Volume Title: Tax Policy and the Economy, Volume 12

Volume Author/Editor: James M. Poterba, editor

Volume Publisher: MIT Press

Volume URL: http://www.nber.org/books/pote98-1

Publication Date: January 1998

Chapter Title: Cost Shifting or Cost Cutting? The Incidence of Reductions in Medicare Payments

Chapter Author: David M. Cutler

Chapter URL: http://www.nber.org/chapters/c10911

Chapter pages in book: (p. 1 - 28)

COST SHIFTING OR COST CUTTING?: THE INCIDENCE OF REDUCTIONS IN MEDICARE PAYMENTS

David M. Cutler
Harvard University and NBER

EXECUTIVE SUMMARY

This paper examines how reductions in hospital payments by Medicare affect hospital operations. I look at two episodes of payment reductions: the late 1980s and the early 1990s. I find a large difference in the impact of payment reductions in these two time periods. In the 1980s, reduced Medicare payments were offset dollar for dollar by increased prices to private insurers. In the 1990s, however, payment reductions result in lower hospital profits, which must ultimately reduce hospital costs. Hospitals have responded to the payment reductions by reducing the number of beds and nurses, and sometimes by closing entirely, but not by reduced acquisition of high-tech equipment.

1. INTRODUCTION

Because Medicare is such a large part of the federal budget, federal deficit reduction measures necessarily look to Medicare for cost savings.

This paper was prepared for the National Bureau of Economic Research conference on Tax Policy and the Economy, November 1997. I am grateful to Dan Altman for outstanding research assistance, and to Jim Poterba and Doug Staiger for helpful comments. This research was supported by grants from the National Institutes on Aging, the Commonwealth Foundation, and the Robert Wood Johnson Foundation to the National Bureau of Economic Research.

In a series of deficit reduction measures in the mid-1980s, in the Omnibus Budget Reconciliation Act (OBRA) of 1990, in the OBRA of 1993, and again in the Balanced Budget Act of 1997, cuts in Medicare were an essential component of fiscal policy. In all of these cases, Medicare cuts were achieved primarily by paying providers less for the same services; changes in costs to beneficiaries have been minimal.

While cutting provider payments seems like a natural way to help balance the budget, there has been little work on the implications of these payment cuts. Are the cost savings from the public sector passed on to private insurers, in the form of higher charges for their patients? Or do cuts in Medicare translate into reduced hospital services? The public-policy implications of cutting Medicare depend critically on this answer. If cuts in Medicare just increase private insurance premiums, the cut is just a disguised tax increase to pay for Medicare. If Medicare cuts reduce service quality or care for the uninsured, however, the cuts could have very important effects on the medical system.

Research on the effect of Medicare payment reforms does not provide a clear answer to this question. On the one hand is evidence that the physical inputs hospitals provide are sensitive to reimbursement rates. Feder, Hadley, and Zuckerman (1987), for example, show that the implementation of the Prospective Payment System (PPS) reduced hospital inputs—particularly the length of hospital stays—substantially. Other studies, reviewed in Coelen and Gaumer (1991), reach a similar conclusion. On the other hand is the widespread belief that hospitals frequently shift costs from public to private payers when public reimbursement becomes less generous. Research from the late 1980s, for example, documented that at that time, Medicare payment was about 10 percent below hospital costs, and Medicaid payment was about 20 percent below costs, with private insurers paying about 30 percent above costs (Prospective Payment Assessment Commission, 1994). If such cost shifting were complete, it would eliminate the need for cost cutting in response to Medicare payment reductions.

Understanding the incidence of Medicare cuts is particularly important because of the growing role of managed care in the medical care system. Figure 1 shows the nature of private health insurance over the past two decades. In 1980, over 90 percent of the population was enrolled in unmanaged fee-for-service (FFS) insurance, with a small residual in a health maintenance organization (HMO). By 1992, most fee-for-service insurance was "managed" (generally with utilization review procedures), and total fee-for-service enrollment was only about one-half of private insurance. The remainder was group- and staff-model HMOs, along with preferred provider organizations (PPOs). By 1996, fee-for-service insurance

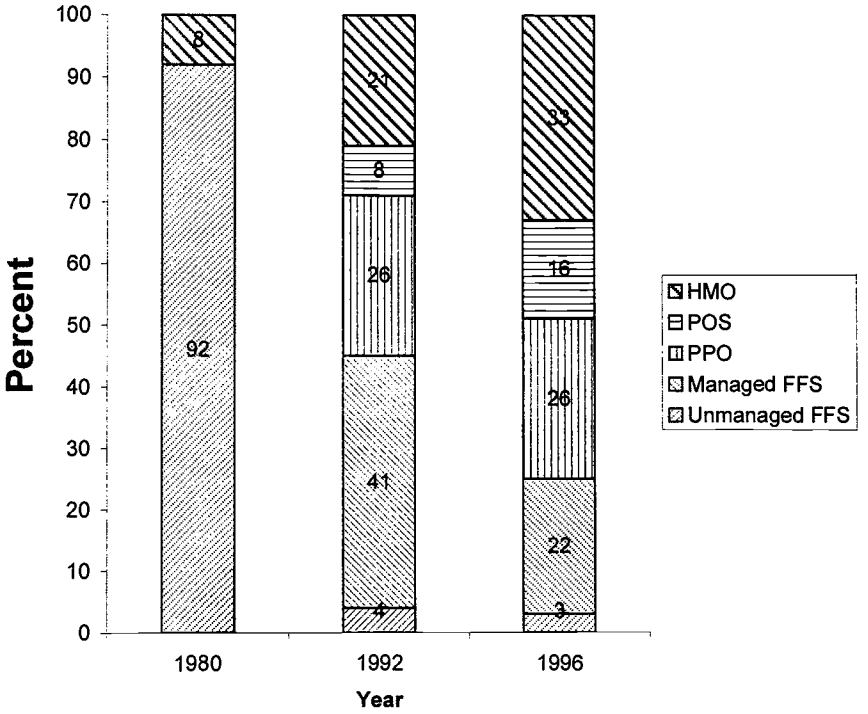

FIGURE 1. ***Changes in Private-Health-Plan Enrollment***

was only 25 percent of the privately insured population, with HMOs—particularly those with an out-of-network (points-of-service) option—becoming the dominant insurance source of private insurance. By controlling where patients are admitted to hospitals and negotiating more strenuously with providers, managed-care insurers might prevent the type of cost shifting that traditional indemnity insurers could not. As managed care comes to dominate the medical care system, therefore, payment reductions may translate more immediately into cost reductions, with implications for both Medicare and non-Medicare patients.

In this paper, I examine empirically the economic implications of reduced Medicare payments to hospitals. I begin by forming a measure of the Medicare *bite* for each hospital—the reduction in Medicare payments resulting from policy actions. Medicare payment per hospital admission is based on the diagnosis-related group (DRG) system: each patient is placed in a single DRG, and the payment to the hospital is the product of the severity of that DRG and a conversion factor that translates DRG weights into dollars. Over time, the conversion factor was designed to

increase with the cost of medical inputs that hospitals purchase. But recent deficit reduction measures have reduced the increase in this update factor. The difference between the growth of the hospital market basket and the actual growth of Medicare payments, times the hospital's number of Medicare patients, is the measure of the Medicare bite.

I analyze the effect of Medicare payment reductions in two periods: the late 1980s (1985–1990), and the early 1990s (1990–1995). The Medicare bite in the late 1980s averaged $175 per patient in the hospital (both Medicare and non-Medicare patients), while in the early 1990s the bite averaged $121 per patient in the hospital.

