have lower charges, as do the chest specialists, though probably for different reasons. Older physicians charge higher fees, perhaps using their age to signal experience and seniority.

EXHIBIT 5-9 DEPENDENT VARIABLE: FEES CHARGED IN SECONDARY MARKET	
VARIABLE	COEFFICIENT
SATISFACTION INDEX	2.538438 (1.26538)
SALARY (PRIMARY EMPLOYMENT)	.3811103 (.3710086)
GYNECOLOGY	6.788542 (6.798263)
FAMILY MEDICINE	-19.010904 (6.280005)
CHEST DISEASES	-20.17744 (5.924823)
SURGERY	24.48665 (5.869592)
AGE	1.435063 (.1814159)
CONSTANT	-22.71193 (10.3386)
R2	.5594
F(7,56)	12.43
PROB>F	0.0000

Next, we look at the impact of the satisfaction index on the number of visits the physician records in the secondary market. The regression results are presented in ***Exhibit 5-10***.

EXHIBIT 5-10 DEPENDENT VARIABLE: PATIENT VISITS (natural log) IN SECONDARY MARKET	
VARIABLE	COEFFICIENT
SATISFACTION INDEX	.0492645
PATIENT VISITS (PRIMARY)	.6764722
FEES CHARGED (SECONDARY)	-.0164391
SENIORITY	.0016807
SALARY (PRIMARY EMPLOYMENT)	-.0579495
GYNECOLOGY	.7311492
FAMILY MEDICINE	.3627497
CHEST DISEASES	-.1368098
SURGERY	.5643382
AGE	.0276362
CONSTANT	-1.103682
R^2	.6176
F(10,53)	11.18
PROB>F	0.0000

Finally, we estimate the physician's labor supply in the secondary market using the two-stage least squares estimation procedure. The satisfaction index is used as instrument for the secondary market earnings of a physician, along with other instruments like age, age squared, seniority, salary in primary employment, and specialization. The regression results are presented in ***Exhibit 5-11***.

EXHIBIT 5-11 DEPENDENT VARIABLE: HOURS WORKED IN SECONDARY MARKET: 2SLS (Standard Errors in Parenthesis)	
VARIABLE	COEFFICIENT
WAGES IN SECONDARY EMPLOYMENT INDEX	.9472013(.7223844)
PATIENT VISITS (PRIMARY)	-.611333 (.9721294)
HOURS IN PRIMARY EMPLOYMENT	-.2604294 (.8472201)
SALARY (PRIMARY EMPLOYMENT)	-.5328491 (.9927194)
SENIORITY	.0077794 (.0202815)
DEPENDENTS	.2935338 (.3311327)
AGE	-.0863523 (.2349314)
GYNECOLOGY	-.3721392 (.749689)
FAMILY MEDICINE	.6023275 (1.037453)
CHEST DISEASES	.3887359 (1.239399)
SURGERY	-.1803453 (.6992186)
CONSTANT	6.54021 (17.33671)

The coefficient on wages turns out to be weakly significant. All other coefficients are more or less the same as the labor supply equation estimated in the previous section.

We do note that our sample size is small, and confined only to patients in the public hospitals and to physicians who have multiple job-holdings. But this does not detract us from making the observation that the physician's behavior toward the patient in the primary hospital can build up the physician's reputation; this reputation can in turn permit the physician to charge higher fees in her private practice.

6.0 POLICY IMPLICATIONS AND CONCLUSIONS

The health care system of India consists of different types of providers, who differ in the kind of medicine they practice, the technology they utilize, and the overall structure they employ in the delivery of health care. Two distinctive ownership styles and organizational structures are those of the public and private sectors, which differ substantively in their priorities, functioning styles, constraints, and commitments. At the same time, between the two of them these sectors provide most of the health care currently available in the country. The private sector owns a little over 58 percent of all hospitals in the country, as compared to 41 percent in the public sector. Of the total beds available, the private sector accounts for about 30 percent, while the government hospitals provide 68 percent of total beds. Clearly, little is left over for the voluntary hospitals and the informal sector.

While there is little evidence of sharing of infrastructure, there is no doubt that there exists a great deal of overlap in the utilization of labor resources in the health sector. With a little over 360,000 physicians and 400,000 nurses, only 41 physicians and 45 nurses are available per 100,000 population. The medical personnel enjoy a monopolistic advantage in the market of employers, with both the public and private sectors competing for their services. The various government laws and regulations distort the market, and at least the public sector's responses to the free market signals are not flexible. Many inefficiencies result in this environment of public-private interactions, making the task of health care delivery and finance even more challenging.

Physicians in India typically enjoy well-paying private practices in the evening hours. Physicians working in government as well as private facilities in the morning hours, which we referred to as the physician's primary employment, also have their own private clinics in the evening hours. In spite of much higher returns in their private practices, very few physicians leave their primary employments to concentrate on their private clinics. We feel that the two markets are interlinked, in the sense that employment in the primary sector generates demand in the secondary sector. One way in which this happens is by self- and cross-referrals, a practice which we found to be very common. If, in the opinion of the physician, the patient visiting the out-patient department in the primary facility has sufficient paying capacity, suggestions are made to the patient that she will probably receive better care in the physician's, or some other physician's, private clinic. This is not to imply that each patient who has some paying capacity is thus referred. And not all the patients who are thus referred respond to the suggestion. The patient's demand for the physician's primary facility time or private clinic time probably depends on a host of other factors, like severity of illness, number of working days lost in illness, waiting time at the primary facility, and the time when the patient can visit the physician. Once the patient chooses to visit a physician in her private clinic, however, the choice of the physician visited is to a large extent influenced by the reputation of the physician, in primary as well as the secondary employment. One of the objectives of this study was to better understand this interlinkage between the two markets, and the extent to which physicians care about their reputation in the primary sector.

