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# Technology Growth and Expenditure Growth in Health Care

New health care technologies offer the promise of improved health and longevity, but also are widely viewed as the biggest contributor to rising health care costs in the U.S. This duality raises the question of whether new technologies are worth the cost and how the rate of health care innovation can be slowed if the costs of new technology exceed the benefits.

In **Technology Growth and Expenditure Growth in Health Care** (NBER Working Paper 16953), researchers **Amitabh Chandra** and **Jonathan Skinner** explore technological growth in health care and its impact on cost growth and productivity improvements.

The researchers develop a model of patient demand and supplier behavior to explain the parallel trends of technology and expenditure growth. The model is one where health spending can affect individuals' longevity and quality of life and providers care about both their patients' health and their own income. The model's key finding is that the productivity of a health care innovation depends on the shape of the health production function (which translates health spending into health outcomes), the heterogeneity of treatment effects across patients, and the cost structure (many procedures have high fixed costs and low marginal costs).

The authors use this finding to develop a typology of medical technology productivity. The first category consists of "home run" treatments that are highly cost effective and useful for nearly everyone. One example is the development of antibiotics, which were highly effective in reducing mortality from pneumonia, tuberculosis, and other diseases starting in the 1930s. Category I treatments can be expensive, so long as they are cost effective and unlikely to be used on patients who will not benefit from the treatment; the use of antiretroviral drugs to treat HIV is an example in this vein.

The second category includes those technologies that are highly cost-effective in some patients but less useful for others. Despite their value to some patients, Category II treatments may have modest or poor average cost-effectiveness due to their use by many patients who experience few health gains. A leading example is angioplasty, which dramatically improves survival following a heart attack if administered within 24 hours, but yields no survival benefit and only modest functioning improvements for those with stable coronary disease.

The third category consists of treatments for which benefits are small or as yet unproven. Category III includes treatments like arthroscopic surgery for osteoarthritis of the knee, which was famously found to have no medical value in a randomized control trial where some patients received "placebo surgery," despite the fact that some 650,000 such surgeries were being performed annually at a cost of more than $5,000 each. Category III also includes treatments for which there is little scientific evidence of their value. Ethical and logistical considerations can make it difficult to conduct double-blinded trials, the gold standard for establishing the efficacy of medical treatments, and even when such trials are possible, it can take years for studies to be done.

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Next, the authors ask how much of the gains in survival and cost increases over the past several decades have been driven by diffusion of each type of treatment. Using cardiovascular disease as an example, they note that 44 percent of the reduction in mortality from 1980 to 2000 was due to improved health behaviors. Another 22 percent of the decline was due to inexpensive Category I treatments such as aspirin and beta blockers, 12 percent was due to Category II treatments like angioplasty, and perhaps 10 percent was due to Category III treatments. On the cost side, the spread of Category I and II treatments appears to have contributed only modestly to cost growth, suggesting a larger role for Category III spending. Despite the rapid diffusion of "home run" technologies like beta blockers during this period, the average cost of saving an additional life-yeartripled, to nearly $250,000.

Taking an international perspective, the authors note that the US is often a leader in the use of expensive technologies with unproven benefits, such as robotic surgery and proton-beam therapy for prostate cancer. Yet improvements in life expectancy in the U.S. have if anything lagged behind those in other OECD countries. This suggests the more rapid diffusion of the less productive Category II and Category III treatments in the U.S. may help to explain why it has experienced higher growth in health care spending relative to GDP without commensurate gains in life expectancy.

Lastly, the authors turn to the question of how to control health care costs. In other countries, regulatory boards use cost factors in setting standards for the use of Category II and III treatments. While discouraging the building of costly facilities such as MRIs and ICU beds is theoretically possible, this approach "would require a tectonic shift in the U.S. regulatory and policy environment."

Making consumers responsible for a larger share of costs is another approach. As consumers are often unaware of the costs and benefits of different treatments, charging higher prices for Category III and some Category II treatments and lower prices for Category I treatments could help consumers to make more appropriate treatment decisions, though few insurance plans are currently structured this way.

