WHO PAYS? THE INCIDENCE OF HIGH MALPRACTICE PREMIUMS.

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Introduction.

Malpractice premiums are higher in some states than in others for apparently similar physician practices. They are rising, and they are rising at different rates. Someone clearly is paying more into the health care or health insurance system, but who? In the first instance, obviously physician practices pay the malpractice premium, but they may be able to shift some or all of high or growing premiums onto insurers and patients. The question of the "incidence" of premiums is an important part of understanding how the system behaves and has been behaving over time. An answer to this question would also help in judging the distribution of gains and losses from efforts to constrain premiums or damage awards. If all the gain from lower premiums goes to physicians, public attitudes may be different than if it is shared with the public. This paper reports on a study of premium incidence over the period 1994-2002, a period when the malpractice insurance

system again went into "crisis" as premiums rose significantly in some geographic areas and for some kinds of physicians.

Prior work and prior history.

Earlier work on the incidence of premiums used data from the last major malpractice crisis, that of the early 1980s. The evidence from that time period suggested that physician practices were able to pass through all (or even more than all) of the cost of malpractice insurance to patients and insurers (Danzon, Pauly, and Kington, 1990). Much of this pass through was accomplished through higher fee levels (Thurston, 2000). There has been no study of the effect of higher premiums on the total quantity of all physician services in that time period, but studies of individual components (e.g., follow-up visits, lab tests) show that they moved in mixed directions (Danzon, 2000), with quantities of some services increasing as premiums increased and others falling. There was no obvious "defensive medicine" pattern in this mix.

The period from the mid-1980s to the mid-1990s was one of flat or even declining malpractice premiums (in inflation adjusted terms), largely because of the high level of interest earnings on reserves held by insurers. To our knowledge, there has been no study of incidence for this time period, but the relatively modest movements in premiums across the board would have made it hard to pick anything up.

Beginning in the 1990s the overall health insurance market changed with the marked shift to managed care plans in the private sector, and the greater use of explicit bargaining by insurers with physicians, rather than the former passive reimbursement insurance. There has been obvious speculation that the old pass through results will have been different in the present period, but up to the present no definitive study. This paper is intended to look at the effect of premiums on physician incomes for the period 1994 to 2002, during which premium growth spiked upward in a number of states. It will also explore the impact of managed care on the extent of pass-through.

Modeling concepts.

We first set out a simple descriptive model of physician net income determination and its possible relationship to malpractice premium levels and changes.

Physician money net income Y can be defined as:

$$Y = PQ(H,L) - wL - M,$$

where Q is the quantity of services, P is the fee level, H is the amount of physician time, L is the quantity of non-physician inputs, and w is the unit price of that input, and M is the malpractice premium.

By the accounting identity, the impact of increases in M on money net income depends on its direct (negative) effect on Y, and then on its indirect effect (if any) on P, on Q, on H, and on L.

The gross price per unit of output P can be affected by higher malpractice premiums in several ways. The most obvious way is if a comprehensive insurer specifies a fee or reimbursement automatically increases when M increases. Blue plans, and Medicare to some extent, follow this policy; they automatically pass through increases for specific specialities or services (though often under overall budget constraints). (In the case of Medicare, the overall increase in total revenues and fees has been limited, but increases in premiums could raise relative and even absolute prices or reimbursements for those specialties providing services with high malpractice weights.) In the benchmark case in which P is increased just enough to offset the increase in M, and H and L are unchanged, net money and net real physician income will be unchanged. However, to the extent that M is a fixed cost, increasing P enough to offset the effect of M on net income will cause the marginal net revenue to rise, and practices may well choose to supply different amounts of more profitable output.

If patient insurance coverage is less than comprehensive, and reimbursement levels are increased when M increases, the price that physician practices will set will generally increase. But if there is positive coinsurance, the effect of an increase in gross price will be translated into an increase in patient cost sharing and a consequent possible partially offsetting reduction in Q demanded. This effect would most impact patients who are self

pay and those with coverage who are either under the deductible or have coverage that permits balance billing (as much private coverage does).

An increase in M not associated with a change in reimbursement or demand more broadly defined will affect profit-maximizing P with incomplete insurance only if it affects marginal cost per unit of output (either more H or more L per unit). A plausible story here is that an increase in M caused by an increase in malpractice claims *frequency* will increase the expected value of H per unit of Q (other things equal) because the physician will expect to bear additional time cost associated with more likely litigation. By the usual markup rule, the size of the increase in P will vary inversely with firm-level demand elasticity. The increase in P could indeed be larger than the increase in M if elasticity is sufficiently small. However, if higher levels of managed care cause firm-level demand to become more elastic, the increase in P will be smaller. If the market demand is inelastic, the offsetting reduction in Q will not be large enough to cause gross revenues to fall.