I first examine whether these Medicare cuts were shifted onto private payers or whether they resulted in lower hospital costs. I find a striking difference between the effect of cuts in the 1980s and in the 1990s. In the 1980s, cuts in Medicare were entirely shifted to private payers; there does not appear to be any cost cutting resulting from the payment reduction. In the 1990s, however, there is much less cost shifting. Cuts appear to be met almost entirely from lower hospital costs, rather than by cost shifting. This is consistent with the growing role of managed care in private insurance. Indeed, I show that in the 1990s, cost shifting is less prevalent in areas of the country where managed care is higher than in areas where managed care is smaller.

I then examine which services are cut back when Medicare payments are reduced. I focus predominantly on the early 1990s, since that is the period where cost cutting is more substantial. I find that some hospitals responded to payment cuts by closing entirely, although the magnitude of this change was small. More commonly, hospitals responded by reducing the number of beds and reducing nursing personnel. I find no evidence that over this time period Medicare cuts reduced the diffusion of high-tech care or led hospitals to shut emergency rooms or trauma centers predominantly serving the poor.

The paper is structured as follows. I begin in the next section by describing the basics of Medicare payment and what it means to "cut" Medicare. The second section presents a simple model of cost shifting and cost cutting in response to reduced Medicare payments. In the third section, I consider whether Medicare cuts were shifted to private insurers or whether they resulted in lower hospital costs. The fourth section then examines how hospitals reduced costs. The last section concludes.

2. THE BASICS OF MEDICARE PAYMENT

To understand what "cutting Medicare" involves, it is necessary to go into some detail on Medicare pricing. The simplest example of Medicare

pricing is for hospital services; this is also the area where Medicare cuts are largest so the issue is most salient. In the empirical work below, I focus exclusively on reductions in payments to hospitals.

Since 1984, Medicare payments to hospitals have been made on a PPS basis. Each hospital admission is categorized into one of roughly 470 DRGs. The DRGs are assigned a relative weight, based on average costs of treating people in that DRG in previous years. The average weight is about 1. Payments to hospitals are a product of the DRG weight and a factor that converts weights into dollars:

$$\text{payment}_{i,h} = P_h \cdot \text{DRG weight}_i, \tag{1}$$

where i is the patient and h is the hospital. The conversion factor P_h varies somewhat across hospitals—for example, between rural and urban hospitals—but not by a great deal. The variation in payments within a DRG across hospitals is not very high.

Over time, the growth of the conversion factor, known as the PPS update, is designed to increase roughly in line with the "market basket" of goods and services that hospitals purchase.[1] But in an effort to save money, the government has periodically increased hospital payments by less than the market-basket increase.

Table 1 shows the nature of these changes. In virtually every year of the late 1980s, there were significant Medicare cuts. In part these cuts were designed to save money, and in part they offset initial hospital responses to the implementation of PPS. When PPS was implemented, hospitals quickly found out that they could receive additional payments if they "upcoded" their patients into more highly weighted DRGs. For example, hospitals were reimbursed greater amounts for patients with a complication and/or comorbidity than for patients without any complications, despite the fact that the treatment received might be the same. Thus, there was a concerted effort in many hospitals to record complications and comorbidities more carefully (Carter and Ginsburg, 1985). The result was that Medicare spending was much greater than anticipated, leading to corrective measures to reduce the update factor.

The most important Medicare payment changes in the 1980s were CO-

[1] The actual process is somewhat more complicated. A recommendation about update factors is made by the Prospective Payment Assessment Commission (ProPAC) and by the Health Care Financing Administration (HCFA), and is then approved by Congress. The expected growth of the market basket is the principal factor involved in the ProPAC and HCFA recommendations, although both groups also look at several other factors, including cost-increasing scientific and technological advances, how much DRG upcoding there has been, and whether to create "incentives" for hospital productivity improvements.

TABLE 1
Provisions of Legislation Reducing Medicare Payments

	Savings ($ billion)			
		Part A savings		
Legislation	Total	Total	Reduced hospital update	Provisions[a]
COBRA85	13	6	5	Reduced medical education payments: delayed transition to PPS
OBRA87	10	4	3	Reduced update in 1988, 1989
OBRA89	11	1	2	Reduction in DRG weights; change in update factors in 1990
OBRA90	70	13	10	Reduced updates in 1991–1993 (Large and urban: 1991: MB−2%; 1992: MB−1.6%; 1993: MB−1.55%; Rural: 1991: MB−0.7%; 1992: MB−0.6%; 1993: MB−0.55%; 1994: MB+1.5%)
OBRA93	56	28	28	Reduced updates in 1994–1997 (Urban: 1994: MB−2.5%; 1995: MB−2.5%; 1996: MB−2%; 1997: MB−0.5%; Rural: 1994: MB−1.0%; 1995: bring to urban level).
BBA97	116	40	17	

[a]MB is the increase in the market basket. Savings are as estimated by the CBO at the time the legislation was passed.

BRA85 (the Consolidated Omnibus Budget Reconciliation Act), OBRA87 (the Omnibus Budget Reconciliation Act), and OBRA89. In each case, Medicare savings were about $10 billion. As the third column of the table shows, about one-half of these savings are from reductions in Part A spending—spending for inpatient hospitals, skilled nursing facilities, and hospices. In practice, most of the Part A savings are from reduced update factors to hospitals. The remaining spending changes were largely reduced payments to physicians.

The 1990s were marked by Medicare payment reductions with the explicit goal of deficit reduction. OBRA90 made even larger cuts in Medicare spending. OBRA90 was the first legislation to have significant increases in Medicare revenues ($27 billion out of $70 billion total). But even with some revenue increases, reductions in Part A costs—and in particular update payments to hospitals—were an important part of the legislation. As the last column shows, the update factor was reduced by up to 2 percentage points below the market-basket increase in 1991, 1992, and 1993.

OBRA93 continued this trend towards greater reductions in update factors. OBRA93 reduced update factors for 1994–1997 by up to 2.5 percentage points per year, although rural hospitals did not have their payments reduced as much. Half of the overall savings in Medicare from this legislation were a result of the reductions in update factors.

Finally, the Balanced Budget Agreement of 1997 made significant cuts in Medicare. Forty billion dollars of the $116 billion total reduction in Medicare payments came from Part A cuts, with a large share of that from reduced update factors.

The net effect of these changes on the hospital update factor is shown in Table 2 and Figure 2. Beginning in 1986, update factors were reduced substantially below the level of the market-basket increase. The largest reductions were between 1985 and 1990, when the update factor grew about 2 percentage points annually less rapidly than the market basket. There was a further divergence in the 1990s. Between 1990 and 1995, the update factor increased by an average of 0.6 percentage points less rapidly annually than the market-basket index. The reductions in the update factor were generally greater for urban than for rural hospitals, but these differences were usually not very large. In the subsequent analysis, I analyze separately the impact of payment cuts in the 1985–1990 and 1990–1995 periods.

To quantify the overall importance of these payment reductions, I form a measure of the Medicare bite—the impact of Medicare cuts on

TABLE 2
Increases in the Update Factor over Time

Year	Market-basket increase (%)	Update Factor (%)			
		All/ average	Large urban	Small urban	Rural
1984	4.9	4.7	—	—	—
1985	3.9	4.5	—	—	—
1986	3.9	0.5	—	—	—
1987	3.5	1.2	—	—	—
1988	4.7	1.5	1.5	1.0	3.0
1989	5.5	3.3	3.4	2.9	3.9
1990	4.6	4.7	4.4	3.7	8.4
1991	4.3	3.4	3.2	3.2	4.5
1992	3.1	3.0	2.8	2.8	3.8
1993	3.0	2.7	2.6	2.6	3.6
1994	2.5	2.0	1.8	1.8	3.3
1995	3.0	2.0	1.6	1.6	4.7

Source: Prospective Payment Assessment Commission.

