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IN THIS ISSUE

Program Report:
The Economics of Aging 1

Research Summaries:
Randomized Trials and Quasi-Experiments in Education Research 11
Inflation Dynamics: Combining Measurement with Theory 15
The New Economics of Smoking 19
Venture Capitalists As Economic Principals 22

NBER Profiles 25
Conferences 28
Bureau News 39
Bureau Books 49
Current Working Papers 50

Program Report

The Economics of Aging

David A. Wise*

Population aging, early retirement, limited but increasing retirement saving, more expensive medical practice patterns, and an established national entitlement to income and health care support after age 65 — all of these factors largely define the economic environment of the United States (and much of the world) at the beginning of the 21st century. Over the past 30 years, life expectancy has increased from age 71 to age 77, while the most common age of retirement has decreased from age 65 to age 62. Retiring at age 62, the typical American retiree today faces another 20 years of living, consuming and, at one time or another, and in many cases regularly, needing expensive health care services. These trends already have placed significant financial pressure on the public and employer-sponsored programs that provide income and health care support to older Americans.

Meanwhile, the massive demographic bulge in the population — the baby boom generation — begins turning age 62 in 2008. Going forward, the number of Americans age 62 and older is projected to double from 40 million today to 80 million 30 years from now, while the working age population is projected to grow by just 12 percent over the same period. Compounding the demographic situation is the continuing rise in medical costs. National health care expenditures have grown from $250 billion annually in 1980 to $1.4 trillion today, and show little sign of slowing down. The combination of economic, labor market, health and demographic trends points to any number of social and economic challenges in the decades ahead. Understanding the complexities of this situation, and the relationships between demographics, policy, behavior, economics, and health — this is the substantive aim of the NBER Program on the Economics of Aging.

Begun in 1986, the Aging Program has developed primarily around large, coordinated research projects that simultaneously address several interrelated issues in the economics of aging. Extensive funding for the program has been provided by the National Institute on Aging (NIA), both through multiple research grants and through a Center grant, which provides centralized infrastructure support to the program effort. NIA also has supported our efforts to engage new investigators in studying

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issues in aging, and at least a dozen graduate students and post-doctoral research fellows become engaged in the program each year through NIA fellowships. Many more become engaged as research assistants on project grants. A number of smaller "exploratory" projects on issues in aging are supported through the Center, as well as projects that integrate related components of the overall research effort. More than 100 papers are completed annually by participants in the NBER program. Some of these also appear in a series of books published by the University of Chicago Press.[1]

The Economic Circumstances of Older Americans

Personal Retirement Accounts

A major theme of the Aging Program since its inception has been to better understand the economic circumstances of older Americans. A key fact from early project work was the very small amount of financial assets of most retirees in the United States in the early 1980s and the overwhelming reliance on Social Security, and in some cases firm pension plans, for financial support in retirement. But over the last two decades, there has been a dramatic transformation in the magnitude of saving that is taking place in personal retirement accounts, such as IRAs and 401(k) plans. Now about 85 percent of contributions to retirement plans are to personal accounts. In decomposing trends in plan eligibility, participation given eligibility, participant contributions, and aggregate wealth accumulation in personal retirement accounts, and in projecting the future of these trends, James M. Poterba, Steven F. Venti and I have confirmed the potential of 401(k) plans to significantly alter the financial circumstances of individuals retiring in the future [W8610, W6295, W5762]. Because more individuals will have had more years of participation in 401(k)-type savings plans, they will reach retirement with increasing accumulations of financial assets. For many, their personal retirement accounts will contribute as much or more in retirement than Social Security. The most recent in a long series of studies on this topic shows that the ratio of retirement plan assets to wage and salary earnings has grown more than five fold since 1975. This represents a fundamental transition in the composition of post-retirement financial support in the United States.

Despite these aggregate trends, it's clear that there is wide variation in saving behavior across the population. For example, Venti and I have found that saving rates vary substantially at all income levels, and that these variations lead to vastly different levels of asset accumulation over a working career [W7521]. What explains this variation in behavior? Part of the answer is simply choice: some people choose to save a lot, and others do not. But that choice is made in the context of one's social and economic environment, as well as the public and employer policies that relate to individual saving decisions. In a series of studies, James Choi, David Laibson, Brigitte Madrian, Andrew Metrick, and Dennis G. Shea find that the "default" provisions of 401(k) plans make a huge difference in whether and how much people save in their 401(k) plans [W8655, W8651, W7682]. Many more employees participate when there is automatic enrollment; and they contribute more to their plans, on average, when the default contribution rate of the program is higher. Recent research by Esther Duflo and Emmanuel Saez provides complementary evidence of increased participation in retirement plans by individuals who received a financial incentive to attend a program information session, as well as by individuals who did not receive the incentive, but who worked in departments where others received the incentive [W8885, W7735]. Thus the influence of peer behavior was found to be a significant factor in plan participation decisions.

Related studies from the Aging Program have considered more specific aspects of retirement saving. Studies of pre-retirement withdrawals from 401(k) plans find little effect on the total dollar accumulations in these plans, as a large fraction of job changers don't withdraw assets from their personal accounts and a large fraction of assets that are withdrawn are "rolled over" into other personal retirement accounts [W7314]. Studies of whether the assets in retirement accounts have replaced saving that would have otherwise taken place in other forms conclude that the large majority of personal retirement saving is new saving that would not have occurred without these plans [W5599]. Studies of the potential offsetting decline in defined benefit pension plan coverage conclude that the growth of personal retirement accounts dwarfs any displacement of assets in traditional plans [W8610]. And, studies of alternative measures of saving emphasize the implications of not counting capital gains as part of saving in the NIPA personal saving rate, while the expenditure of money that has accumulated in the form of capital gains is still counted as dis-saving (or spending) [W8237, W8610]. As a result, the NIPA-measured saving rate can be very low — about 2 percent now — while the retirement plan contribution rate (as a percentage of wage and salary earnings) has been over 8 percent.

Looking ahead, our research agenda has evolved to focus on the risks associated with different forms of retirement saving, and how recent trends may have changed the risk exposure of individuals in providing for their retirement. The different risk characteristics of fixed assets (like 401(k) accounts), as compared with annuitized assets (like Social Security and traditional pension plans) is one piece of this work. Another is the increased exposure to market fluctuations that is associated with personal retirement accounts. The extreme case of company stock as a retirement investment has been explored recently by Olivia S. Mitchell and Stephen P. Utkus; they confirm the risk of such investments, and identify policy tools that might encourage greater diversification [W9250]. Poterba, with various coauthors, also has looked at the allocation of investments in personal retirement accounts, focusing particularly on the mix between debt and equity holdings [W9268, W7991, W7392]. Among other findings, his research shows that the aggregate allocation between stocks and bonds in individual accounts is broadly similar to the allocation one finds in defined benefit plans, which are managed by financial professionals. But there is much more variation across individual retirement accounts. For instance, just over 45 percent of households with tax-deferred accounts appear to hold only equities, and 22 percent hold only debt. These results provide a starting point from which to consider the market risk of personal accounts.

Social Security, Housing, Annuities, and Bequests

As the primary source of retirement income support in the United States, Social Security defines the economic circumstances of many older Americans. Many members of the Aging Program are engaged in analyses of Social Security, as well as on the potential design and implications of various Social Security reform possibilities. In this report, I have focused on projects supported by the National Institute on Aging as part of NIA research grants. One such project, directed by Jeffrey B. Liebman, looks at how alternative Social Security reforms would be likely to affect lower-income households. Social Security is widely recognized as a redistributive program, replacing a greater fraction of earnings for those at lower income levels. Liebman's research, however, points to many other redistributive aspects of Social Security — from people with shorter life expectancies to people with longer life expectancies, from single workers and dual-earning couples to one-earner couples, and from long-career workers to short-career workers. Because of these other factors, about 20 percent of Social Security participants in the top income quintile receive a larger net transfer from Social Security than the average transfer for people in the lowest income quintile [W8625].

Liebman also finds that Social Security reforms that blend the current system with an investment-based component could give most Social Security beneficiaries higher expected benefits than the current system, and lower the percentage of widowed, divorced, and never married women with benefits below the poverty line from 26 percent to 9 percent [W7492]. Kathleen McGarry has also looked at poverty among the elderly, noting that reforms to the Supplemental Security Income Program could have a significant effect in reducing elderly poverty [W7574]. She also finds that a surprising number

of potential SSI recipients do not apply for benefits.

Aside from Social Security (and for some, an employer-provided pension), housing equity is the major asset of a large fraction of current retirees. Despite the value of these housing assets, Venti and I find that housing equity is rarely used to support general non-housing consumption during retirement [W8608, W7882]. We find that in the absence of a precipitating event (such as divorce, the death of a spouse, or the entry of a family member into a nursing home), families are unlikely to sell their homes, downsize, or remortgage. And even among those experiencing major life changes, discontinuing ownership is the exception rather than the rule. A related study by Gary V. Engelhardt, Jonathan Gruber, and Cynthia Perry finds that the living arrangements of widows and divorcees are more sensitive to economic circumstances than the living arrangements of couples [W8911]. They estimate that a 10 percent cut in Social Security benefits would lead more than 600,000 single-resident elderly households to move into shared living arrangements.

The role of bequests in the financial circumstances of older Americans also has been considered in a number of recent studies. One study by Michael D. Hurd and James Smith finds that the distribution of bequests is highly skewed, so that the typical baby-boom person will receive a very modest inheritance [W9142]. This is partly because of the skewed distribution of wealth and partly because of the tendency of the wealthy to have fewer children. But it is also attributable to anticipated dis-saving: it is estimated that households aged 70-74 will bequeath just 39 percent of their wealth, consuming the rest before they die. Jeffrey Brown and Scott Weisbenner also have explored the magnitude of assets that are passed from one generation to another through bequests and other intergenerational transfers [W8753]. They find that about one-fifth of current household wealth (on average) was obtained as a result of transfers and bequests, while four-fifths resulted from individual decisions about how much income to save. But, as in the Hurd and Smith study, they find a heavy concentration of transfer wealth among a relative smaller number of households. Focusing on the allocation of bequests among siblings, McGarry and Audrey Light find that 80 percent of older parents plan to make equal bequests. Among those planning to divide their estates unequally, about half point to the inequality as compensation for a child taking care of them in their old age, and half point to differences in the needs of different children.

Aging Program research is also exploring how assets are used at older ages, and how consumption changes at retirement. Recent work by Hurd and Susann Rohwedder, for example, finds a reduction in both anticipated and actual spending at retirement [W9586]. Brown, Amy Finkelstein, Poterba, Mitchell, and others are studying issues in annuity pricing, the differences in mortality experience between annuitants and the population at large, the potential for good inflation-adjusted annuity products, the differing characteristics of individual and joint-life annuity products, the differences in pricing between mandatory and voluntary annuity products, and the redistributive effects of annuities from those with shorter to those with longer life expectancies [W9256, W8567, W8064, W8045, W7812, W7560, W7268, W7199, W7193, W7191, W7168, W7005, W6918]. As more assets are being accumulated in personal retirement accounts, the question of whether, under what circumstances, and how much those assets might be annuitized is an increasingly important one. An important finding of this work is the higher longevity of those who purchase annuities, relative to the population as a whole, and the need to price annuities higher because of this differential.

Finally, a broad view of the financial circumstances of older Americans is presented in a recent study by Victor R. Fuchs [W8236]. Fuchs takes what he calls "a holistic approach" to the financial problems of the elderly, focusing simultaneously on expenditures that are self-financed and those financed by transfers from the young (under age 65). He finds that about 35 percent of the elderly's full income was devoted to health care; 65 percent to other goods and services. He also finds that 56 percent of full income was supported by transfers from the young; compared with 44 percent from the elderly themselves. He also points to future trends which may stimulate the need for more saving and more work prior to retirement.

Retirement Policies and Labor Market Behavior

Retirement Policy in the United States

A second major theme of the Aging Program is the relationship between retirement policies and labor market behavior, as well as the determinants of work and retirement decisions more generally. Over the years, the strong relationship between the economic incentives of retirement policies and the ages at which individuals retire from the labor force has been confirmed in multiple studies, using multiple data sources, and applying multiple research methodologies. The most recent have been conducted by Courtney Coile and Gruber [W7830, W7651, W7318], Alan L. Gustman and Thomas L. Steinmeier [W9183, W8229, W7588], and Andrew A. Samwick and me.[2] These studies point to the younger retirement that occurs, when younger retirement is encouraged by the economic structure of the benefit programs. Recent work by Courtney Coile has extended this line of analysis to the joint retirement decisions of couples, finding for example that the economic incentives in a wife's retirement plan can have a significant effect on the retirement decisions of both husband and wife [W9496]. Gustman and Steinmeier also have explored joint retirement decisions, and find much stronger interdependence when the spouses say they value spending time together [W8772].

Many other studies have looked at other determinants of retirement. A recent study by McGarry finds that changes in retirement expectations are driven to a much greater degree by changes in health than by changes in income or wealth [W9317]. Gustman and Steinmeier find that the dramatic

stock market rise in the 1990s had an effect in increasing retirement, while it lasted, but any continuing effects since the decline in the market are much more modest [W9404]. A study by Hurd, James Smith, and Julie M. Zissimopoulos finds that those who have worse survival expectations retire sooner, and collect retirement benefits sooner, although the majority of workers claim Social Security benefits as soon as they are eligible, regardless of their survival expectations [W9140]. Leora Friedberg finds that computer users retire later than non-users [W8297]. And a review of the literature by Gruber and Madrian (including a number of their own studies) concludes that health insurance availability is another important determinant of retirement [W8817]. This collection of studies makes clear the complexity of interrelated health, economic, social, and job circumstances that contribute to individual retirement decisions.

Social Security and Retirement Around the World

Beyond the analyses of retirement behavior in the United States, we also have been engaged in a major cross-national project on social security systems and retirement around the world. This project, now in its third phase, has brought together a team of investigators from Belgium, Canada, Denmark, Italy, France, Germany, Japan, the Netherlands, Spain, Sweden, the United Kingdom, and the United States. For each phase of the project, a set of parallel studies has been conducted in each country; and these studies are then integrated together to allow comparisons across countries. Both the individual studies [such as W9494, W9455, W8658] and the integrated analyses are published in a series of volumes by the University of Chicago Press.[3] These volumes have been supplemented by publications that describe the overall results [W9407, W8103].[4]

The first phase of the project mapped out the detailed provision of social security programs into measures of retirement incentives comparable across countries. The studies demonstrated a very strong correspondence across countries between the social security incentives to retire and the age at which older workers withdraw from the labor force. The second phase of the project applied micro-data from each country to estimate more formally the relationship between social security provisions and retirement in each country. The models emphasized the effect on retirement of the age of eligibility for retirement programs, and measures of the incentive to leave the labor force once a person is eligible. The model simulations confirmed very large effects of program provisions on retirement decisions in every country.

The third phase of the project (just finished) has used the retirement model estimates from phase two to describe the fiscal implications of various illustrative social security reforms. The first simulation predicts the effect of delaying all program benefit eligibility ages by three years. The second reform is a common social security system in all countries. The third reform is an adjustment of each country's program to an actuarially fair level with benefit payment rates adjusted on an actuarial basis for earlier or later retirement. While the simulations were conducted for each of the countries in the project, the character of the findings can be illustrated by looking at the case of Germany, which has not (until recently) reduced retirement benefit rates for those qualifying for early retirement. The findings suggest that implementing actuarially fair adjustments to retirement benefits in Germany would lead to an increase in the average retirement age of about 3 years, for both men and women. Combining the impact of such a reform on retirement behavior, benefit payments, contributions to the social security system, and other taxes paid as a result of retention in the labor force — there is an estimated fiscal benefit to the illustrative policy change of over 80,000 Euros per worker, or about 1.2 percent of GDP in Germany.

Continuing work on the project will consider the relationship between social security system provisions and the well-being of the elderly, as well as the young; the more complicated relationships between health, functional disability, social security provisions, and retirement; and the relationship between social security system provisions and the employment of the young. All of the new work is being done in the context of an evolving retirement policy environment worldwide, a policy evolution driven in large part by a growing awareness that social security programs are not sustainable under demographic trends which are compounded by program inducements for older workers to leave the labor force at younger and younger ages.

Socioeconomic Circumstances, Health, and Health Disparities

There is a dramatic and well documented correlation between socioeconomic measures, such as education, income, and wealth, on the one hand, and health measures, such as self-reported health status and mortality, on the other. What leads those with more income, education, wealth, and other measures of social status to be in better health, on average; and what leads those in better health to have more economic resources? Many potential causal links have been explored in NBER research, and the subject is a key aspect of our research agenda going forward.

In a series of studies, Angus S. Deaton and Christina Paxson have explored the multiple facets of the relationship between health and economic circumstances, using data from a number of countries, and making clear that there is no simple causal relationship [W8534, W8370, W8318, W8099, W7141, W7140]. Indeed the nature of the relationship may be quite different across geographic regions with different living standards, health conditions, racial composition, population density, inequality, and other factors. Most recently, the focus of this work has been on economic inequality, independent from economic status, as a potential determinant of inequalities in health. One approach of this investigation has focused on long-term historical trends in income inequality in the United States and United Kingdom, finding that the long-term decline in

mortality rates over the last half century occurred most rapidly when income inequality was rising — just the opposite of what one might expect if income inequality were an important causal factor of poorer health. The project also has looked at relative deprivation (low income relative to a reference group) as a potential influence on health, developing a relative deprivation model of health determination, along with empirical analyses to test the model. In the empirical work, relative deprivation as a measure of inequality also appears to have little effect on health outcomes. The general conclusion of this line of research is that while the direction of the causal relationship between health and wealth may be in doubt, the relationship is not determined by economic inequality.