Doing more comparative effectiveness research could also improve the productivity of health care spending, though the fact that treatment effects can vary by patient type complicates such work. Finally, reimbursing providers based on the value rather than the volume of services provided may help to ensure that innovations are focused on cost-effective treatments. Some analysts believe that the fragmentation in the health care delivery system leads to higher costs and suggest that integrated delivery systems (like the "accountable care organizations" cited in the 2010 health care reform law) could be part of the solution, though their ability to promote cost-effective treatments has not yet been established.

The authors conclude "U.S. growth in health care costs is neither inevitable nor necessarily beneficial for overall productivity gains. Instead, cost growth is the aggregated outcome of a large number of fragmented decisions regarding the use and spread of both old and new health technologies." They warn "there does not appear to be a single magic bullet to solve the health care problem. The extent of waste in the U.S. could, ironically, prove to be a boon if a fundamental restructuring of health care unleashed some of this lost productivity. The alternative to not making such changes is far more worrisome: rising political and economic resistance against tax hikes, insurance premium increases, or coverage expansion could serve as particularly inefficient brakes on both health care costs and health care innovation."

*The researchers acknowledge funding from the National Institute on Aging (P01 AG19783) and the Robert Wood Johnson Foundation.*

## Demand for Health Insurance Among the Uninsured

A central goal of the Affordable Care Act of 2010 (ACA) is to cut the number of uninsured Americans from the current level of roughly 50 million. To achieve this goal, the ACA includes an expansion of Medicaid, substantial premium subsidies for low- and middle-income households, health insurance exchanges, and an individual mandate.

Projections of the effect of the ACA, much of which is not implemented until 2014 or later, rely on existing estimates of the price elasticity of demand for health insurance. Yet existing estimates are generally based on workers' decisions regarding enrollment in employer-sponsored health insurance and may not be well-suited for these projections. The uninsured are substantially poorer than the average worker who is offered employer-provided insurance and are rarely offered the opportunity to purchase insurance through their employer. Many of the uninsured have been denied coverage in the past. The decision to purchase subsidized insurance from a state-run exchange may also differ from that to enroll in employer-sponsored coverage.

In **The Demand for Health Insurance Among Uninsured Americans: Results of a Survey Experiment and Implications for Policy (NBER Working Paper 16978),** researchers **Alan Krueger** and **Ilyana Kuziemko** conduct a survey experiment to assess the willingness to pay for a health plan among a large sample of uninsured Americans. This study represents the first attempt to elicit such information from this population.

The data used in the study were collected as part of the Gallup-Healthways Daily Poll, a daily survey of about 1,000 individuals. During a two-week period, the poll asked all individuals who reported being uninsured—about 1,300 individuals in all—whether they would be willing to pay some specified amount (for example, $3,000) in order to obtain a health insurance policy as good as the one members of Congress have. If individuals said no, they were asked the question again with a lower amount. To avoid the "anchoring bias" that can result from starting at a particular value, the starting dollar amount was varied randomly.

The authors begin with a simple comparison of the characteristics of the insured and uninsured in their data. The uninsured are younger, more likely to be male, and less likely to be married. They also have lower income than the insured, are less likely to have a job, and, interestingly, are twice as likely to have been denied coverage when trying to purchase health insurance in the past.

Turing to the results, the authors find that the uninsured are quite sensitive to price in their health insurance purchase decisions. If offered the opportunity to purchase insurance for a $2,000 annual premium, more than 60 percent of those who are currently uninsured say they would voluntarily buy insurance.

Applying these estimates to the provisions of the ACA suggests that the law will substantially reduce the number of uninsured. Under the current configuration of subsidies, over 75 percent of the

uninsured are projected to enroll, implying that 39 million individuals would gain coverage as a result of the law. Removing the tax penalty imposed by the individual mandate, a provision whose constitutionality is being challenged in federal court, would result in 7 to 12 million fewer individuals gaining coverage.

The authors note that this projected decrease in the uninsured population is larger than the estimate generated by the Congressional Budget Office, likely resulting from the fact that the price sensitivity they estimate and use is greater than that found in previous studies. The authors offer several possible reasons for this difference. First, the uninsured population is poorer than the population of workers offered employer-sponsored insurance and may be more price sensitive as a result; indeed, the authors find that within their sample, relatively richer people are less price sensitive. Second, this study is designed to evaluate sensitivity to prices in a range that is generally lower than that explored in previous work.