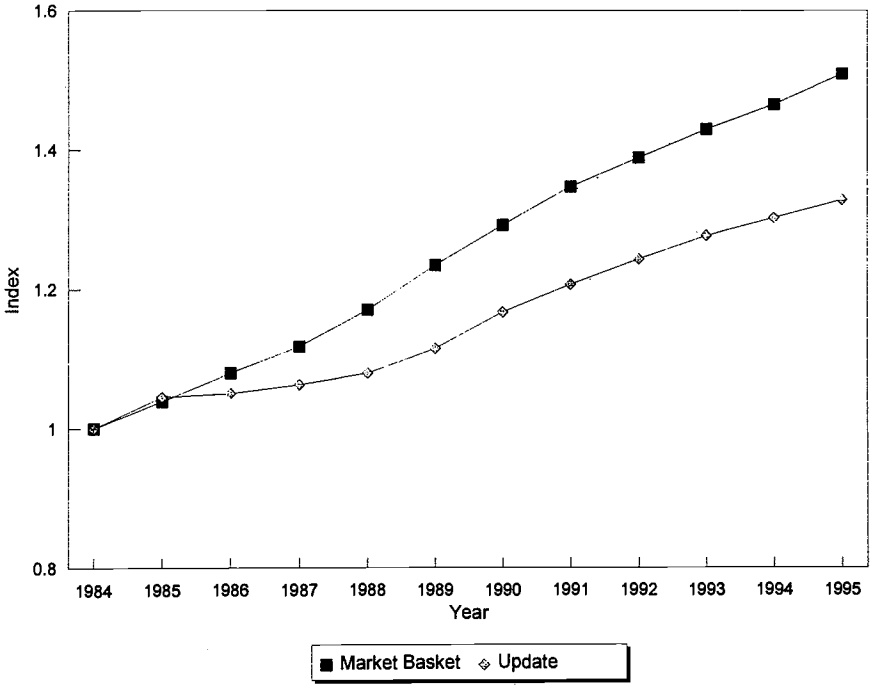

FIGURE 2. ***The Market Basket and Growth of the Update Factor***

each hospital. I start with Medicare reimbursement in the hospital in a base year, t_1. In the absence of Medicare cuts, Medicare payments per privately insured patient would grow at the rate of market-basket increase, or $\Pi_{t_1}^{t_2}(1 + mb_t)$. Because of the Medicare cuts, however, the actual growth of payments was only $\Pi_{t_1}^{t_2}(1 + act_t)$. The difference between these two is the effect of Medicare cuts on the hospital:

$$(\text{medicare bite})_{t_1,t_2} = (\text{medicare revenue})_{t_1} \cdot \left[\prod_{t_1}^{t_2}(1 + mb_t) - \prod_{t_1}^{t_2}(1 + act_t)\right].$$

Note that the factor in square brackets is the same for all hospitals (with the exception of urban versus rural status), so that most of the variation across hospitals is due to differences in Medicare revenue across hospitals. Note also that the Medicare bite variable is defined entirely as of time t_1. Thus, nothing that the hospital does between t_1 and t_2 to change Medicare reimbursement or the mix of patients admitted to the hospital will affect the measure.

TABLE 3
Summary Statistics on Medicare Bite

Statistic	Value	
	1985–1990	1990–1995
Mean	−$175	−$121
Standard deviation	$89	$61
Minimum	−$1	$0
Maximum	−$500	−$464
Number of hospitals	3,355	2,925

Note: The bite is the reduction in Medicare revenues divided by the total number of patients admitted to the hospital. Observations are weighted by the number of patients admitted to the hospital.

An important issue is the scale for the bite measure—what is the base over which the Medicare bite should be measured. In gauging the overall impact of the Medicare cuts on the hospital, it is most natural to form the Medicare bite per total patient in the hospital. For other purposes, however, it will be more natural to examine Medicare cuts per Medicare patient or per private patient, as I discuss below.

Data on hospital revenues, expenditures, and admissions are from Medicare cost reports.[2] Cost reports are filed annually by each hospital and can be obtained from the Health Care Financing Administration (HCFA). The cost reports have a wealth of important information—including total patient revenues and expenses, and Medicare revenues and expenses—but they are not without problems. There are extremely large outliers for many variables that appear to be due to misreporting rather than true differences across hospitals.[3] For all of the variables in the analysis, I have eliminated very large outliers from the sample. I drop observations that lie outside two standard deviations of the mean in any of the basic accounting figures from the PPS data. I next drop a tail consisting of the top 5 percent of the dependent variables and a trivial number of outliers in the bite variable (about three or four) in each year.

Table 3 shows summary statistics for the Medicare bite per total patient. In the 1985–1990 period, the bite averaged −$175, with a standard deviation of $89. In the 1990–1995 period, the bite was smaller (because the reduction in payments was smaller), averaging only $121. But the standard deviation was still large ($61).

[2] The cost reports are the only source of data on hospital revenues.

[3] Some hospitals, for example, will report millions of dollars of Medicare revenue but only one Medicare admission. One of these values is clearly incorrect.

3. THE INCIDENCE OF MEDICARE CUTS

Before analyzing the incidence of Medicare cuts empirically, I discuss what type of effects we might expect to observe from Medicare cuts. I consider a simple model of hospital decision making. A hospital treats three types of patients: Medicare patients, privately insured patients, and uninsured patients. Under the DRG system, Medicare has administered prices; thus the hospital has no leverage over the price received from Medicare. The hospital does have some leverage in the prices it charges to private insurers. I assume the hospital faces a downward-sloping demand curve for private patients. Subject to this demand curve and the hospital's costs, the hospital chooses a price for its services.

Figure 3 shows the market for privately insured patients. The demand curve is labeled D, with corresponding marginal revenue of MR. Patient care costs are c. The price the hospital charges determines the profits it will earn. At $P=c$, there are no profits. As P increases, profits increase, up to the profit-maximizing point P_{max} (the quantity where marginal revenue is equal to cost). Above this price, profits again fall.

In addition to profits from private patients, hospitals also receive profits (or losses) from Medicare. I assume that Medicare profits are π_M,