Studies by Anne C. Case and Duflo have looked at the relationship between socioeconomic status and health from a somewhat different angle, focusing on the health effects of the expanded pension program in South Africa. This program dramatically elevated the economic resources of many extended families in South Africa, and not just the individuals directly eligible for the pension. Case finds a large causal effect of income on health status in poorer populations — an effect that works at least in part through sanitation and living standards, in part through nutritional status, and in part through the reduction of depression and psychosocial stress [W8495]. Duflo finds larger effects on the health of family members when a woman is the recipient of the pension than when a man is the recipient, suggesting differences in how income is allocated within households [W8061].

Research by Case, Darren Lubotsky, and Paxson has focused on the childhood origins of the relationship between socioeconomic status and health [W8344]. Using numerous data sources, they find that health is positively related to household income even in childhood. The relationship between household income and children's health status becomes more pronounced as children grow older, as the adverse health effects of lower income accumulate over children's lives. Thus, part of the intergenerational transmission of socio-economic status may work through the impact of parents' long-run average income on children's health.

Fuchs, Mark B. McClellan, Jonathan S. Skinner, and others have studied the geographic, income, and racial distribution of medical utilization [W8628, W6910, W6013]. One study explores the flow of Medicare benefits to high-income and low-income neighborhoods in 1990 and 1995. The authors find that Medicare spending per capita for the lowest income groups grew much more rapidly than Medicare spending in either high income or middle income neighborhoods. Thus, disparities in health care access and health care utilization may be decreasing over time.

Another set of studies looks at the potential impact of insurance coverage as a determining factor in health care utilization and access to care. For example, a question addressed in several studies is whether managed care has limited access to care. Paul Heidenreich, McClellan, Craig Frances, and Laurence C. Baker find that patients in geographic settings with a high share of managed care patients, following a heart attack, are more likely to received appropriate treatment with beta-blockers and aspirin, but less likely to undergo coronary angiography [W8065]. In a similar study, Daniel Altman, David M. Cutler, and Richard Zeckhauser find almost no difference between treatment intensity among individuals enrolled in HMO plans and those enrolled in indemnity insurance plans in the same health care markets [W7832].[5] The reason HMOs cost less, they conclude, is not because HMOs provide less care. Instead, about half of HMO cost savings is attributable to lower incidence of disease among HMO enrollees; and about half results from HMOs paying lower prices for the same treatments.

Where managed care may make a difference, however, is in the medical practice patterns used in geographical regions that have more or less managed care penetration, and in the spillover effects of cost containment on the provision of unreimbursed care. According to Cutler, one implication of the expansion of managed care — and indeed the cost containment strategies in all health insurance plans — is increased financial pressure on hospitals and associated limitations on "charity" care. This has led to more division of patients across hospitals according to their ability to pay. Low or non-paying patients increasingly are directed toward safety net hospitals, and fewer resources are available to these hospitals to provide un-reimbursed care. In other words, hospitals that have traditionally provided more care to uninsured patients are being doubly affected: first by having responsibility for an even larger portion of uninsured care; and second by getting less reimbursement from insured patients.

Many other components of NBER research in the Aging Program relate to the theme of socioeconomic status, health and health disparities. Robert T. Jensen has been engaged in a project on the effects of the macro economy on health circumstances in Russia and Eastern Europe. McClellan has looked at the effects of adverse health events on work and earnings. Daniel L. McFadden has developed a new research project on the dynamics of health and wealth, building on methodological work done in cooperation with Peter Adams, Hurd, Angela Merrill, and Tiago Ribeiro.[6] With Hurd and Merrill, McFadden also has looked at the quantitative importance of various predictors of mortality, including income, wealth and education [W7440]. All of these investigations relate to the causal links between socioeconomic circumstances and health; the Aging Program plays a significant role in integrating them in a coordinated programmatic way.

Health, Health Care, and Health Policy

Health, Disability and Mortality

Many have worried that increasing longevity would create a new burden of health and long-term care needs for an increasingly sick and disabled elderly population. While population aging has created additional health and long-term care needs, the

potential cost has been moderated — at least in the short run — by a significant long-term decline over time in the functional limitations of older people. This trend has been documented in numerous data sources. However, much less is known about the rate, acceleration, character, causes, and consequences of the decline. Thus the study of disability has become a new high priority area of research in the Aging Program.

In some initial work on this topic, Cutler has conducted an overview of the evidence on disability decline, and potential causal explanations.[7] He quantifies the rate of disability decline at 1 percent or more per year for the past several decades. Among the potential explanations of disability decline that Cutler cites are medical care improvements, improved health behaviors, increasing use of assistive devices and improvements in living conditions that increase independence with functional limitations, higher levels of education and improved socioeconomic status, reductions in disease exposure, and social supports. He and I are engaged in an ongoing research effort to better understand disability decline, its causes, the potential of interventions to extend it, and the cost implications of the decline for Medicare expenditures. A related project deals with the role of health behaviors as a determining factor of health and functional ability.

Dora L. Costa also has been studying trends in chronic illness, functional disability, and mortality. Her focus has been on longer-term historical trends, and the historical underpinnings of more recent health trends. For example, Costa finds that functional disability (disability in walking, difficulty in bending, paralysis, blindness, and deafness) in the United States has fallen at an average annual rate of 0.6 percent among men age 50 to 74 from the early twentieth century to the early 1990s [W7605]. Another recent study by Costa looks at the socioeconomic and demographic determinants of frame size using a data set of Civil War soldiers [W8843]. Costa finds that changes in frame size explain about three-fifths of the mortality decline among white men between 1915 and 1988 and predict even sharper declines in older age mortality between 1988 and 2022. Another study finds that the immediate effects of reduced infectious disease rates and reduced mortality from acute disease account for 62 percent of the 20th century increase in survival rates, and the long-term effects account for another 12 percent of the increase [W8000]. This line of research has provided a valuable historical perspective on more recent health and disability trends.

Alan M. Garber, Jay Bhattacharya, and Thomas E. MaCurdy also have initiated a new project on disability decline, focusing on medical care for the disabled elderly. This work will explore the individual patterns of disability decline (and improvement), the persistence of disability status of individuals over time, the inter-temporal links between disabilities and chronic diseases, and the medical utilization and expenses of individuals before and after the development of disability, and as individual functional ability evolves over time.

Trends in Treatment, Utilization, and Costs

A diversity of health care and health policy issues have been studied as part of the Aging Program in recent years. These include studies of trends in utilization, the composition of medical care costs in different health insurance programs, the persistence of individual health care expenditures over time, the role of technology change in medical practices as a key factor in medical expenditure growth, the increasingly disproportionate spending on medical care at older ages, the effectiveness of medical technology in treating various health conditions, the effects of different policy provisions in containing health care costs, and the differences in access to medical care across the population.

One line of research, involving Garber, MaCurdy, McClellan, and others, has focused on the one-third of Medicare expenditures that are spent on patients near the end of life.[8] In recent years, hospice care and other out-of-hospital treatment has decreased the proportion of the population that dies in the hospital, a trend that might have been expected to reduce costs. Instead, while there has been a decline in hospitalization rates over the 1988-95 period, the use of intensive care and intensive inpatient procedures has continued to increase, offsetting any potential cost savings.

Another set of studies has looked at trends in the treatment of specific health conditions, such as acute myocardial infarction or liver disease or ventricular arrhythmia.[9] Illustrative of the findings, a study of implantable cardioverter-defibrillators finds that their use, at a cost of up to $50,000 for the procedure and treatment of complications, grew more than 10-fold among Medicare beneficiaries between 1987 and 1995. Increasing use of bypass surgery and angioplasty, the more intensive approaches to heart attack treatment, also have increased rapidly, raising overall expenditure on heart attack treatment, despite a drop in the cost of any particular approach to treatment. The increasing technological intensity of medicine dominates almost all other sources of health care cost growth, including demographics, decreasing mortality, decreasing hospitalization rates, decreasing chronic illness rates, and other factors.

Complementing these studies of treatment trends are a collection of studies on the incremental benefits of intensive treatment, and the changing productivity of medical care.[10] A recent study of angioplasty by Cutler and Robert S. Huckman is representative of this work [W9311]. The use of angioplasty has spread dramatically over the 20 years since its introduction. It has raised the cost of treatment for coronary artery disease. However, because it now sometimes substitutes for bypass surgery, a more expensive procedure, there is some offset in costs with the same or better health outcomes as bypass surgery. And where angioplasty has replaced non-intensive medical management, the value of the technology is likely enough to justify the cost. Indeed many of the analyses of medical productivity by NBER investigators find that the increasing use of intensive procedures has done a lot to improve health, on average,

although the procedures may be less effective in marginal patients.

Health Insurance, Hospital Organization, and Health Policy Reform

In large part as a response to rising costs, the health insurance and health policy environment in the United States has continued to evolve. Cutler has explored the decline in health insurance coverage among working families in the United States in the 1990s, finding that coverage declined primarily because fewer workers took up coverage when offered it, not because fewer workers were offered insurance or were eligible for it [W9036].[11] Project estimates suggest that increased costs to employees can explain the entire decline in take-up rates in the 1990s.

Kessler and McClellan have been engaged in a project on the effects of hospital organizational form on medical productivity. A recent study from this project finds that areas with a for-profit hospital have about 2.4 percent lower hospital expenditures, but virtually the same patient health outcomes [W8537]. Kessler and McClellan attribute this to the likely spillover effects of for-profit hospitals on their nonprofit and public counterparts: the competition from for-profit hospitals may limit the ability of non-profits to behave inefficiently. In another study, Kessler, McClellan, and Henry Hansmann compare the responsiveness of hospitals to reductions in demand, finding that for-profit hospitals respond most rapidly, followed in turn by public and religiously affiliated non-profit hospitals, while secular non-profits are distinctly the least responsive ownership form [W8989].

Matthew Eichner, McClellan, and I have considered the incentives, characteristics, and potential limitations of medical savings accounts (MSAs) as an alternative approach to firm health insurance provision.[12] Under these plans, a specified amount of money is deposited each year in an employee MSA, and these funds are available to support non-catastrophic medical care expenses as needed. Unused assets in the MSA account are treated as long-term retirement saving. A catastrophic insurance plan covers any expenditures above this deductible. Such schemes are designed to provide consumers — and their health care providers — incentives not to spend money on care which offers only low marginal benefit. Our research has considered both the desirable incentive features of MSA plans and the potential limitations that might result for individuals with long-term continuing health care expenditures. We find that only a small fraction of households have continuing medical expenditures year after year at a level that would overwhelm their MSA balances. Indeed our most recent work on the project shows how MSA plans might work in conjunction with other personal retirement accounts as a means of financial preparation for retirement. Based on actual medical histories, our simulations suggest that more than half of plan enrollees participating in an equity-invested MSA program over a working career would accumulate MSA balances of over three times the amount contributed to the plans. And very few would accumulate less than 100 percent of their contributions, even after paying for non-catastrophic health care costs. Thus a key finding from the project is that MSA plans may not only be effective in containing health care costs; they may also work in conjunction with other programs to increase pre-retirement saving.

Cutler also has considered the dynamics of international health policy reform.[13] One study finds that as new and expensive medical technologies have developed over time, the policy commitment to equal access to care has become ever more expensive. Historically, countries have dealt with rising costs by maintaining equal access and restricting total spending. Today, many countries are considering a move away from spending controls and toward incentive-based medical care reform — possibly inducing more cost-effective health care decisions, but also greater reductions in care among those less able to afford the incentive-based cost-sharing provisions of the plans.

Database Development in Aging

Many NBER investigators have been involved in the development of data on older people in the United States and abroad. The Health and Retirement Survey (HRS) began about a decade ago and now provides longitudinal information on the health and economic circumstances of about 25,000 older Americans from 1992 to the present. NBER affiliates Charles Brown, Gustman, Hurd, and Mitchell are members of the HRS management team; David O. Meltzer, John Rust, and Skinner are on the HRS Steering Committee; and Cutler, David I. Laibson, and I are on the NIA Data Monitoring Committee for the HRS. The HRS project has developed and applied numerous survey innovations, including the use of bracketing questions to minimize non-response, the use of experimental modules for continuous database development, the inclusion of data on expectations, the linkage of survey data to administrative records from the Social Security Administration and the Centers for Medicaid and Medicare Services, and the inclusion and coding of pension and health plan data obtained directly from firms. Many participants in the Aging Program have assisted in developing, analyzing, and improving these innovative components.

McFadden has been a leader in the study of survey response bias and in the development of internet survey methodologies. A major accomplishment of this work has been to implement an experimental internet survey method for data collection, administered through an internet virtual laboratory, or IVLab, developed explicitly for the project. The IVLab has confirmed the value of internet-based questioning as a low-cost survey methodology that enables cost-effective experimentation with questionnaire formatting and survey content — experimentation that is generally cost-prohibitive using other survey approaches. McFadden's work also has been at the cutting edge in exploring how the format, sequencing, and context of questioning affects responses, and how to

effectively correct (or at least correctly interpret) biases that result from these survey limitations. In addition to the methodological advances made through the IVLab, McFadden and colleagues have completed both a pilot and a larger-scale version of an internet-based survey of older Americans, called the Retirement Perspectives Survey (RPS). The content of the RPS survey draws heavily on the asset and health components of HRS, but with substantially more variation in questionnaire format, sequencing, cues and context. These experimental treatments have enabled the research team to test order effects and other framing effects on subject responses. The larger-scale RPS survey also includes both mail-out and internet versions of the survey, so investigators can begin to assess how both sample selection and response biases differ between them, as well as between these experimental surveys and the HRS itself.

The analysis of survey response bias has continued to be a key element of this work. For example, a recent study by Li Gan, Hurd, and McFadden looks at people's mortality expectations, which are very close to actual mortality risks on average, but which have problematic characteristics, such as unrealistic focal point responses [W9480]. The methodological research being done by Hurd, McFadden, and others is helping to explain these anomalies, correct for them whenever possible, and appropriately interpret research that uses these data.

Yet another exciting area of database development has been in the development of international data on aging. Axel Börsch-Supan is the coordinator of the Survey of Health, Aging, and Retirement in Europe (SHARE). SHARE is a coordinated data collection effort in Denmark, France, Germany, Greece, Italy, the Nether-lands, Spain, and Sweden. It evolved in part from the HRS, and from the NBER project on social security systems and retirement around the world, and a number of NBER investigators (in addition to Börsch-Supan) are advisors to the SHARE project. In other parts of the world, Case, Deaton, and others have been involved in designing surveys and conducting research on the effects of the pension system in South Africa. Aging Program investigators also have been involved, peripherally at this point, in discussions with a larger consortium of research and data sites in developing regions throughout Africa and parts of Asia (the INDEPTH network). Duflo is involved in database development in areas of poor health in various regions of India. And Jensen has extended his research and database development work on health and economic circumstances in Russia and Eastern Europe to developing countries in Asia, including India and Pakistan.

For almost two decades, the NBER Aging Program has focused widespread attention on population aging, and the health and economic circumstances of individuals as they age. It has also worked well in integrating a wide range of related research projects into a cohesive program, including regular interaction among members of the research team, extensive dissemination of re-search findings in both academic publications and non-technical reports, external involvement in promoting aging-related research and data resource development in aging, organizing international collaborations and cross national comparisons of aging issues, sponsoring regular workshops and conferences on the economics of aging, and inspiring the collaborative engagement of both senior scholars and new investigators in the study of aging issues.

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[1] *These volumes include* The Economics of Aging *(1989)*, Issues in the Economics of Aging *(1990)*, Topics in the Economics of Aging *(1992)*, Studies in the Economics of Aging *(1994)*, Advances in the Economics of Aging *(1996)*, Inquiries in the Economics of Aging *(1998)*, Frontiers in the Economics of Aging *(1998)*, Themes in the Economics of Aging (2001), *and* Perspectives on the Economics of Aging *(forthcoming)*.

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[3.] *J. Gruber and D.A. Wise, eds.,* Social Security and Retirement Around the World*, University of Chicago Press, 1999; J. Gruber and D.A. Wise, eds.,* Social Security Programs and Retirement around the World: Micro-Estimation*, Chicago: University of Chicago Press, forthcoming.*

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Research Summaries

Randomized Trials and Quasi-Experiments in Education Research

Joshua D. Angrist*

The 2001 No Child Left Behind (NCLB) Act promises a series of significant reforms. The hope is that these reforms will jump-start underperforming American schools. Most public discussion of the Act has focused on the mandate for test-based school accountability and the federal endorsements of charter schools and other forms of school choice. Other important provisions include changes in funding rules for states and a new emphasis on reading instruction. The NCLB Act also repeatedly calls for education policy to rely on a foundation of *scientifically based research*. Although this appears to be a bland technical statement, it strikes me as potentially at least as significant as other components of the Act.

What is Scientifically Based Research?

NCLB defines scientifically-based research as research using rigorous methodological designs and techniques, including control groups and random assignment. In a presentation made shortly after President Bush signed NCLB into law, the deputy director of the Office of Research in the Department of Education put studies involving randomized trials and quasi-experiments at the top of the methodological hierarchy.