In addition to effects on and through P, changes in M may also influence Q directly if physicians engage in either defensive medicine or demand inducement. While either action may have a disutility cost to the physician, the effect can preserve or even increase net money income. If quantity does increase, either H or L (or both) will also increase.

Finally, income effects as a result of higher M can cause physicians to increase H (and reduce L) even while producing the same quantity; the effect will be to help to maintain money income, even though real income falls.

In what follows we examine the effect of variations in M on some of the variables just discussed: on money net income, on total revenues (PQ), on cost of non-physician inputs, and as an interaction with managed care penetration.

Data.

We obtained data from the Medical Group Management Association's (MGMA) annual survey data of a large set of single specialty group practices for the years 1994, 1998, and 2002. As indicated in Table 1, the data each year furnishes information on approximately 600-800 single-specialty practices. It provides information on the specialty type, and on the number of full-time-equivalent physicians in the practice, both owners and employees. It does not distinguish owner physicians from salaried physicians. While many of the reporting practices repeat each year, some do not. The specialty mix in the sample was roughly constant over this time period, with only the share of primary care practices increasing slightly.

The dependent variable of primary interest is practice net physician income (revenues minus all costs except physician costs) per full time equivalent physician. This measures money net income both for owner and salaried physicians at the practice. Other measures

include net revenues per physician and non-physician practice costs (excluding malpractice premiums) per physician.

Explanatory variables include the practice size (measured by number of FTE physicians), wages per FTE non-physician employee, binary variables for specialty, proportions of revenues from managed care insurers, Medicare, and Medicaid, and, of course, malpractice premiums per physician.

We undertook two forms of analysis. First, as in our earlier work, we estimated cross sectional analyses of the effects of variations across states in malpractice premiums for each of the three years for which we have data. A question of interest is whether any estimates of the impact of premiums on income across states are changing over time as technology, insurance markets, and the national legal climate changes. To explore this, we compare the results of successive cross-sections. Second, for those approximately 400 practices which responded to the survey in both 1998 and 2002, when premiums jumped most rapidly, we estimate first difference regressions, in which the dependent variable is the change in net income. Over this four year period there was a substantial increase in sample-wide malpractice premiums; we want to see whether those practices that experienced the largest increases in premiums also experienced larger changes in net income per physician, compared to those practices experiencing relatively smaller increases in premiums per physician. (We did not perform this analysis for the period 1994-1998 because the average change in premiums was much smaller.)

We first show single-equation cross sectional OLS results. Then, because a practice's premium level is to some extent endogenous and because total premiums are an imperfect measure of the price of a given level of coverage, we explore both first difference and instrumental variables estimates.

OLS Cross sections.

Tables 2 and 3 show the results of estimating cross sectional OLS regressions to explain variations in net income and net revenues per physician. Table 2 shows the data for the full sample of practices submitting complete data; Table 3 shows it for a subsample of practices in the surgical specialties (for whom premiums are much higher in absolute value and moderately higher relative to total practice revenues). The empirical model shown in Table2 and Table 3 will be the same one used in other results reported below.

In all three years, and both samples, there is no evidence that practices that pay higher premiums per physician report significantly lower physician net incomes. In regressions with net income per physician as the dependent variable, either the coefficient on the (log of) the premium per physician is not statistically significant, or it has a significant positive effect on net income. There is no consistent pattern of changes in the size of these effects over time, although it does appear that the positive impacts of premiums on both net income and revenues for the "all specialties" sample was somewhat larger in 1994 than in the two later years.

Other variables have relationships with physician net income that are expected. Compared to non-managed care private insurance, net incomes are lower in practices with high Medicare, Medicaid, and private managed care shares. Net incomes are higher for surgical specialties and, among surgical specialties, highest for OBG-GYN. Higher wages per FTE non-physician worker are positively and significantly related to physician net income, probably reflecting cross-area differences in the cost of living.

We also explored whether there is an interaction between the level of managed care penetration in a practice's state and the impact of premiums on net income (results not shown). Whether we used a continuous measure or focused on practices in the highest quartile of managed care share, there were no significant interaction effects. Thus the conclusion from this analysis is that, the last decade and a half, practices were still able to shift forward to consumers the differential cost of higher malpractice premiums, and that the ability to do so was not reduced by the relative spread of managed care. This ability is definitely not affected by the share of managed care patients treated by the practice. In short, somehow, these practices could make up for high malpractice premiums even when they are in areas with above-average managed care pressure.

There is also no statistically significant relationship between the number of claims per physician in the state and net incomes, controlling for the malpractice premiums. Doctors appear not to require higher money incomes when the chances of having to take time to deal with lawsuits rise. We do not know whether the time involved dealing with legal matters actually increased.