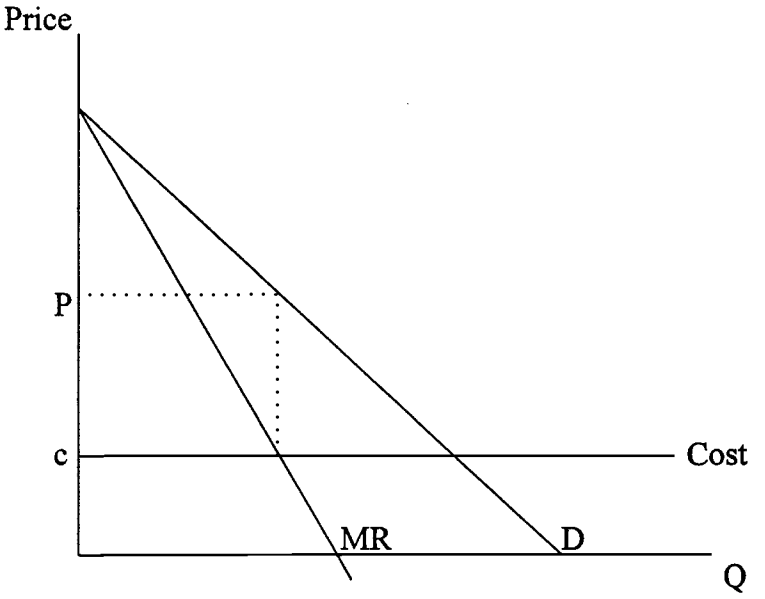

FIGURE 3. *The Market for Privately Insured Patients*

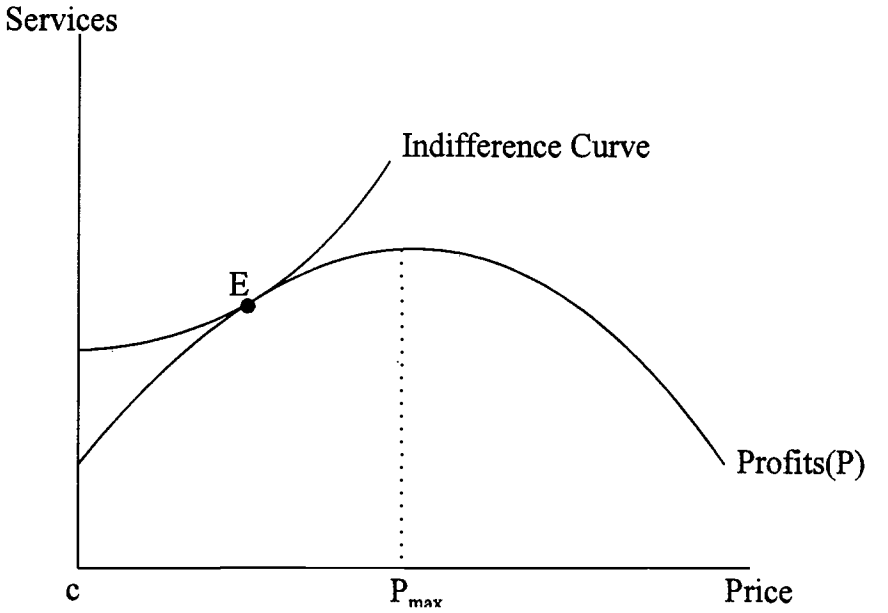

FIGURE 4. *Determination of the Optimal Price*

independent of the price the hospital charges to private patients. The hospital uses Medicare and private profits to finance other activities—care for the uninsured, teaching, research, or investment in new technologies. The hospital is always making zero profits, but the "residual claimants" on the hospital's income are these other activities. Figure 4 graphs these subsidies as a function of the price charged to private payers. If prices to private payments equal costs, the hospital will make a profit of π_M, which is defined here as a positive number although it could be negative.

The price the hospital will choose depends on the objectives of the hospital. It is generally agreed that profit-maximizing firms will set price equal to P_{max}, with the profits going to the hospital's owners. But most hospitals are not for profit. Thus, the objective function of the hospital is not as certain. I assume that the hospital values both lower prices to private payers and more of the other activities. Lower prices are a form of "charity care": by not charging privately insured patients the profit-maximizing price, the hospital is donating money to privately insured patients. Profits are valuable because they allow the hospital to better serve its (self-perceived) mission. A hospital that cares about both of these goals will have an indifference curve as in Figure 4.

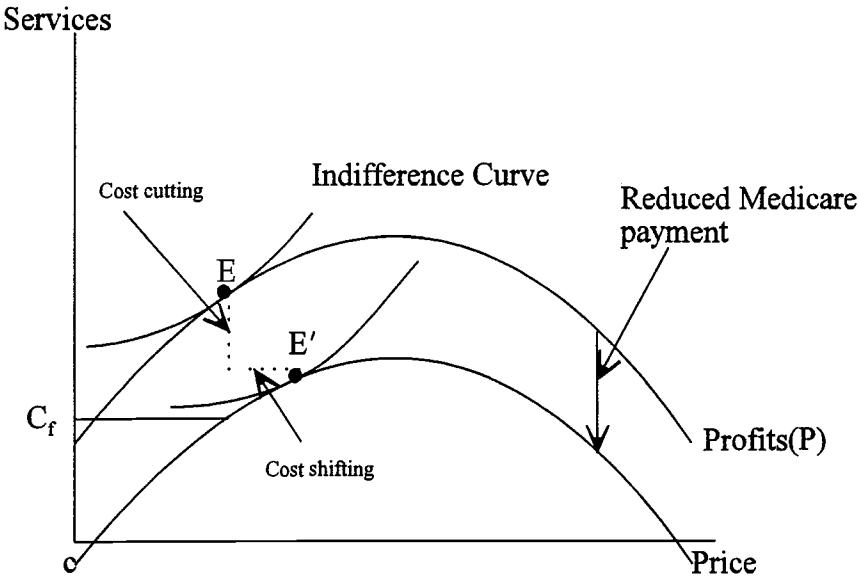

FIGURE 5. *Effect of Medicare Cuts on Prices and Services*

The equilibrium is for the hospital to choose point *E*, where it earns some profits from privately insured patients but does not charge the profit-maximizing price.

Now consider a reduction in Medicare payments. As Figure 5 shows, this can be represented as a shift down of the profit curve. The utility-maximizing hospital will both reduce its "charity" care to private patients (that is, increase the prices it charges them) and reduce its profits. With the general utility function, both of these responses would occur. The effect of Medicare payment reductions on increasing prices to private patients is termed *cost shifting*. The effect of payment reductions on reduced profits, and thus the ability of the hospital to pursue its other missions, is termed *cost cutting*. I consider what this involves in more detail in section 5.

One corner solution to the hospital's problem is worth noting. Suppose that the hospital has a fixed amount C_f it needs to spend on a given purpose (for example, care for the uninsured). In this case, the hospital's utility function will be flat at C_f, and the entire amount of the price change would be shifted to private patients. Thus, there will be perfect cost shifting.

The ability to cost-shift depends on having a residual private sector

where demand for hospital care is relatively inelastic. Recent changes in the medical care marketplace—in particular the rise of managed care—have likely changed the demand elasticity. While managed care has many effects on the medical care system, the most important effect for this analysis is that it makes patients more responsive to price increases at particular hospitals. Consider what happens in Figure 5 if the market for hospital services is more elastic. I show the profit schedule for this market in Figure 6. The profit schedule both has a lower peak (because maximum profits are smaller) and is flatter (because the same increase in price will result in a smaller increase in profits). As Figure 6 shows, Medicare cuts in this market will result in more cost cutting and less cost shifting than Medicare cuts in the market with less elastic demand. The reason for this is that the increased demand elasticity raises the loss to the hospital of shifting a dollar of costs relative to the loss to the hospital from having lower profits. Indeed, as managed care spreads and the hospital extracts all of the revenues possible from private insurers, the entire amount of Medicare reduction will result in cost cutting. Cost shifting should be less prevalent in markets where managed care is more important.