Randomized trials are experiments in which the division into treatment and control groups is determined at random (for example, by tossing a coin). Quasi-experimental research designs are based on naturally occurring circumstances or institutions that (perhaps unintentionally) divide people into treatment and control groups in a manner akin to purposeful random assignment.

A reliance on control groups and random assignment indeed would mark a new direction for education research. For example, an important question on the education research agenda is the role of technology in schools. Most previous research on the use of technology in the classroom (computer-aided instruction or CAI) relies on uncontrolled measurements, such as the level of satisfaction experienced by technology users. Not surprisingly, teachers and students typically report that they enjoy using new computer equipment (as shown in a recent study of laptops in Maine's public schools). But this does not establish that students who use the laptops are learning more, or that the expenditure on computers meets a cost-benefit standard (after all, computer hardware and software is expensive).

Randomized trials provide the best scientific evidence on the effects of policies like educational technology, changes in class size, or school vouchers because differences between the treatment and control group can be attributed confidently to the treatment. A good quasi- or natural experiment is the next best thing to a real experiment. In some cases, quasi-experiments also involve random assignment, such as in the lotteries sometimes used to distribute school vouchers. In addition to comparing apples to apples, randomized trials and natural experiments also rely on assessments by disinterested non-participants and on clearly defined outcomes that other researchers can reproduce and interpret. This is what science is all about. In contrast, U.S. education policy has often relied on evidence that is fragmentary or anecdotal, uses subjective outcomes, and, most importantly, fails to make rigorous comparisons of treatment and control groups.

If successful, a shift to scientifically based research will move the study of education much closer to medicine, which has been experiencing a similar transition to scientifically based research over the last half-century. NBER researchers have been in the vanguard of this transition to scientifically based research on education. We have used natural experiments — and in some cases, actual randomized trials — to provide powerful evidence on issues ranging from the effects of compulsory attendance laws to changing class size. I describe some of this work below, focusing on my own efforts. I have used quasi-experiments — and in recent and ongoing projects, randomized trials — to make scientifically grounded inferences regarding the effects of achievement incentives and school choice, school resources, and macro education policy.

School Incentives and School Choice

The desire to help disadvantaged teens get through high school is a recurring theme of school reform proposals. Most anti-dropout efforts involve the provision of support services to low-achieving students. But the results from recent demonstration projects assessing services for at-risk high-school students have been disappointing.[1] Motivated by the economic view of education, which sees student

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effort in school as determined partly by a comparison of the costs and benefits of effort devoted to schooling, Victor Lavy and I developed a unique program that rewards Israeli high school students who pass their high school matriculation exams (something like the New York Regents exam or British A Levels) with cash payments. Although this project was controversial in Israel (and eventually was cancelled as a political liability), it is in the spirit of a 1998 proposal by former Labor Secretary Reich, who suggested that students from low- income families in the United States be offered a $25,000 cash bonus for graduating from high school. It is also similar to the merit-based stipends common in higher education.

Perhaps most unusually, Lavy and I implemented the *Achievement Awards* program as a school-based randomized trial.[2] That is, we identified 40 of the lowest-achieving schools in Israel, and randomly selected 20 of them for participation in the program. Any student from the 20 treatment schools who passed their exams was eligible for a $1500 payment, quite a large sum in Israel, although small relative to the private and social costs of dropping out. Only about 18 percent of students in the control group completed their matriculation exams. Students in our control group were about 7 percentage points more likely to complete their matriculation exams, a statistically significant difference with an economic benefit that easily outweighs the cost of bonus payments.

The *Achievement Awards* demonstration is the first of what we hope will be a series of randomized trials designated to test education incentive plans. In research in progress, Lavy and I are evaluating a package of incentives that provides awards for teachers as well as for students. A unique feature of our ongoing work is that the new demonstration project includes a component specifically designed to explore the interaction of student and teacher incentives.[3] We also plan a long-run follow up study of the *Achievement Awards* program.

One of the most controversial innovations highlighted by NCLB is school choice. In a recently published paper,[4] my collaborators and I studied what appears to be the largest school voucher program to date. This program provided over 125,000 pupils from poor neighborhoods in the country of Colombia with vouchers that covered approximately half the cost of private secondary school. Colombia is an especially interesting setting for testing the voucher concept because private secondary schooling in Colombia is a widely available and often inexpensive alternative to crowded public schools. (In Bogota, over half of secondary school students are in private schools.) Moreover, governments in many poor countries are increasingly likely to experiment with demand-side education finance programs, including vouchers.

Although not a randomized trial, a key feature of our Colombia study is the exploitation of voucher lotteries as the basis for a quasi-experimental research design. Because demand for vouchers exceeded supply, the available vouchers were allocated by lottery in large cities. Our study compares voucher applicants who won a voucher in the lottery to those who lost. Since the lotteries used random assignment, losers provide a good control group for winners. A comparison of voucher winners and losers shows that three years after the lotteries were held, winners were 15 percentage points more likely to have attended private school and were about 10 percentage points more likely to have finished eighth grade, primarily because they were less likely to repeat grades. Lottery winners also scored 0.2 standard deviations higher on standardized tests. A follow-up study in progress shows that voucher winners also were more likely to apply to college. On balance, our study provides some of the strongest evidence to date for the possible benefits of demand-side financing of secondary schooling, at least in a developing country setting.[5]

Research on vouchers naturally focuses on the question of whether voucher recipients benefit from the opportunity to use vouchers. A related question that gets less attention arises from the fact that voucher recipients and other school choice beneficiaries are typically low-income. For example, NCLB singles out the students in the worst schools as being eligible for choice. In particular, NCLB requires districts to allow students in schools judged to be "failing" the opportunity to change schools. Policymakers and parents in the schools that accept these students have wondered what the consequences will be for high-achieving children when low achievers from poor areas choose to attend their schools. Economists refer to research on questions of this sort as the measurement of peer effects.

Boston's long-running Metco program provides a unique opportunity to estimate peer effects in the classroom using a quasi-experimental research design. Metco gives mostly black students in the Boston public school district the opportunity to attend schools in more affluent suburban districts. Kevin Lang and I focus on the impact of Metco on the students in one of the largest Metco-receiving districts.[6] Because Metco students have substantially lower test scores than local students, this inflow generates a significant decline in average scores. Our research shows that the overall decline in scores is attributable to a composition effect, though, because we find no impact on average scores in a sample limited to non-Metco students. This weighs against the hypothesis of significant negative peer effects as a result of school choice (although we do find a short-lived negative effect on the scores of minority third graders in reading and language). Our research on Metco exploits idiosyncratic features of the process used to allocate Metco students to different schools through what is known as the "regression-discontinuity" method for analysis of quasi-experiments.

School Resources

Another strand of my work uses quasi-experiments to look at what economists call the education production function. This research links school resources, including computers and class size, with outcomes such as student achievement on standardized tests. The principal challenge in research of this type, as in most empir-

ical research in economics, is in isolating cause and effect. Many factors make the observed correlation between school resources and student achievement hard to interpret. Rich and poor districts differ on many dimensions, teachers sort students into classes of different size, and students and parents make systematic choices that are reflected in the resources/achievement relationship.

The question of how technology affects learning has been at the center of recent debates over educational inputs. My most recent research on school resources, joint with Lavy,[7] exploits a natural experiment arising from the fact that the Israeli State lottery, which uses lottery profits to sponsor various social programs, funded a large-scale computerization effort in many elementary and middle schools. Although lottery officials did not use random assignment to allocate the computers across towns and schools, they used an idiosyncratic priority scheme that appears to have an essentially random component. We used this to estimate the impact of computerization on both the instructional use of computers and pupil achievement. Results from a survey of Israeli school-teachers show that the influx of new computers increased teachers' use of CAI in the fourth grade, with a smaller effect on CAI in eighth grade. Perhaps surprisingly, CAI does not appear to have had educational benefits that translated into higher test scores. In fact, estimates for fourth graders show lower math scores in the group that was awarded computers, with smaller (insignificant) negative effects on language scores. These results call into question the widely-held view that additional resources should be devoted to CAI.[8]

Another central question in the school resources debate is the importance of class size. Although recent years have seen renewed interest in the class-size question, academic interest in this topic is not simply a modern phenomenon: the choice of class size has been of concern to scholars and teachers for hundreds of years. One of the earliest references on this topic is the Babylonian Talmud, completed around the beginning of the 6th century, which discusses rules for the determination of class size and pupil-teacher ratios in bible study. The great 12th century Rabbinic scholar, Maimonides, interprets the Talmud's discussion of class size as follows: "Twenty-five children may be put in charge of one teacher. If the number in the class exceeds twenty-five but is not more than forty, he should have an assistant to help with the instruction. If there are more than forty, two teachers must be appointed."

In my first study of school resources, also joint with Lavy,[9] we use Maimonides' rule capping class size at 40 to construct a natural experiment to estimate the effects of class size on the scholastic achievement of Israeli pupils. To see how this experiment works, note that according to Maimonides' rule, class size increases one-for-one with enrollment until 40 pupils are enrolled, but when 41 students are enrolled, there will be a sharp drop in class size, to an average of 20.5 pupils. Similarly, when 80 pupils are enrolled, the average class size will again be 40, but when 81 pupils are enrolled the average class size drops to 27. Our use of this variation is an application of the quasi-experimental regression-discontinuity method.

Interestingly, the observed association between class size and student achievement in our data is always perverse (that is, students in larger classes tend to do better). But this illustrates the importance of research using a good experiment. Estimates of class size effects using Maimonides' Rule suggest that reductions in class size induce a significant and substantial increase in math and reading achievement for fifth graders, and a modest increase in reading achievement for fourth graders. We gain confidence is this result (as opposed to the simple correlation between class size and test scores) because a randomized trial manipulating class size in Tennessee generated similar estimates.[10]

The Effects of Macro-Education Policy

The work discussed above focuses on a micro-level analysis of students and schools. I have also used natural experiments to study legislative and other macro-level education policies. Here, experiments are harder to come by and research may have to rely on simple policy shifts that affect some states and not others. Nevertheless, this work follows the natural-experiments model in that there is always a well-defined control group. For example, Jon Guryan and I recently looked at state changes in teacher certification requirements.[11] We find that states that introduced teacher tests (such as the national teachers examination) ended up paying higher teacher salaries with no measurable increase in teacher quality. This suggests that tests are more of a barrier to entry than an effective quality screen.

In earlier work, Alan B. Krueger and I looked at the effects of compulsory attendance laws.[12] This research exploits the interaction between individuals' quarter of birth and state laws (children born earlier in the year are allowed to drop out of school after having completed less schooling than those born later). More recently, Daron Acemoglu and I have used state compulsory attendance laws to estimate the social returns to education (that is, an economic benefit beyond that accruing to the more educated individuals themselves).[13] I also have looked at natural experiments increasing the education infrastructure, for example a large-scale expansion of higher education in the West Bank and Gaza Strip.[14] Finally, Lavy and I studied the economic consequences of the change in language of instruction in Morocco's secondary schools.[15]

Conclusion

In addition to providing evidence on specific questions, I believe that an important overall contribution of my work on education has been to document the feasibility and promise of both quasi- experimental methods and randomized trials in education research. Many other NBER researchers are also involved in this work and I expect that education research along these lines will be a growth area for economists in the years to come. I am certainly looking forward to doing more of it.

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[2] *J. D. Angrist and V. Lavy, "The Effect of High School Matriculation Awards" Evidence from Randomized Trials,' NBER Working Paper No. 9389, December 2002.*

[3] *See P. Glewwe, N. Ilias, and M. Kremer, "Teacher Incentives," NBER Working Paper No. 9671, May 2003, for a recent randomized trial of teacher incentives in Kenya.*

[4] *J. D. Angrist, E. P. Bettinger, E. Bloom, E. King, and M. Kremer, "Vouchers for Private Schooling in Colombia: Evidence from a Randomized Natural Experiment," NBER Working Paper No. 8343, June 2001, and in* American Economic Review*, 92 (5) (December 2002), pp. 1535-58.*

[5] *Evidence on voucher effects for the United States has been more mixed. Two studies involving randomization are A. B. Krueger and P. Zhu, "Another Look at the New York City Voucher Experiment," NBER Working Paper No. 9418, January 2003 and C. E. Rouse, "Private School Vouchers and Student Achievement: An Evaluation of the Milwaukee Parental Choice Program,"* The Quarterly Journal of Economics*, 113 (2) (May 1998). C. M. Hoxby, "Does Competition Among Public Schools Benefit Students and Taxpayers?"* American Economic Review*, 90 (5) (December 2000), pp. 1209-38 is a quasi-experimental study of school choice. In work in progress, J. B. Cullen, S. D. Levitt, and B. A. Jacob are using lotteries to study school choice in the Chicago public schools in, "The Impact of School Choice on Enrollment and Achievement: Evidence from over 1000 Lotteries," manuscript, 2003 (forthcoming as an NBER Working Paper).*

[6] *J. D. Angrist and K. Lang, "How Important are Classroom Peer Effects? Evidence from Boston's METCO Program," NBER Working Paper No. 9263, October 2002.*

[7] *J. D. Angrist and V. Lavy, "New Evidence on Classroom Computers and Pupil Learning,"* The Economic Journal*, 112 (October 2002), pp. 735-65.*

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Inflation Dynamics: Combining Measurement with Theory

Jordi Galí and Mark Gertler*

Among the central issues in macroeconomics is the nature of short-run inflation dynamics. This matter is also one of the most fiercely debated, with few definitive answers available after decades of investigation. At stake, among other things, is the nature of business fluctuations and the appropriate conduct of monetary policy. How a central bank should go about engineering a disinflation, for example, depends critically on the extent to which: 1) there may be a short-run tradeoff between inflation and real activity and 2) expectations of future economic activity affect current price setting behavior. The issue is also highly relevant in the current era of low inflation: how to manage monetary policy to avoid deflation and potentially slipping into a liquidity trap (of the type many observers believe is happening in Japan) is similarly sensitive to how inflation is determined in the short run.

Our research over the past few years has focused on both theoretical and empirical analysis of inflation dynamics. In contrast to much of the important traditional work on the Phillips curve, which was largely empirical in nature, we explicitly employ economic theory to develop an econometric model of inflation. By tying the empirical analysis tightly to theory, we believe we are able to obtain a deeper understanding of what determines inflation in the short run than would be the case from just examining statistical relationships. In addition, by estimating an explicit economic model, we can potentially understand how significant structural changes might affect inflation better than a mainly empirical approach would permit. Examples of significant structural changes include shifts in trend productivity and changes in the monetary policy regime.

The New Keynesian Phillips Curve

Our work builds on the optimization-based approach to modeling short-run inflation dynamics that has been used increasingly in applied work in recent years. This literature, in turn, is an outgrowth of early theoretical work by Fischer[1], Taylor[2], Calvo[3] and others that emphasized staggered nominal wage and price setting by forward looking workers and firms. The modern literature extends this earlier work by casting the price setting decision within an explicit individual optimization problem. Aggregating over individual behavior then leads, typically, to a relationship between inflation in the short run and some measure of overall real activity, in the spirit of the traditional Phillips curve. The explicit use of micro-foundations, of course, places additional structure on the relationship and further leads to some important differences in detail.

A canonical version of this kind of Phillips curve — often referred to as the New Keynesian Phillips Curve (NKPC) — is attributable to Calvo. This approach involves making assumptions that greatly simplify the aggregation of individual price setting, but still retain the feature of non-synchronized multi-period price setting. Because it results in a reasonably parsimonious aggregate relation for inflation, the model has gained widespread attention. It also has generated some controversy, as we discuss below.

There are two basic building blocks to the Calvo variant of the NKPC. The first is an equation that relates current inflation to two factors: the percent deviation of real marginal cost (averaged across firms) from its steady state; and expected future inflation. This relation is obtained as a log-linear approximation of the aggregated behavior of individual firms that set prices for multiple periods based on current and anticipated future nominal marginal cost, and do so on a staggered basis.

The second key building block is an equation that has real marginal cost vary proportionately with the output gap, where the latter is defined as the percent deviation of output from its natural (flexible price equilibrium) level. This second relation holds explicitly in the model under certain auxiliary assumptions, including in particular the assumption of competitive labor markets. Intuitively, periods of excess demand (output above the natural level) are associated with marginal cost above average, and the reverse is true for periods of excess supply.

Combining these fundamental relations yields the baseline NKPC: inflation depends on the output gap and anticipated future inflation. Note that the NKPC has some of the flavor of a traditional Phillips curve in the sense that inflation varies positively in the short run with the output gap. The similarity stops there, however. The defining property of the baseline NKPC is the forward looking nature of inflation dynamics. The NKPC is effectively a first-order forward-looking difference equation in inflation with the output gap as the forcing variable. Iterating this relation forward yields inflation equal to a discounted sum of current and expected future output gaps. Intuitively, the theory suggests that price adjustment is based on current and anticipated marginal cost. Under certain conditions, the output gap proxies movements in marginal cost. Hence, inflation depends on the expected future path of the output gap, as well as on its current value.

This forward-looking behavior of inflation contrasts sharply with the traditional Phillips curve (TPC), where inflation is an entirely backward looking phenomenon.[4] With the TPC, inflation depends on the output gap and an arbitrary number of lags of inflation. In contrast to the NKPC,

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the exact specification, of course, is not explicitly guided by theory. Also, the TPC rules out the possibility that beliefs about the future may affect current price setting and, hence, inflation.