Turning to the issue of adverse selection (the question of whether those who are less healthy will be more likely to buy insurance), the authors find that less healthy individuals are less price sensitive, but no more likely to enroll under the ACA's subsidy schedule. However, the authors note that the results might differ under other subsidy schedules.

The authors conclude "our results suggest that extrapolating the effects of premium subsidies for the uninsured from the elasticities generated in past papers could seriously under-estimate the coverage rates these policies could achieve."

*The authors acknowledge financial support from the Industrial Relations Section at Princeton University.*

## Does Framing Affect Social Security Claiming?

The decision of when to claim Social Security benefits is one of the most economically significant choices facing older Americans. Eligible individuals are entitled to claim benefits as early as age 62 but can defer claiming to as late as age 70. Monthly benefit levels are adjusted depending on claiming age — for example, an individual who stops working at age 62 but waits to claim until age 70 will receive a monthly benefit that is 76 percent higher (in real terms) than what she would have received if she had claimed at 62.

About half of workers eligible for Social Security benefits claim at age 62 and roughly two-thirds claim before age 66, the current Full Retirement Age. Does the substantial amount of early claiming represent rational, utility-maximizing behavior on the part of workers? Or is it possible that other factors, such as how information about Social Security benefits is presented, also influence workers' decisions?

This question motivates a new working paper by researchers **Jeffrey Brown, Arie Kapteyn,** and **Olivia S. Mitchell, Framing Effects and Expected Social Security Claiming Behavior** (NBER Working Paper 17018). The researchers use an experimental design to explore whether the manner in which Social Security claiming information is framed influences expected claiming behavior.

The authors first explain the "frames" that are shown to survey participants. The first frame is designed to present the information as neutrally as possible. This is similar to the approach used by the Social Security Administration (SSA) since 2008 and serves as a baseline against which other frames may be compared. The second frame emphasizes a "breakeven" concept, stressing the minimum number of years one would need to live in order for the incremental benefits resulting from delayed claiming to exceed the benefits "forfeited" by claiming later. This frame is similar to the approach used by the SSA for decades, prior to the adoption of more neutral language in 2008. It is also an approach frequently used by financial advisers.

The other frames test workers' sensitivity to framing the claiming decision in terms of consumption vs. investment, gains vs. losses, and older vs. younger reference ages. The motivation for exploring each of these dimensions comes from previous studies in economics and psychology. For example, prior studies have shown that consumers are more interested in purchasing an annuity when it is described as protecting one's ability to consume throughout life, than when it is described in terms of its investment return. Past literature has also shown that individuals are often more sensitive to losses than to gains with an equivalent value, and that "anchoring bias" affects decision-making in a wide variety of contexts.

To test the effect of these frames on expected claiming behavior, the authors fielded a survey through the RAND American Life Panel, a sample of roughly 3,000 households who are regularly interviewed over the Internet. Survey respondents were asked about their expected claiming age in one wave of the survey, and then in subsequent survey waves were presented with different frames and asked to provide their expected claiming age again in view of the new information. This approach allows the authors to test how different frames affected expected claiming behavior, controlling for any individual-specific factors (e.g., poor health) that might also affect it.

Turning to the results, the authors find that presenting individuals with the breakeven frame leads them to plan to claim 15 months earlier than they would if presented with the neutral frame – a very large effect. Framing the decision in terms of gains rather than losses or using an older anchoring age (66 or 70 vs. 62) is associated with later claiming ages, though the effects are not as large as that seen with the breakeven frame. The authors find no significant difference in framing the decision in terms of consumption vs. investment.

The authors derive two conclusions from their study. First, the results "cast doubt on a simple economic model of fully rational decision-making by showing that individual decisions are influenced by factors other than ultimate consumptions outcomes." Second, on a more

practical level, the findings suggest "the manner in which information is provided to plan participants can shape behavior." The authors note that their findings are particularly relevant for an agency such as the SSA, which prides itself on providing information without offering advice and has the authority to determine how information is presented to future Social Security beneficiaries.

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## NBER Profile: *Kent Smetters*

Kent Smetters is a Research Associate of the NBER's programs in aging and public economics. Smetters is a Professor of Insurance and Risk Management at the Wharton School of the University of Pennsylvania.