Other objectives of this study were to improve our understanding of the various factors that influence the physicians' allocation of time between public and private employment, and of the perceived differences of quality of treatment between public and private sectors. Data limitations have, however, prevented achieving all our objectives fully.

In this section. we present our main conclusions and policy implications. In ***Section 6.1***, we discuss facility characteristics. Evidence on physician behavior is discussed in ***Section 6.2***, and patient responses are analyzed in ***Section 6.3***.

6.1 THE FACILITY

a) Private sector hospitals employ fewer physicians as compared to the government hospitals. Private facilities instead rely on specialists and consultants, usually paid on a case basis. This not only keeps the costs down, it also ensures the availability of more qualified medical personnel. On the other hand, the government hospitals rely heavily on full-time, tenure track, junior-level positions. While there are merits in both of these arrangements, there is definitely sufficient scope of reducing costs in public sector hospitals by cutting down on direct employment.

(b) The department distribution of physicians is almost the same across public and private sector hospitals. This similarity is perhaps in response to the demand for medical services, and seems to indicate that the patients do not have any treatment preferences for different illnesses.

(c) As far as the inpatients are concerned, the private sector has a much higher physician utilization rate as compared to the public sector, with the private hospitals recording far more discharges per physician than the public facilities. There could be at least two reasons for this. First, the private hospitals could be better utilizing physician time. Second, the public hospitals could be admitting more severe cases. Unfortunately, we do not have any way of confirming either of the two hypotheses, and this remains an area for future research.

(d) The picture is different for outpatients, where public sector physicians record a much higher number of visits than the private facilities. There could be many reasons for this. First, the public facilities are typically free, and thus attract greater demand. In comparison, only about one-third of the private sector outpatient services are free. Second, the private sector facilities spend more time and attention per patient as compared to the public hospital, and therefore examine fewer patients per physician. Third, the public sector physicians seek to widen their contact circle as much as possible, and therefore encourage numbers more than quality of care. Whatever the reasons, it is clear that the public sector physicians need to spend more time with their patients in the out-patient department: the present rate of four minutes per patient compares very unfavorably with the eleven minutes recorded at the private facilities, and the nine minutes in the physician's private clinic in the secondary market.[18]

[18] As pointed out by Joseph Newhouse, Harvard University, in a review of an earlier draft, conclusive evidence on comparative efficiency of the two sectors should take into account measures of severity of illness, case mix of the two systems of health care production and delivery, and perhaps some indicators of health care outcomes. To that extent, the data available does not permit any final and conclusive findings on relative efficiency.

6.2 THE PHYSICIAN

(a) One favorable outcome of the practice of multiple employment by physicians is that the physician-to-population ratio is considerably improved. A rough estimate, based on an additional half-day availability by three-quarters of the physicians, improves the physician-population ratio from 41 physicians per 100,000 population in India to about 56 physicians per 100,100 population. Since the availability of physicians is a serious problem in most developing countries, governments should not discourage private practice. Besides ensuring an increased availability of physicians, it would also provide the necessary incentives for future enrollment in the profession.

(b) One unfavorable consequence of the practice of multiple employments by physicians is the near-absence of effort put in by the physicians in their primary employment. There appears to be at least one way in which this situation can be remedied, without at the same time putting any restrictions on the physician's secondary employment opportunities. The solution lies in exploiting and further developing the strong link that exists between the physician's primary and secondary employments. This connection works through the contacts and reputation that the physician establishes in the primary facility, and seeks to carry over the effects to the secondary employment. The physicians care about the impression they make on the patients in the primary employment, as is emphasized by their ability to charge higher fees if the patients are satisfied with services received in the primary facility. The physicians also care about the number of patients they see in their primary employment, insofar as it expands their circle of influence. This link between the two markets can be formalized and strengthened by the government to ensure both satisfactory effort input in the primary employment and continuing gains in the secondary market.

A three-pronged policy is suggested to achieve this objective. First, we know that the physician is highly sensitive to the number of hours put in the primary employment. Considering that these hours are largely unmonitored, it would be more efficient to reduce the requirement of hours to about half. This would have the effect of shifting more health care to the private sector, where the patient pays for it. At a logical extreme, the position could be such that only the truly indigent use the public sector services, with the others seek private health care. The practice of physicians holding more than one job and the coexistence of the two sectors, therefore, ration the number and type of patients in the two sectors.[19]

Admittedly, the link between the physician's two jobs is not as simple as this.

At the same time, the salaries in the primary employment can also be scaled down or frozen at the current level if it is politically not feasible to reduce. The physician is not particularly sensitive to salary in the primary employment, as long as the cut applies to everyone across the board.