The extent to which the NKPC captures reality has important policy implications. If expectations of the future matter, then current inflation will depend not only on prevailing economic conditions but also on beliefs about future conditions, including the future course of monetary policy. As a consequence, establishing the credibility of intentions about the future course of monetary policy becomes an important dimension of its conduct. As recent literature has shown, with forward looking price setting, establishing a credible commitment to maintaining price stability in the future reduces the cost of doing so in the present. Roughly speaking, in this context establishing credibility improves the short-run output-inflation tradeoff. Note that this gain from credibility does not depend on having a central bank that wishes to push output above the natural level, as is critical in the early literature on credibility. Rather, it is a product of the forward-looking nature of price setting.[5]

The issue is also relevant to current discussions of the liquidity trap. As emphasized by Krugman,[6] Eggertson and Woodford[7] and others, with forward looking price setting, an economy constrained by the zero interest rate bound may be able to nonetheless stimulate economic activity by committing to inflate in the future.

Early Criticisms of the NKPC

As is now well known, the baseline NKPC, which links inflation to the output gap and expected future inflation, is at odds with the data. Estimates of this equation have the output gap enter either insignificantly or with the wrong sign. The basic problem is that the theory suggests that inflation should anticipate movements in the output gap. In the data, the reverse appears true, at least using ad hoc measures of the output gap based on simple detrending methods, that is, the output gap tends to lead inflation.[8] One possibility is that detrended output might not be a good proxy for the output gap, particularly if there is considerable variation in the true natural level of output. However, it appears that it would take a somewhat peculiar pattern of measurement error in the natural level of output for the model to fully account for the timing evidence on detrended output versus inflation observed in the data.

Mankiw[9] emphasizes a closely related criticism: The identified VAR literature suggests that an anticipated tightening of monetary policy produces a decline in output after two to three quarters, but no decline in inflation until nearly a year after a shock. Simulations of models that use the NKPC may get the output response correct, but produce too early and too strong a response of inflation. Again, the problem is that inflation anticipates the output gap in the NKPC but not in the data. More generally, the NKPC has difficulty accounting for the apparent history dependence of inflation in the data. The TPC addresses this issue by simply adding lags of inflation to the right hand side of the equation. Of course, there is no underlying theoretical motivation.

A Hybrid NKPC: Development and Structural Estimates

Our work addresses the basic empirical shortcomings of the NKPC. In Galí and Gertler[10] we build on the basic Calvo model and develop a new econometric framework for estimating a structural equation describing the dynamics of inflation. We start from the view that the canonical version of the model suggests that inflation should be related to movements in real marginal cost, and not to the output gap per se. It is only under the strong assumption of frictionless labor markets that the output gap should vary proportionately with marginal cost. With labor market rigidities (for example, stickiness in either nominal or real wages) this relation will not hold. Put differently, one reason for the empirical failure of the baseline model may be that the output gap is not a good proxy for marginal cost, rather than the canonical model of staggered forward price setting being incorrect. This leads us to estimate the canonical version of the model that links inflation directly to real marginal cost.[11]

Further, we allow for the possibility that price setting is not purely forward looking. In particular, in our paper we introduced a fraction of firms in the model that adjust prices using a simple backward looking rule of thumb. The rule has the property that it converges to the optimal forward looking pricing policy rule in the steady state. The net result is a hybrid of the NKPC that nests the pure forward looking model as a special case.[12] Under our hybrid formulation, inflation depends on real marginal cost and a linear combination of expected future and lagged inflation.[13] The model coefficients, further, are explicit functions of the primitive parameters, including the frequency of price adjustment and the fraction of firms that are backward looking. Lagged inflation disappears in the limiting case where the fraction of rule-of-thumb firms goes to zero and the model converges to the pure forward looking NKPC.

We estimate our hybrid NKPC using Generalized Method of Moments (GMM) with lagged variables as instruments (thus allowing for the possibility of measurement error.) Three principle findings emerge: 1) the coefficient on real marginal cost is positive and statistically significant; 2) the coefficient on lagged inflation is positive and statistically significant, implying that the pure forward looking model is rejected by the data; 3) forward looking behavior is still dominant across a range of estimates. The coefficients on expected future and lagged inflation generally sum to one, with the coefficient on lagged inflation ranging between 0.2 and 0.4. In subsequent work with David López-Salido[14], we broadly confirmed these estimates, although we have tightened the coefficient estimates to roughly 0.35 for lagged inflation and 0.65 for expected future inflation. In addition, we show that the simple theory-based model does a reasonable job of capturing the

movements in inflation over the past forty years, including: the rise to double digit inflation in the 1970s; the disinflation of the early 1980s; and the period of simultaneous high output growth and low inflation during the latter half of the 1990s.

As some further confirmation on the empirical plausibility of our model, we obtain sensible estimates of the degree of price rigidity. From our estimates of the slope coefficients of the hybrid NKPC, we can use the underlying theory to back measures of how long prices are fixed on average. Our early work suggested a period of 4 to 5 quarters, which is high relative to the survey evidence. In subsequent work we found that after relaxing some of the technological assumptions of our model, our estimates of the average duration of a price being fixed fell to about two and a half quarters, clearly in the range of what recent survey evidence suggests.[15] When applying the same approach to euro area data, we obtain similar results: the hybrid version of the NKPC seems to fit the European data equally well, if not better. Some differences emerge: the estimates of average price duration (between four and six quarters) are a bit higher than in the United States, but the forward-looking component is, if anything, even more dominant than in the United States.

It is clearly a virtue of our approach that we are able to obtain estimates of the degree of price rigidity. One potential shortcoming, though, is that we have to assume that the average time interval over which firms keep price fixed remains constant over the sample. Put differently, our model assumes time dependent price setting (where the time period remains constant) as opposed to state dependent pricing (where firms face fixed costs of changing price but with the time interval between adjustments endogenous.)[16] Our implicit assumption is that variation in macroeconomic conditions (particularly inflation) is not sufficiently large to systematically affect the interval over which firms change prices. In this case, the relatively simple time-dependent model may be thought of as a reduced form approximation of the more complex state-dependent model.

As a check on whether this assumption is reasonable, we explored the robustness of our estimates of the degree of price rigidity to different sub-samples. We found the estimates to be reasonably stable, suggesting that our assumption of time-dependent price setting may be plausible for a country like the United States that has experienced moderate variation in inflation. Clearly it would not be reasonable for a country that has experienced high and volatile inflation, such as Brazil, or Argentina.

Overall, our estimates of the hybrid NKPC appear reasonably robust to different estimation strategies.[17] For example, our results are largely invariant to estimating the closed form of the model (obtained by solving out for expected inflation). Nor are they the product of weak instruments. In addition, while we have used a single equation/instrumental variable approach, a number of other papers have obtained very similar results to ours using a full blown systems approach.[18]

Overall, the clear message from our work is that while the pure forward looking version of the NKPC may be rejected by the data, the hybrid variant with a dominant role for forward looking behavior does reasonably well. It is in this respect that the NKPC provides useful insights into the nature of inflation dynamics and, along with it, useful insights for the conduct of monetary policy.

The NKPC and Inflation Persistence

How does the hybrid NKPC account for the apparent high degree of persistence of inflation in the data? Two factors are key: the relatively modest amount of lagged inflation (certainly as compared to the TPC) and the persistence of real marginal cost. Regarding the latter: under the assumption of Cobb-Douglas technology, real marginal cost corresponds to real unit labor costs: the real wage divided by average labor productivity. In the data, real unit labor costs are highly persistent and highly correlated with inflation. Given that firms are pricing based on current and anticipated real unit labor costs, the sluggishness in this variable helps account for the persistence in inflation.

Note too that this approach provides a theoretically cogent way to capture the influence of supply shocks on inflation. Here supply shocks (for example, shift in oil prices or shift in total factor productivity) affect inflation by influencing the measure of firms' real marginal cost. In the Cobb-Douglas case, these shocks affect marginal cost by changing average labor productivity. For example, in the late 1990s, the surge in productivity (in conjunction with only mild real wage growth) led to a decline in unit labor costs relative to trend. For this reason, our model is able to capture the low inflation of this period reasonably well.

A complete story of short-run inflation dynamics requires modeling the evolution of real marginal cost. It appears that much of the persistence in real marginal cost (at least as measured by real unit labor cost) is associated with sluggishness in the evolution of real wages. Whether this sluggishness is attributable to stickiness in nominal or real wages is an open question. Several authors have shown that extending models similar to ours to allow for staggered nominal wage setting holds promise.[19] Indeed a variation of this model that allows for wages to be indexed to past inflation appears to do well empirically. Among other things, this model of staggered wage and price setting captures very well the response of inflation to a monetary policy shock, thus providing a direct response to the Mankiw critique. We are currently exploring how well the model captures the overall variation of postwar inflation.

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[13] *Furhrer and Moore earlier proposed a hybrid model. Ours differs by having real marginal cost as the forcing variable and also having the slope coefficients derived as explicit functions of the primitive parameters. Our formulation leads to a more important role for forward-looking behavior. See J. Galí and M. Gertler, "Inflation Dynamics: A Structural Econometric Analysis;" J. Galí, M. Gertler, and D. López-Salido, "Robustness of The Estimates of the Hybrid Version of the New Keynesian Phillips Curve," mimeo, 2003; and J. C. Fuhrer, "The (Un)Importance of Forward-Looking Behavior in Price Setting,"* Journal for Money, Credit and Banking*, 29 (August 1997), pp. 338-50.*

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The New Economics of Smoking

Jonathan Gruber*

The past six years have seen an enormous change in the treatment of smoking by both the public and policy makers. In 1995, federal and state excise taxes on cigarettes were one-third lower, in real terms, than their peak level of the mid-1960s. But taxes have risen by over 50 percent since then, and now stand at over one dollar per pack.

From the traditional economic perspective, this shift in government policy is unwarranted. The traditional economic model of smoking follows the standard approach to modeling any decision that involves tradeoffs over time[1]. Fully informed, forward-looking, rational consumers make the decision of whether to smoke, weighing the benefits of doing so in terms of smoking enjoyment against the costs in terms of health and other risks. The only call for intervention in such a model is related to the externalities that smokers impose on others, such as increased medical costs for our public insurance programs. But such externalities are in fact fairly small by most measures, since these costs are offset by the savings from earlier mortality of smokers, who pay a lifetime of Social Security taxes but often don't live long enough to collect their benefits. As a result, the traditional economic model would suggest that the "optimal" tax on cigarettes may be below even its 1995 level.

My recent work has questioned the validity of this traditional model. I have developed, in work with Botond Koszegi, an alternative model of the smoking decision which has radically different implications for government policy, rationalizing large taxes on cigarettes and other types of regulatory controls[2]. In this article, I describe this "new economics of smoking."

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The New Approach

The fundamental problem with the rational addiction model is that it does not account for the "self- control" problems faced by smokers. There is ample evidence that adults are unable to quit smoking even if they have a desire to do so. Eight in ten smokers in America express a desire to quit the habit, but many fewer than that actually do quit. According to one study, over 80 percent of smokers try to quit in a typical year, and the average smoker tries to quit every eight and half months. Fifty-four percent of serious quit attempts fail within one week.

These facts motivated Koszegi and me to develop an alternative formulation of the smoking decision which changes the traditional formulation in just one critical way: by allowing smokers to be *time inconsistent*. This approach, now widely used within the new field of "behavioral economics," is one where there is conflict between what the smoker would like for himself today and what he would like for himself tomorrow. Today's "self" is impatient. Faced with the tradeoff between the short- term pleasures of smoking and the long- term health damages of doing so, he will greatly discount the latter and decide to smoke. But tomorrow's "self" is much more patient. That more patient self would prefer to quit smoking. The problem, however, is that *tomorrow never comes*. The next day, the future self who was patient is now the current self who is impatient. So the smoking continues, to the long-term regret of the smoker. This is in contrast with the *time consistent* formulation that is assumed by the traditional economics model. In that formulation, today's self and all future selves are in agreement about the advisability of smoking, leading to no regret or inability to carry out plans to quit.

This formulation of preferences is one which is much more widely supported by the large literature on experimental evaluations of individual choice over time. Experiments consistently show that consumers are much more patient when making decisions about the future than when those same decisions are made about today. Individuals are much more willing to declare that their diets will start tomorrow than to start the diet today. The problem is that when tomorrow comes, it is once again easier to push off the date that the diet will begin. So, there is a conflict: you would always like to start the diet tomorrow, but you never get to the point where you are actually willing to make that sacrifice.

The key implication of time inconsistent preferences is that one's future self would like to somehow constrain one's current self to behave more patiently (for example to somehow force you today to push away that extra piece of cake). Thus, time inconsistent consumers will have demand for *commitment devices* that can be used to induce more appropriate behavior in the present. Indeed, the search for such commitment devices is the hallmark of most recommended strategies for quitting smoking: people regularly set up socially managed incentives to refrain from smoking by betting with others, telling others about the decision, and otherwise making it embarrassing to smoke.

Unfortunately, such self-control devices are only imperfectly provided by the private market. For every possible device, there is another device that can undo it. I can always cheat on my bets with others, or not go to my support group meetings and smoke instead. There is no way to truly commit oneself to not smoke or to not buy cigarettes through the private market.

But the government, on the other hand, can provide an excellent com-

mitment device: cigarette taxation (or legally-induced price rises). By raising the price of cigarettes, the government and courts can make smoking more costly for today's self, helping achieve what the smoker's own long- term self would desire by lowering smoking today. There is a large literature which documents that smoking falls as cigarette prices rise; the best estimates suggest that each 10 percent rise in the price of cigarettes lowers the consumption of cigarettes by 5 to 6 percent. For youth smokers, price sensitivity is even higher. So higher taxes, and therefore higher prices, will significantly reduce smoking today.

Implications of the New Approach for Government Policy

While this new approach to modeling smoking changes the traditional model in only one way, it has dramatic implications for government policy. In this model, the damage that smokers *do to themselves* is relevant, above and beyond external effects on others. This is because, from their own long-run perspective, smokers are smoking too much. Their long-term selves recognize this failure and would like to reduce smoking. But, their current selves are unable to do so. So the government can do what the private sector cannot; they can make it more costly to smoke in a way that cannot be evaded, combating one's short term impatience on behalf of one's long term interests.

While the damage that smokers do to others is, on net, small, the damage that smokers do to *themselves* is enormous. There are many negative impacts of smoking on individual health, but Koszegi and I focus on only one: the costs in terms of shortened lives. As noted above, on average smokers live about six fewer years than nonsmokers. Economists have spent years showing how we can use individuals' revealed preferences toward risk to value this type of lost life. Putting these estimates together with information on the reduction in years of life attributable to smoking and the average cigarettes smoked over the smoker's life, Koszegi and I compute that the cost of smoking one pack of cigarettes, in terms of the value of life lost, is *$35 per pack*. This is an enormous figure which is on the order of 100 times the typical estimate of the external damage done by smoking. Given this enormous damage that smokers do to themselves by smoking, any model which suggests that some share of these "internalities" should be reflected in government policy will suggest very large optimal taxes on cigarettes.

Koszegi and I show this in our work by considering the alternative formulation described above. We first consider a very modest degree of time inconsistency, much below that assessed by most laboratory experiments. Even in that case, we find that the optimal tax on cigarettes, above and beyond any externality effects, is $1 to $2. For more severe time inconsistency, which is consistent with laboratory evidence on preferences, the tax is much higher, on the order of $5 to $10 per pack. Another common argument against cigarette taxation is on distributional grounds. Smoking in the United States is very socioeconomically concentrated. Expenditures on tobacco products as a share of family income fall from 3.2 percent in the bottom income quartile to only 0.4 percent in the top income quartile. This pattern raises a concern that increased cigarette taxes will be excessively burdensome on those with the lowest incomes.

But this alternative approach to modeling smoking also challenges the standard perception that cigarette taxes are highly regressive. This is because the self-control benefit of cigarette taxation is larger, the larger is the price sensitivity of smoking. That is, for groups who are particularly price sensitive, higher prices are a particularly effective self-control device, since they will have more of the desired effect of reducing their smoking. And lower income groups are much more price sensitive than higher income groups. Indeed, our estimates suggest that the price elasticity of cigarette demand in the bottom quartile of the income distribution is roughly minus one; that is, when cigarette prices rise, there is no net increase in cigarette spending for the lowest income group. For higher income groups, the price sensitivity is only about one-third as large.

Koszegi and I show that, given these differences, cigarette taxes are in general not very regressive, since the larger self-control benefits for lower income groups compensate for the higher taxes they pay as a share of income. Indeed, if self-control problems are large, then cigarette taxes can be highly *progressive* under this alternative approach. The point is that, with a price elasticity of minus one, the poor as a group spend no more of their incomes on cigarettes after tax increases than they did before; the higher spending among those who still smoke is offset by the savings among those who quit. But, as a group, the poor are much healthier as a result of the fact that they have reduced their smoking. So, on net, they are better off from the higher prices if they wanted to quit smoking, but could not because of self-control problems.

