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The effects of liability rules on medical practice

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forecasting is not whether unit root pretests select the "true" model, but whether they select models that produce superior forecasts. My recent work with Kilian suggests that unit root tests are effective when used for that purpose.²⁶

¹ J. H. Cochrane, "New Facts in Finance," NBER Working Paper No. 7169, June 1999, provides a fine survey of many of the recent developments in finance.

² The "Forecasting and Empirical Methods in Finance and Macroeconomics" group is supported by the NBER and the National Science Foundation. Its meetings have produced several associated symposiums, including those whose proceedings appear in: Review of Economics and Statistics, November 1999, F. X. Diebold, J. H. Stock, and K. D. West, eds.; International Economic Review, November 1998, F. X. Diebold and K. D. West, eds.; and Journal of Applied Econometrics, September–October 1996, F. X. Diebold and M. W. Watson, eds.

³ For overviews, see F. X. Diebold, Elements of Forecasting, Cincinnati: South-Western College Publishing, 1998, and "The Past, Present, and Future of Macroeconomic Forecasting," NBER Working Paper No. 6290, November 1997, and Journal of Economic Perspectives, 12 (1998), pp. 175–92.

⁴ See, for example, A. C. Stockman, "Economic Theory and Exchange Rate Forecasts," International Journal of Forecasting, 3 (1987), pp. 3–15.

⁵ P. F. Christoffersen and F. X. Diebold, "Optimal Prediction under Asymmetric Loss," NBER Technical Working Paper No. 167, October 1994. Published in two parts, as "Optimal Prediction under Asymmetric Loss," Econometric Theory, 13 (1997), pp. 808–17, and "Further Results on Forecasting and Model Selection under Asymmetric Loss," Journal of Applied Econometrics, 11 (1996), pp. 561–72.

⁶ P. F. Christoffersen and F. X. Diebold, "Cointegration and Long-Horizon Forecasting," NBER Technical Working Paper No. 217, October 1997, and Journal of Business and Economic Statistics, 16 (1998), pp. 450–8.

⁷ For a survey, see F. X. Diebold and J. A. Lopez, "Forecast Evaluation and Combination," NBER Technical Working Paper No. 192, March 1996, and Handbook of Statistics, G. S. Maddala and C. R. Rao, eds., pp. 241–68. Amsterdam: North-Holland, 1996.

⁸ F. X. Diebold and R. S. Mariano, "Comparing Predictive Accuracy," Journal of Business and Economic Statistics, 13 (1995), pp. 253–65, and in Economic Forecasting, T. C. Mills, ed., Cheltenham, U.K.: Edward Elgar Publishing, 1998.

⁹ K. D. West, "Asymptotic Inference about Predictive Ability," Econometrica, 64 (1996), pp. 1067–84.

¹⁰ H. White, "A Reality Check for Data Snooping," Econometrica, forthcoming, and R. Sullivan, A. Timmermann, and H. White, "Data Snooping, Technical Trading Rule Performance, and the Bootstrap," Journal of Finance, forthcoming.

¹¹ F. X. Diebold, T. A. Gunther, and A. S. Tay, "Evaluating Density Forecasts, with Applications to Financial Risk Management," NBER Technical Working Paper No. 215, October 1997, and International Economic Review, 39 (1998), pp. 863–83.

¹² F. X. Diebold, J. Hahn, and A. S. Tay, "Multivariate Density Forecast Evaluation and Calibration in Financial Risk Management: High-Frequency Returns on Foreign Exchange," revised and re-titled version of NBER Working Paper No. 6845, December 1998. Forthcoming in Review of Economics and Statistics, 81 (1999).

¹³ F. X. Diebold, A. S. Tay, and K. F. Wallis, "Evaluating Density Forecasts of Inflation: The Survey of Professional Forecasters," NBER Working Paper No. 6228, October 1997, and Cointegration, Causality, and Forecasting: A Festschrift in Honor of Clive W. J. Granger, R. Engle and H. White, eds., pp. 76–90. Oxford: Oxford University Press, 1999.

¹⁴ For an overview, see T. Andersen, T. Bollerslev, F. X. Diebold, and P. Labys, "Understanding, Optimizing, Using, and Forecasting Realized Volatility and Correlation," Risk, 12 (forthcoming).

