5. Physician Production of Patient Care – The Literature

In this chapter, the extensive literature on public/private health care provision in LMI and transition countries provides an understanding of the financial incentives facing private physicians. A review of the medical services production function literature further informs the development of the model of physician performance.

PRIVATE HEALTH CARE PROVISION

Nearly all lower and middle income countries allow private health care provision to varying extents. Private sectors in some countries are very limited, like Papua New Guinea, where only 18% of all doctors are in private practice (Kolehmainen-Aitken, 1990). Others have a more mixed systems like the Czech Republic with 50% of all doctors in private practice (Healy and McKee, 1997) and India where, in 1988, 49% of all outpatient clinics were privately owned (Bhat, 1993). Private sector provision often consumes disproportionately more of the total health spending than the public sector. For example, while private doctors in 1988 accounted for 17.8% of all physicians in Thailand, private spending on private facilities was 46% of total household expenditures on health in 1988 (Nitayaramphong and Tangcharaaoensathien, 1994). Also, in 1987 25% of South Africa’s population received care from private providers accounting for over 43% of total national health expenditures (Broomberg et al., 1990).

While the structure and spending on private sector health provision varies, what is common to all these countries is that there is no strategic policy for private sector development and private sector provision is poorly integrated into national health systems (Bennet et al., 1994, Newbrander, 1997). One of the major barriers to coherent, effective policy is simply that very little is often known about the characteristics of the private sector and its performance that could be used to structure effective policies (Newbrander, 1997). CEE reformers face this situation. Only very limited studies of market forces in health care provision have been undertaken in the past (Semenov et al., 1996). Most market-oriented health care reforms are pressing ahead with little information on how private providers perform in transition economies. Likewise, the Government of Macedonia and the World Bank are committing to
further privatization and introduction of market forces in health care provision. The present study is unusual in this regard: it seeks to inform the public/private debate and help develop privatization policies appropriate for Macedonia.

**The Public/Private Debate**

The neo-classical economic argument in favor of private provision of health care is clear. Introducing a profit motive encourages providers to become more efficient in their use of resources as they bear financial risk for their decisions. Furthermore, competition between private providers leads to higher overall quality as doctors strive to attract and keep patients. The advantage to national insurance systems of private provision is that it leverages private resources to reduce the burden on publicly funded care. As well known are the market failures in health care and the case for government intervention.

Health care provision exists in an imperfect market. Information asymmetries between doctor and patient can result in supplier induced demand whereby doctors overprovide services to satisfy patients and raise their own income. Resulting losses in efficiency and quality require regulatory intervention. Health care markets provide both public goods and private merit goods, both of which may be under-produced by private providers, largely since individuals have inadequate incentives to pay for or consume them. Additional concern arises when access to services is based on patients ability to pay; poor patients may receive lower quantity and quality of health care or not have access to care at all. Governments typically intervene to correct such market failures with a variety of mechanisms including free or low-cost state-provided public health goods and financial or other incentives to private doctors for provision of public and merit goods.

These issues take on special importance in low- and middle-income economies as they have limited resources and often have higher public health burdens than richer countries (Chernicovsky, 1995). Countries of CEE also do not want to sacrifice otherwise adequate provision of some public goods via the existing state-run health system. An additional concern is the effect the private sector may have on human resources in the public sector. Public sector pay in poor countries and those transitioning to market systems is often fixed by government policy at very low levels relative to the private sector. This pay gap may
draw doctors into the private sector, leaving public clinics understaffed or staffed with less qualified doctors. Equity is also a concern if private doctors seek higher incomes by providing only discretionary care or locating only in urban areas.

With such clear theoretical distinctions between public and private health care provision, much of the extensive literature is cast in terms of which sector is “better”. (World Bank 1996; World Bank 1993; Cichon, 1991; Griffin, 1989). Reality of course is complex; in certain situations public sector provision can be more efficient than private care (Bennet 1991; Broomberg et al. 1990); private physicians do provide public goods such as family planning and childhood immunizations (Berman and Rose, 1996; Leopando, 1988); and, private clinics do provide care to the poor and sometimes are the only source of care in urban slums (Thaver et al., 1998; Yesudian, 1991; Akin et al., 1985).