New Evidence

It is important to highlight that this alternative model is not a radical departure from the traditional economic approach. This formulation continues to assume perfectly rational, forward-looking, fully informed consumers. That is, in every respect but one (time consistency), we retain the features of decisionmaking that economists have used to model behaviors for years. As a result, this alternative model also generates many aspects of real world behavior that are predicted by the traditional model. For example, under both models, smokers react to higher prices by smoking less. But the models do have one key differential prediction. Under the traditional formulation, higher taxes on cigarettes make smokers worse off; the government is constraining their choice of an activity that they are pursuing rationally. But, under this alternative formulation, higher taxes on cigarettes make smokers better off: the government is helping them achieve the self-control

that they cannot achieve through the private market.

In a recent study, my coauthor Sendhil Mullainathan and I directly tested this prediction[3]. We did so by assessing whether the self-reported well-being of smokers falls or rises when cigarette taxes increase. Using data from the General Social Survey in the U.S., we find consistently strong evidence that higher cigarette taxes are associated with higher levels of reported well-being among those with a propensity to smoke. Moreover, the effects are almost identical when we replicate the exercise with Canadian data, and, in both countries, these effects are present for cigarette taxes but not for any other excise taxes. While this is not an ideal experimental evaluation of these alternative models, it is much more consistent with the alternative formulation of the smoking decision than it is with the traditional model.

Youth Smoking

An additional problem with both of these models of smoking is that the decision to initially begin smoking is made primarily by youths, whose ability to make fully-informed, appropriately forward looking decisions is questioned by society in many contexts (for example,. minimum ages for drinking, driving, and voting). More than three-quarters of smokers begin smoking before age 19. Moreover, youths apparently initiate smoking without a full appreciation for the long-run implications of their actions. Among high school seniors who smoke more than one pack/day, the smoking rate five years later among those who stated that they *would not* be smoking (74 percent) is actually higher than the smoking rate among those who stated that they *would* be smoking (72 percent).

So how do youths make decisions to smoke, and to engage more generally in the set of risky behaviors that they undertake, such as consumption of alcohol and illicit drugs, criminal behavior, unprotected sex, over- or under- eating, driving dangerously, dropping out of school, or attempting suicide? This was the question that motivated me to organize the NBER Project on "Risky Behavior Among Youths: An Economic Analysis."[4] This project brought together ten teams of leading researchers to analyze the risky decisions made by youths. The resulting set of papers on these diverse behaviors yielded several clear and consistent conclusions, as summarized in my introductory chapter. First, economic incentives matter for youths in making these risky decisions; youth behavior in these areas is very sensitive to prices, penalties, and other policy levers that affect the costs of engaging in the activity. Second, these economic incentives nonetheless can explain only a small part of the time-series movements in youth risk taking. For example, the substantial decline in real cigarette prices during the 1990s can explain at most one-quarter of the dramatic rise in youth smoking over this period. Third, macroeconomic conditions matter for youth decisionmaking; dropping out of school goes up, but having unprotected sex goes down, as the economy improves.

Finally, there is clear evidence that the decisions made by youths have long lasting implications for their lives. For example, my analysis of youth smoking with Jonathan Zinman showed that adults who lived in low cigarette tax states as youths were much likelier to smoke as adults than were those who lived in higher cigarette tax states[5]. Our estimates imply that the rise in youth smoking of the 1990s will lead to 3.2 million fewer years of life for this youth cohort. Other papers show that lower drinking ages lead to more adult binge drinking as youths age, and that those who drop out of school because of a good economy never make up those years of lost schooling. Thus, the potential "mistakes" made by youths, such as the understatement of the long-run addictiveness of smoking noted above, can have important future implications.

What We Have Learned and Where We Need to Go Next

My work on this new economics of smoking over the past few years has shown that there is an alternative formulation of the smoking decision which is more consistent with the existing evidence on behavior, and which has radically different implications for government regulation of this activity. But this is only one alternative to the traditional model; for example, B. Douglas Bernheim and Antonio Rangel recently have developed another alternative which shares many predictions with my model with Koszegi[6]. Thus, there is clearly more work needed in distinguishing these alternatives to the traditional model. And, more work is needed on developing and testing alternative models of other potentially addictive behaviors; David M. Cutler, Edward Glaeser, and Jesse Shapiro provide a nice example of applying these models to the important issue of obesity in the United States[7].

Moreover, there remains much more to do in terms of understanding the decisions by youths to start smoking, or to engage in other risky activities. While research in this area has shown that economic incentives matter, we have been unsuccessful thus far in developing models that explain the wide variation over time the propensity of youths to engage in these behaviors.

[1] *G. S. Becker and K. M. Murphy, "A Theory of Rational Addiction,"* Journal of Political Economy, *96 (1998), pp. 675-700.*

[2] *J. Gruber and B. Koszegi, "Is Addiction 'Rational'? Theory and Evidence," NBER Working Paper No. 7507, January 2000, and* Quarterly Journal of Economics, *(116) (4) (November 2001), pp. 1261-1303; and "A Theory of Government Regulation of Addictive Bads: Optimal Tax Levels and Tax Incidence for Cigarette Taxation," NBER Working Paper No. 8777, February 2002.*

[3] *J. Gruber and S. Mullainathan, "Do Cigarette Taxes Make Smokers Happier?" NBER Working Paper No. 8872, April 2002.*

[4] *J. Gruber, "Risky Behavior Among Youth: An Economic Analysis, Introduction" in J. Gruber, ed.,* Risky Behavior Among Youth: An Economic Analysis, *Chicago: University of Chicago Press, 2001, pp. 1-28.*

[5] *J. Gruber and J. Zinman, "Youth Smoking in the U.S.: Evidence and Implications," NBER Working Paper No. 7780, July 2000, and in J. Gruber, ed.,* Risky Behavior Among Youth: An Economic Analysis*, Chicago: University of Chicago Press, 2001, pp. 69-120*

[6] *B. D. Bernheim and A. Rangel, "Addiction and Cue-Conditioned Cognitive Processes," NBER Working Paper No. 9329, November 2002.*

[7] *D. M. Cutler, E. Glaeser, and J. Shapiro, "Why Have Americans Become More Obese?" NBER Working Paper No. 9446, January 2003.*

Venture Capitalists As Economic Principals

Steven N. Kaplan and Per Strömberg*

There is a large academic literature on the principal-agent problem in financial contracting.[1] This literature focuses on the conflicts of interest between an agent — an entrepreneur with a venture that needs financing — and a principal — an investor with the funds to finance the venture. According to these theories, there are a number of ways that the investor/principal can mitigate these conflicts. First, the investor can collect information before deciding whether to invest, in order to screen out ex ante unprofitable projects and bad entrepreneurs. Second, investors can structure financial contracts — that is, the allocation of cash flow, control and liquidation rights — between themselves and entrepreneurs to provide incentives for the entrepreneurs to behave appropriately. And third, the investors can engage both in collecting information and in monitoring it once the project is under way.

Despite the large volume of theory, the empirical work in comparing the contracts and actions of real world principals to their counterparts in financial contracting theory has lagged behind. In this paper, we describe recent empirical work and its relation to theory for one prominent class of such principals — venture capitalists (VCs). In our view, VCs are real world entities that closely approximate the investors of theory. VCs invest in entrepreneurs who need financing to fund a promising project or company. VCs have strong incentives to maximize value, but at the same time receive few or no private benefits of control. Although they are intermediaries, VCs typically receive at least 20 percent of the profits on their portfolios.

In this article, we describe recent empirical work — both ours and others' — on the three things that VCs do: contracting, screening, and monitoring. Unlike previous empirical work that has relied largely on surveys, our work (and much of the work we describe) relies on detailed information collected from actual VC financings.

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Contracting

In a forthcoming article[2], we compare the characteristics of real world financial contracts to their counterparts in financial contracting theory. We do so by conducting a detailed study of 213 actual contracts between VCs and entrepreneurs. We find first that VC financings allow VCs to separately allocate cash flow rights, voting rights, board rights, liquidation rights, and other control rights. The separation of these rights is apparent, for example, in that VCs control roughly half of the cash flow rights on average, but have a majority of board seats in only 25 percent of the investments.

Second, while convertible securities are used most frequently, VCs also implement the same set of rights using combinations of multiple classes of common stock and straight preferred stock. We also point out that VCs use a variant of convertible preferred called "participating preferred" in roughly 40 percent of the financings. Participating preferred, under most circumstances, behaves like a position of straight preferred stock and common stock rather than like a position of convertible preferred.

Third, cash flow rights, voting rights, control rights, and future financings are frequently contingent on observable measures of financial and non-financial performance. These state contingencies are more common in the early stages of the VC-entrepre-

neur relationships (first VC rounds) and in earlier stage investments.

Fourth, voting rights, board rights, and liquidation rights are allocated such that if the company performs poorly, the VCs obtain full control. As company performance improves, the entrepreneur retains/obtains more control rights. If the company performs very well and the VCs earn a sizable multiple of its investment, the VCs retain their cash flow rights, but relinquish most of their control and liquidation rights through the automatic conversion provision that is present in virtually all our financings.

Fifth, VCs typically include non-compete and vesting provisions that make it more expensive for the entrepreneur to leave the firm, thus mitigating the potential hold-up problem between the entrepreneur and the investor. Vesting provisions are more common in early stage financings where it is more likely that the hold-up problem is more severe.

Our results have a number of implications. For example, cash flow rights matter in a way that is consistent with standard principal-agent theories such as Holmstrom (1979)[3]. VCs change the entrepreneur's equity compensation function, making it more sensitive to performance when incentive and asymmetric information problems are more severe.

Further, the allocation of control rights between the VC and the entrepreneur is a central feature of the financial contracts. This strongly suggests that, despite the prevalence of contingent contracting, contracts are inherently incomplete. This finding gives support to the incomplete contracting approach pioneered by Grossman and Hart[4] and Hart and Moore[5].

Cash flow rights and control rights also can be separated and made contingent on observable and verifiable measures of performance. This is most supportive of theories that predict shifts of control to investors in different states, such as Aghion and Bolton (1992)[6]. Finally, the widespread use of non-compete and vesting provisions indicates that VCs care about the hold-up problem.[7]

Screening

Before making an investment and designing the financial contracts, VCs spend a significant amount of time and effort evaluating and screening the investment opportunity. In recent work[8], we focus empirically on this information collection and evaluation.

To help the VC partnership evaluate an investment in a company, the individual VC who is sponsoring the investment often prepares a detailed investment analysis or memorandum for the other partners. In our 2002 paper, we analyze the investment memoranda from eleven VC partnerships for investments in 67 portfolio companies. We complement that analysis with information from the company business plans, as well as data on financial contracts from our previous study[9].

The VC analyses that we describe include a set of investment theses or rationales for making the investment and a discussion of the concomitant risks. VCs explicitly consider the attractiveness of the external environment — the market size, customer adoption, and competition — the feasibility of the strategy and technology, the quality of the management team, and the deal terms. VCs also explicitly delineate the risks involved in the investments. The risks typically relate to the same characteristics that the VCs evaluate for attractiveness.

We use these assessments to form three different "risk measures": internal uncertainty — the relevant information is internal to the firm and it is more likely that the VC is less informed than the entrepreneur; external uncertainty — the relevant information is external to the firm and it is more likely that the VC and the entrepreneur are equally informed; and difficulty of execution, different from both previous notions of risk, which captures the complexity of the task and the reliance on the entrepreneur's human capital. We compare these risk measures to the financial contracts.

If agency conflicts arising from moral hazard and asymmetric information are important, then the financial contracts should be related to internal uncertainty. The agency theories make mixed predictions regarding external uncertainty. Traditional moral hazard theories based on risk-sharing predict performance-based pay decreases with external uncertainty. Alternatively, more recent theories[10] suggest that performance-based pay and direct monitoring are substitutes. As external uncertainty increases, direct monitoring becomes less effective and principals make greater use of pay-performance incentives.

Two types of theories make predictions about execution or complexity risk. Theories of multitasking[11] predict that pay based on specific milestones should decrease as execution risk increases because compensation based on a signal correlated with a particular action will lead the manager to put too much emphasis on that action. Hold-up theories[12] suggest that in highly complex environments where the entrepreneur's human capital is particularly important, we should observe contracts — such as vesting provisions — that make it costlier for the entrepreneur to leave.

Consistent with the agency explanation, internal uncertainty is significantly related to many of the incentive and control mechanisms in the financial contracts. Higher internal risk is associated with more VC control, more contingent compensation to the entrepreneur, and more contingent financing in a given round.

Higher external risk, like internal risk, is associated with more VC control, and more contingent compensation. Higher external risk is also associated with increases in the strength of VC liquidation rights, and tighter staging, in the sense of a shorter period between financing rounds. These findings are highly inconsistent with optimal risk-sharing between risk-averse entrepreneurs and risk-neutral investors, a common assumption in standard agency models.

Risk related to difficulty of execution shows a (weakly) negative relation with many contractual mechanisms, such as contingent compensation and VC liquidation rights. These results suggest that for highly complex environments, where the manager's human capital is particularly important, standard incentive mechanisms are less

effective. Furthermore, execution risk is significantly positively related to founder vesting provisions. This result is consistent with the multitasking and hold-up theories.

Monitoring

Finally, several recent papers focus on post-investment information collection, monitoring, and other actions by the VC. Anecdotal accounts stress an important role for VCs in monitoring management, finding management, and providing advice. For example, Lerner[13] finds that VCs are more likely to join or be added to the boards of private companies in periods when the chief executive officer (CEO) of the company changes. He interprets this as evidence of VC monitoring.

Hellman and Puri[14] study a hand-collected sample of 173 start-up firms from California's Silicon Valley. They find that venture capital is associated with a significant reduction in the time to bring a product to market. They provide some evidence that this association holds after controlling for VC ability to select a more successful company.

Hellman and Puri[15] also study another aspect of the same dataset. They find that VC-financed firms are more likely, and quicker, to professionalize by adopting stock option plans and hiring a vice president of sales, and by bringing in CEOs from outside the firm.

The three studies described in the previous paragraphs find indirect evidence of post-financing VC actions. In our 2002 paper[16], we complement these studies by presenting direct evidence on VC actions or monitoring. We use the investment analyses to measure the actions that the VCs took before investing and that the VCs expect to undertake conditional on investing. In at least half of the investments, the VC expects to play an important role in recruiting management. In more than one-third of the investments, the VC expects to provide value-added services, such as strategic advice or customer introductions. Because the investment memoranda vary in the detail they provide, these results likely understate the VCs' activities in this area.

We also show that the actions the VCs expect to take are related to the contracts. Consistent with control theories, VCs are more likely to strengthen management as VC control increases. These theories show that investor control is necessary to implement actions that reduce the entrepreneur's private benefits, such as management interventions.

Consistent with theories like Inderst and Muller's[17] that stress having incentives for the VC to provide value-added services, we also find that VC's value-added services increase as the VC's equity stake increases, but are not related to VC control.

Implications and Conclusion

The empirical studies of venture capitalists indicate that they attempt to mitigate principal-agent conflicts in the three ways suggested by theory: through sophisticated contracting, pre-investment screening, and post-investment monitoring and advising. The evidence also suggests that contracting, screening, and monitoring are closely interrelated. In the screening process, the VCs identify areas where they can add value through monitoring and support. In the contracting stage, the VCs allocate rights in order to facilitate monitoring and minimize the impact of the identified risk factors, for example by allocating more control to investors when management is weak, or making founder cash flow rights and release of funds contingent on management actions. Also, the allocations of equity to VCs provide incentives to engage in costly support activities that increase the upside value of the venture, rather than just minimizing potential losses. There is room for future empirical research to study these activities in greater detail, both for VCs and for other intermediaries, such as banks.

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[2] *S. N. Kaplan and P. Strömberg, "Financial Contracting Theory Meets the Real World: An Empirical Analysis of Venture Capital Contracts," forthcoming in the* Review of Economic Studies.

[3] *B. Holmström, "Moral Hazard and Observability,"* Bell Journal of Economics*, 10 (1979), pp. 74-91.*

[4] *S. J. Grossman and O. D. Hart. "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration,"* Journal of Political Economy*, 94 (1986), pp. 691-719.*

[5] *O. D. Hart and J. Moore, "Property Rights and the Nature of the Firm,"* Journal of Political Economy*, 98 (1990), pp. 1119 – 58; and "Default and Renegotiation: A Dynamic Model of Debt," NBER Working Paper No. 5907, January 1997, and in* Quarterly Journal of Economics*, 113 (1) (1998), pp. 1-41.*

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[7] *O. D. Hart and J. Moore. "A Theory of Debt Based on the Inalienability of Human Capital,"* Quarterly Journal of Economics*, 109 (4) (November 1994), pp. 841-79.*

[8] *S. N. Kaplan and P. Strömberg, "Characteristics, Contracts, and Actions: Evidence From Venture Capitalist Analyses," NBER Working Paper No. 8764, February 2002.*

[9] *See S. N. Kaplan and P. Strömberg, "Financial Contracting Theory Meets the Real World: An Empirical Analysis of Venture Capital Contracts."*

[10] *See, for example, C. J. Prendergast, "The Tenuous Tradeoff Between Risk and Incentives,"* Journal of Political Economy*, 110 (5) (2002) pp. 1071-1102.*

[11] *See, for example, B. Holmström and P. Milgrom, "Multitask Principal Agent Analyses: Incentive Contracts, Asset Ownership, and Job Design",* Journal of Law, Economics, and Organization*, 7 (1991), pp. 24-92.*

[12] *See O. D. Hart and J. Moore. "A Theory of Debt Based on the Inalienability of Human Capital."*

[13] *J. Lerner, "Venture Capitalists and the Oversight of Private Firms,"* Journal of Finance*, 50 (March 1995), pp. 301-18.*

[14] *T. Hellman and M. Puri, "The Interaction Between Product Market and Financial Strategy: The Role of Venture Capital,"* Review of Financial Studies*, (Winter*

2000), pp. 959-84.