¹⁵ See T. Andersen, T. Bollerslev, F. X. Diebold, and P. Labys, "The Distribution of Exchange Rate Volatility," NBER Working Paper No. 6961, February 1999, and the references therein.

¹⁶ See F. X. Diebold, A. Hickman, A. Inoue, and T. Schuermann, "Scale Models," Risk, 11 (1998), pp. 104–7, and Hedging with Trees: Advances in Pricing and Risk Managing Derivatives, M. Broadie and P. Glasserman, eds., pp. 233–7. London: Risk Publications, 1998.

¹⁷ P. F. Christoffersen and F. X. Diebold, "How Relevant Is Volatility Forecasting for Financial Risk Management?" NBER Working Paper No. 6844, December 1998, and Review of Economics and Statistics, 82 (forthcoming).

¹⁸ F. X. Diebold and A. Inoue, "Long

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¹⁹ F. X. Diebold and G. D. Rudebusch, "A Nonparametric Investigation of Duration Dependence in the American Business Cycle," Journal of Political Economy, 98 (1990), pp. 596–616; F. X. Diebold, D. Neumark, and D. Polsky, "Job Stability in the United States," Journal of Labor Economics, 15 (1997), pp. 206–33; and A. N. Bomfim and F. X. Diebold, "Bounded Rationality and Strategic Complementarity in a Macroeconomic Model: Policy Effects, Persistence, and Multipliers," Economic Journal, 107 (1997), pp. 1358–75.

²⁰ F. X. Diebold and G. D. Rudebusch, Business Cycles: Durations, Dynamics, and Forecasting. Princeton: Princeton University Press, 1999.

²¹ F. X. Diebold and G. D. Rudebusch, "Measuring Business Cycles: A Modern Perspective," Review of Economics and Statistics, 78 (1996), pp. 67–77; and F. X. Diebold, J.-H. Lee, and G. Weinbach, "Regime Switching with Time-Varying Transition Probabilities," in Nonstationary Time Series Analysis and Cointegration, C. Hargreaves, ed., pp. 283–302. Oxford: Oxford University Press, 1994.

²² C.-J. Kim and C. R. Nelson, "Business Cycle Turning Points, a New Coincident Index, and Tests of Duration Dependence Based on a Dynamic Factor Model with Regime-Switching," Review of Economics and Statistics, 80 (1998), pp. 188–201, and State Space Models with Regime Switching. Cambridge, Mass.: MIT Press, 1999.

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²⁴ F. X. Diebold and L. Kilian, "Measuring Predictability: Theory and Macroeconomic Applications," NBER Technical Working Paper No. 213, August 1997.

²⁵ F. X. Diebold and A. S. Senhadji, "The Uncertain Unit Root in Real GNP: Comment," American Economic Review, 86 (1996), pp. 1291–8.

²⁶ F. X. Diebold and L. Kilian, "Unit Root Tests Are Useful for Selecting Forecasting Models," NBER Working Paper No. 6928, February 1999, and forthcoming in Journal of Business and Economic Statistics, 18.

The Effects of Liability Rules on Medical Practice

Daniel P. Kessler*

Medical malpractice liability law has two principal objectives: to compensate patients who are injured through the negligence of health care providers, and to deter providers from practicing negligently. Considerable evidence indicates that the current liability system in the United States is not achieving its compensation goal. Awards for medical malpractice claimants are subject to lengthy delays: on average, it takes around four years to resolve a malpractice claim.¹ In addition, the current system is neither sensitive nor specific in its distribution of awards. Only 1 in 15 patients who suffer an injury because of medical negligence receives compensation, and five-sixths of the cases that receive compensation have no evidence of negligence.²

The unpredictability of malpractice compensation suggests that the system may not be achieving its second objective: to provide incentives for physicians to take optimal precautions against patient injury. Injury attributable to medical care generally, and to negligence specifically, is surprisingly common. Nearly 4 percent of hospital admissions in New York state in 1984 involved an injury that was attributable to medical care, with roughly one-quarter caused by negligence (the proportion of serious injuries that were attributable to negligence was even higher).³

At the same time, U.S. health spending has reached unprecedented levels, with no clear sign of slower

growth rates in sight. Does the malpractice system lead physicians to take too little care to avoid harming patients? Or does it lead to "defensive medicine"—costly precautionary treatments with minimal expected medical benefit administered out of fear of legal liability? Why has the liability system performed poorly in the health care sector? What policy reforms might improve the ability of the system to meet its twin goals? My research with Mark B. McClellan addresses these questions.