The second part of tables 2 and 3 use the same set of explanatory variables, but now uses net practice *revenues* per physician as the dependent variable. The hypothesis is that if premium costs are shifted forward so net income is unchanged, net revenues should rise (or, less likely, non-physician costs should fall). In all cases the coefficient on the level of malpractice premiums is positive and statistically significant. Thus the zero or positive effect on net income occurred primarily because more revenue was collected. The proportion of revenues that goes to pay malpractice premiums was approximately 4 percent for the surgical specialties subsample and 2 percent for the full sample of practices. The estimated elasticity of revenues per physician with respect to the premium is greater than or equal to the ratio of premiums to total practice revenues, as would be consistent with 100 % or more forward shifting. Here again there was no evidence that the magnitude of forward shifting changed appreciably over time or (in results not show) was affected by the proportion of revenues from managed care.

We would ideally like to decompose the effects of higher premiums on revenues into unit prices (for services of a given type and quality) and effects on the quantity and quality of services. However, with the rise of negotiated fees in this period, a measure of "price levels" is hard to conceptualize, and was not available for most of our data. (The best measure would be revenue per relative value unit, but RVU data was not available for most of the practices.) But we can get some insight into the decomposition issue if we assume that the volume of services per physician is approximately proportional to the level of FTE employment per physician, that is, there is approximately a "fixed

proportions" production function. This assumption is surely not perfectly accurate since some services are produced at the hospital, physician time can substitute for non-physician time (Reinhardt, 1971), and perhaps capital can also substitute, but it may be reasonable if there was no effect of variations in revenues per se on the mix of labor and other inputs in producing output. In effect, we will generate an upper bound estimate (under these assumptions) of the proportion of forward shifting due to price.

We therefore re-estimated the practice revenue and net income regressions substituting a measure of FTE workers per physician for the non-physician wage rate. That measure was also strongly related to revenue per physician, but the key finding is that the significant positive effect of malpractice premiums on revenues remained. Table 4 provides selected regression coefficients for OLS regressions for the three cross sections. The elasticity of revenues to premiums did decline into a range of 0.05 to 0.10, suggesting that some portion, perhaps a half to three quarters, of the response of revenues to premiums did reflect higher quantities, and the coefficients drew closer to the expense shares, exactly what one would expect if it was price effects that were being reflected. Moreover, the elasticity is now in the range of 100 % shifting into prices. The elasticity of revenues with respect to labor expense per doctor was always positive but always less than unity, consistent either with the absence of perfectly fixed proportions or there being price and other effects on revenues if the fixed proportions assumption is correct. We conclude that a sizeable and possibly growing proportion of the forward shifting of premiums was accomplished by provision of larger volumes of non-physician-labor-

using medical services. But there was still an important effect of premiums on revenues even with inputs (and outputs) held approximately constant.

Table 5 shows similar net income and revenue regressions using first differences of the dependent variables net income and net revenues, and the continuous explanatory variables. The sample here was about 400 practices that reported in both 1998 and 2002, where premiums rose substantially in many (though by no means all) states. (The specialty variables did not change over time for those practices that reported in both 1998 and 2002 and are therefore not included.) These first difference analyses should be less subject to endogeneity bias (discussed below) as long as unmeasured influences are approximately constant over time.

The results here are very similar to the cross section results. If anything, the positive relationships between premiums and revenues and income are even larger. The change in net income was either unrelated to or positively related to the change in premiums. The change in net revenues was positively and significantly related to the change in premiums. Forward shifting appears to occur in a relatively short run time frame, suggesting that the increases in revenues per physician are not being affected by changes in the number of physicians in the market area.

Are premiums endogenous?

The ideal measure of malpractice premiums would appear to be the market price per "unit" of coverage the practice faced, or the premiums for a policy with given sets of benefits. This type of information is not available in the MGMA data; we only know what each practice paid, not what it could have paid for a given policy. The total premium measure we have used therefore includes both price and quantity of coverage, and its use will yield biased coefficients if the quantity of coverage (in particular) were to be related to other determinants of either net income or net revenue. The most obvious rationale for bias here would be if premiums tended to be high for practices facing higher patient demands per physician; then any measured effects of premiums on gross or net income might simply reflect the influence of stronger demand on prices or quantities. Another potential problem is that the premium may serve largely as a proxy for the implicit cost associated with a higher probability of malpractice actions, but may be an imperfect proxy. What can we do to sort out these possibilities?

The first step is to consider what might lead practices to pay different premiums per physician. This question has previously been explored (and applied to the older data on output prices we used earlier) by Norman Thurston. He found that the relationship of premiums to output prices in the late 1980s was affected both by state-market-wide influences and by practice-specific influences.