**Private Provider Performance**

Considering the ambiguities of the effects of private provision, Rice (1998) suggests that the benefits of health care privatization should be studied empirically. Unfortunately, the supply-side has received little rigorous study in low and middle income countries in contrast to the extensive body of demand-side research in developing countries (see for example, Peabody et al., 1999). As the Macedonian government and the World Bank, and more broadly other transition countries, seek to privatize health care provision, what are the key concerns about the performance of private care? In this section I review the key dimensions used to evaluate private provision in low and middle income countries, using this as a basis to develop a model of physician performance. The literature consistently cites three key features of health care provision to evaluate the relative advantages of public and private providers:

1. shift of physicians from public sector to private practice
2. quality of care
3. efficiency in producing services

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1 Induced demand among private providers is also commonly noted in developing countries. However, even with rich datasets from developed countries, it is a notoriously difficult issue to study (cites, e.g., Pauly and Rice)
These are prominent and recurring issues in health care research in low and middle income countries. However, their application and results of evaluations using measures based on these variables show great divergence. Much of this can be attributed to the difficulties of research in poor and transition countries. Lack of high quality data are common to all areas of research in such countries (World Bank, 1996 and 1993; OECD, 1991; Caiden and Wildavsky, 1974). Additionally, research contexts vary widely. Research settings in rural areas, urban areas, in countries with a heritage of central planning, or in those with decentralized service structures make comparisons across studies difficult and can limit generalizability. Finally, there is disagreement on which measures to use and only in a few areas, such as equity and structural quality measures, is there consistency across studies.

**Private Physician Supply and Market Entry** Most CEE countries have oversupplies of physicians (Healy and McKee, 1997; Borrisov and Rathwell, 1996; Field, 1985). Coupled with the much higher potential incomes in private practice, this gives rise to two related concerns about the development of private sector provision; 1) location and number of private providers and, 2) attrition of highly skilled physicians from the public sector.

Theory and logic suggest that physicians will locate in areas offering a high quality of life and large patient pools (Rice, 1998). This is generally confirmed by the extensive empirical literature on the geographical distribution of physicians in both rich and poor countries (Hanson and Berman, 1998; Chang and Halfon, 1997; Krishnan, 1997; Olubuyide, 1995; Chiang, 1995; Blumenthal, 1994; Williams et al., 1983; Newhouse et al., 1982a; Schwartz, et al, 1980). There is general agreement among studies that the number of physicians depends strongly on population. Other factors often cited include urbanicity, income, and population education level (Hanson and Berman, 1998; Blumenthal, 1994). However, others have found that private clinics are the only source of care in Indian urban slums (Garner and Thaver, 1993).

At the level of the individual physician, there is concern that more qualified doctors may be drawn by higher potential income to the private sector, leaving the public sector with a higher proportion of younger or less skilled physicians (Healy and McKee, 1997; Berman, 1997; Bennet, 1992). This, however, has not been studied systematically, as there has been little
data available on the characteristics of physicians who enter private practice. One study of the private sector in Thailand provides some evidence of factors encouraging physicians to leave the public sector (Nittayaramphong and Tangcharoensathien, 1994). Low morale in public clinics and a pay differential of up to 700% boosted the size of the private sector from 9.6% to 17.8% of all physicians between 1986 and 1989. There is no information on the relative qualifications of the group that entered private practice.

**Quality** Until recently, quality of care assessments have been a low priority in LMI countries due primarily to greater priorities on increasing coverage and difficulties encountered with inadequate information and poor management information systems (Reerink and Sauerborn, 1996). As a result, there is disagreement in the available literature concerning measures of quality of care (DeGeynt, 1995). Furthermore, few studies include private for-profit providers and hence there is little quantitative support for the claim of higher quality of private care. One common feature though, is the use of the standard framework for measuring quality of health care provision. Use of structural, process and outcome dimensions of quality have been reviewed extensively (Donabedian, 1982; DeGeynt, 1995) and I follow that taxonomy here.

*Structural quality.* These measures include the personnel and facilities used to provide care and their organization. The main advantage to structural measures is the ease with which they are obtained and are quite common in LMI country research (DeGeynt, 1995). Structural quality is not sufficient for better health outcomes, but good structural quality is considered necessary for effective care since it is important to patients’ care seeking decisions. That is, patients make care-seeking decisions, in part, on observable features of clinics using these as proxies for process quality (due to lack of an ability to assess process quality) and as predictors of outcome quality. Structural measures are also useful in public private evaluations since these are features that physician/owners can easily manipulate to attract patients (Alderman and Lavy, 1996).

In Ghana, Lavy and Germain (1994) found that structural measures such as number of staff, availability of medications and lab equipment, and facility infrastructure are important determinants of patient satisfaction and demand. Others have augmented staffing level
measures with measures of staff training finding that private mission-sponsored clinics in Gambia tend to have more and better trained staff, which the authors credit in part for higher utilization at these clinics (Fabricant and Newbrander, 1997). Conversely, investigations of qualifications and number of staff in India and Thailand have found that private clinics score lower than public clinics (Yesudian, 1993; Nitayaramphong and Tangcharoensathien, 1994).