[15] *T. Hellman and M. Puri. "Venture Capital and the Professionalization of Start-up Firms: Empirical Evidence,"* Journal of Finance*, 57 (1) (2002), pp. 169-197.*

[16] *See S. N. Kaplan and P. Strömberg, "Characteristics, Contracts, and Actions: Evidence From Venture Capitalist Analyses."*

[17] *R. Inderst and H. Müller, "Competition and Efficiency in the Market for Venture Capital", working paper, New York University, 2001.*

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NBER Profile: Joshua Angrist

Joshua Angrist is a Research Associate in the NBER's Programs on Children, Education, and Labor Studies, and a Professor of Economics at MIT. A dual U.S. and Israeli citizen, he taught at the Hebrew University of Jerusalem before coming to MIT. He holds a B.A. from Oberlin College and also spent time as an undergraduate studying at the London School of Economics and as a Masters student at Hebrew University. He completed his Ph.D. in Economics at Princeton in 1989 and his first academic job was as an Assistant Professor at Harvard from 1989-91.

Angrist's research interests include the effects of school inputs and organization on student achievement, the impact of education and social programs on the labor market, immigration, labor market regulation and institutions, and econometric methods for program and policy evaluation. Although many of his papers use data from other countries, he does not especially like to travel and prefers to get the data in the mail. He is also a Fellow of the Econometric Society and a Co-editor of the *Journal of Labor Economics*.

Angrist has a long-standing interesting in public policy. In addition to his academic work, he has worked as a consultant to the U.S. Social Security Administration, The Manpower Demonstration Research Corporation, and for the Israeli government after the Oslo peace negotiations in 1994. He lives in Brookline with his wife Mira, and their two children, Adie and Noam. The Angrist family enjoy activities like hiking, skiing, skating, sailing, and eating.

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Jordi Galí is a Research Associate in the NBER's Program on Economic Fluctuations and Growth and the Program on Monetary Economics. He is also a Senior Researcher and Director of the Center for Research on International Economics (CREI) at Universitat Pompeu Fabra (Barcelona).

Galí earned his Ph.D. in Economics at MIT in 1989 and has been a Professor of Economics at New York University and, prior to that, an Associate Professor at the Graduate School of Business at Columbia University. His research interests include macroeconomics, monetary theory, and macro-econometrics. He is currently a part-time Professor of Economics at Universitat Pompeu Fabra, a visiting Scholar at the Bank of Spain, and co-director of the International Macroeconomics Program of the Centre for Economic Policy Research (CEPR) in London.

Gali currently lives in Barcelona (Catalonia). He is married to Ellen Caldwell, who works in the pharmaceutical industry. They have two children, Arnau, 10, and Anna Carla, 9. In his leisure time, Galí enjoys listening to jazz and classical music, reading, skiing, and mountain biking.

NBER Profile: *Jonathan Gruber*

Jonathan Gruber is Director of the NBER's Program on Children, an NBER Research Associate, and a Professor of Economics at MIT, where he has taught since 1992. He is also a co-editor of the *Journal of Public Economics*, and an Associate Editor of the *Journal of Health Economics*.

Gruber received his B.S. in Economics from MIT and his Ph.D. in Economics from Harvard University. He was the recipient of an Alfred P. Sloan Foundation Research Fellowship, a FIRST award from the National Institute on Aging, and the Kenneth Arrow Award for the Best Paper in Health Economics in 1994. He was also one of 15 scientists nationwide to receive the Presidential Faculty Fellow Award from the National Science Foundation in 1995. During the 1997-8 academic year, Gruber was on leave as Deputy Assistant Secretary for Economic Policy at the Treasury Department.

Gruber's research focuses on public finance and health economics. His recent areas of particular interest include the economics of employer-provided health insurance, the efficiency of our current system of delivering health care to the indigent, the effect of the Social Security program on retirement behavior, and the economics of smoking.

Gruber lives in Lexington with his wife, Andrea, and three children, Sam (8), Jack (6), and Ava (4). He spends his free time "keeping them busy!"

NBER Profile: *Steven N. Kaplan*

Steven N. Kaplan is an NBER Research Associate in the Corporate Finance Program and the Neubauer Family Professor of Entrepreneurship and Finance at the University of Chicago's Graduate School of Business (GSB). He is also the faculty director of the GSB's Polsky Entrepreneurship Center. Kaplan has been a member of the GSB faculty since 1988.

He received his Ph.D. in Business Economics from Harvard University and his A.B. in Applied Mathematics and Economics from Harvard College. Between college and graduate school, he was an investment banker at Kidder Peabody.

Kaplan's research and teaching focuses on issues in private equity and entrepreneurial finance, corporate governance, mergers and acquisitions, e-commerce, and corporate finance. He has published papers in a number of academic and business journals.

He lives in Chicago with his wife, Carol Rubin, and their two sons, Sam and Alec.

NBER Profile: Per Strömberg

Per Strömberg is a Faculty Research Fellow in the NBER's Program on Corporate Finance and an Associate Professor of Finance at the Graduate School of Business (GSB) of the University of Chicago. He has been a member of the GSB faculty since 1997, and previously taught at the Stockholm School of Economics and at Carnegie Mellon University.

Strömberg received his Ph.D. in Financial Economics from Carnegie Mellon University. He also holds an MBA from the Stockholm School of Economics.

Strömberg has done research in the areas of financial distress and venture capital finance. His work has been published in *Journal of Finance*, *American Economic Review,* and *Review of Economic Studies*, and has been presented at numerous conferences and universities. His work on bankruptcy auctions won the 2001 *Brattle Prize* for best corporate finance paper published in the *Journal of Finance*.

Strömberg is married to Lina, who is expecting their third child in June. In his free time, apart from spending it with his family, he enjoys playing jazz piano and cooking.

Conferences

Eighteenth Annual Conference on Macroeconomics

The NBER's Eighteenth Annual Conference on Macroeconomics, organized by Mark Gertler, NBER and New York University, and Kenneth Rogoff, NBER and Harvard University, was held in Cambridge on April 4 and 5. The program was:

Susanto Basu, NBER and University of Michigan; **John G. Fernald**, Federal Reserve Bank of Chicago; and **Nick Oulton** and **Sylaja Srinivasan**, Bank of England, "The Case of Missing Productivity Growth, or: Why Has Productivity Accelerated in the United States but not the United Kingdom?"
Discussants: Olivier J. Blanchard, NBER and MIT, and Gianluca Violante, New York University

Dirk Krueger, NBER and Stanford University, and **Fabrizio Perri**, NBER and New York University, "On the Welfare Consequences of the Increase in Inequality in the United States"
Discussants: Steven J. Davis, NBER and University of Chicago, and Kjetil Storesletten, Institute for International Economics

Annette Vissing-Jorgensen, NBER and Northwestern University, "Behavioral Finance: An Impartial Assessment, or: Does Irrationality Disappear with Wealth? Evidence from Expectations and Actions"
Discussants: John Y. Campbell, NBER and Harvard University, and Owen Lamont, NBER and University of Chicago

N. Gregory Mankiw, NBER and Harvard University; **Ricardo Reis**, Harvard University; and **Justin Wolfers**, Stanford University, "Disagreement About Inflation Expectations"
Discussants: Robert King, NBER and Boston University, and John Williams, Federal Reserve Bank of San Francisco

Pierpaolo Benigno, New York University, and **Michael Woodford**, NBER and Princeton University, "Optimal Targeting Rules for Monetary and Fiscal Policy"
Discussants: Stefania Albanesi, New York University, and Marios Angeletos, NBER and MIT

Arminio Fraga, **Ilan Goldfajn**, and **Andre Minella**, Central Bank of Brazil, "Inflation Targeting in Emerging Market Economics"
Discussants: Frederic S. Mishkin, NBER and Columbia University, and Robert E. Hall, NBER and Stanford University

The United Kingdom experienced an information and communications technology (ICT) investment boom in the 1990s in parallel with the United States, but measured total factor productivity (TFP) there has decelerated rather than accelerated in recent years. **Basu**, **Fernald**, **Oulton**, and **Srinivasan** ask whether ICT can explain the divergent TFP performance in the two countries. As a "general purpose technology," measured TFP should rise in ICT-using sectors (reflecting either unobserved accumulation of intangible organizational capital, spillovers, or both) with a long lag. The authors indeed find that the acceleration in U.S. TFP after the mid-1990s was broadbased — located primarily in ICT-using sectors rather than ICT-producing sectors — and there is some evidence that the TFP acceleration was larger in industries that increased their ICT share in the preceding 15 years (especially in the early 1980s). Furthermore, the TFP acceleration appears negatively correlated with increases in ICT usage in the late 1990s. In the United Kingdom, by contrast, the increase in ICT-intensity came later than in the United States. Given the long lags, these results suggest, albeit tentatively, that the United Kingdom should see an acceleration in TFP over the next decade.

Krueger and **Perri** investigate the welfare consequences of the stark increase in wage and earnings inequality in the United States for the last 30 years. Their data come from the Consumer Expenditure Survey (CE), the only U.S. dataset that contains information on wages, hours worked, earnings, and consumption for a large cross section of U.S. households. In their sample, the cross-sectional variation in wages and disposable earnings has increased significantly, both within and between groups identified by education and sex. This trend potentially implies large welfare losses, especially for the poorest groups in the U.S. population. On the other hand, the dispersion in consumption and in hours worked has not increased significantly, suggesting that smoothing mechanisms (like credit markets) might have reduced these losses. To better quantify the welfare consequences of the recent changes in inequality, the authors estimate stochastic processes for income, consumption, and leisure that are consistent with observed

cross-sectional variability and with one-year mobility patterns from the CE. They insert these estimates into a standard lifetime-utility framework to obtain estimates of the welfare losses. They find that, for commonly used specifications of the lifetime-utility function, the welfare losses for a substantial fraction of the U.S. population amount to between 2 and 3 percent of lifetime consumption.

Vissing-Jorgensen discusses the current state of the behavioral finance literature. She argues that more direct evidence on investors' actions and expectations would make existing theories more convincing to outsiders and would help sort among behavioral theories for a given asset pricing phenomenon. Furthermore, evidence on the dependence of a given bias on investor wealth/sophistication would be useful, first for determining whether the bias could be attributable to (fixed) information or transactions costs or is likely to require a behavioral explanation, and second for determining which biases are likely to be most important for asset prices. The author analyzes a novel dataset on investor expectations and actions obtained from UBS/Gallup. The data suggest that an investor's expectations about future market returns depends strongly on the investor's own investment experience, and expectational variables *do* affect portfolio choice. The dependence of beliefs on own experience remains strong for high-wealth investors, suggesting that information costs are not a likely explanation. She then reviews evidence on the dependence of a series of "irrational" investor behaviors on investor wealth and concludes that many such behaviors diminish substantially with wealth. As an example of how one may approach a calculation of the costs needed to explain a particular type of "irrational" behavior, she considers the size of the costs needed to explain why many households do not invest in the stock market.

Analyzing 50 years of inflation expectations data from several sources, **Mankiw**, **Reis**, and **Wolfers** document substantial disagreement among consumers and professional economists about expected future inflation. Moreover, this disagreement shows substantial variation through time, moving with inflation, the absolute value of the change in inflation, the output gap, and relative price variability. The authors argue that a satisfactory model of economic dynamics must speak to these important business cycle moments. Nothing that most macroeconomic models do not endogenously generate disagreement, they show that a simple "sticky-information" model broadly matches these facts. Moreover, the sticky information model is consistent with other observed departures of inflation expectations from full rationality, including autocorrelated forecast errors and insufficient sensitivity to recent macroeconomic news.

While by now two substantial literatures seek to characterize optimal monetary and fiscal policy respectively, the two have developed largely in isolation, and apparently on contradictory foundations. The modern literature on dynamically optimal fiscal policy often abstracts from monetary aspects of the economy, and thus implicitly allows for no useful role for monetary policy. The literature on optimal monetary policy instead has been concerned mainly with quite distinct objectives for monetary stabilization policy, namely the minimization of the distortions that result from prices or wages that do not adjust quickly enough to clear markets. At the same time, this literature typically ignores the fiscal consequences of alternative monetary policies; the characterizations of optimal monetary policy that are obtained thus are strictly correct only for a world in which lump-sum taxes are available. Here **Benigno** and **Woodford** model price stickiness by assuming staggered pricing of the kind introduced by Calvo (1983). Perhaps more importantly, they obtain analytical results rather than purely numerical ones, by proposing a linear-quadratic approach to the characterization of optimal monetary and fiscal policy that allows them to nest both conventional analyses of optimal monetary policy and analyses of optimal tax-smoothing as special cases of their more general framework. They show how a linear-quadratic policy problem can be derived which yields a correct linear approximation to the optimal policy rules from the point of view of the maximization of expected discounted utility in a dynamic stochastic general-equilibrium model, building on their work for the case of optimal monetary policy when lump-sum taxes are available. Finally, they do not content themselves with merely characterizing the optimal dynamic responses of their policy instruments (and other state variables) to shocks under an optimal policy, given one assumption or another about the nature and statistical properties of the exogenous disturbances to our model economy. Instead, they derive policy rules for the monetary and fiscal authorities. In particular, they seek to characterize optimal policy in terms of optimal targeting rules for monetary and fiscal policy. The rules are specified in terms of a target criterion for each authority; each authority commits itself to use its policy instrument in each period in whatever way is necessary in order to allow it to project an evolution of the economy consistent with its target criterion.

Fraga, **Goldfajn**, and **Minella** assess inflation targeting in emerging market economies (EMEs) and develop applied prescriptions for the conduct of monetary policy and inflation-targeting design in EMEs. They verify that EMEs have faced more acute trade-offs — higher output and inflation volatility — and worse performance than developed economies. These results stem from more pronounced external shocks, lower credibility, and lower levels of development of institutions in these countries. In order to improve their performance, the authors recommend high levels of transparency and communication with the public and the development of more stable institutions. At an operational level, the authors describe a procedure that a central bank under inflation targeting can apply and communicate when facing strong supply shocks, and present a monitoring structure for an inflation-targeting regime under an IMF program.

These papers will be published by the MIT Press as *NBER Macroeconomics Annual*, Volume 18. They will also be available at "Books in Progress" on the NBER website, *www.nber.org*.

Innovation Policy and the Economy

The NBER's fourth annual Conference on Innovation Policy and the Economy, organized by Research Associates Adam B. Jaffe of Brandeis University, Joshua Lerner of Harvard Business School, and Faculty Research Fellow Scott Stern of MIT, took place in Washington on April 15. The following papers were discussed:

Manuel Trajtenberg, NBER and Tel Aviv University, "Crafting Defense R and D Policy in the Anti-Terrorist Era"

Adam B. Jaffe; **Richard Newell**, Resources for the Future; and **Robert Stavins**, Harvard University, "Technology Policy for Energy and the Environment"

Kathryn Shaw, NBER and Carnegie Mellon University, "The Human Resources Revolution: Is it a Productivity Driver?"

Bronwyn H. Hall and **David C. Mowery**, NBER and University of California, Berkeley; **Stuart J.H. Graham**, University of California, Berkeley; and **Dietmar Harhoff**, Ludwig-Mazimilians-Universität München, "Prospects for Improving U.S. Patent Quality via Post-grant Opposition"

Jeremy Bulow, NBER and Stanford University, "The Gaming of Pharmaceutical Patents"

Trajtenberg seeks to analyze the nature of the terrorist threat following 9/11, and to explore the implications for defense R and D policy. First he reviews the defining trends of defense R and D since the cold war, and brings in pertinent empirical evidence: during the 1990s, the United States accumulated a defense R and D stock ten times larger than any other country's, and almost thirty times larger than Russia's. Big weapon systems, key during the cold war but of dubious significance since then, still figure prominently, commanding 30 percent of current defense R and D spending, vis-a-vis just about 13 percent for intelligence and antiterrorism. Trajtenberg then examines the nature of the terrorist threat, focusing on the role of uncertainty, the lack of deterrence, and the extent to which security against terrorism is (still) a public good. Drawing from a formal model of terrorism developed elsewhere, he explores these and related issues in detail. Two strategies to confront terrorism are considered: fighting terrorism at its source, and protecting individual targets, which entails a negative externality. Contrary to the traditional case of national defense, security against terrorism becomes a mixed private/public good. A key result of the model is that the government should spend enough on fighting terrorism at its source so as to nullify the incentives of private targets to invest in their own security. Intelligence emerges as the key aspect of the war against terrorism and, accordingly, R and D aimed at providing advanced technological means for intelligence is viewed as the cornerstone of defense R and D. This entails developing computerized sensory interfaces, and increasing the ability to analyze vast amounts of data. Both have direct civilian applications, and therefore the required R and D is mostly "dual use". Indeed, there is already a private market for these systems, with a large number of players. R and D programs designed to preserve this diversity and to encourage further competition may prove beneficial both for the required R and D, and for the economy at large.