Among the practice-specific influences, within a given specialty a practice's premiums might vary because different practices choose different levels of financial protection, in terms of deductibles, upper limits, and the like. According to Danzon (2000) there is a

only a limited variety of standard policies, so the scope for variation here is limited. More to the point, it is not clear on a priori grounds that the choice of different levels of coverage would be related to firm-level quantity of medical care demanded per physician; it is likely to depend more on practice's tolerance for risk and availability of alternative sources of financial protection (such as pooling net income over a larger number of physicians).

Unit malpractice premiums are thought to vary relatively little with practice specific risk; experience rating is uncommon, so the higher exposure of a busier practice would not be reflected in the premium (Sloan et al., 1996). (There has been somewhat greater de facto rating of late as insurers cancel for practices with bad experiences.) Changes over time in insurer net investment income and/or interest rates can also cause premiums to change, but these changes are unlikely to vary across practices. Some practices do appear to be more successful in searching out lower premiums than do others, but this success is unlikely to be related to unobserved demand variables. It is also possible that if a practice offers a wider scope of services, especially non-physician services, that may have some impact on the unit premium if the practice chooses a higher total liability limit or if the services added are riskier and insurers adjust the premium for this. The premium is also strongly influenced by physician decisions on performing some broad classes of high malpractice risk procedures (like normal deliveries). This there is some possibility for bias here.

Among the market-wide determinants of premiums per physician, in the cross sections the main influence is likely to be the state malpractice "climate," broadly defined. This "climate" would be exogenous to individual practices. The greater the relative frequency of malpractice claims per patient encounter or per physician, and the higher the dollar amount of the claim, the higher will be malpractice insurance payouts and therefore the higher will be premiums that cover those claims. Over time, the loading or difference between premiums and expected benefits is also influenced by insurer administrative costs and by earnings on reserves. The change in the return on reserves is widely thought to explain some of the changes over time in premiums, but these changes presumably occur uniformly across all areas.

To explore what happens in reality, we pursed an instrumental variables strategy. We could not find any variables to identify practice-specific premium differences within a state. However, we hypothesize that, across states, state-level measures of expected malpractice payouts will be related to malpractice premium variations across practices in different states but will not themselves be related to the demand for medical care. (This hypothesis would be incorrect if consumers in states with a higher chance of collecting benefits were willing to pay higher prices for a given quantity of physician services.)

Several specifications of first stage regressions were explored. We used actual private premium levels, the Medicare malpractice weight for its practice cost index, and direct measures of expected claims. All of these malpractice climate variables at the state level were indeed statistically significant predictors of cross-sectional variations in premiums.

However, as would be expected, there is much of the cross practice variation in premiums (e.g., within a state) that is not explained.

Using total expected malpractice payouts per physician generated somewhat greater predictive accuracy than using either the Medicare weight or the two components of expected claims: the likelihood or frequency of claims and the average dollar amount per claim. In what follows we therefore used statewide average or expected claims per doctor as the identifying variable.

Instrumental variables estimates: second stage.

Table 6 shows the results of regressions similar to those in Tables 2and 3 but using "predicted" rather than actual malpractice premiums as a regressor in an instrumental variables specification. (Because state-level claim frequency per physician was never statistically significant in the second stage but was a collinear predictor of premiums, it was dropped from the second stage in these analyses.) As in the OLS results, there is no relationship between the premium and net income (except for a marginally significant positive effect in 1994). In contrast to the OLS results, the coefficients for both net income and revenues are not always statistically significant. The coefficient is significant for all practices for 1994 only. In the other cases, while the coefficients have both positive and negative signs, with negative signs predominating for the 2002 cross section, none are statistically significant. At a minimum, based on this analysis, we can say that

there is no evidence that physician net incomes are depressed in those states where premiums are higher because of a more adverse malpractice climate.

The remaining puzzle is that, if an adverse climate increases premiums but does not reduce net income, why does it not always increase revenues enough to offset? It appears, as Thurston found with earlier data, that much of the relationship of premiums to revenues is at the individual practice rather than state level. The errors of measurement that are intrinsic to instrumental variables measures mean that statistical significance is often lost. Nevertheless, there does still remain something of a mystery.

We also explored an instrumental variables approach to the first difference regression but found, as have others (Baicker and Chandra 2004; Sage et al. 2005) that changes in state malpractice climate variables are poor predictors of changes in premiums. Without effective identifying variables, we were unable to pursue this strategy further.

Conclusion.

We find that in a large nationwide sample of group practices, higher malpractice premiums do not depress physician net incomes. Instead, by a combination of increasing prices and increasing quantity of (apparently) profitable outputs, the group practice physicians we studied appear able and willing to offset the effect of higher premiums on their incomes. If higher prices are to be the cause, they presumably were not important for patients covered by Medicare or by private insurers that prohibit balance billing. The

physicians' services consumer price index (CPI) (which measures prices for people who pay some or all out of pocket) rose about 3.2% per year over this period, but the producer price index (PPI) (which measures prices received) rose by only about 1% and did not rise at all toward the end of the period for some specialties. In contrast, measures in MGMA of trends in RVUs for those practices submitting such data from 1994 to 2002 are positive for most specialties and are of the order of 3-6% per year.