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[19] I owe this observation to Albert Ma, Boston University, and Joseph Newhouse, Harvard University. While the argument is compelling, it certainly needs a more detailed analytical framework for studying its full implications.

Some measure of competition can also be introduced in the physician's primary employment. A number of physicians can be scheduled at the same time in the outpatient section, giving the patient a choice of the physician she wishes to visit. Since the physician is sensitive to the satisfaction rating the patients accord, this competition could turn out to be very healthy.

Third, there should be no upper limit to the number of patients the physician can examine in the primary employment. If the physician is interested in widening her contact circle, it would be in her interest to ensure that the maximum number of patients are seen. At the same time, concern with patient's satisfaction rating will ensure that a proper balance is struck between the number of patients seen and the time spent with each patient.

Fourth, a system of rewards should be instituted, recognizing the physician's services in the primary employment. For this to be meaningful, there should be some system of continuous in-house rating of the physician. This task can best be carried out by conducting mini-surveys of the patients periodically, a task best handled by some outside impartial agency. Though this would increase costs, the gains from the feedbacks would be far more valuable.

Fifth, the physicians could be given an option of setting up their private practice in the evening hours, on payment of a token rent, in the government facility itself. This has at least two benefits. First, the out-patient wards of most public sector facilities are deserted after morning hours, and the space and infrastructure is thus underutilized. Second, the introduced competition thus becomes more meaningful, since the captive contact group is now locally available.

Finally, the savings the government makes on salaries could be put in a revolving fund available for the physicians to meet a part of their clinic start-up costs. Start-up costs are likely to be high, though in this study we have not considered them.

(c) There appears to be no need for the government to introduce a high fee per patient payable to the physician in addition to salaries, since there are other more efficient ways of ensuring that the physician puts in adequate effort in their primary employment. Moreover, fee per patient would perhaps increase the requirement of funds, and may dissuade the physician from participating in the secondary market.

6.3 THE PATIENT

We do not have much to say about patients, since our study has not examined the demand side in any detail. We do note certain characteristics of patients and suggest ways in which government funds can be better utilized.

(a) There is tremendous scope of bringing about greater awareness of better health among females. We understand that the cultural and educational barriers are often formidable; however, it is distressing to note that most of the female patients do not find their way to the hospital. This issue is widely recognized and accepted as a major reform initiative (see The World Development Report 1993, The World Bank), and our study only confirms the pressing need for the governments to also take some initiative in this direction.

(b) Patients do seem to make rational choices, insofar as most choose a particular facility by its quality of medical personnel. The relevant information on medical personnel, availability of facilities, drugs, equipment, etc. in public facilities, however, is not generally available. In contrast, the private sector hospitals advertise their strengths more aggressively and effectively. We feel that the patients' decision-making process will be vastly improved if the governments emulate the private sector in this regard and provide more information about their facilities. A starting point would be to list the availability of physicians, nurses, paramedical staff, equipments, beds, etc., a practice rather common among private hospitals.

APPENDICES

APPENDIX 1

HOSPITALS VISITED
(all in Delhi Metropolitan Area)

B.L. Kapoor Hospital, Rajindra Place

Chest Clinic, Jhandewalan

Chest Clinic, Motinagar

Colony Hospital, Motinagar

Colony Hospital, Tilaknagar

Delhi Administration Dispensary, Janakpuri

Delhi Administration Dispensary, Janata Market, Jhandewalan

Delhi Administration Dispensary, Uttamnagar

Employee State Insurance Hospital, Basaidarapur

Employee State Insurance Dispensary, Santpura, Tilak Nagar

J.K. Nursing Home, Patel Nagar

Jeevan Hospital, Karol Bagh

Kalra Hospital, Kirti Nagar

Khanna Nursing Home, Janakpuri

Khera Hospital, Rajinder Nagar

Khetrapal Nursing Home, Tilak Nagar

Kolmet Hospital, Pusa Road

Sir Gangaram Hospital, Karol Bagh

Ram Manohar Lohia Hospital, Talkatora Road

U.K. Nursing Home, Moti Nagar

APPENDIX 2
FACILITY QUESTIONNAIRE

Name of Interviewer:_____

Name of Supervisor:_____

Questionnaire Number:_____

Date of Interview:_____ Start Time:_____

City: Delhi

Facility Code: (enter two-digit code here)_____

Type of Facility: (check one)

Private:_____

Public:_____

Who responded to questions?_____

_____

QUESTIONNAIRE VERIFICATION (Check one)

_____ Questionnaire partially completed; interview unfinished.

_____ Questionnaire completed; interview finished.

_____ Unable to complete questionnaire; explanation:

_____ Administrator refused to participate in interview; interview ended.

Initials of Interviewer:_____ Date: _____

End time:_____

Initials of Supervisor:_____ Date: _____

DATA ENTRY VERIFICATION

Name of data entry person:_____

Name of data entry supervisor:_____

_____ Data entry completed

_____ Data entry reviewed

_____ Approved by supervisor

_____ Data entry not completed; to be completed later

_____ Data entry not completed; impossible to complete;

EXPLANATION:_____

_____

_____

Initials of Supervisor:_____ Date_____

(To be signed after having reviewed and approved data entry)