Why the Liability System Leads to Nonoptimal Health Care Decisions: Insurance

In theory, the liability system should provide physicians with incentives to take the socially optimal amount of care against accidental medical injury. Doctors bear the costs of injuries that they negligently cause. With their patients, they balance the costs of injuries against the costs of precautionary medical treatment and undertake those tests and procedures that are worthwhile from the perspective of social welfare.

But the pervasiveness of insurance in the health care sector drives a wedge between these seemingly sensible incentives and socially optimal medical decisionmaking. On the one hand, because physicians have insurance against the financial costs of malpractice that is not strongly experience-rated, they may bear little of the costs of medical injuries.⁴ This could lead physicians to take fewer precautions than the low costs of diagnostic tests, for example, would warrant. On the other hand, because most health care is financed through health insurance, patients and physicians bear little of the costs of pre-

cautionary medical care in any particular case. Generally, insured expenses for drugs, tests, and other services performed for precautionary purposes are much larger than the uninsured cost of the physician's own effort. Insensitivity to the true costs of health care could lead physicians to take socially excessive precautions against injury—to practice defensive medicine. Thus, even a perfectly functioning liability system could lead to socially undesirable medical treatment decisions—either too much or too little health care.

Do Doctors Practice Defensive Medicine?

The direction and extent of the divergence between the privately and socially optimal levels of precaution depend in part on states' medical malpractice liability laws. Although the basic "negligence rule"—which states that damages equal to the harm suffered should be awarded in cases of negligence—applies to most medical malpractice claims in the United States, individual states have modified their liability laws along various dimensions over the past 30 years. For example, several states have imposed caps on malpractice damages such that recoverable losses are limited to a fixed dollar amount, such as \$500,000. These modifications to the basic negligence rule can affect physician behavior by affecting the costs to physicians and the benefit to patients from a given malpractice claim or lawsuit, and the overall frequency of claims.⁵

To investigate whether liability law reforms lead to welfare-reducing or welfare-improving changes in medical treatment decisions, we analyzed longitudinal data from 1984, 1987, and 1990 on essentially all elderly Medicare beneficiaries hospitalized with serious cardiac illness, matched

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with information on reforms from the state in which the patient was treated.⁶ We studied the effect of reforms on total hospital expenditures on the patient in the year after the heart attack (AMI) or ischemic heart disease (IHD) as a way of measuring intensity of treatment. We also modeled the effect of reforms on important patient outcomes. We estimated the effect of reforms on a serious adverse outcome that is common in our study population: mortality within one year of occurrence of the cardiac illness. We also estimated the effect of reforms on two other common adverse outcomes related to a patient's quality of life: whether the patient experienced a subsequent AMI, or heart failure requiring hospitalization, in the year following the initial illness. Our basic strategy was to compare trends in treatments, costs, and outcomes for patients from states reforming their liability system with those from states that were not reforming their systems, holding constant patient background characteristics, state and time fixed effects, and the legal and political characteristics of states.

Our analysis indicates that reforms that directly limit liability—such as caps on damages—reduced hospital expenditures by 5 to 9 percent in the late 1980s. The effects were greater for the IHD than for the AMI patients. Because IHD is a less severe form of illness, the IHD patients may have had more “marginal” indications for intensive treatment, leading to a greater scope for defensive practices. In contrast, reforms that limit liability only indirectly were not associated with any substantial effects on expenditures. Neither type of reform led to any consequential differences in mortality or in the occurrence of serious complications. The estimated expenditure/benefit ratio associated with intensive treatment induced by liability pressure was more than \$500,000 per additional one-year sur-

vivor, with comparable ratios for recurrent AMIs and heart failure. Thus, treatment of elderly patients with heart disease does involve defensive medical practices, and limited reductions in liability can reduce this costly behavior.⁷

How Liability Law Affects Medical Productivity

Even if they improve productivity, direct reforms only address the problem of excessive physician precaution. Other reforms have sought to resolve a greater number of claims outside of formal litigation—the goal being to improve the sensitivity and specificity of malpractice compensation and to reduce the prevalence of defensive medicine.⁸ More fundamental changes in the liability system have also been proposed,⁹ although few of these changes have been broadly implemented. In addition, the rise of managed care in the 1990s, by reducing moral hazard from health insurance, may have affected the relationship between reforms and defensive practices; without this moral hazard, it is unlikely that defensive medicine would be an important social problem.