Regardless of the form, physicians appear able to shift premiums forward whether premiums are increased by an adverse legal climate or for other more practice-specific reasons. They were equally able to do so in different time periods or in geographic areas with heavy managed care presence.

This result implies that claims that higher premiums and a more costly malpractice system cause practices to "lose money" may be overstated, and conclusions about consequent departures from the practice of medicine or large scale moves from high malpractice to low malpractice states caused by differences in net physician income may be overstated.

However, that net money incomes are unaffected on average does not necessarily mean that there are no effects. There may still be some practices that experience malpractice related decreases in money incomes (offset by some who experience increases) and it may be complaints from the former that are most audible. Moreover, even if money net income is not reduced, adverse effects on physicians who may work longer hours

producing low value or defensive medicine services, or whose scarce leisure is consumed meeting with lawyers, may mean that real utility from medical practice is reduced.

The key unanswered question is the nature of the additional services that appear to be associated with higher premiums. What precisely are they, and do they provide more benefit than cost? Some services to guard against adverse outcomes, even if labeled by physicians as "defensive medicine," still may be worthwhile; we just don't know.

What does seem to be the case, however, is that higher premiums generate levels of medical spending as high as or higher than the costs they entail. Patients (or their insurers) pay; doctors do not. While the orders of magnitude here are not enormous (and any spending reduction associated with lower premiums would be offset after several years' technological change), reform could still make a contribution to lower patient cost. If the lost health and financial protection benefits are zero or small, it could also make a contribution toward more efficient production of health care.

Table 1. Description of data

	number of practices			mean number of physicians/practice			total number of FTE physicians			average percent malpractice costs of total revenue		
practice type	***1994***	***1998***	***2002***	***1994***	***1998***	***2002***	***1994***	***1998***	***2002***	***1994***	***1998***	***2002***
primary care	119	137	186	8.66	10.26	8.13	1,030	1,406	1,512	1.84%	1.67%	1.52%
ob/gyn	40	36	66	6.30	7.77	7.71	252	280	509	4.92%	3.55%	5.20%
anesthesia	37	52	50	21.06	26.18	22.97	779	1,361	1,149	2.97%	1.90%	2.21%
surgery	171	213	192	6.81	8.49	8.81	1,165	1,809	1,691	3.68%	3.06%	3.82%
radiology	30	31	28	13.54	14.04	21.22	406	435	594	1.76%	1.29%	1.79%
cardiology	58	97	103	8.38	11.47	13.36	486	1,112	1,376	1.37%	1.36%	1.45%
hemotology/oncology	14	20	48	4.21	5.71	7.08	59	114	340	0.64%	0.51%	0.64%
other specialties	165	167	186	7.18	7.21	8.56	1,186	1,205	1,592	1.72%	1.40%	1.79%
total	*634*	*753*	*859*	*8.46*	*11.60*	*10.20*	*5,363*	*7,722*	*8,763*	*2.49%*	*2.02%*	*2.37%*