Medicine availability was also used as a structural quality measure in a study of utilization in Kenya (Mwabu, 1995). They noted that such measures can be unreliable as quality measures since better clinics that attract a large number of patients may suffer from depleted pharmaceutical stocks. Service availability may be better in this regard as these cannot be depleted, though these measure are seldom used in LMI country research. Exceptions include availability of immunizations in private clinics in the Philippines (Leopando, 1988) and hours that clinics remain open for business (Griffin, 1989).

Process quality. These measures evaluate what providers do with patients, and comprise both technical and interpersonal aspects of care provision (Donabedian, 1982). From an economic perspective, process quality measures, thus defined, are measures of physician skill. Process measures are used less frequently than structural measures reflecting difficulties in LMI country research (DeGeynt, 1995). Process quality measures typically entail one of three general methods: written case simulations (vignettes); simulated clients; and observed patient-physician consultations (Peabody et al., 2000).

Thaver et al. (1998) administered vignettes of four minor acute conditions to private practitioners in Karachi to gauge quality of care. Vignette scores were also compared to direct observation. Physicians scored well on vignette diagnosis, but poorly on treatment and advising. Performance in actual interactions with patients was lower, indicating that physician vignette scores did not correlate highly with improved practice, especially in prescribing behavior. Madden et al. (1997) reviewed the use of simulated clients (actors or confederates with true conditions) to evaluate the care given to patients in LMI countries. Of 23 published studies from 1970 to 1994, only two studies surveyed physicians in clinical settings. Both used simulated patients with cold symptoms or sore throats to investigate elements of the consultation; history-taking, physical exam, lab work, prescribing behavior
and other treatments given. One of these two studies compared physician performance with simulated clients to previously administered written exams for similar conditions. Similar to results of Thaver et al. (1998), exam scores were higher than actual performance with simulated clients. Tracer conditions were used in a study of community clinics in Ghana that directly observed physician consultations with patients with cough, diarrhea, or fever (Amonoo-Lartson, 1981). Elements of the care process that were measured included history taking, physical examination, treatment provided and prescriptions written. Performance, evaluated against criteria established by a panel of local doctors, was shown to generally meet expectations.

**Outcome quality.** Outcome quality measures attempt to detect changes in health status due to health care received. Outcome measures for specific interventions are easily defined; for example 5-year survival rates are commonly reported for major interventions such as new cancer treatments. As a general comparison between providers, outcome measures are problematic. Health status depends on many factors including lifestyle, education, income, household and community characteristics, in addition to health care services. Their use has also been limited in LMI countries (DeGeynt, 1995). Exceptions to this employ measurements of children, where observation periods can be shorter. In a study of birth outcomes in Jamaican clinics, Peabody et al. (1996) examined the relationship between birth weight and measures of structural and process quality. They found that process measures, such as examinations and counseling, had positive effects on birth outcomes. Structural measures had no significant effect. In an evaluation of quality of care in Ghanaian clinics, Lavy et al. (1994) used child height and weight as outcome measures.

**Efficiency** Efficiency is problematic to define and difficult to measure in primary health care provision. Furthermore, advocates of PHC and private provision use different definitions of efficiency. Primary health care is promoted as improving the efficiency of health systems by shifting patients from more expensive secondary care to the less costly and more effective primary care setting (Goldzweig et al., 1997; Saltman and Figueras, 1997), thus alluding to allocative efficiency. Private provision of health care, on the other hand, is promoted as improving incentives to providers in their use of resources, thus implying technical (productive) efficiency.
When we consider the productive efficiency of providers problems arise in defining outputs and input measures. In certain situations, it may be adequate to define efficiency without reference to quality. This is often done in reporting aggregate measures of public and private sector performance at the national level of financial inputs and patients served. For instance, payments to the South African private health care sector in 1987 accounted 43.6% of total health expenditures while that sector treated less than 25% of the total population (Broomberg et al., 1990). Contrasting this at the facility level, Smith (1980) reported that public hospitals in Lesotho operated at a cost per patient three times that of private hospitals. Disparities in aggregate per capita cost are typically attributed to either induced demand in the private sector or inefficiencies in the public sector (e.g., Broomberg et al., 1994; Griffin, 1989; Gilson and Mills, 1995; Nittayaramphong and Tangcharaoensathien, 1994). However, in most situations quality and efficiency are related. Without controlling for quality of care, case mix, and other supply factors, it is impossible to compare productive efficiency of the public and private sector.