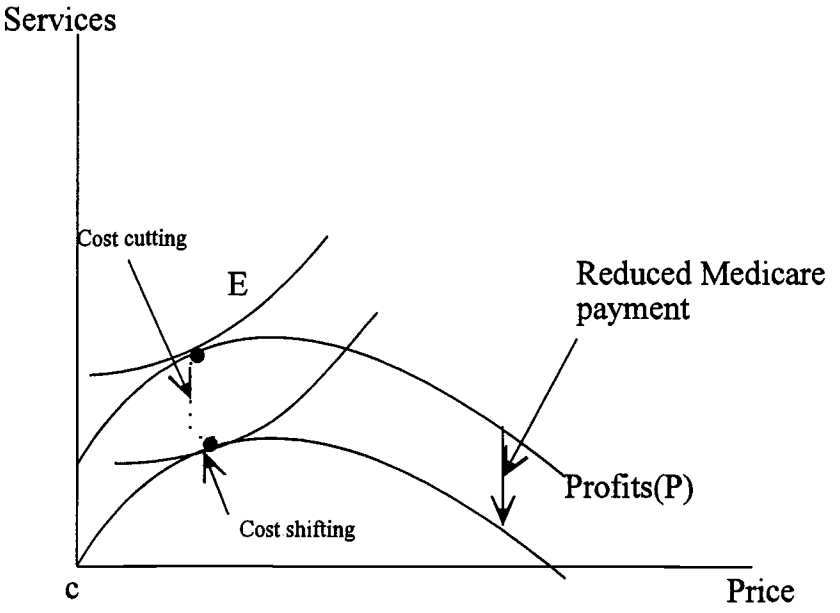

FIGURE 6. *Effect of Medicare Cuts in a More Competitive Market*

4. COST SHIFTING OR COST CUTTING?

In this section, I test whether Medicare payment reductions have been shifted to other payers or whether they have lowered hospital profits. I group all non-Medicare patients as "private" patients even though some of them have insurance through other government programs (such as Medicaid). In the cost-report data, I am not able to separate out the non-Medicare revenues, however, so I combine the two in the estimation. Revenue changes are formed using the following equation:

$$\left(\frac{\text{private revenue change}}{\text{no. of private patients}}\right)_{t_1,t_2} = \left(\frac{\text{private revenue}}{\text{no. of private patients}}\right)_{t_2} - \left(\frac{\text{private revenue}}{\text{no. of private patients}}\right)_{t_1} \times \left(1 + \text{average private revenue growth}\right)_{t_1,t_2},$$

where the average private revenue growth is the average change in revenues per patient between t_1 and t_2. I form cost changes analogously. By definition, the average revenue change per private patient and average cost change per private patient will be zero.

One natural test of the division between cost shifting and cost cutting is to relate the Medicare bite to revenue and cost changes. One could estimate regressions of the form

$$\left(\frac{\text{private revenue change}}{\text{no. of private patients}}\right)_{t_1,t_2} = \beta_0 + \beta_1 \left(\frac{\text{medicare bite}}{\text{no. of private patients}}\right)_{t_1,t_2} + X\beta + \epsilon,$$

$$\left(\frac{\text{private cost change}}{\text{no. of private patients}}\right)_{t_1,t_2} = \gamma_0 + \gamma_1 \left(\frac{\text{medicare bite}}{\text{no. of private patients}}\right)_{t_1,t_2} + X\gamma + \eta.$$

The cost-shifting theory implies that $\beta_1 = -1$ and $\gamma_1 = 0$: a \$1 reduction in Medicare revenues per private patient should lead to a \$1 increase in

revenues per private patient (recall that the Medicare bite is measured as a negative number) but no change in private costs per private patient. Cost cutting, in contrast, implies that $\beta_1 = 0$ and $\gamma_1 = 1$: private revenues are unaffected by the Medicare cut, but private costs fall dollar for dollar with Medicare cuts.

The most important difficulty in estimating these equations is the problem of "case mix" differences (the severity of admissions) across hospitals. If a hospital's patient mix becomes more severely ill, both costs and revenues will increase. If the change in case mix is correlated with the Medicare bite measure, this will result in biased estimates of β_1 and γ_1. There is reason to believe the Medicare bite variable will be correlated with case mix change. The bite measure is closely related to the initial case mix of the hospital—a hospital with a less intensive case mix will have lower Medicare revenues than a hospital with a more intensive case mix. If there is a tendency for low case mix hospitals to have more rapid growth of case mix—either because of regression to the mean in patient severity or because they acquire technologies that then allow them to treat more severely ill patients—a smaller bite variable will be systematically correlated with more rapid growth of revenues and expenses, creating a spurious negative correlation on the bite variable.

To address this issue, I examine a weaker form of the hypothesis. I take advantage of the fact that changes in case mix should affect costs and revenues equally. Thus, if we control for the change in costs, the change in revenues will indicate whether there is cost shifting or not. If there is no cost shifting, the implication is that there must be cost cutting. In particular, I estimate equations of the form

$$\left(\frac{\text{private revenue change}}{\text{no. of private patients}}\right)_{t_1,t_2}$$

$$= \delta_0 + \delta_1 \left(\frac{\text{private cost change}}{\text{no. of private patients}}\right)_{t_1,t_2}$$

$$+ \delta_2 \left(\frac{\text{medicare bite}}{\text{no. of private patients}}\right)_{t_1,t_2} + X\delta + \epsilon,$$

where a coefficient of $\delta_2 = -1$ means full cost shifting, and $\delta_2 = 0$ means no cost shifting and thus cost cutting. Indeed, we can constrain this equation further by imposing a coefficient of 1 on δ_1; this constraint eliminates bias in the estimate of δ_1 that would result from measurement error in costs. The test is weaker than estimating the two equations

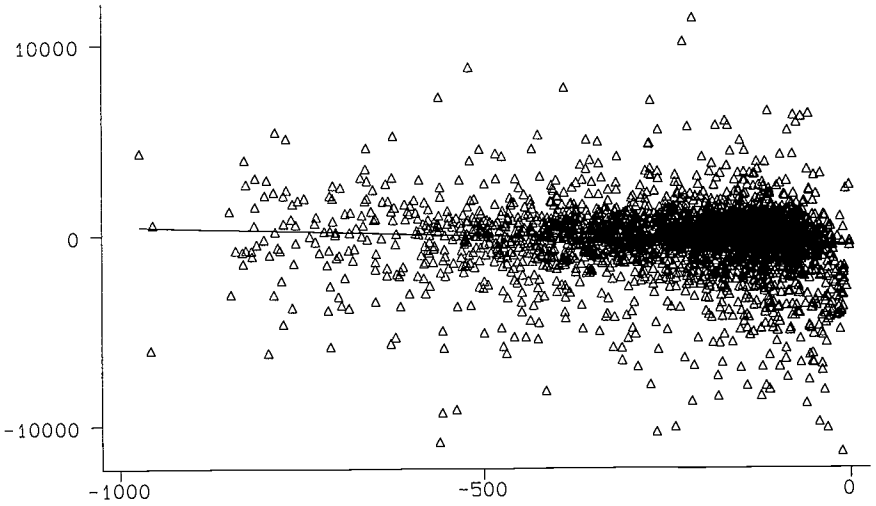

FIGURE 7. ***Non-Medicare Revenue Change minus Cost Change versus Bite, 1985–1990***

separately, since we cannot look separately at cost and revenue changes; but this specification eliminates the potential for case mix change to bias the results.

Figure 7 shows the relation between the change in private revenues per private patient and the Medicare bite per private patient in the 1985–1990 period. Figure 8 shows an analogous relation for the 1990–1995 period. There is a clear difference in the relation between these variables over time. In the 1980s, Medicare cuts are associated with increased revenues for private insurers. This is not true in the 1990s; in that period, there appears to be no relation between the variables.