source: MGMA 1994, 1998, 2002

Table 2. OLS regressions

Variable	1994 coefficient	1994 p-value	1998 coefficient	1998 p-value	2002 coefficient	2002 p-value
a. Dependent variable: physician income						
Malpractice premium/doctor (Ln)	0.1144	(0.000)	0.0126	(0.502)	0.0078	(0.662)
Wage/FTE non-physician (Ln)	0.0310	(0.352)	0.1351	(0.007)	0.1652	(0.000)
Managed care penetration	-0.0019	(0.071)	-0.0032	(0.001)	-0.0046	(0.000)
Total number of malpractice claims/doctor (Ln) by state	0.0346	(0.383)	0.0013	(0.974)	-0.0315	(0.401)
Specialty*						
Surgery	0.7379	(0.000)	0.8028	(0.000)	0.7645	(0.000)
Radiology	0.7607	(0.000)	0.8502	(0.000)	0.8856	(0.000)
Hemotology/oncology	0.8025	(0.000)	0.7718	(0.000)	0.8246	(0.000)
Cardiology	0.8556	(0.000)	0.8085	(0.000)	0.8262	(0.000)
Ob/gyn	0.4406	(0.000)	0.4165	(0.000)	0.3669	(0.000)
Anesthesia	0.6299	(0.000)	0.6048	(0.000)	0.6409	(0.000)
Other specialties	0.5321	(0.000)	0.5426	(0.000)	0.5665	(0.000)
Payer**						
Medicare	0.0002	(0.830)	-0.0004	(0.658)	0.0005	(0.586)
Medicaid	-0.0046	(0.031)	-0.0007	(0.725)	-0.0048	(0.005)
Other payers	----------	----------	-0.0017	(0.256)	-0.0004	(0.792)
b. Dependent variable: revenue per physician						
Malpractice premium/doctor (Ln)	0.1239	(0.000)	0.0844	(0.000)	0.0747	(0.000)
Wage/FTE non-physician (Ln)	0.0168	(0.623)	0.0326	(0.499)	0.0225	(0.642)
Managed care penetration by state	-0.0003	(0.802)	-0.0029	(0.003)	-0.0038	(0.000)
Total number of malpractice claims/doctor (Ln) by state	0.0446	(0.273)	-0.0087	(0.823)	-0.1017	(0.010)
Specialty*						
Surgery	0.4058	(0.000)	0.4843	(0.000)	0.4377	(0.000)
Radiology	0.3680	(0.000)	0.4902	(0.000)	0.4859	(0.000)
Hemotology/oncology	0.9211	(0.000)	1.2305	(0.000)	1.4567	(0.000)
Cardiology	0.5708	(0.000)	0.5996	(0.000)	0.6854	(0.000)
Ob/gyn	0.1650	(0.025)	0.2549	(0.000)	0.1669	(0.007)
Anesthesia	0.0832	(0.241)	0.1612	(0.008)	0.1289	(0.048)
Other specialties	0.3507	(0.000)	0.4288	(0.000)	0.3477	(0.000)
Payer**						
Medicare	-0.0024	(0.026)	-0.0023	(0.012)	-0.0028	(0.004)
Medicaid	-0.0086	(0.000)	-0.0034	(0.074)	-0.0070	(0.000)
Other payers	----------	----------	-0.0001	(0.939)	-0.0002	(0.885)

* Reference category is primary care.

** Reference category is private payer; in 1994, there are no "other payers." Reference category remains private payer.

Table 3. OLS regressions: Surgical practices only

Variable	1994 coefficient	1994 p-value	1998 coefficient	1998 p-value	2002 coefficient	2002 p-value
a. Dependent variable: revenue per physician						
Malpractice premium/doctor (Ln)	0.0505	(0.097)	0.0406	(0.180)	0.0476	(0.196)
Wage/FTE non-physician (Ln)	0.2660	(0.004)	0.1626	(0.042)	0.2753	(0.006)
Managed care penetration by state	0.0012	(0.486)	-0.0030	(0.063)	-0.0052	(0.004)
Total number of malpractice claims/doctor (Ln) by state	0.0753	(0.245)	0.0877	(0.166)	-0.0872	(0.197)
Payer**						
Medicare	0.0010	(0.572)	-0.0009	(0.503)	0.0013	(0.416)
Medicaid	-0.0077	(0.040)	-0.0066	(0.018)	-0.0013	(0.651)
Other payers	----------	----------	0.0012	(0.755)	0.0062	(0.004)
b. Dependent variable: physician income						
Malpractice premium/doctor (Ln)	0.0693	(0.038)	0.0275	(0.435)	0.0326	(0.417)
Wage/FTE non-physician (Ln)	0.1877	(0.063)	0.2196	(0.019)	0.4203	(0.000)
Managed care penetration	-0.0009	(0.633)	-0.0025	(0.190)	-0.0062	(0.002)
Total number of malpractice claims/doctor (Ln) by state	0.1233	(0.083)	0.1350	(0.068)	-0.0821	(0.265)
Payer**						
Medicare	0.0067	(0.001)	0.0051	(0.002)	0.0071	(0.000)
Medicaid	-0.0043	(0.289)	-0.0040	(0.221)	-0.0030	(0.345)
Other payers	----------	----------	0.0074	(0.094)	0.0077	(0.001)

** Reference category is private payer; in 1994, there are no "other payers." Reference category remains private payer.

Table 4.
Elasticities of revenues per physician with respect to malpractice premiums per physician and labor expense per physician.

Full Sample			
Year	1994	1998	2002
Malpractice Premium Elasticity	.10	.07	.05
Labor per Physician Elasticity	.28	.28	.31
Specialists Only			
Malpractice Premium Elasticity	.06	.06	.05*
Labor per Physician Elasticity	.43	.33	.49

* All coefficients significant at better than 0.95 level except * = significant at better than 0.90.