A second key problem, especially relevant in CEE, is the quality of cost data (Paterson et al., 1997; Caiden and Wildavsky, 1974). Public cost accounting systems in CEE are inadequate and unreliable; health care cost accounting has no resemblance to true costs. Furthermore, public health clinics in most CEE countries still receive a variety of subsidies, from facility operating costs to medications, that further skew cost comparisons between clinics and sectors. These pose severe problems for reliable estimates of efficiency based on cost measures between the public and private sectors.

One study of private and public providers in the Czech Republic avoids these problems to an extent. Massaro et al. (1994) examined computerized insurance claims of the fee-for-service system for all private and public physicians, using medical specialty as a proxy for case-mix. Claims data covered two years: 1992, the end of which saw the legalization of private practice; and, 1993, the first year of private practice. This unique observational design controls for much of the variation among public and private physicians since all physicians in the study were in public practice in 1992. The authors found that private physicians performed more procedures per patient and charged more for both services and supplies. This strongly suggests that, under the same fee-for-service system, private physicians exhibit
lower efficiency than public counterparts and that this difference is due to incentives of private practice.

**PHYSICIAN PRODUCTIVITY**

The above review illustrates the current level of understanding of private sector provision in LMI and transition countries: features of public and private providers are typically compared bivariately, often anecdotally. The privatization program in Macedonia could benefit from a more systematic evaluation of how physicians respond to the incentives of private and public sector practice. Below, the literature on physician productivity and production functions is overviewed with the aim of developed a model of physician output decisions.

Reinhardt (1972) was one of the first to develop a production function for physician services. Physicians are assumed to maximize utility in terms of income and leisure. In the resulting production function, physician output is related to physician hours worked, capital inputs, other labor inputs, and practice characteristics. Reinhardt addresses the problem of output definition noting that, while perhaps ideal, measures of impact on patient health would be quite difficult to operationalize. They remain so. Rather, he uses intermediate outputs such as patient visits and annual billings to patients. An attempt was made to control for types of services provided but the data was not adequate to support this. Using OLS estimation, Reinhardt finds that group practice increases individual output and that non-physician aides also raise productivity, but with decreasing returns.

Since Reinhardt’s classic work, production function models of physician output have expanded in application to hospital and office-based contexts. An important evolution has been the greater efforts to separate the effects of different incentives facing physicians from other factors. This is evidenced by the introduction of a richer set of patient and physician characteristics that influence productivity and resource use (Hellinger, 1996; Burns, 1994). The concurrent recognition that patient case mix may have a large effect on productivity has led to inclusion of measures of severity of illness, patient health status, and socioeconomic background (Burns, 1994; Horn et al., 1985). In hospital settings (e.g., Jensen and Morisse, 1986), a common technique is to use a case-mix index to adjust patient admissions across hospitals. In studies that have looked at outpatient productivity, where individual patient-
level data are available, demographic controls are used such as age, gender, and insurance status and type and controls for physicians characteristics (Camasso and Camasso, 1994). However, case mix adjustments are less frequent.

Physician characteristics have also been shown to explain variations of resource use and output in both inpatient and outpatient care (Burns, 1994; Escarce, 1992; Chassin, 1986). Measures such as experience, practice specialty, graduate education, and board certification are commonly used to capture individual characteristics influencing productivity (Burns et al., 1994; Feinglass, 1991; Gaynor and Pauly, 1990). Controlling for these variables has led to a deeper understanding of physician productivity in hospitals and office-based practices. For instance, less experienced physicians have been found to order more tests and provide more intensive care (Eisenberg and Nicklin, 1981; Burns et al., 1994, Roos et al., 1986). Specialists have also been found to provide more intensive care, explained possibly by training that emphasizes a greater use of services (Eisenberg, et al., 1983; Manu and Schwartz, 1983; Fishbane and Starfield, 1981)

**In-patient Settings.**

Jensen and Morissey (1986) examine the effect physicians have on productivity and use of resources in teaching versus non-teaching hospitals. Output is measured both as raw annual admissions and also admissions adjusted by a Medicare case-mix index. This index is the proportionally weighted sum of admissions across diagnostic classifications and controls for output variations due to patient case-mix. The authors use OLS to estimate a translog production function relating admissions to staff size measures, hospital beds, market characteristics, and hospital teaching status. They find that the marginal productivity (admissions/doctor) is higher in non-teaching hospitals vs. teaching hospitals, due to the less complicated case-mix in non-teaching hospitals. Nursing staff is also found to have a strong positive impact on hospital admissions for non-surgeons but with decreasing returns.