Table 4 shows regression versions of these equations. In addition to the bite variable, I include the share of people in the MSA who are enrolled in managed care—either an HMO or a PPO—as well as controls for whether the hospital is for profit, private not for profit, or government-owned. The managed-care data are from Interstudy. Finally, I include controls (not reported) for the number of beds in the hospital (divided into groups of <25, 25–100, 100–200, 200–300, 300–400, 400–500, 500–600, and >600) and the size of the MSA the hospital is located in (<150k people, 150k–300k, 300k–600k, 600k–900k, 900k–1.5M, and >1.5M). The first three columns report regressions for the change in revenues between 1985 and 1990; the second three columns are for 1990–1995. In each case, the first equation estimates the coeffi-

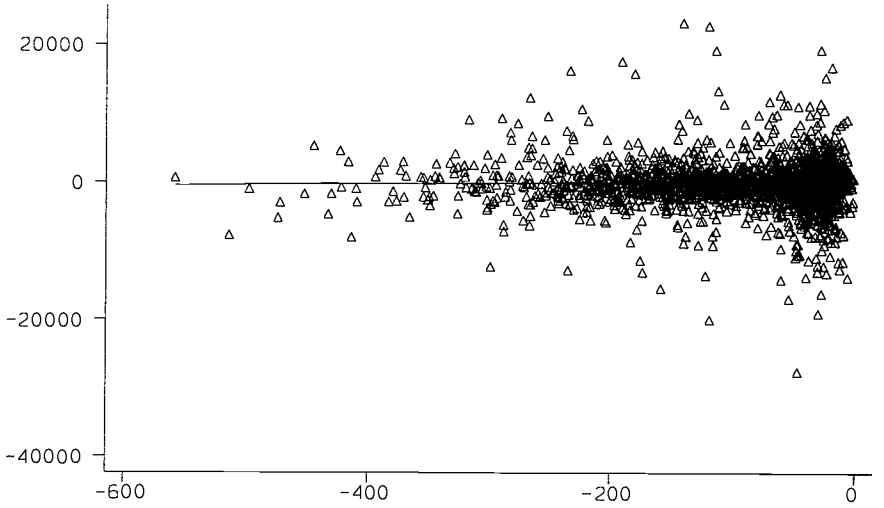

FIGURE 8. ***Non-Medicare Revenue Change minus Cost Change versus Bite, 1990–1995***

TABLE 4
The Effect of Medicare Cuts on Private Revenues[a]

	1985–1990			1990–1995		
Variable	1	2	3	1	2	3
Cost change	0.93	1.00	0.89	0.95	1.00	0.95
	(0.01)		(0.02)	(0.01)		(0.02)
Medicare bite per private patient	−2.26	−2.66	− 1.19	3.87	3.18	5.23
	(0.36)	(0.35)	(0.55)	(0.83)	(0.82)	(1.38)
HMO enrollment	−1,216	−1,053	−1,536	−1,386	−1,117	−1,724
	(304)	(303)	(406)	(462)	(462)	(646)
Ownership:						
For profit	−143	−179	− 200	438	532	646
	(84)	(86)	(126)	(122)	(121)	(200)
Government	160	134	80	76	72	−38
	(86)	(86)	(160)	(122)	(123)	(243)
N	3,352	3,352	1,361	2,922	2,922	1,079
R^2	.625	.035	.609	.790	.023	.762

[a]Dependent variable: change in private revenues per private patient.

Note: In the column 2 we imposed a coefficient of 1 on cost changes. Column 3 in each set is for MSAs only. Standard errors are in parentheses.

cient on the cost change variable while the second column imposes a coefficient of $\delta_1 = 1$. The third column is for the rural sample only.

The table confirms the change in relation between Medicare cuts and private revenues. In the 1985–1990 period, every $1 reduction in Medicare revenues is associated with a $2 increase in private revenues, both with and without the constraint on private cost changes. This suggests cost shifting of more than dollar-for-dollar, although much of the additional effect above $1 is a result of the rural sample of hospitals. In the urban sample, where competition is more prevalent, the effect suggests dollar-for-dollar cost shifting. In the 1990–1995 period, in contrast, there is no evidence of cost shifting. Indeed, the coefficient on the Medicare bite is actually positive.

The other variables are also in line with expectations. In areas with more managed-care enrollment, revenues increase less rapidly given costs. The effect on for-profit hospitals is different in the two time periods, and government hospitals generally do not have more or less rapid revenue growth than private, not-for-profit hospitals.

These findings are consistent with a change in the ability to cost-shift associated with the rise in managed care. To test this prediction further, Table 5 repeats the regressions in Table 4, adding an interaction term

TABLE 5
***The Effect of Medicare Cuts on Private Revenues*[a]**

	1985–1990		1990–1995	
Variable	1	2	1	2
Cost change	0.93	1.00	0.95	1.00
	(0.01)		(0.01)	
Medicare bite per private patient	−2.38	−2.72	2.27	1.62
	(0.52)	(0.51)	(1.14)	(1.14)
Medicare bite	0.78	0.43	11.45	11.19
	(2.35)	(2.36)	(5.62)	(5.65)
Managed-care enrollment	−1,075	−975	−94	147
	(521)	(522)	(785)	(788)
Ownership:				
For profit	−141	−179	443	537
	(84)	(84)	(122)	(121)
Government	160	136	77	73
	(86)	(86)	(122)	(123)
N	3,352	3,352	2,922	2,922
R^2	.625	.035	.791	.024

[a]Dependent variable: change in private revenues per private patient.

Note: In the second column we imposed a coefficient of 1 on cost changes. Standard errors are in parentheses.

between the Medicare bite variable and managed care enrollment in that MSA.[4] If managed care has reduced the ability to cost-shift, the coefficient on the interaction-term between the Medicare bite and managed care should be positive—in areas with more managed care enrollment the degree of cost shifting should fall. This is indeed what the results suggest. In the 1990s, the ability to cost-shift declines as managed-care enrollment rises: a 10-percentage-point increase in managed care enrollment is associated with a reduction in the cost-shifting coefficient of $1. The greater effect of managed care on the ability to cost-shift in the 1990s is consistent with increased stringency of managed care over this time period.

In both Tables 4 and 5, there is some evidence that Medicare cuts in the 1990s may be associated with *reductions* in non-Medicare revenues, not just that the two are independent. While this seems at first implausible, it may actually reflect a response of managed care to earlier Medicare cuts. Over the 1980s, private insurers paid more when Medicare payments were cut. As managed care spreads, it may reverse this initial round of cost shifting. Since hospitals with big payment cuts in the 1980s may be the same institutions with big payment cuts in the 1990s, this reversal of earlier cost shifting would be correlated with the non-Medicare bite in the 1990s.

In addition to shifting costs onto private payers, hospitals that receive reductions in Medicare reimbursement might shift costs back onto Medicare. There are several ways that this type of cost shifting might be accomplished. One method is the type of upcoding noted above. Hospitals with greater cuts in Medicare reimbursement might do more cost shifting than hospitals with smaller cuts in Medicare reimbursement. Alternatively, hospitals might increase the volume of services for which Medicare payment is greater than marginal cost. Since Medicare payments are based on *average* costs within a DRG, if a DRG has particularly high *fixed* costs, the DRG payment will exceed marginal costs. For many medical procedures (particularly intensive treatments), fixed costs can be very high.

Finally, providers might increase Medicare reimbursement by unbundling the DRG payment. Medicare makes no additional DRG amount if some services are provided in the hospital but will pay more if the services are out of the hospital. For example, the hospital receives the DRG payment for patients with a hip fracture regardless of whether rehabilitation services are provided during the acute-care episode or separate from that episode. But Medicare will reimburse separately rehabilitation services provided in a rehabilitation hospital, or in the rehabilitation unit of an acute-care hospital. As a result, hospitals that shift from providing reha-

[4] Managed-care enrollment is assumed to be zero outside of MSAs.