Predicting whether untried reforms, or existing reforms under new market conditions, will improve the performance of the liability system requires an understanding of the channels through which malpractice laws affect physician behavior. But my 1996 work with McClellan (as well as much of the work to date on program evaluations in other contexts) treats the mechanisms through which the effects of laws are achieved as a black box. This approach is simple, in that it avoids explicit empirical modeling of the key behavioral responses that actually lead to the outcomes of interest. However, without explicit models of policy effects on incentives, and in turn of the effects

of incentives on behavior, moving beyond the details of a particular reform to consider the likely consequences of other types of policy changes is highly speculative. Moreover, an explicit analysis of mechanisms could provide important validating information. Economic studies of policy effects are generally based on observational data, raising concerns that unmeasured factors rather than the policy changes themselves could account for the empirical results. Finally, explicit analysis of mechanisms provides a much richer context for modeling economic behavior; especially in the health care industry, provider behavior is not well understood.

My recent work empirically identifies these mechanisms. McClellan and I¹⁰ integrate four unique data sources to illuminate how existing liability law and liability reforms affect the outcomes of the liability system, and how reform-induced changes in the incentives provided by the liability system affect treatment decisions, medical costs, and health outcomes. We match by state and year the longitudinal Medicare data discussed earlier (updated to include all years from 1984 to 1994) with data on law reforms, with physician-level data on the frequency of malpractice claims from the American Medical Association's Socioeconomic Monitoring System (AMA SMS), and with malpractice claim-level data from the Physician Insurers Association of America on claim costs and claim outcomes.

We model the complete process by which malpractice reforms affect health care productivity. First we study the impact of liability reforms on a range of measures of the pressures on providers generated by the malpractice system: the frequency of malpractice claims, the likelihood of a prolonged duration of claims resolution, administrative and legal expenses incurred in defending against

a claim, and the amount of any settlement or award to the plaintiff. We then analyze the extent to which changes in malpractice pressure affect the major categories of medical treatment decisions for elderly heart disease patients, and in turn the consequences of these changes in practices for medical expenditures and patient health outcomes. We thus remove the black box by identifying the actual incentives that policy reforms alter to influence the production of medical services, and how these changes in medical production affect health and cost outcomes.

Although we find that direct reforms improve medical productivity primarily by reducing malpractice claims rates and compensation conditional on a claim, our results suggest that other policies that reduce the time spent and the amount of conflict involved in defending against a claim can also reduce defensive practices substantially. In addition, we find that "malpractice pressure" has a larger impact on diagnostic rather than therapeutic treatment decisions. Our results provide an empirical foundation for simulating the effects of untried malpractice reforms on health care costs and outcomes, based on their predicted effects on the malpractice pressure facing medical providers. For example, at least for elderly heart disease patients, an untried reform that reduced the legal-defense burden on physicians and hospitals by one-quarter—which is within the range of policy possibilities—could be expected to reduce medical treatment intensity by approximately 6 percent, but not to increase the incidence of adverse health outcomes. In the same population, a policy that expedited claim resolution by six months across the board could be expected to reduce hospital treatment costs by 2.8 percent, without greater adverse outcomes.

My other work with McClellan tests specific hypotheses about the ways

in which liability law affects medical practices. We match longitudinal Medicare data with law reforms and data on health insurance markets to explore the ways in which managed care and liability reform interact to affect treatment intensity and health outcomes.¹¹ Have more parsimonious practices associated with managed care reduced physicians' incentive and ability to engage in defensive treatment, making the policy question about liability reform moot? Has managed care increased the benefits from liability reform? Or has managed care made liability reform socially harmful? In addition to contributing to our understanding of the effects of liability reforms in general, the answers to these questions can inform the debate over the extension of malpractice liability to health insurers and managed care organizations.

We find that direct reforms reduce defensive practices in areas with both low and high levels of managed care enrollment. Managed care and direct reforms do not have long-run interaction effects that are harmful to patient health. However, at least for patients with less severe cardiac illness, managed care and direct reforms are substitutes, so the reduction in defensive practices that can be achieved with direct reforms is smaller in areas with high managed care enrollment.