Burns et al., (1994) examine hospital resource use for patients in separate Diagnosis Related Groups (DRGs) to control for case mix variation. They examined discharge data on women

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2 “Intensive” in this sense, and as used in the remainder of this dissertation, refers to a greater use of equipment, supplies, lab tests, or procedures per patient and should not be confused with care provided in hospital Intensive Care Units.
undergoing cesarean sections and uncomplicated vaginal deliveries and the links to physician characteristics. Relative inefficiency was measured, defined as variation in two alternate dependent variables (patient charges and lengths-of stay) above the average value controlling for case severity, discharge status, and treating hospital. Physician characteristics, including experience and specialty training, are found to have significant influence on resource use. The researchers found evidence to support their hypothesis that efficiency is determined in part by patient load and physician payment scheme: physicians with larger patient loads and greater proportion of managed care patients use fewer resources.

Out-patient Settings.

More relevant to the present study, similar studies have also been conducted in outpatient practices. Gaynor and Pauly (1990) examine relative efficiency of production in group practices as group size and incentive structures vary. They modify the traditional model to include an “effort incentive” variable, developing a behavioral model of production. Gaynor and Pauly argue that production technology – choices of labor and capital input combinations – are set by the firm and thus exogenous to physician decisions. The remaining element of decision autonomy is reduced to choosing a level of effort, which is conditioned on the incentive variable, that includes information on aide wages and a scale reflecting how closely compensation is tied to productivity. Physician and practice characteristics included are: practice specialty, experience, non-physician labor inputs, and whether the practice is a multispecialty group. Capital input is measured by the number of examination rooms. Results are comparable across estimation techniques (two-stage least squares and maximum likelihood frontier estimation) and suggest that efficiency gains are made by a “neutral” application of effort that shift the production function, not by changing its shape. The authors also find that output increases as compensation tied to productivity increases. However efficiency, as measured, does not increase. Individual productivity declines with group size and a greater level of experience is associated with higher output.

Defelice and Bradford (1997) revisit the relative productivity of group and solo practices. They begin by probing whether the two practice types can be compared and pooled in their analysis. Along several dimensions of practice patterns and patient mix, including proportion of patients with different insurance types and proportion of visits requiring different types of
services, solo and group practices are similar. Exceptions are where group practices might be expected to score higher including use of lab and x-ray services and referrals to hospital. They further test whether the groups can be pooled in the multivariate analysis and are unable to reject the null hypothesis that the groups may be pooled. Physician output, in visits per week, is modeled using frontier estimation as a function of physician characteristics (experience, board certification, income external to practice), practice features (mutispecialty group) and market characteristics (number of area hospitals, HMOs, physician to population ratio). In contrast to Reinhardt (1972) they find that there is no significant difference in productivity between solo and group practices.

Summary

These studies share some common elements. First, comparisons between group types (teaching vs. non-teaching hospitals or group vs. solo practice), are based on interpretation of a single dummy variable. That is, the underlying assumption is that the differences between practice types is due to a shift in efficiency of how fixed input combinations are used, not in how input combinations and resource allocation may vary. Second, all use cross-sectional data, sometimes combining data over a two year period (Jensen and Morissey, 1986; Reinhardt, 1972). This puts a premium on choice of physician and case-mix variables to reduce unobserved heterogeneity. Physician production studies also typically suffer from common problems of variable definition and availability. In hospital contexts, input measures are often omitted or not measured well, especially nursing labor and capital inputs (Newhouse, 1997). More detailed input measures are typically available in outpatient settings. Output, however, is also difficult to define, and available case-mix indices may not be adequate (Newhouse, 1997).

Finally, all studies address the problem of endogeneity of inputs and output and appeal to a variety of devices to deal with it. Reinhardt (1972) attempted two-stage least squares estimation, but concluded that available instrumental variable were poor. Gaynor and Pauly (1990) argue that key inputs (such as physician work hours and capital input) are set at the firm level, therefore outside physician control and exogenous to their output decisions. Defelice and Bradford (1997) instrument for inputs and are unable to reject that inputs are exogenous and proceed with single equation frontier estimation. These authors refer to prior
work which shows that while input and output are endogenous, the simultaneous equation bias introduced is nevertheless negligible (e.g., Griliches, 1963; Feldstein, 1968; Reinhardt, 1975). Hoch (1958) proved that, in a Cobb Douglas form, the bias will be small if producers face variations in input prices and differ in choices of input combinations.