TABLE 6
The Effect of Medicare Cuts on Medicare Revenues[a]

Variable	1985–1990	1990–1995
Cost change per Medicare patient	1.00	1.00
Medicare bite per Medicare patient	7.85	1.51
	(0.21)	(0.76)
HMO enrollment	1,779	159
	(156)	(174)
Ownership:		
For profit	−54	609
	(43)	(44)
Government	−140	−36
	(39)	(38)
N	3,170	2,840
R^2	.329	.077

[a]Dependent variable: change in medicare revenues per medicare patient.

Note: Regressions impose a coefficient of 1 on cost changes. Standard errors are in parentheses.

bilitation services in the main hospital setting to providing those services in a separate rehabilitation unit (or transferring them to a separate hospital) will receive increased revenues at the same cost.

Table 6 tests the theory that Medicare cuts are cost-shifted to other parts of the Medicare program. I regress the change in Medicare revenues per Medicare patient on the Medicare bite per Medicare patient. The specification is

$$\left(\frac{\text{medicare revenue change}}{\text{no. of medicare patients}}\right)_{t_1,t_2} = \theta_0 + \theta_1\left(\frac{\text{medicare cost change}}{\text{no. of medicare patients}}\right)_{t_1,t_2} + \theta_2\left(\frac{\text{medicare bite}}{\text{no. of medicare patients}}\right)_{t_1,t_2} + X\theta + \epsilon.$$

A coefficient of $\theta_2 = -1$ would indicate full shifting of costs onto Medicare, while a coefficient of $\theta_2 = 0$ would indicate no cost shifting onto Medicare. Because the Medicare cost change per Medicare patient is very noisy, I show only results imposing a coefficient of $\theta_2 = 1$.

As Table 6 shows, in neither time period is there evidence of cost shifting onto Medicare. Indeed, the evidence is more consistent with

additional reductions in Medicare revenues in hospitals facing Medicare cuts than with cost shifting.

In summary, the results on cost shifting suggest a clear conclusion: in the 1980s, Medicare cuts were offset dollar for dollar by increases in costs to private insurers. By the early to mid-1990s, however, cost shifting was essentially eliminated. The difference between the 1980s and the 1990s is in the rise of managed care. In the fee-for-service era of the 1980s, public-sector payment reductions could be shifted to private payers if the need arose. In the managed-care era of the 1990s, that is no longer true. The implication is that Medicare cuts in the 1990s may have more effect on hospital operations than Medicare cuts in the 1980s. I turn to this question next.

5. MEDICARE CUTS AND HOSPITAL SERVICES

The finding that cost cutting, rather than cost shifting, is the dominant mechanism for adjusting to Medicare payment reductions in the 1990s raises the question of how hospitals are reducing costs. Cost cutting might happen in two ways. First, providers might respond to lower Medicare payments by paying factors of production (physicians, nurses, orderlies, etc.) less. Since some of payment to medical care providers is a return on past investment, provider payments can fall substantially in the short run with no change in supply. This type of change is just a transfer from medical care providers to the government.

Alternatively, hospitals might cut costs by reducing services. The service cut could be across the board, or differential for some groups of patients. A major public policy concern is whether hospitals respond to Medicare cuts by cutting back on care to the poor. For example, hospitals might use Medicare surpluses to run unprofitable emergency rooms or neonatal intensive-care units. Medicare cuts might reduce hospital investment more generally, however. These cuts would have important implications for the nature of medical care throughout the health system.

A related concern is that some hospitals will close or reduce their size as a result of Medicare cuts. Closure of hospitals has been increasingly common over the 1990s, and this might be due in some part to cutbacks in Medicare reimbursement. Reductions in the number of impatient beds have been even more common.

To examine how Medicare cuts affect hospital behavior, I merge the Medicare cost report data with data from the American Hospital Association's (AHA) annual survey of hospitals. The AHA data contain information on technology owned by the hospital and characteristics such as employment of nurses.

Table 7 examines whether cuts in Medicare reimbursement are associated with reductions in the size of hospitals. The first column in each grouping estimates a logit model for the probability that the hospital closed over the indicated time period. I relate this to the same variables as in the previous tables. If Medicare cuts induced hospitals to close, the coefficient would be negative. In both of these time periods, about 8 percent of hospitals closed. The evidence suggests that recent Medicare cuts have had some effect on hospitals closing. In the 1980s, there is no relation between the Medicare bite and closures. In the 1990s, however, greater Medicare cuts significantly increase the probability that a hospital closes. While the effect is present, however, the overall magnitude is relatively small. A one standard deviation increase in Medicare bite increases the probability that a hospital closes by only 0.3 percentage points.

The second column in each grouping examines whether the hospital reduced the number of inpatient beds in response to Medicare cutbacks. A positive coefficient would indicate that a larger Medicare bite is associated with a greater reduction in hospital beds. I find no evidence of such a reduction. Indeed, the coefficient in both time periods is actually negative.

The discussion above suggested particular concern about how Medi-

TABLE 7
***The Effect of Medicare Cuts on Hospital Structure*[a]**

	1985–1990		1990–1995	
Variable	Hospital closure	Change in beds	Hospital closure	Change in beds
Medicare bite per Medicare patient	.0014	−.000038	−.0060	−.000067
	(.0022)	(.000097)	(.0033)	(.00025)
HMO enrollment	1.63	.069	0.30	−.004
	(0.91)	(.036)	(0.73)	(.047)
Ownership:				
For profit	.264	.019	.176	.000
	(.205)	(.010)	(.180)	(.012)
Government	−.828	−.015	−.527	−.015
	(.283)	(.010)	(.247)	(.012)
N	4,150	3,355	4,016	2,925
R^2/ln(likelihood)	−565.28	.041	−777.28	.052

[a]Dependent variable: change in Medicare revenues per Medicare Patient.

Note: The first and third columns are logit models for the probability that the hospital closes in the indicated time period. The second and fourth columns are ordinary least-squares models for the change in the logarithm of hospital beds. Standard errors are in parentheses.

TABLE 8
The Effect of Medicare Cuts on Hospital Services

Measure	1985–1990 Medicare bite per patient	1985–1990 N	1985–1990 R^2/ ln(likelihood)	1990–1995 Medicare bite per patient	1990–1995 N	1990–1995 R^2/ ln(likelihood)
Full-time employment:						
Δ ln(RNs)	.00054	2,678	0.022	.00073	2,243	0.020
	(.00019)			(.00052)		
Δ ln(LPNs)	.00129	2,586	0.035	.00058	2,156	0.026
	(.00032)			(.00084)		
Technology acquisition:						
Cardiac services	−.00099	8,037	−2,134.00	−.00174	6,735	−1,739.45
	(.00185)			(.00404)		
Diagnostic radiology	.00160	10,644	−1,613.51	.00385	8,988	−4,293.66
	(.00183)			(.00224)		
Technology Elimination:						
Emergency care	.00282	5,358	−1,665.89	.00881	4,494	−594.91
	(.00202)			(.00770)		

Note: The first two rows are ordinary least-squares estimates of the effect of the Medicare bite on the change in the logarithm of nursing employment per patient day in the hospital. The next two rows are logit models for the acquisition of particular services. Cardiac services are angioplasty, open-heart surgery, and cardiac catheterization. Diagnostic radiology is CT scanners, MRIs, PET scanners, and SPECT scanners. The last row is a logit model for whether the hospital eliminates emergency services, either an emergency room or a trauma center. In each of the technology regressions, data are pooled across technologies. Standard errors are corrected for multiple observations on the same hospital and are reported in parentheses.

care cuts affect the internal structure of the hospital—the amount of care devoted to patients, and the acquisition of particular technologies. I examine this question directly on Table 8. The first two rows of the table show the effect of Medicare payment changes on the change in the logarithm of the number of full-time-equivalent-employment registered nurses (RNs) and licensed practical nurses (LPNs) per inpatient day. RNs are more skilled (and earn more) than LPNs, so that hospitals might substitute LPNs for RNs. Reductions in Medicare generosity are associated with reductions in the amount of nursing input. In both time periods, hospitals with larger Medicare cuts have more rapid declines in nursing input per patient day. While the standard errors are larger in the 1990s than in the 1980s, the coefficients are similar in the two time periods. A one-standard-deviation increase in the Medicare bite is associated with a 3-percent reduction in nursing input per day.