Jaffe, **Newell**, and **Stavins** analyze the implications of the interaction of market failures associated with pollution and the environment with market failures associated with the development and the diffusion of new technology. These combined market failures imply a strong prima facie case for public policy intervention to foster environmentally beneficial technology. Both theory and empirical evidence suggest that the rate and direction of technological advance is influenced by incentives from the market and from regulation. Environmental policy based on incentive-based approaches is more likely to foster cost-effective technology innovation and diffusion than policy based on command and control approaches. In addition, society's investments in the development and diffusion of new environmentally beneficial technologies is very likely to be less than is socially desirable, in the presence of weak or nonexistent environmental policies that would otherwise foster such technology. Positive knowledge and adoption spillovers and information problems further weaken innovation incentives. While environmental technology policy is fraught with difficulties, a long-term view suggests a strategy of experimenting with different policy approaches, and systematically evaluating their success.

Shaw assesses the empirical evidence and policy issues associated with the human resources "revolution." While managers and practitioners have long emphasized the role of human resource practices, economists and policymakers only recently have begun to evaluate the impact of human resource policies on overall productivity growth. This paper suggests that advanced human resource practices (ranging from team-based problem-solving to incentive pay for training) have facilitated the strong productivity record experienced since the mid-1990s, both directly and as a complement to the intensive adoption of information technology. Two implications emerge from the analysis. First, the advantages to innovative human resource practices can only be realized when America's workforce possesses a strong human capital foundation. Second, although the private sector has invested intensively in advanced human resource practices, many of these investments have not been measured in a consistent way or expensed

correctly as an accounting matter. The lack of standards by which to measure workplace organization implies that society finds it difficult to identify and diffuse productive practices as quickly as possible.

The recent surge in U.S. patenting and expansion of patentable subject matter has increased patent office backlogs and raised concerns that in some cases patents of insufficient quality or with inadequate search of prior art are being issued. At the same time patent litigation and its costs are rising. **Hall**, **Graham**, **Harhoff**, and **Mowery** explore the potential of a post-grant review process modeled on the European opposition system to improve patent quality, reveal overlooked prior art, and reduce subsequent litigation. The authors argue that the welfare gains to such a system may be substantial.

Paragraph IV of the Hatch-Waxman Act provides a mechanism for the litigation of pharmaceutical patent infringement disputes. Many of these cases have been settled with "reverse payments" by the brand to the generic in return for delayed generic entry. The FTC has contested a number of these settlements with good but not complete success. **Bulow** argues for per se illegality of settlements that include side payments or deals which are beneficial to the generic. Further, he shows a number of additional strategies beyond side payments, some highly questionable from an antitrust perspective, that brands have used to keep out generics.

These papers will appear in an annual volume published by the MIT Press. Its availability will be announced in a future issue of the *Reporter*. They can also be found at "Books in Progress" on the NBER's website.

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Economics of Aging

The NBER's held another in a series of conferences on the economics of aging on May 2-4. Program Director David A. Wise of Harvard University organized this agenda:

James M. Poterba, NBER and MIT; **Joshua Rauh**, MIT; **Steven F. Venti**, NBER and Dartmouth College; and **David A. Wise**, "Utility Evaluation of Risk in Retirement Saving Accounts"
Discussant: Bob Willis, University of Michigan

James Choi, Harvard University; **David Laibson**, NBER and Harvard University; **Brigitte Madrian**, NBER and University of Chicago; and **Andrew Metrick**, NBER and University of Pennsylvania, "Optimal Defaults"
Discussant: Antonio Rangel, NBER and Stanford University

David M. Cutler, NBER and Harvard University, "Intensive Medical Technology and the Reduction in Disability"
Discussant: Alan M. Garber, NBER and Stanford University

Thomas E. MaCurdy, NBER and Stanford University, "Explanations for the Growth in Medicare Cost"
Discussant: Jonathan S. Skinner, NBER and Dartmouth College

Jonathan S. Skinner, **Elliot S. Fisher**, and **John W. Wennberg**, Dartmouth Medical School, "The Efficiency of Medicare?"
Discussant: Alan M. Garber

James P. Smith, RAND, "Consequences and Predictors of New Health Events"
Discussants: David M. Cutler

Anne C. Case, NBER and Princeton University, and **Angus S. Deaton**, NBER and Princeton University, "Broken Down by Work and Sex: How our Health Declines"
Discussant: Daniel L. McFadden, NBER and University of California, Berkeley

Robert T. Jensen, NBER and Harvard University, "Support for Widows in Underdeveloped Countries"
Discussant: Esther Duflo, NBER and MIT

Florian Heiss, University of Mannheim; **Michael D. Hurd**, RAND and NBER; and **Axel Börsch-Supan**, NBER and University of Mannheim, "How the Health-Wealth Nexus is Moderated by Family Closeness"
Discussant: Steven F. Venti

Arie Kapteyn and **Stan Panis**, RAND, "Individual Retirement Planning, Institutions, and Outcomes"
Discussant: Andrew Samwick, NBER and Dartmouth College

Axel Börsch-Supan, and **Lothar Essig**, University of Mannheim, "Household Saving in Germany — Results of the First SAVE Study"
Discussant: Andrew Samwick, NBER and Dartmouth College

Li Gan, NBER and University of Texas; **Michael D. Hurd**; and **Daniel McFadden**, "Individual Subjective Survival Curves"
Discussant: Bob Willis

Poterba, **Rauh**, **Venti**, and **Wise** develop a stochastic simulation algorithm to evaluate the effect of holding a broadly diversified portfolio of common stocks, or a portfolio of index bonds, on the distribution of 401(k) account balances at retirement. They compare the alternative distributions of retirement wealth by showing the empirical distribution of potential wealth values and by computing the expected utility of these outcomes under standard assumptions about the structure of household preferences. Their analysis highlights the critical role of other sources of wealth, such as Social Security, defined benefit pension annuities, and saving outside retirement plans, in determining the expected utility cost of holding equities in the retirement account. Their findings also demonstrate the importance of the equity premium in affecting investors' utility from different retirement asset allocations. Viewed from the beginning of a working career, and given the historical patterns of returns on stocks and bonds, a household that does not have extremely high risk aversion would achieve a higher expected utility by holding a portfolio of stocks rather than bonds.

Default options have an enormous impact on household "choices." Defaults matter, because opting out of a default is costly and these costs change over time, generating an option value of waiting. In addition, people have a tendency to procrastinate. **Choi**, **Laibson**, **Madrian**, and **Metrick** develop a theory of optimal defaults based on these considerations. They find that it is sometimes optimal to set extreme defaults, which are far away from the mean optimal savings rate. A default that is far away from a consumer's optimal savings rate may make that consumer better off, because such a "bad" default will lead procrastinating consumers to opt out of the default more quickly. The authors calculate optimal defaults for employees at four different companies. Their work suggests that optimal defaults are likely to be at one of three savings rates: the minimum savings rate (that is, 0 percent); the match threshold (typically 5 percent or 6 percent); or the maximum savings rate.

Substantial recent evidence shows a reduction in disability among the elderly in the United States, on the order of 25 percent in the past two decades.

The major issue raised by these findings is why disability has declined. **Cutler** investigates the role of intensive medical technologies in the decline in disability. Using data from the National Long-Term Care Survey, he documents that increased use of intensive procedures might be associated with some reduction in disability, but probably does not account for the majority of the decline.

MaCurdy reveals several valuable insights into the growth of Medicare expenditures in recent years. For example, 20–30 percent of total growth in Medicare program payments from 1989-99, arose from an increase in the participation rate; 50–60 percent from an increase in average program payments per service recipient; and the remainder from higher enrollment. In sharp contrast to the first half of the 1990s, total Medicare costs actually fell in the late 1990s. Whereas the lower percentiles of the expenditure distribution continued to increase throughout the period, expenditures actually fell for the highest-cost users of Medicare services. Published statistics extending beyond this sample period suggest that the reversal in the total growth of Medicare expenditures achieved in the late 1990s was only temporary; starting in 2000, the overall growth in Medicare expenditures reverted to its previous rate and may have even accelerated. Annual Medicare spending is also highly concentrated among a small segment of the beneficiary population, and shares of spending attributable to high-cost users have remained remarkably stable over the 1989-99 decade, even though growth rates have varied considerably during the period and across intensity of use. Those beneficiaries classified in the top 2 percent of the annual expenditure distribution alone account for about one quarter of total expenditures, and those in the top 5 percent cover almost half of annual expenditures. Considering spending by months only reinforces this picture of concentration. The top 2 percent of months with spending during a year account for around two-fifths of total annual expenditures, and the top 5 percent of months cover nearly two-thirds of yearly Medicare expenditures. While high-cost episodes account for a large proportion of total spending during any year, the majority of elderly experience such episodes at some point over a decade, implying far less concentration in expenditures when viewed over lifetimes. Three-fifths of beneficiaries experience at least one 95-percentile month in the decade, and two-fifths realize one or more 98-percentile months. Knowledge of the incidence of 95-percentile months alone explains nearly two-thirds of Medicare spending over the decade, and spending accumulated for those in the 98-percentile months comprises almost four-fifths of total decade expenditures.

Technological advances in health care have been shown to yield large health benefits for the U.S. elderly population. However, less is known about the marginal or incremental benefits of health care spending at a point in time. **Skinner**, **Fisher**, and **Wennberg** use Medicare claims data on 306 hospital referral regions in the United States to estimate how different dimensions of health care affect survival rates. They find that measures of effective care — factors that have been well established to be efficacious in treatment — are not associated with Medicare costs, but are associated with greater survival in the Medicare population after controlling for a variety of health status measures. By contrast, the authors find that a large component of Medicare expenditures — $26 billion in 1996 dollars, or nearly 20 percent of total Medicare expenditures — is associated with care for chronically ill patients and appears to provide no benefit in terms of survival, nor is it likely that this extra spending improves the quality of life. While secular trends in health care technology have delivered large health benefits, variation in health care intensity at a point in time have not.

Smith examines the consequences of new health events on a series of SES-related outcomes: out-of-pocket labor supply, labor force activity, household income, and wealth. For each of these outcomes, new severe health events have a significant effect, although most of the impact on income and wealth takes place through labor supply and not medical expenses. Smith also examines the ability of different measures of SES to predict the future onset of disease. He finds no predictive effect of income or wealth, but education does predict future onset, even after controlling for current health status.

Self-reported health status (SRHS) allows examination of how health status varies over the life course. The SRHS of both men and women deteriorates with age. In the bottom quartile of income, SRHS declines more rapidly with age, but only until retirement age. These and related facts motivate a study of the role of work, particularly manual work, in health decline with age. The Grossman capital-stock model of health implies that declines in health status are driven, not by the rate of deterioration of the health stock, but by the rate of increase of the rate of deterioration. **Case** and **Deaton** show instead that people in manual occupations have worse SRHS, and more rapidly declining SRHS, even with a comprehensive set of controls for income and education. They also find that much of the differences in SRHS across the income distribution is driven by health-related absence from the labor-force, which is a mechanism running from health to income, not the reverse.

Jensen explores two themes relating to the well-being of widows in India. First, measuring individual welfare via household income or expenditure per person implicitly assumes that each person in the household receives an equal share. However, if some individuals systematically receive less, which is typically the case for women in upper caste households, this will be a misleading measure of individual welfare. Jensen finds that while upper caste widows have significantly higher levels of household expenditure per capita, there is no difference in average Body Mass Index, a summary measure of individual nutritional status, between upper and lower caste widows; wealthier, upper caste widows are no better-off in terms of nutritional status than poorer but more equally treated lower caste widows. Second, Jensen analyzes well-being more broadly though measures of practices and customs relating to widows. He

finds that the status of widows is better in villages where women and the elderly are able to make larger economic contributions, in particular where less strength-intensive crops (such as rice) are grown. Following their husbands' deaths, widows in these areas are less likely to experience declines in treatment by the husband's family or others in the village, to lose control of land, or to feel unwelcome at social events.

Health, wealth, and where one lives are important, if not the three most important material living conditions. There are many mechanisms that suggest that living arrangements and well-being derived from health and economic status are closely related. **Heiss**, **Hurd**, and **Börsch-Supan** investigate the joint evolution of the three conditions, using a microeconometric approach similar to what is known as "vector autoregressions" in the macroeconomics literature.

Kapteyn and **Panis** analyze retirement saving and portfolio choice in the United States, Italy, and the Netherlands. While these countries enjoy roughly the same standard of living, they vary widely in their institutional organization of retirement income provisions. Building on extensions of the life cycle model, the authors derive hypotheses on the implications of institutional differences for wealth accumulation and portfolio composition: for example, the ratio of net worth and gross wealth should be highest in Italy; Dutch households should hold the lowest wealth levels at retirement; and the ownership of risky assets should be highest in the United States. The authors investigate these and other hypotheses at both the macro and micro level and find that the data are generally consistent with the hypotheses.

Germany is an interesting country for the study of saving among older households because nearly everyone — whether in the middle income bracket or richer — saves substantial amounts in old age. Only households in the lowest quarter of the income distribution spend more between the ages of 60 and 75 than they save. **Börsch-Supan** and **Essig** exploit newly collected data, the first wave of the so-called SAVE panel, specifically collected to understand economic, psychological, and sociological determinants of saving. Overall, they find extraordinarily stable savings patterns. More than 40 percent of German households regularly save a fixed amount. About 25 percent of German households plan their savings and have a clearly defined savings target in mind. Most German household saving is in the form of contractual saving, such as saving plans, whole life insurance, and building society contracts. This makes the flow of saving rather unresponsive to economic fluctuations, such as income shocks. Most households prefer to cut consumption if ends do not meet. In particular, the elderly do not like to use credit cards, and they eschew debt. The authors suspect large cohorts differences and will study them once further waves of the SAVE panel become available.

Testing life-cycle models and other economic models of saving and consumption at the micro level requires knowledge of individuals' subjective beliefs of their mortality risk. Previous studies have shown that individual responses regarding subjective survival probabilities are generally consistent with life tables. However, survey responses suffer serious problems caused by focal responses of zero and one. **Gan**, **Hurd**, and **McFadden** suggest using a Bayesian update model that accounts for the problems encountered in focal responses. They also propose models that help us to identify how much each individual deviates from the life table in her subjective belief. The resulting individual subjective survival curves have considerable variations, can better predict observed survival experience than life tables, and are readily applicable in testing economic models that require individual subjective life expectancies.

The proceedings of this conference will be published as an NBER conference volume by the University of Chicago Press. Some of the papers may also be found at "Books in Progress" on the NBER's website.

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Corporate Governance

An NBER-Universities Research Conference on "Corporate Governance" took place in Cambridge on May 9 and 10. The organizers were Bengt Holmström, NBER and MIT, and Steven N. Kaplan, NBER and University of Chicago. These papers were discussed:

Simi Kedia, Harvard University, "Do Executive Stock Options Generate Incentives for Earnings Management? Evidence from Accounting Restatements"
Narayanan Subramanian, **Atreya Chakraborty**, and **Shahbaz Ali Sheikh**, Brandeis University, "Performance Incentives, Performance Pressure, and Executive Turnover"
Discussant: Jeremy Stein, NBER and Harvard University

Chris McNeil, Pennsylvania State University, and **Greg Niehaus** and **Eric Powers**, University of South Carolina, "Management Turnover in Subsidiaries of Conglomerates Versus Stand Alone Firms"
Francisco Peréz-González, Columbia University, "Inherited Control and Firm Performance"
Discussant: Marianne Bertrand, NBER and University of Chicago

Renee B. Adams, Federal Reserve Bank of New York, and **Daniel Ferreira**, Getulio Vargas Foundation, "A Theory of Friendly Boards"
Harley E. Ryan, **Jr.**, Louisiana State University, and **Roy A. Wiggins**, **III**, Bentley College, "Who Is In Whose Pocket? Director Compensation, Board Independence, and Barriers to Effective Monitoring"
Discussant: George Baker, NBER and Harvard University

Rajesh K. Aggarwal, Dartmouth College, and **Andrew A. Samwick**, NBER and Dartmouth College, "Empire-Builders and Shirkers: Investment, Firm Performance, and Managerial Incentives"
Bernie Black, Stanford University; **Hasung Jang**, Korea University; and **Woochan Kim**, KDI School of Public Policy and Management, "Does Corporate Governance Affect Firm Value? Evidence from Korea"
Discussant: Michael Weisbach, NBER and University of Illinois

R. Gaston Gelos, International Monetary Fund, and **Shang-Jin Wei**, NBER and Harvard University, "Transparency and International Investor Behavior" (NBER Working Paper No. 9260)
Mariassunta Giannetti and **Andrei Simonov**, Stockholm School of Economics, "Which Investors Fear Expropriation? Evidence from Investors' Stock Picking"
Mihir A. Desai, NBER and Harvard University; **Alexander Dyck**, Harvard University; and **Luigi Zingales**, NBER and University of Chicago, "The Protecting Hand: Taxation and Corporate Governance"
Discussant: Rene Stulz, NBER and Ohio State University

Kedia examines the option grants and option exercises of top executives of 224 firms that announce restatements of their financial results because of accounting irregularities between January 1997 and June 2002. He finds that firms that announce large negative restatements grant about 50 percent more stock options to their top executives in the years prior to the announcement than members of a size-and-industry-matched control group. Top executives of firms with large negative and large positive restatements also exercise significantly more options in the years prior to the announcement than members of a size-and-industry-matched control group. Higher option exercises appear to be concentrated among firms that are subsequently subject to SEC enforcement actions, while higher option grants are not concentrated in this group of extreme violators. Further, Kedia finds that the percentage of restating firms in the highest quintile, by option grants, is double that in the lowest quintile; this difference is significant at the 1 percent level.