OBSERVATIONS:_____

_____

_____

_____

_____

A. STAFF AND DEPARTMENTS

1. Number of Physicians: (also complete ***Exhibit A-1***)

General Duty Medical Officer: _____

Resident: _____

Specialist: _____

Consultant: _____

Sub-total: (a) _____

Nurses: (b) _____

Paramedical Staff:(c) _____

Total:(a + b + c) _____

EXHIBIT A-1 NUMBER OF PHYSICIANS				
DEPARTMENT	GDMO	RESIDENT	SPECIALIST	CONSULTANT
MEDICINE				
SURGERY				
GYNECOLOGY				
PEDIATRICS				
EYE				
E.N.T.				
CHEST				
OTHERS				

B. UTILIZATION

OUT-PATIENTS DEPARTMENT

1. Days functioning:_____ Hours: _____

2. Number of outpatient visits recorded in July 1993: _____
(complete ***Exhibit A-2*** by department to the extent possible)

EXHIBIT A-2 OUTPATIENT VISITS (DEPARTMENT)	
DEPARTMENT	NUMBER OF OUT-PATIENTS
MEDICINE	
SURGERY	
GYNECOLOGY	
PEDIATRICS	
EYE	
E.N.T.	
CHEST	
OTHERS	

3. Physicians on duty (complete ***Exhibit A-3***)

EXHIBIT A-3 PHYSICIANS ON DUTY			
PHYSICIANS	NUMBER	DAYS IN WEEK	HOURS IN DAY
GDMO			
RESIDENT			
SPECIALIST			
CONSULTANT			

IN-PATIENT SERVICES

1. Departmental treatment episodes and charges (complete **Exhibit A-4**)

EXHIBIT A-4 UTILIZATION OF SERVICES			
DEPARTMENT	TREATMENT	# EPISODES	AVERAGE PRICE CHARGED
GYNECOLOGY	DELIVERY		
	D&C		
	CAESARIAN SECTION		
	HYSTERECTOMY		
PEDIATRICS			
SURGERY	HERNIA		
	ABSCESS		
	KIDNEY STONES		
	LIPOMA		
	APPENDECTOMY		
	GOITER		
MEDICINE			
ORTHOPEDICS	FRACTURES		
EYE	CATARACT		
	DETACHED RETINA		
E.N.T.	POLYP REMOVAL		
	TONSILLECTOMY		
	TYMPANOPLASTY		
CHEST			

2. Number of beds (complete ***Exhibit A-5***)

EXHIBIT A-5 NUMBER OF BEDS			
DEPARTMENT	FREE BEDS	PAY BEDS	TOTAL BEDS
MEDICINE			
SURGERY			
GYNECOLOGY			
PEDIATRICS			
EYE			
E.N.T.			
CHEST			
OTHERS			

GENERAL

1. Does the facility have an in-house pharmacy? YES/NO_____
2. Does the facility have its own pathology lab? YES/NO_____
3. Does the facility have its own radiology lab? YES/NO_____
4. Does the facility have its own waste-disposal system? YES/NO_____
5. Does the facility have its own backup power supply? YES/NO_____

C. FREE CARE AND PAYMENT SYSTEMS

1. Does this hospital give free care to any of its patients? YES/NO_____

2. If YES, which category?

   Accident Cases _____

   Low-Income Patients _____

   Others (please specify) _____

3. How many free care OPD patients did this hospital see in July 1993? _____

4. What was the expenditure in July 1993 on free care patients?_____

D. SALARIES

1. What is the salary scale as of July 1993 (minimum of scale):

GDMO doctors: _____

Resident doctor: _____

Specialist: _____

Consultant: _____

2. What is the value of perquisites:

HRA: _____

Conveyance: _____

Allowance: _____

Other: _____

3. Do you pay special allowances to your doctors in lieu of private practice?

Yes _____ No _____

4. If yes, how much paid last month?

_____

APPENDIX 3
PHYSICIAN QUESTIONNAIRE

Name of Interviewer:_____

Name of Supervisor:_____

Questionnaire Number:_____

Date of Interview: _____ Start Time: _____

City: _____Delhi_____

Physician Code: (enter three-digit code here) _____

Facility where interviewed: (check one)

Private: _____

Public: _____

QUESTIONNAIRE VERIFICATION (check one)

_____ Questionnaire partially completed; interview unfinished

_____ Questionnaire completed; interview finished

_____ Unable to complete questionnaire; explanation:_____

_____

_____ Respondent refused to participate in interview; interview ended.

Initials of Interviewer: _____Date:_____

End time:_____

Initials of Supervisor: _____Date:_____

DATA ENTRY VERIFICATION

Name of data entry person: _____

Name of data entry supervisor: _____

_____ Data entry completed

_____ Data entry reviewed

_____ Approved by supervisor

_____ Data entry not completed; to be completed later

_____ Data entry not completed; impossible to complete.

Explanation: _____

_____

Date: _____

Initials of supervisor: _____Date: _____

(To be signed after having reviewed and approved data entry)

Observations:

_____

_____

_____

_____

_____

A. GENERAL

1. What is your age? _____

2. How many dependents do you have? _____

(Interviewer: remind the respondent that dependents include spouse, children under 21, and parents that depend on the physician's income)