Table 6a. Two-stage least squares regressions: All practices

Variable	1994 coefficient	1994 p-value	1998 coefficient	1998 p-value	2002 coefficient	2002 p-value
a. First stage dependent variable: malpractice premium/doctor (Ln)						
Wage/FTE non-physician (Ln)	0.0655	(0.324)	0.1170	(0.221)	-0.1045	(0.235)
Managed care penetration by state	-0.0061	(0.009)	0.0003	(0.893)	0.0021	(0.255)
Specialty*						
Surgery	0.8966	(0.000)	1.2059	(0.000)	1.5151	(0.000)
Radiology	0.3373	(0.022)	0.1205	(0.379)	0.7589	(0.000)
Hemotology/oncology	-0.2545	(0.209)	0.0548	(0.737)	0.4208	(0.000)
Cardiology	0.2992	(0.018)	0.3514	(0.000)	0.6575	(0.000)
Ob/gyn	1.0527	(0.000)	1.1481	(0.000)	1.6256	(0.000)
Anesthesia	0.6848	(0.000)	0.2824	(0.017)	0.6037	(0.000)
Other specialties	0.2256	(0.011)	0.1692	(0.049)	0.4649	(0.000)
Total number of malpractice claims/doctor by state (Ln)	0.0170	(0.872)	0.3190	(0.001)	0.3927	(0.000)
Medicare malpractice index	0.2107	(0.070)	0.3618	(0.000)	0.1656	(0.084)
Average premium by state (Ln)	0.2724	(0.000)	-0.0187	(0.780)	-0.0120	(0.883)
Average malpractice payout (Ln)	0.2109	(0.015)	0.3946	(0.000)	0.1400	(0.021)
Payer**						
Medicare	0.0024	(0.247)	0.0003	(0.877)	0.0008	(0.680)
Medicaid	0.0051	(0.228)	0.0033	(0.376)	-0.0042	(0.190)
Other payers	----------	----------	0.0029	(0.314)	-0.0005	(0.860)
b. Dependent variable: revenue per physician						
Malpractice premium/doctor (Ln)	0.1238	(0.036)	0.0051	(0.923)	-0.0662	(0.367)
Wage/FTE non-physician (Ln)	0.0156	(0.652)	0.0442	(0.369)	0.0148	(0.772)
Managed care penetration by state	-0.0002	(0.845)	-0.0027	(0.004)	-0.0036	(0.000)
Specialty*						
Surgery	0.4059	(0.000)	0.5813	(0.000)	0.6490	(0.000)
Radiology	0.3735	(0.000)	0.5029	(0.000)	0.5879	(0.000)
Hemotology/oncology	0.9286	(0.000)	1.2353	(0.000)	1.5111	(0.000)
Cardiology	0.5754	(0.000)	0.6311	(0.000)	0.7746	(0.000)
Ob/gyn	0.1629	(0.140)	0.3541	(0.000)	0.3948	(0.003)
Anesthesia	0.0868	(0.278)	0.1881	(0.003)	0.2074	(0.012)
Other specialties	0.3516	(0.000)	0.4459	(0.000)	0.4126	(0.000)
Payer**						
Medicare	-0.0024	(0.024)	-0.0022	(0.019)	-0.0028	(0.007)
Medicaid	-0.0084	(0.000)	-0.0033	(0.082)	-0.0078	(0.000)
Other payers	----------	----------	0.0001	(0.925)	-0.0004	(0.755)
c. Dependent variable: physician income						
Malpractice premium/doctor (Ln)	0.1092	(0.058)	-0.0517	(0.346)	-0.0562	(0.410)
Wage/FTE non-physician (Ln)	0.0306	(0.364)	0.1440	(0.005)	0.1595	(0.001)
Managed care penetration by state	-0.0018	(0.078)	-0.0031	(0.002)	-0.0044	(0.000)
Specialty*						
Surgery	0.7443	(0.000)	0.8821	(0.000)	0.8611	(0.000)
Radiology	0.7668	(0.000)	0.8617	(0.000)	0.9335	(0.000)
Hemotology/oncology	0.8075	(0.000)	0.7762	(0.000)	0.8510	(0.000)
Cardiology	0.8608	(0.000)	0.8352	(0.000)	0.8685	(0.000)
Ob/gyn	0.4466	(0.000)	0.4981	(0.000)	0.4713	(0.000)
Anesthesia	0.6361	(0.000)	0.6279	(0.000)	0.6789	(0.000)
Other specialties	0.5339	(0.000)	0.5573	(0.000)	0.5970	(0.000)
Payer**						
Medicare	0.0002	(0.843)	-0.0003	(0.734)	0.0006	(0.564)
Medicaid	-0.0043	(0.041)	-0.0007	(0.740)	-0.0051	(0.003)
Other payers	----------	----------	-0.0015	(0.332)	-0.0004	(0.764)