In our 1997 work,¹² McClellan and I use physician survey data from the AMA SMS to measure how malpractice pressure affects physician perceptions of appropriate practices. In that way, we capture a determinant of treatment decisions. We find that both liability reforms and individual physicians' personal experiences with the malpractice system are important determinants of the perceived importance of defensive medicine. Physicians from states adopting liability reforms report significant relative declines in the perceived impact of malpractice pressure on practice pat-

terns, as compared with physicians from nonadopting states. Physicians who have had a malpractice claim filed against them, particularly a recent claim, are more likely to report changes in practices as a result of malpractice pressure than physicians who have not. Furthermore, the effect of claims experience on perceptions is smaller in adopting versus nonadopting states. Taken together, these results suggest that reforms in law do affect physicians' attitudes, both by reducing the probability of an encounter with the liability system and by changing the nature of the experience of being sued, for those physicians who defend against malpractice claims.

Conclusion

My work with McClellan concludes that defensive medicine is an important problem in the U.S. health care system, and that limited reductions in liability can reduce the social costs of defensive practices. In future work, we will investigate how much our results can be generalized. How does liability reform affect treatment decisions in nonelderly populations, and does it affect different types of elderly patients (for example, men versus women) differently? We are also conducting additional analysis of physician surveys to explore the validity of our results. Questions designed exclusively for this project (administered as part of the 1998 AMA SMS) asked physicians detailed questions about their experiences with the malpractice system and their market environment, in order to identify how malpractice pressure and other incentives interact to affect medical decisionmaking.

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² *Harvard Medical Practice Study*, Patients, Doctors, and Lawyers: Medical

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³ Weiler et al., *A Measure of Malpractice*, p. 137.

⁴ F. A. Sloan, "Experience Rating: Does It Make Sense for Medical Malpractice Insurance?" *American Economic Review*, 80 (1990), pp. 128–33. However, physicians bear significant uninsured expenses in response to a malpractice claim, such as the value of time and emotional energy spent on legal defense (U.S. Congress, Office of Technology Assessment, *Impact of Legal Reforms on Medical Malpractice Costs*, OTA-BP-H-119, p. 7. Washington, D.C.: U.S. Government Printing Office, 1993).

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¹¹ D. P. Kessler and M. B. McClellan, "Medical Liability, Managed Care, and Defensive Medicine," NBER Working Paper No. 7537, February 2000.

¹² Kessler and McClellan, "The Effects of Malpractice Pressure and Liability Reforms."

International Economic Organizations, Developing Country Reforms, and Trade

Anne O. Krueger*

International Economic Organizations

The three major international economic organizations are the World Bank, the International Monetary Fund (IMF), and the World Trade Organization (WTO). The WTO emerged out of the General Agreement on Tariffs and Trade (GATT) in 1995; it is an arrangement across countries that serves as a forum for negotiations on trading rules as well as a mechanism for dispute settlements in trade issues.¹ By contrast, the World Bank and IMF deal with

their member countries one at a time. They have little influence with industrial countries but can affect developing countries during times of economic crisis and when those countries seek additional foreign exchange resources. The origins and evolution of the three organizations are of considerable interest.² Perhaps even more important in light of the recent financial crises in Mexico, East Asia, and a few other countries, are the questions that arise about the current and future roles of the IMF and the World Bank.³

These questions cover a broad set of issues. A healthy open trading system is crucial for the progress of the international economy. It is particularly important in providing an environment in which developing countries can successfully reform their policies and achieve rapid economic growth and rising living standards for

all. I have been particularly interested in the relationship between preferential trading arrangements, such as the North American Free Trade Agreement (NAFTA), and the WTO.⁴ The issue is simple: the WTO is based on the principle of open, nondiscriminatory trade among its members, while preferential trading arrangements are, by their nature, discriminatory. Under NAFTA, for example, goods originating in Mexico and Canada are not subject to duties when they enter the United States, yet the same goods from other countries are subject to U.S. duties. Assuring that preferential trading arrangements will not block progress in multilateral liberalization is important, and I am now completing a paper in which I analyze how much discrimination has been a factor under the first three years of NAFTA.

My other major concern regarding

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