3. Where do you work?

JOB 1:_____HOURS:_____

JOB 2:_____HOURS:_____

JOB 3:_____HOURS:_____

(Interviewer: call the job where maximum hours are spent "primary employment"; call the job with the second-highest hours "secondary employment")

4. For how long have you been working in:

JOB 1:_____YEARS:_____

JOB 2:_____YEARS:_____

JOB 3:_____YEARS:_____

5. What is your specialization?_____

6. Check all the degrees/certificates/diplomas that apply:

(a) MBBS_____

(b) MD/MRCP_____

(c) DM_____

(d) DGO_____

(e) DCH_____

(f) DTM_____

(g) DCD_____

(h) MS/FRCS_____

(i) DS_____

(j) Other_____

B. CHARACTERISTICS OF PRIMARY OCCUPATION

(Interviewer: these questions are to be addressed regarding a physician's public sector occupation)

1. Name of the facility:_____

   Public_____ Private_____

2. Why do you work in that facility?
   (Interviewer: ask the physician to rank the following between 1 and 10, giving a rank of 1 to the most important reason)

   High Salary:_____

   Attractive Perks (housing, etc.):_____

   Job Security:_____

   Status:_____

   Exposure to a Large Number of Patients:_____

   Better Opportunity of Serving the Community:_____

   Availability of Latest Equipment:_____

   Other Reasons (please specify):_____

   _____

3. How many patients do you see in an hour in your primary employment?
   (Interviewer: try to obtain an exact figure; if not try the following ranges)

   Less than four_____

   Five_____

   Seven_____

   Nine_____

   More than ten_____

4. How many patients did you see yesterday?_____

5. What is your gross annual salary from your primary employment?_____

C. CHARACTERISTICS OF PRIMARY OCCUPATION

(Interviewer: please note that these questions are to be addressed to the physician regarding her private practice)

1. How long have you been in practice here? (Enter number of years)_____

2. What are your working hours?

   Starting time_____

   Closing time_____

3. How much do you charge a patient when he visits you?_____

4. What services are included in this charge?

   Clinical Examination_____

   Pathological Examination_____

   Radiological Examination_____

   Medicines and Drugs_____

   Others (please specify)_____

   _____

   (Interviewer: multiple responses are permitted)

4. Do you have different types of charges for different types of visits?

   No _____ Yes_____

5. If yes, what are they?

   First visit: _____

   Follow-up visit 1: _____

   Follow-up visit 2: _____

6. How many patients do you see in an hour?

(Interviewer: try to obtain an exact figure; if impossible try the following ranges):

Less than four_____

More than four but less than six_____

More than six but less than eight_____ _____

More than eight but less than ten_____

More than ten_____ _____

7. How many patients did you see yesterday?_____

8. Do you give free care to any of your patients?

Yes_____ No_____

9. If yes, which category?

Accident Cases_____

Low-Income Patients_____

Others (please specify)_____

_____

10. What is your gross annual earnings from this clinic?_____

(Interviewer: try to get an exact figure; if unable to do so, try to obtain the response in as small a range as possible)

11. Do you have any contractual arrangements with any business houses or insurance companies?

Yes _____ No_____

12. Number of insured patients served last month:_____

_____

13. Are there other doctors/nurses working in your clinic?

Yes _____ No_____

(Interviewer: if the answer is yes, complete both *Exhibits A-6 and A-7*)

EXHIBIT A-6 STAFFING PATTERN: PHYSICIANS			
SPECIALTY	NUMBER	TRAINING	REMUNERATION

EXHIBIT A-7 STAFFING PATTERN: NURSES			
SPECIALTY	NUMBER	TRAINING	REMUNERATION

D. TIME-MOTION RECORDS

(Interviewer: this is to be recorded in the physician's chamber, in the presence of the physician and patient. Please make records available to the physician, needed.)

PHYSICIAN ID#: _____ DATE: _____

Time the patient entered the chamber: _____

Time the patient left the chamber: _____

TOTAL TIME SPENT WITH PATIENT: _____

OBSERVATIONS:

1. Did the physician greet the patient? YES/NO_____

2. Did the physician take the patient's pulse or use a thermometer, or any other instrument? YES/NO_____

3. Did the physician ask questions regarding the patient's symptoms? YES/NO_____

4. Was the physician polite? YES/NO_____

5. Was the patient polite? YES/NO_____

6. Was the physician talking to someone else at the time of examining the patient? YES/NO_____

7. Was any payment made to the physician? YES/NO_____

GENERAL COMMENTS:

_____

_____

_____

_____

APPENDIX 4

QUESTIONNAIRE FOR OUTPATIENT DEMAND FOR HEALTH CARE

FACILITY:

Type of Facility:_____

Private_____

Public_____

Name of Interviewer:_____

Name of Supervisor:_____

Questionnaire Number:_____Date of Interview:_____

Start Time:_____End Time:_____

Who responded to questions and why?