Table 6b. Two-stage least squares regressions: Surgical practices only

	1994		1998		2002	
Variable	coefficient	p-value	coefficient	p-value	coefficient	p-value
a. First stage dependent variable: malpractice premium/doctor (Ln)						
Wage/FTE non-physician (Ln)	0.3651	(0.081)	0.2024	(0.230)	-0.3987	(0.020)
Managed care penetration by state	-0.0050	(0.276)	0.0014	(0.672)	-0.0005	(0.878)
Specialty*						
Surgery	-0.3972	(0.074)	0.0279	(0.880)	0.0145	(0.925)
Orthopedic surgery	0.2176	(0.098)	-0.1298	(0.193)	-0.3078	(0.001)
Total number of malpractice claims/doctor by state (Ln)	0.3530	(0.073)	0.4310	(0.006)	0.2041	(0.210)
Medicare malpractice index	0.1048	(0.632)	0.3975	(0.033)	0.1104	(0.398)
Average premium by state (Ln)	0.0667	(0.594)	-0.2132	(0.088)	0.0086	(0.947)
Average malpractice payout (Ln)	0.3765	(0.024)	0.5634	(0.000)	0.2795	(0.003)
Payer**						
Medicare	0.0013	(0.797)	0.0010	(0.779)	0.0022	(0.541)
Medicaid	0.0080	(0.356)	0.0061	(0.331)	-0.0103	(0.038)
Other payers	----------	----------	0.0110	(0.175)	0.0020	(0.615)
b. Dependent variable: revenue per physician						
Malpractice premium/doctor (Ln)	0.1140	(0.317)	-0.0100	(0.907)	0.0296	(0.827)
Wage/FTE non-physician (Ln)	0.2586	(0.011)	0.1911	(0.021)	0.3504	(0.001)
Managed care penetration by state	0.0019	(0.264)	-0.0029	(0.066)	-0.0048	(0.003)
Specialty*						
Surgery	0.0610	(0.563)	0.1433	(0.097)	0.1279	(0.111)
Orthopedic surgery	0.1616	(0.010)	0.1287	(0.010)	0.3090	(0.000)
Payer**						
Medicare	0.0002	(0.926)	-0.0023	(0.181)	-0.0037	(0.069)
Medicaid	-0.0048	(0.210)	-0.0021	(0.477)	0.0019	(0.536)
Other payers	----------	----------	0.0011	(0.783)	-0.0011	(0.611)
c. Dependent variable: physician income						
Malpractice premium/doctor (Ln)	0.2476	(0.067)	-0.0147	(0.886)	-0.1597	(0.332)
Wage/FTE non-physician (Ln)	0.1078	(0.365)	0.2018	(0.038)	0.3283	(0.011)
Managed care penetration by state	0.0003	(0.902)	-0.0026	(0.162)	-0.0063	(0.001)
Specialty*						
Surgery	0.2244	(0.073)	0.3287	(0.001)	0.4020	(0.000)
Orthopedic surgery	0.0156	(0.832)	0.0229	(0.694)	0.0112	(0.892)
Payer**						
Medicare	0.0042	(0.112)	0.0014	(0.471)	-0.0009	(0.711)
Medicaid	-0.0027	(0.550)	0.0015	(0.664)	-0.0025	(0.500)
Other payers	----------	----------	0.0048	(0.283)	0.0012	(0.663)

* Reference category is primary care.

** Reference category is private payer; in 1994, there are no "other payers." Reference category remains private payer.

Table 5. First difference regressions

Variable	Changes between 1998 and 2002 coefficient	p-value
a. Dependent variable: change in revenue per physician		
Change in Malpractice premium/doctor (Ln)	0.0469	(0.018)
Change in Wage/FTE non-physician (Ln)	0.1191	(0.027)
Change in Total number of malpractice claims/doctor (Ln) by state	0.0846	(0.199)
Specialty*		
Surgery	-0.0589	(0.220)
Radiology	0.0639	(0.352)
Other specialties	-0.0515	(0.292)
Cardiology	0.0373	(0.469)
Ob/gyn	-0.1375	(0.077)
Anesthesia	-0.0692	(0.350)
Multispecialty practices	-0.0101	(0.809)
Change in share for Payer**		
Medicare	0.0011	(0.479)
Medicaid	-0.0028	(0.344)
Other payers	-0.0005	(0.662)
b. Dependent variable: Change in physician income		
Change in Malpractice premium/doctor (Ln)	0.0512	(0.015)
Change in Wage/FTE non-physician (Ln)	0.2058	(0.000)
Change in Total number of malpractice claims/doctor (Ln) by state	0.0942	(0.177)
Specialty*		
Surgery	-0.0683	(0.179)
Radiology	0.0394	(0.587)
Other specialties	-0.0336	(0.515)
Cardiology	-0.0253	(0.642)
Ob/gyn	-0.1529	(0.063)
Anesthesia	-0.0364	(0.642)
Multispecialty practices	-0.0514	(0.245)
Change in share for Payer**		
Medicare	0.0013	(0.405)
Medicaid	-0.0035	(0.264)
Other payers	-0.0017	(0.126)

* Reference category is primary care.

** Reference category is private payer; in 1994, there are no "other payers." Reference category remains private payer.

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