Dr. Smetters is a non-resident scholar of the American Enterprise Institute, a member of the National Academy of Social Insurance, and a research associate of the Michigan Retirement Research Center and the Pension Research Council. He has served as the Deputy Assistant Secretary for Economic Policy at the U.S. Treasury Department and as a member of the U.S. Congress' Blue Ribbon Advisory Panel on Dynamic Scoring, and has testified before Congress numerous times.

Dr. Smetters is the winner of several research awards, including the TIAA-CREF Paul A. Samuelson Certificate of Excellence and the Robert C. Witt award for the best paper in the *Journal of Risk and Insurance*. He has published his research in journals including the *American Economic Review* and the *Journal of Political Economy* and written opinion pieces for *The Wall Street Journal* and *The Financial Times*.

Professor Smetters holds a Ph.D. in Economics from Harvard University and a B.S. in Economics and Computer Science from Ohio State University. Prior to joining the faculty at Wharton, he worked as an economist at the Congressional Budget Office; he has also been a visiting professor at Stanford University. At Wharton, he teaches courses in insurance economics and managerial economics.

Professor Smetters' research includes the dynamic modeling of Social Security and tax policy. In some of his recent work, he has examined whether privatizing Social Security increases efficiency and who bears the burden of the corporate tax.

In his spare time, he enjoys spending time with his wife, as Kent was recently married, much to the delight of his 99-year old grandmother who thought that Kent would never marry

## Abstracts of Selected Recent NBER Working Papers

**Insurance Mandates and Mammography**
**Marianne P. Bitler, Christopher S. Carpenter**
**NBER Working Paper No. 16669**

Recently adopted federal health reform requires insurers to cover mammograms without cost-sharing. We examine similar state insurance mandates that vary substantially in the timing of adoption and in specifying the ages of women eligible for different mammography benefits. In triple differences models we find that mandates requiring coverage of annual mammograms significantly increased past year mammography screenings by about 8 percent, representing over 800,000 additional women screened from 1987–2000. Mandates that explicitly prohibit deductibles are especially effective at increasing screenings among high school dropouts, suggesting that federal health reform is likely to further increase use of screening mammography.

**Selection in Insurance Markets: Theory and Empirics in Pictures**
**Liran Einav, Amy Finkelstein**
**NBER Working Paper No. 16723**

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We present a graphical framework for analyzing both theoretical and empirical work on selection in insurance markets. We begin by using this framework to review the "textbook" adverse selection environment and its implications for insurance allocation, social welfare, and public policy. We then discuss several important extensions to this classical treatment that are necessitated by important real world features of insurance markets and which can be easily incorporated in the basic framework. Finally, we use the same graphical approach to discuss the intuition behind recently developed empirical methods for testing for the existence of selection and examining its welfare consequences. We conclude by discussing some important issues that are not well-handled by this framework and which, perhaps not unrelatedly, have been little addressed by the existing empirical work.

**The Long-term Impact of Medicare Payment Reductions on Patient Outcomes**
**Vivian Y. Wu, Yu-Chu Shen**
**NBER Working Paper No. 16859**

This study examines the long term impact of Medicare payment reductions on patient outcomes using a natural experiment—the Balance Budget Act (BBA) of 1997. We use predicted Medicare revenue changes due to BBA, with simulated BBA payment cuts as an instrument, to categorize hospitals by degrees of payment cuts (small, moderate, or large), and follow Medicare patient outcomes in these hospitals over a 11 year panel: 1995–1997 pre-BBA, 1998–2000 initial years of BBA, and 2001–2005 post-BBA years. We find that Medicare AMI mortality trends stay similar across hospitals when comparing between pre-BBA and initial-BBA periods. However, the effect became measurable in 2001–2005: hospitals facing large payment cuts saw increased mortality rates relative to that of hospitals facing small cuts in the post-BBA period (2001–2005) after controlling for their pre-BBA trends. We find support that part of the worsening AMI patient outcomes in the large-cut hospitals is explained by reductions in staffing level and operating cost following the payment cuts, and that in-hospital mortality is not affected partly due to patients being discharged earlier (shorter length-of-stay).