_____ Patient

_____ Person accompanying patient; _____ patient was a child

_____ Person accompanying patient; _____ patient was too sick to respond

QUESTIONNAIRE VERIFICATION

_____ Questionnaire partially completed; interview not finished

_____ Questionnaire completed; interview finished

_____ Unable to complete questionnaire; explanation:_____

_____ Outpatient refused to participate in interview; interview ended.

Signature of Interviewer _____ Date_____

Signature of Supervisor _____ Date_____

Time ended _____

DATA ENTRY VERIFICATION

Name of data entry person_____

Name of supervisor_____

_____ Data entry completed.

_____ Data entry reviewed

_____ Approved by supervisor

_____ Data entry not completed; to be completed later

_____ Data entry not completed; ____ impossible to complete. Explain:

_____

_____

_____

Signature of supervisor_____

Date_____

(To be signed after having reviewed and approved data entry)

OBSERVATIONS:

_____

_____

_____

_____

(ALL QUESTIONS MUST BE DIRECTED TO THE OUTPATIENT OR PERSON ACCOMPANYING THE PATIENT IF PATIENT IS A CHILD OR IS VERY SICK AND CANNOT TALK. IN THIS CASE, INTERVIEWER SHOULD SUBSTITUTE "THE PATIENT" FOR "YOU")

A: PATIENT AND HOUSEHOLD IDENTIFICATION

1. WHAT IS YOUR AGE?
   1. 0 - 5 _____
   2. 6 - 14 _____
   3. 15 - 29 _____
   4. 30 - 45 _____
   5. 45 + _____

2. SEX:
   1. Male _____
   2. Female _____

3. DID SOMEBODY ACCOMPANY YOU TO THIS FACILITY?
   1. Yes, one person _____
   2. Yes, more than one person _____
   3. No _____

4. DO YOU HAVE A RELATIVE OR FRIEND WHO WORKS AT THIS FACILITY?
   1. Yes, a relative _____
   2. Yes, a friend _____
   3. No _____

5. WHAT IS YOUR RELATIONSHIP TO THE HEAD OF HOUSEHOLD?
   1. The patient is the head of household _____
   2. Spouse _____
   3. Child _____
   4. Other (specify) _____

6. WHAT IS YOUR MARITAL STATUS?
   1. Single _____
   2. Married _____
   3. Divorced _____
   4. Widowed _____
   5. No response _____

7. HOW MANY CHILDREN DO YOU HAVE?
   1. 0 _____
   2. 1 - 4 _____
   3. 4 + _____
   4. No Response _____

8. HOW MANY ADULTS LIVE IN YOUR HOUSEHOLD? _____

9. WHAT IS YOUR RELIGION?
   1. Hindu _____
   2. Muslim _____
   3. Sikh _____
   4. Christian _____
   5. Other (specify)_____

B: SOCIOECONOMIC STATUS

10. WHAT IS THE PRINCIPAL OCCUPATION OF THE HEAD OF HOUSEHOLD?
   1. Merchant_____
   2. Government Employee (other than military)_____
   3. Military_____
   4. Employee of Private Company_____
   5. Student_____
   6. Unemployed_____
   7. Other _____ (specify)_____

(INTERVIEWER: IF THE PATIENT OR RESPONDENT IS THE HEAD OF HOUSEHOLD, SKIP THE FOLLOWING QUESTION)

11. WHAT IS YOUR PRINCIPAL OCCUPATION?
   1. Merchant_____
   2. Government Employee (other than military)_____
   3. Military_____
   4. Employee of Private Company_____
   5. Student_____
   6. Unemployed_____
   7. Other _____ (specify)_____

12. WHAT IS THE EDUCATION LEVEL OF THE HEAD OF HOUSEHOLD?
   1. Some primary school_____
   2. Completed primary school_____
   3. High school (some or completed)_____
   4. University (some or completed)_____
   5. Never went to school_____

13. CAN THE HEAD OF HOUSEHOLD READ AND WRITE?
   1. Yes_____
   2. No_____
   3. No response_____

(INTERVIEWER: IF THE PATIENT OR RESPONDENT IS THE HEAD OF HOUSEHOLD, SKIP THE FOLLOWING TWO QUESTIONS)

(IF THE PATIENT IS AN ADULT, ASK WHAT HIS / HER EDUCATION LEVEL IS. IF THE PATIENT IS A CHILD, ASK WHAT HIS /HER MOTHER'S EDUCATION LEVEL IS)

14. WHAT IS YOUR (THE PATIENT'S MOTHER'S) EDUCATION LEVEL?
   1. Some primary school_____
   2. Completed primary school_____
   3. High school (some or completed)_____
   4. University (some or completed)_____
   5. Never went to school_____

15. CAN YOU (THE PATIENT'S MOTHER) READ AND WRITE?
    1. Yes_____
    2. No_____
    3. No response_____

16. DO YOU CONSIDER YOUR HOUSEHOLD INCOME STATUS
    1. High_____
    2. Middle_____
    3. Low_____
    4. Don't Know_____

17. WHAT WAS THE TOTAL HOUSEHOLD INCOME LAST MONTH?
    1. _____
    2. Don't Know_____

18. WHAT IS THE TOTAL INCOME OF YOUR HOUSEHOLD PER MONTH?
    1. _____
    2. Don't Know_____

19. HOW OFTEN DOES THE HEAD OF HOUSEHOLD RECEIVE INCOME?
    1. Daily_____
    2. Weekly_____
    3. Monthly_____
    4. Piecemeal / Per job_____
    5. Other (specify)_____