The remaining three rows of the table show the effect of Medicare cuts on particular technologies owned by hospitals. As Cutler and Scheiner (1998) show, a number of important medical technologies diffused over the 1980s and 1990s. Cutler and Sheiner find the diffusion of these technologies to be particularly sensitive to HMO enrollment in the state. These technologies might thus also be sensitive to Medicare reimbursement. I group the technologies into two groups: cardiac services (angioplasty, cardiac catheterization, and open-heart surgery) and diagnostic radiology (CT scanners, MRI scanners, PET scanners, and SPECT scanners). I estimate one coefficient for the effect of Medicare cuts on the diffusion of cardiac technologies, and a separate coefficient for the effect on diagnostic radiology services. Because I pool data across these technologies, there are more observations in these regressions than in the previous regressions. In each case, I correct the standard errors for the fact that I have multiple observations on the same hospitals. The table shows little evidence that Medicare payment changes have affected the diffusion of these technologies. The coefficients have different signs in the two equations, and none are statistically significant. It thus does not appear that Medicare cuts have had a substantial effect on the diffusion of intensive technology.

A related concern is whether Medicare cuts have induced hospitals to cut back on care for the poor. As Medicare becomes less generous, it may be increasingly difficult for hospitals to provide care to the uninsured. Hospitals might respond by discouraging these patients from being admitted to the hospital. I test for this effect by examining whether reductions in Medicare reimbursement are associated with hospital decisions to drop two components of emergency care: the emergency room, and its status as a trauma center. Since the uninsured use emergency services relatively more than the insured, eliminating such services would be a way to reduce access by the poor. As the last row of the table shows, however, there is no statistically significant effect of changes in Medicare generosity on the availability of these services. The coefficients are statistically insignificant and are opposite in sign to what dropping the technology would suggest.

The evidence on hospital responses to Medicare cuts thus suggests that the primary burden of reduced Medicare spending has been on hospital employees. Employment of nurses has fallen as Medicare has been cut. There is also some effect of Medicare changes on the probability that a hospital closes, but the magnitude of this effect is relatively small. And there is no evidence that hospitals have cut back on technology investment or services for the poor as Medicare has been cut.

6. IMPLICATIONS

The evidence in this paper tells a clear story. In the 1980s, Medicare reimbursement cuts were financed by shifting costs to the private sector; cost shifting eliminated the need for cost cutting. But in the 1990s, cost shifting is no longer viable. Hospitals that used to shift costs to the private sector must now reduce costs as Medicare cuts its reimbursement. The first round of cost cutting appears to have come from hospital staff—RNs in particular. Hospitals have also downsized as Medicare payments have been reduced. But I find no strong evidence that hospitals have responded to Medicare cuts by reducing their acquisition of new technologies, or by shutting down services provided disproportionately to the poor.

The central question raised by these results is whether Medicare cuts have substantial effects on the quality of hospital care. Quality is only partly related to the availability of physical services; it also depends on nursing quantity and quality and harder to measure aspects such as the overall organization of the hospital. My results shed no direct evidence on the quality of hospital care.

Past research on quality of care responses to Medicare cuts can be used as some guide to the likely effects of these changes. Cutler and Staiger (1996) suggest that medical technology can be modeled with a standard production function. As more medical inputs are provided, patient health improves but at a declining rate. Under the traditional, fee-for-service medical care system, the incentives were to provide additional quality until the marginal benefit of medical care was essentially zero. One would expect that from this point, reductions in Medicare reimbursement that had only a small effect on hospital profits would have only a small effect on patient care. This is indeed the finding of Cutler (1995) and Staiger and Gaumer (1995). Both of these studies show that in response to Medicare reimbursement changes in the 1980s, some patients died closer to a hospital admission, but these are largely patients that would have died several months later. There was no change in the share of patients surviving to one year after the hospitalization.

One might extrapolate from this finding to conclude that changes in Medicare reimbursement in the 1990s will have similarly small effects on medical care quality. But his conclusion may not be warranted. As the Medicare cuts increase in size and the ability to shift cost falls, reductions in care provided will be increasingly large. One would thus expect the health implications of Medicare cuts to increase. Evaluating whether

recent cuts in Medicare reimbursement have had substantial quality implications is a pressing item for future research.

More generally, these results raise the question about the future of Medicare cost containment efforts. Public policy has developed a dichotomy between Medicare savings from "providers" and savings from "beneficiaries." Because beneficiary payments are direct, public policy has shied away from such changes and has favored cuts in provider payments. To the extent that these payment cuts were shifted to private insurers, this strategy was equivalent to a tax increase for Medicare. As Medicare reimbursement cuts increasingly affect provider profits and thus the money available for patient care, however, the incidence will be much more on Medicare beneficiaries, and on the health system as a whole.

Almost certainly, this suggests focusing policy options more on other methods for reducing Medicare costs. Such reforms can take one of two paths (Cutler, 1996). First, the direct cost of Medicare to beneficiaries can be increased. This could be done by increasing the premium required for Part B services or increasing the age of eligibility for Medicare. Second, Medicare could move away from the fee-for-service model and encourage more enrollment in managed care organizations. The Balanced Budget Act of 1997 made some changes along these lines, but additional changes could be made.

Finally, these results raise questions about the link between Medicare and the rest of the health care system. Reductions in Medicare reimbursement that affect the provision of medical care will have effects on both Medicare beneficiaries and non-Medicare beneficiaries. As cuts in Medicare increase, it will be increasingly important to gauge the impact of these cuts on those without insurance, since those without insurance may be most at risk from reducing Medicare spending. It would be a shame if, in discovering ways to reduce Medicare spending, we did so by reducing the medical care for those most in need.

REFERENCES

Carter, Grace M., and Paul B. Ginsburg (1985). "The Medicare Case Mix Index Increase: Medical Practice Changes, Aging, and DRG Creep." Santa Monica, CA: Rand Corp., Rand Publication Series, R-3292-HCFA.

Coulam, Robert F., and Gary L. Gaumer (1991). "Medicare's Prospective Payment System: A Critical Appraisal." *Health Care Financing Review* 13(Supp.):45–78.

Cutler, David M. (1995). "The Incidence of Adverse Medical Outcomes Under Prospective Payment." *Econometrica*, January/February: 29–51.

——— (1996). "Restructuring Medicare for the Future." In *Setting National Priorities*, Robert Reischauer, (ed.). Washington, DC: The Brookings Institution.

———, and Louise Sheiner (1998). "Managed Care and the Growth of Medical Expenditures." Forthcoming in *Frontiers in Health Policy Research,* Alan Garber (ed.).

———, and Doug Staiger (1996). "Measuring the Benefits of Medical Progress." Harvard University. Mimeo.

Feder, Judith, Jack Hadley, and Stephen Zuckerman (1987). "How Did Medicare's Prospective Payment System Affect Hospitals?" *New England Journal of Medicine,* 317: 867–873.

Prospective Payment Assessment Commission (1994). *Medicare and the American Health Care System.* Washington, DC.

Staiger, Douglas, and Gary Gaumer (1995). "The Impact of Medicare Changes on Hospitals." Harvard University. Mimeo.