**Physician Response to Pay-for-Performance: Evidence from a Natural Experiment**
**Jinhu Li, Jeremiah Hurley, Philip DeCicca, Gioia Buckley**
**NBER Working Paper No. 16909**

Explicit financial incentives, especially pay-for-performance (P4P) incentives, have been extensively employed in recent years by health plans and governments in an attempt to improve the quality of health care services. This study exploits a natural experiment in the province of Ontario, Canada to identify empirically the impact of pay-for-performance (P4P) incentives on the provision of targeted primary care services, and whether physicians' responses differ by age, practice size and baseline compliance level. We use an administrative data source which covers the full population of the province of Ontario and nearly all the services provided by practicing primary care physicians in Ontario. With an individual-level data set of physicians, we employ a difference-in-differences approach that controls for both "selection on observables" and "selection on unobservables" that may cause estimation bias in the identification. We also implemented a set of robustness checks to control for confounding from the other contemporary interventions of the primary care reform in Ontario. The results indicate that, while all responses are of modest size, physicians responded to some of the financial incentives but not the others. The differential responses appear related to the cost of responding and the strength of the evidence linking a service with quality. Overall, the results provide a cautionary message regarding the effectiveness of pay-for-performance schemes for increasing quality of care.

**Selection on Moral Hazard in Health Insurance**
**Liran Einav, Amy Finkelstein, Stephen P. Ryan, Paul Schrimpf, Mark R. Cullen**
**NBER Working Paper No. 16969**

In this paper we explore the possibility that individuals may select insurance coverage in part based on their anticipated behavioral response to the insurance contract. Such "selection on moral hazard" can have important implications for attempts to combat either selection or moral hazard. We explore these issues using individual-level panel data from a single firm, which contain information about health insurance options, choices, and subsequent claims. To identify the behavioral response to health insurance coverage and the heterogeneity in it, we take advantage of a change in the health insurance options offered to some, but not all of the firm's employees. We begin with descriptive evidence that is suggestive of both heterogeneous moral hazard as well as selection on it, with individuals who select more coverage also appearing to exhibit greater behavioral response to that coverage. To formalize this analysis and explore its implications, we develop and estimate a model of plan choice and medical utilization. The results from the modeling exercise echo the descriptive evidence, and allow for further explorations of the interaction between selection and moral hazard. For example, one implication of our estimates is that abstracting from selection on moral hazard could lead one to substantially over-estimate the spending reduction associated with introducing a high deductible health insurance option.

**How does Risk Selection Respond to Risk Adjustment? Evidence from the Medicare Advantage Program**
**Jason Brown, Mark Duggan, Ilyana Kuziemko, William Woolston**
**NBER Working Paper No. 16977**

Governments often contract with private firms to provide public services such as health care and education. To decrease firms' incentives to selectively enroll low-cost individuals, governments frequently "risk-adjust" payments to firms based on enrollees' characteristics. We model how risk adjustment affects selection and differential payment—the government's payments to a firm for covering an individual minus the counterfactual cost had the government directly covered her. We show that firms reduce selection along dimensions included in the risk-adjustment formula, while increasing selection along excluded dimensions. These responses can actually increase differential payments relative to pre-risk-adjustment levels and thus risk adjustment can raise the total cost to the government of providing the public service. We confirm both selection predictions using individual-level data from Medicare, which in 2004 began risk-adjusting payments to private Medicare Advantage plans. We find that differential payments actually rise after risk adjustment and estimate that they totaled $30 billion in 2006, or nearly eight percent of total Medicare spending.

**The Pragmatist's Guide to Comparative Effectiveness Research**
**Amitabh Chandra, Anupam B. Jena, Jonathan S. Skinner**
**NBER Working Paper No. 16990**

All developed countries have been struggling with a trend toward health care absorbing an ever-larger fraction of government and private budgets. Adopting any treatment that improves health outcomes, no matter what the cost, can worsen allocative inefficiency by paying dearly for small health gains. One potential solution is to rely more heavily on studies of the costs and effectiveness of new technologies in an effort to ensure that new spending is justified by a com-

mensurate gain in consumer benefits. But not everyone is a fan of such studies and we discuss the merits of comparative effectiveness studies and its cousin, cost-effectiveness analysis. We argue that effectiveness research can generate some moderating effects on cost growth in healthcare if such research can be used to nudge patients away from less-effective therapies, whether through improved decision making or by encouraging beefed-up copayments for cost-ineffective procedures. More promising still for reducing growth is the use of a cost-effectiveness framework to better understand where the real savings lie—and the real savings may well lie in figuring out the complex interaction and fragmentation of healthcare systems.