C. ILLNESS

20. WHY DID YOU SEEK MEDICAL CARE?
    1. To consult a provider (specify)_____
    2. To do lab tests_____
    3. To have a medical examination_____
    4. Other (specify)_____
    5. No response_____

(INTERVIEWER: FOR THE FOLLOWING QUESTION, PUT A STAR (*) NEXT TO THE PRINCIPAL SYMPTOM AND CIRCLE ANY OTHER RESPONSES)

21. WHAT IS THE MAIN SYMPTOM YOU HAVE?_____
    DO YOU HAVE ANY OTHER SYMPTOMS? _____
    1. Fever_____
    2. Diarrhea_____
    3. Weakness_____
    4. Headache_____
    5. Stomachache_____
    6. Sore throat_____
    7. Other (specify)_____

22. WHEN DID YOUR SYMPTOMS START?
    1. ____ days ago
    2. Don't know_____

23. DO YOU (PATIENT OR PARENT) CONTINUE TO EARN YOUR REGULAR INCOME DURING THE PRESENT ILLNESS?
    1. Yes_____
    2. No_____

24. HOW LONG AGO WAS YOUR PRINCIPAL ACTIVITY INTERRUPTED?
    1. ____ days ago
    2. Don't know_____

D. SERVICES RECEIVED AND CHOICE OF PROVIDER

(INTERVIEWER: FOR THE FOLLOWING QUESTION, PUT A STAR (*) NEXT TO THE PRINCIPAL REASON AND CIRCLE ANY OTHER RESPONSES.)

25. WHY DID YOU CHOSE THIS FACILITY?
    1. Normally come here_____
    2. Low price_____
    3. Capable personnel_____
    4. Availability of drugs and supplies_____
    5. Short waiting time_____
    6. Religious or traditional reasons_____
    7. Close to home_____
    8. Other (specify) _____

26. WHAT SERVICES DID YOU RECEIVE? (multiple responses allowed)
    1. Consultation_____
    2. Drugs_____
    3. Lab test_____
    4. Radiology (X-ray)_____
    5. Surgery_____
    6. Dental care_____
    7. Emergency care_____
    8. Other (specify)_____

27. WERE YOU GIVEN DRUGS OR A PRESCRIPTION?
    1. Drugs_____
    2. Prescription_____
    3. Drugs + prescription_____
    4. Neither_____

28. IS THIS YOUR FIRST VISIT TO THIS FACILITY DURING THIS ILLNESS?
    1. Yes_____
    2. No_____

(INTERVIEWER: IF NO, SKIP THE FOLLOWING QUESTION; OTHERWISE CONTINUE)

29. HOW MANY PREVIOUS VISITS HAVE YOU MADE TO THIS FACILITY?_____

30. DO YOU EXPECT TO VISIT THIS FACILITY AGAIN DURING THIS ILLNESS?
   1. No_____
   2. Yes, once_____
   3. Yes, more than once_____

31. HOW FAR IS THIS FACILITY FROM YOUR HOME?_____km

32. WHAT MEANS OF TRANSPORTATION DID YOU USE TO GET TO THIS FACILITY?
   1. By foot_____
   2. Personal car_____
   3. Bus_____
   4. Taxi_____
   5. Bicycle or motorcycle_____
   6. Other (specify) _____

33. HOW LONG DID IT TAKE YOU TO GET TO THE FACILITY?
   1. ____ Hours
   2. ____ Minutes

34. HOW MANY PEOPLE ACCOMPANIED YOU?
   1. None_____
   2. _____

35. HOW MUCH DOES ROUND TRIP TRANSPORTATION TO THIS FACILITY COST?
   1. ____ Rs. per person
   2. ____ Rs. for the group

36. DID YOU OR THE PEOPLE ACCOMPANYING YOU HAVE TO STAY NEARBY OVERNIGHT WHILE WAITING TO RECEIVE CARE?
   1. Yes_____
   2. No_____

37. HOW MUCH DID YOU AND THE PEOPLE ACCOMPANYING YOU SPEND FOR FOOD AND LODGING WHILE WAITING TO RECEIVE CARE?
   1. _____
   2. Nothing_____
   3. No response_____

38. ARE THERE OTHER FACILITIES YOU CAN USE IN CASE OF ILLNESS?
   1. Yes_____
   2. No_____

39. WHICH PROVIDERS HAVE YOU VISITED PREVIOUSLY DURING THIS ILLNESS?
   (Multiple responses allowed)
   1. Pharmacy (specify name) _____
   2. Hospital (specify name) _____
   3. Clinic (specify name) _____
   4. Traditional healer_____
   5. Other _____
   6. None _____

40. HOW MUCH DID YOU SPEND FOR TREATMENT FROM OTHER PROVIDERS?_____

41. HOW MUCH DID YOU SPEND ON TRANSPORT TO OTHER PROVIDERS?_____

E. PATIENT SATISFACTION

42. OVERALL, HOW SATISFIED ARE YOU WITH THE SERVICES YOU RECEIVED TODAY?
    1. Very satisfied_____
    2. Satisfied_____
    3. Somewhat satisfied_____
    4. Dissatisfied_____

43. WHAT ASPECTS OF THIS FACILITY DID YOU LIKE? (Multiple responses)
    1. Availability of drugs_____
    2. Cleanliness of facility_____
    3. Availability of equipment_____
    4. Quality of personnel_____
    5. Other _____