**Pensions in the 2000s: the Lost Decade?**
**Edward N. Wolff**
**NBER Working Paper No. 16991**

One of the most dramatic changes in the retirement income system over the last three decades has been a decline in traditional defined benefit (DB) pension plans and a corresponding rise in defined contribution (DC) pensions. Have workers benefited from this change? Using data from the Survey of Consumer Finances, I find that after robust gains in the 1980s and 1990s, pension wealth experienced a marked slowdown in growth from 2001 to 2007. Projections to 2009 indicate no increase in pension wealth from 2001 to 2009. Retirement wealth is also found to offset the inequality in standard household net worth. However, I find that pensions had a weaker offsetting effect on wealth inequality in 2007 than in 1989. As a result, whereas standard net worth inequality showed little change from 1989 to 2007, the inequality of private augmented wealth (the sum of pension wealth and net worth) did increase over this period. These results hold up even when Social Security wealth and employer contributions to DC plans are included in the measure of wealth and when adjustments are made for future tax liabilities on retirement wealth.

**Optimal Portfolio Choice with Wage-Indexed Social Security**
**Jialun Li, Kent Smetters**
**NBER Working Paper No. 17025**

This paper re-examines the classic question of how a household should optimally allocate its portfolio between risky stocks and risk-free bonds over its lifecycle. We show that allowing for the wage indexation of social security benefits fundamentally alters the optimal decisions. Moreover, the optimal allocation is close to observed empirical behavior. Households, therefore, do not appear to be making large "mistakes," as sometimes believed. In fact, traditional financial planning advice, as embedded in "target date" funds—whose enormous recent growth has been encouraged by new government policy—often leads to even relatively larger "mistakes" and welfare losses.

**The Doctor Might See You Now: The Supply Side Effects of Public Health Insurance Expansions**
**Craig L. Garthwaite**
**NBER Working Paper No. 17070**

In the United States, public health insurance programs cover over 90 million individuals. Changes in the scope of these programs, such as the Medicaid expansions under the recently passed Patient Protection and Affordable Care Act, may have large effects on physician behavior. This study finds that following the implementation of the State Children's Health Insurance Program, physicians decreased the number of hours spent with patients, but increased their participation in the expanded program. Suggestive evidence is found that this decrease in hours was a result of shorter office visits. These findings are consistent with the predictions from a mixed-economy model of physician behavior with public and private payers and also provide evidence of crowd out resulting from the creation of SCHIP.

**Financial Literacy around the World: An Overview**
**Annamaria Lusardi, Olivia S. Mitchell**
**NBER Working Paper No. 17107**

In an increasingly risky and globalized marketplace, people must be able to make well-informed financial decisions. Yet new international research demonstrates that financial illiteracy is widespread when financial markets are well developed as in Germany, the Netherlands, Sweden, Japan, Italy, New Zealand, and the United States, or when they are changing rapidly as in Russia. Further, across these countries, we show that the older population believes itself well informed, even though it is actually less well informed than average. Other common patterns are also evident: women are less financially literate than men and are aware of this shortfall. More educated people are more informed, yet education is far from a perfect proxy for literacy. There are also ethnic/racial and regional differences: city-dwellers in Russia are better informed than their rural counterparts, while in the U.S., African Americans and Hispanics are relatively less financially literate than others. Moreover, the more financially knowledgeable are also those most likely to plan for retirement. In fact, answering one additional financial question correctly is associated with a 3–4 percentage point higher chance of planning for retirement in countries as diverse as Germany, the U.S., Japan, and Sweden; in the Netherlands, it boosts planning by 10 percentage points. Finally, using instrumental variables, we show that these estimates probably underestimate the effects of financial literacy on retirement planning. In sum, around the world, financial literacy is critical to retirement security.

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