44. WHAT ASPECTS OF THIS FACILITY DID YOU DISLIKE? (Multiple responses)
    1. _____
    2. _____
    3. _____
    4. _____

45. UPON ARRIVAL, HOW LONG DID YOU HAVE TO WAIT TO RECEIVE CARE?
    1. _____ minutes
    2. _____ hours
    3. Don't know _____

46. DID YOU RECEIVE THE SERVICES YOU NEEDED?
    1. Yes_____
    2. Some_____
    3. No_____
    4. Not sure _____

47. WHO WAS THE PRINCIPAL CAREGIVER?_____

48. HOW MUCH TIME DID HE / SHE SPEND WITH YOU?_____minutes

49. WHAT OTHER MEDICAL PERSONNEL DID YOU SEE? (See box)

50. DID THEY SEEM KNOWLEDGEABLE? (See box)

CAREGIVERS' / KNOWLEDGEABILITY					
√		VKN	KN	SKN	NKN
	1. Doctor				
	2. Medical Assistant				
	3. Nurse				
	4. Midwife				
	5. Pharmacist				
	6. Other				
	7. Other				
	8. Other				

VKN = Very Knowledgeable
KN = Knowledgeable
SKN = Somewhat Knowledgeable
NKN = Not Knowledgeable

51. DID THE PRINCIPAL CAREGIVER ASK ADDITIONAL QUESTIONS ABOUT YOUR SYMPTOMS?
    1. Yes_____
    2. No_____

52. DID THE PRINCIPAL CAREGIVER CHECK YOUR TEMPERATURE BY TOUCHING YOU OR USING A THERMOMETER?
    1. Yes_____
    2. No_____

53. DID THE PRINCIPAL CAREGIVER TAKE YOUR PULSE?
    1. Yes_____
    2. No_____

54. DID THE PRINCIPAL CAREGIVER GREET YOU WHEN HE / SHE FIRST SAW YOU?
    1. Yes_____
    2. No_____

55. WAS THE PRINCIPAL CAREGIVER POLITE?
    1. Yes_____
    2. No_____

56. ARE THE DOSES AND FREQUENCIES OF MEDICINES GIVEN OR PRESCRIBED TO THE PATIENT CLEARLY INDICATED?
   1. Yes_____
   2. No_____

57. DOES THE PATIENT KNOW THE DOSE AND FREQUENCY OF MEDICINES TO BE CONSUMED? (Ask about the dose/frequency and check against the prescription)
   1. Yes_____
   2. No_____

F. PAYMENT SYSTEM

58. HOW MUCH DID YOU PAY TODAY FOR SERVICES?
   1. _____
   2. Did not pay_____
   3. Does not know_____

(Interviewer: Skip the next question if no payment was made)

59. WHO DID YOU PAY? (Multiple responses allowed)
   1. Accountant_____
   2. Provider of service_____
   3. Other (specify) _____
   4. Does not know _____

60. DO YOU HAVE PRIVATE HEALTH INSURANCE?
   1. Yes_____
   2. No_____

APPENDIX 5

DERIVATION OF THE COVARIANCE MATRIX FOR THE HAUSMAN TEST

Let b_1 and b_2 be the two estimators computed under the two different sets of assumptions about the instruments. Since these estimators need not be efficient, we need to compute the $var(b_1-b_2)$, for which we require $V(b_1)$, $V(b_2)$, and $Cov(b_1,b_2)$.

Define M_i to be the projection matrix

$$M_i = I - Z_i(Z_i'Z_i)^{-1}Z_i'$$

Then the variance of b_1 can be written as

$$V(b_1) = (X' \cdot M_1 M_1 X)^{-1}(X' \cdot M_1)(M_1 u)$$

from which it follows that

$$\begin{vmatrix} V(b_1) & Cov(b_1,b_2) \\ Cov(b_1,b_2) & V(b_2) \end{vmatrix} = A^{-1}BCB' \cdot A^{-1}$$

where

$$A = \begin{vmatrix} X' \cdot Z_1'(Z_1'Z_1)^{-1}Z_1'X & 0 \\ 0 & X' \cdot Z_2(Z_2'Z_2)^{-1}Z_2'X \end{vmatrix}$$

and

$$B = \begin{vmatrix} X' Z_1 (Z_1' Z_1)^{-1} & 0 \\ 0 & X' Z_2 (Z_2' Z_2)^{-1} \end{vmatrix}$$

and

$$C = \sum_{i=1}^{N*} \begin{vmatrix} Z_{1i} Z_{1i}' \hat{u}_{1i}^2 & Z_{1i} Z_{2i}' \hat{u}_{1i} \hat{u}_{2i} \\ Z_{2i} Z_{1i}' \hat{u}_{1i} \hat{u}_{2i} & Z_{2i} Z_{2i}' \hat{u}_{2i}^2 \end{vmatrix}$$

where X is a matrix (N* by k) of explanatory variables, Z_1 and Z_2 are instrumental variables set, with dimension N* by k_1 and N* by k_2 respectively, Z_{ji} is a vector of the ith observation's instruments variables in the jth set, and u_{ji} is the ith observation in the jth equation.

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