Subramanian, **Chakraborty**, and **Sheikh** examine the relationship between the optimal incentive contract and the firm's decision to fire a manager for poor performance. They find that CEOs with steeper compensation contracts (that is, with greater incentives) are more likely to be fired following poor firm performance. Logit estimations indicate that, among poorly performing firms, a CEO receiving incentives at the 60th percentile level is roughly 10 percent more likely to be fired than a CEO with incentives at the 40th percentile. Also, the performance pressure was greater in the latter half (1997-9) of the sample than in the first (1993-6). Increased firing pressure might have been one of the factors contributing to the accounting shenanigans of the late 1990s.

McNeil, **Niehaus**, and **Powers** compare turnover of subsidiary managers inside conglomerate firms to turnover of CEOs of comparable stand-alone firms. The authors find that subsidiary manager turnover is significantly more sensitive to changes in performance and significantly more likely following poor performance than turnover of CEOs is. Further, for subsidiary managers, the relationship between turnover and performance is significantly stronger when the subsidiary operates in an industry that is related to the parent's primary industry. These results suggest that boards of directors are relatively ineffective disciplinarians of CEOs, and that, despite their other apparent failings, conglomerate firms have relatively strict disciplining mechanisms for subsidiary managers.

Peréz-González examines the impact of inherited control on firms' performance. He uses data from management successions where the depart-

ing CEO was a member of the controlling family of the corporation. He finds that firms where control is inherited undergo large declines in return on assets and market-to-book ratios that are not experienced by firms that promote CEOs not related to the controlling family. Consistent with wasteful nepotism, these declines are particularly prominent in firms that appoint family CEOs who did not attend a selective college. Overall, the results strongly suggest that nepotism hurts firms' performance by limiting the scope of labor market competition.

Adams and **Ferreira** analyze the consequences of the board's dual role as an advisor and a monitor of management. Because of this dual role, the manager faces a trade-off concerning the amount of information he discloses to the board. On the one hand, if he reveals his information, he gets better advice. On the other hand, the board may change its opinion of his ability on the basis of his information. The authors' model shows that the board may choose to pre-commit to reduce its monitoring of the manager in order to encourage the manager to share his information. Therefore, management-friendly boards may be optimal governance structures under certain circumstances. The authors discuss some evidence consistent with the new empirical implications of their theory. Using the insights from the model, they also analyze the differences between a sole board system, such as in the United States, and the dual board system, as in various countries in Europe.

Ryan and **Wiggins** examine the relationship between the structure of outside-director compensation and board-of-director independence. They consider the relationship between the structure of director compensation and board size, the percentage of outside directors on the board, CEO tenure, and CEO/Chair duality. The evidence indicates a positive relationship between characteristics associated with an independent board and director compensation that is tied to stock-price performance. If barriers to monitoring are prevalent in a firm, then director compensation provides weaker incentives. Directors of firms in which the CEO is entrenched receive the fewest financial incentives to monitor.

Aggarwal and **Samwick** consider the equilibrium relationships between incentives from compensation, investment, and firm performance. Using an optimal contracting model, the authors show that the relationship between firm performance and managerial incentives, in isolation, is insufficient to identify whether managers have private benefits of investment, as in theories of managerial entrenchment. The authors then estimate the joint relationships between incentives and firm performance *and* between incentives and investment and show that investment increases with incentives. Further, they find that firm performance increases with incentives at all levels. Taken together, these results are not consistent with theories of overinvestment based on managers having private benefits from investment but are consistent with managers having private costs of investment and, more generally, with models of underinvestment.

Black, **Jang**, and **Kim** report that corporate governance is an important factor in explaining the market value of Korean public companies. The authors construct a corporate governance index for 526 companies based primarily on responses to a Spring 2001 survey of all listed companies by the Korea Stock Exchange. The index is based on five subindexes for shareholder rights, board and committee structure, board and committee procedures, disclosure to investors, and ownership parity. In their ordinary least squares (OLS) regressions, a moderate 10 point increase in the corporate governance index predicts a 6 percent increase in Tobin's q and a 14 percent increase in market/book ratio. A worst-to-best change in the index predicts a 42 percent increase in Tobin's q and an 87 percent increase in market/book ratio. This effect is statistically strong and robust to choice of performance variable (Tobin's q, market/book, and market/sales) and to specification of the corporate governance index. Each subindex is a significant predictor of higher Tobin's q (and other performance variables). This value effect appears to exist primarily because investors value the same reported earnings more highly for a better-governed firm, rather than because better-governed firms generate higher reported earnings or pay higher dividends. Unique features of Korea's corporate governance rules allow the authors to partially address two alternative explanations for these results: signaling (firms signal high quality by adopting good governance rules) and endogeneity (firms with high Tobin's q choose good governance rules). The authors use both a two-stage (2SLS) and a three-stage (3SLS) least squares approach; the coefficients are larger than estimated earlier and are highly significant. This is consistent with causation running from the exogenous component of corporate governance rules to higher Tobin's q (and other performance variables).

Does country transparency affect international portfolio investment? **Gelos** and **Wei** examine this and related questions using new measures of transparency and a unique micro dataset on international portfolio holdings of emerging market funds. They distinguish between government and corporate transparency. There is clear evidence that funds invest systematically less in less transparent countries. Herding among funds tends to be more prevalent in less transparent markets. Funds seem to react less strongly to macroeconomic news about opaque countries. There is also some evidence that during crises, funds flee non-transparent countries to a greater extent.

Using a dataset that provides unprecedented details on individual investors' stockholdings, **Giannetti** and **Simonov** analyze whether investors take into account corporate governance when they select stocks. After controlling for the supply effect via free float and other firm characteristics, the authors find that all categories of investors who generally enjoy only security benefits (domestic and foreign; institutional and small individual investors) are reluctant to invest in companies with bad corporate governance. In contrast, individuals who have strong connections with the local financial community because they are board members or hold large blocks of at least some listed companies behave differently. They do not care about the

expected extraction of private benefits or even prefer to invest in firms where there is more room for it. The effect of corporate governance on portfolio decisions is more pronounced for small and medium-size companies. These findings shed new light on the determinants of investor behavior, and suggest that in order to understand portfolio choices it is important to distinguish between investors who enjoy private benefits or access private information and investors who enjoy only security benefits.

Desai, **Dyck**, and **Zingales** analyze the previously unexplored relationship between corporate governance and corporate taxation. They show that a higher tax rate increases the level of managerial diversion, while stronger tax enforcement reduces it. They also show that when the corporate governance system is ineffective (that is, when it is easy to divert income), or when ownership concentration levels are high, an increase in the tax rate actually can reduce tax revenues, generating a corporate version of the Laffer curve. Finally, the authors show that an increase in tax enforcement can increase (rather than decrease) the stock market value of a company. They find that corporate tax rate changes have smaller (in fact, negative) effects on revenues when ownership is more concentrated and corporate governance is worse. This corporate governance role of corporate taxes provides a new rationale for the existence of a low, well-enforced tax at the corporate level.

International Seminar on Macroeconomics

The NBER's 26th Annual International Seminar on Macroeconomics (ISOM), organized by Zvi Eckstein, Boston University, and Kenneth West, NBER and University of Madison, Wisconsin, was held on June 13-14 at the Universitat Pompeu Fabra in Barcelona. Jeffrey A. Frankel, NBER and Harvard University, and Francesco Giavazzi, NBER and Bocconi University, serve as co-chairs of ISOM. The following papers were discussed at the conference:

Richard Blundell and **Ian Preston**, University College London, and **Luigi Pistaferri**, Stanford University, "Consumption Inequality and Partial Insurance"
Discussants: John Kennan, NBER and University of Wisconsin, and Jose-Victor Rios-Rull, NBER and University of Pennsylvania

Andreas Hornstein, Federal Reserve Bank of Richmond; **Per Krusell**, University of Rochester; and **Giovanni L. Violante**, New York University, "Upgrading Vintage Capital"
Discussants: Philippe Aghion, NBER and Harvard University, and Lars Ljungqvist, Stockholm School of Economics

Danny Quah, London School of Economics, and **Helen Simpson**, Institute for Fiscal Studies, "Spatial Cluster Empirics"
Discussants: Albert Marcet, Universitat Pompeu Fabra

Adi Brender, Bank of Israel, and **Allan Drazen**, NBER and Tel Aviv University, "Where Does the Political Fiscal Cycle Really Come From?"
Discussants: Alessandra Casella, NBER and Columbia University, and Kenneth S. Rogoff, International Monetary Fund

Kosuke Aoki, Universitat Pompeu Fabra, and **Kalin Nikolov**, Bank of England, "Rule-Based Monetary Policy under Central Bank Learning"
Discussants: Fabio Canova, Universitat Pompeu Fabra, and V.V. Chari, NBER and University of Minnesota

James H. Stock, NBER and Harvard University, and **Mark W. Watson**, NBER and Princeton University, "Understanding Changes in International Business Cycle Dynamics"
Discussants: Denise Osborn, University of Manchester, and Lucrezia Reichlin, Université Libre de Bruxelles

Neville Francis, Lehigh University, and **Valerie A. Ramey**, NBER and University of California, San Diego, "The Source of Historical Economic Fluctuations: An Analysis using Long-Run Restrictions"
Discussants: Susanto Basu, NBER and University of Michigan, and Harald Uhlig, Humboldt University

Andrew B. Abel, NBER and University of Pennsylvania, and **Janice C. Eberly**, NBER and Northwestern University, "Investment and Firm Valuation with Growth Options"
Discussants: John V. Leahy, NBER and New York University, and Plutarchos Sakellaris, University of Maryland

Blundell, **Pistaferri**, and **Preston** use panel data on household consumption and income inequality to evaluate the degree of insurance against income shocks. They aim to describe the transmission of income inequality into consumption inequality. Their framework nests the special cases of self-insurance and the complete markets assumption. The authors assess the degree of insurance, over and above self-insurance through savings, by contrasting shifts in the distribution of income growth with shifts in the distribution of consumption growth, and analyzing the way these two measures of household welfare correlate over time. Combining panel data on

income with consumption data, they find some partial insurance but reject the complete markets restriction. They also find a greater degree of insurance for transitory shocks and differences in the degree of insurance over time. Finally, they document the importance of durables and of taxes and transfers as a means of insurance.

Hornstein, **Krusell**, and **Violante** argue that certain ingredients are likely to be important for understanding how wage distributions and employment respond to technology. First, it matters whether there are labor market frictions. Matching frictions, and associated departures from marginal-product wage determination, are important. Second, the form of technological change matters. Capital embodiment is a key characteristic of technological change. Third, how new capital is introduced into the economy — what firms acquire it, and who decides on the purchase – is important. Fourth, labor market institutions are highly relevant for both wage distribution and unemployment, especially in analyzing the effects of technological change. Thus this paper analyzes a matching model with vintage capital and capital-embodied technological change. The authors consider the importance of where and how new capital enters, and contribute to the literature on "Europe-United States comparisons" by emphasizing how the institutional setting can matter for the effects of technology in general and for technological revolutions, such as the new "IT era," in particular.

A useful model of economic geography should determine not just how much economic activity occurs at a given location but also where that location is relative to others. In empirical studies, those latter features appear nowhere in measures of concentration or in cross-section and panel data regression. Indeed, they are absent in many analytical models of economic geography. **Quah** and **Simpson** provide a new econometric method for studying clustering that explicitly takes into account such spatial relations, motivating the analysis with a theoretical model of dynamically evolving spatial distribution. They then apply their techniques to geographically disaggregated data on the U.K. manufacturing sector.

Whereas a political fiscal cycle once was though to be a phenomenon of less developed economies, some recent studies find such a cycle in a large cross section of both developed and developing countries. **Brender** and **Drazen** re-examine these empirical results and show that they are not robust to the choice of countries and time periods. The authors show that the finding of a political fiscal cycle is driven by the experience of "new democracies," in which fiscal manipulation may "work" because of lack of experience with electoral politics or lack of information that voters in more established democracies use. The strong fiscal cycle in those countries accounts for the finding of a fiscal cycle in larger samples that include these countries. Once these countries are removed from the larger sample, the political fiscal cycle disappears. These findings also reconcile two contradictory views of pre-electoral manipulation, one arguing it is a useful instrument to gain voter support and a widespread empirical phenomenon, the other arguing that voters punish rather than reward fiscal manipulation.

Aoki and **Nikolov** evaluate the performance of three kinds of rule-based monetary policies under central bank-learning about the parameter values of a simple New Keynesian model. The central bank and the private sector learn the slopes of the IS and the Phillips curves by recursive least squares estimation, and form expectations and set policy based on their estimated model. The three policies the authors evaluate are: 1) the optimal non-inertial rule; 2) the optimal history-dependent rule; and 3) the Wicksellian rule. They show that the optimal Wicksellian rule delivers the highest welfare, by improving the inflation-output gap variability trade-off, without introducing undesirable feedback from past policy mistakes that are caused by imprecise parameter estimates.

Stock and **Watson** find first that, although there has not been a general increase in international synchronization among G-7 business cycles, there have been important changes, in particular the emergence of two groups — one consisting of Euro-zone countries and the other of English-speaking countries — within which correlations have increased and across which correlations have decreased. Further, cyclical movements in the United Kingdom became less correlated with Euro-zone countries and more correlated with North American countries in the period they study. Second, common international shocks have been smaller in the 1980s and 1990s than they were in the 1960s and 1970s. This declining volatility of common G-7 shocks is the source of much of the observed moderation in individual country business cycles. Moreover, this moderation of common G-7 shocks is responsible, in a mechanical sense, for the failure of business cycles to become more synchronous as one might expect given the large increase in trade over this period: had world shocks been as large in the 1980s and 1990s as they were in the 1960s and 1970s, then international cyclical correlations would have increased considerably. Third, the Japanese experience in many ways is exceptional. For the other G-7 countries, volatility generally decreased or at least stayed constant in the 1990s, but it increased in Japan in the 1990s. During the 1980s and 1990s, cyclical fluctuations in Japanese GDP almost became detached from the other G-7 economies, with domestic shocks explaining almost all of the cyclical movements in Japanese GDP. Fourth, however measured, persistence of disturbances has increased in Canada, France, and the United Kingdom. In those countries, a shock of a given magnitude would result in more cyclical volatility today than 30 years ago.

Francis and **Ramey** investigate the source of historical fluctuations in annual U.S. and U.K. data extending back to the nineteenth century. They use long-run identifying restrictions to decompose shocks into technology shocks and other shocks. For the U.S. data, a variety of models with differing auxiliary assumptions are investigated. In the United States, the impact of technology shocks on labor input in the pre-WWII period is the opposite of its impact in the post-WWII period

in most models. The U.K. data shows more sample stability, with the short-run impact of technology on labor being negative. The decomposition also reveals important changes in the volatility of shocks over time.

The presence of growth options in the value of the firm generates variability in firm value that is not driven by current cash flows. This variability diminishes the correlation between investment and Tobin's *Q*, while maintaining a positive correlation between investment and cash flow. By simulating the model, **Abel** and **Eberly** show that there is also a high frequency negative relation between investment and cash flow shocks that can reverse these effects. However, time aggregation restores the weak relationship between investment and *Q*, and a strong positive association between investment and cash flow, consistent with that found in empirical studies. Growth options also generate excess volatility of firm value relative to cash flows.

These papers will be published in a special issue of the *European Economic Review*. Many of them are also available at "Books in Progress" on the NBER's website.

Bureau News

President Bush Taps NBER Economists for CEA

President Bush has nominated two more NBER researchers to become members of his Council of Economic Advisers. Harvey S. Rosen and Kristin Forbes will be joining N. Gregory Mankiw, a Harvard economics professor and NBER Research Associate, who is CEA Chairman.

Rosen, an NBER Research Associate and professor of economics at Princeton University, was nominated in April. He holds a Ph. D. from Harvard University and served as deputy assistant secretary for tax analysis in the administration of George H. W. Bush.

Forbes, an NBER Faculty Research Fellow and professor at MIT's Sloan School of Management, was nominated in May. She has also served as deputy assistant secretary of the Treasury Department in the current Bush Administration.

NBER Research Associate Andrew A. Samwick, a member of the economics faculty at Dartmouth College, is the CEA's Chief Economist.

Levitt Receives John Bates Clark Medal

NBER Research Associate Steven D. Levitt, a professor of economics at the University of Chicago, received the American Economics Association's John Bates Clark Medal this year. The award is given every two years to the economist under the age of 40 who has made the most substantial contribution to the field of economics.

Levitt is a member of the NBER's Programs on Public Economics, Law and Economics, Children, and Education. He received the medal for his work on crime and corruption, including studies of teacher cheating at Chicago schools, corruption in Japanese sumo wrestling circles, and the economics of gang life. Levitt received his B.A. from Harvard University in 1989 and his Ph.D. from MIT in 1994.

Previous Clark medalists among NBER Research Associates were: Zvi Griliches, Daniel L. McFadden, Martin S. Feldstein, Joseph E. Stiglitz, James J. Heckman, Jerry A. Hausman, Sanford J. Grossman, Paul R. Krugman, Lawrence H. Summers, David Card, Kevin M. Murphy, and Andrei Shleifer.

NBER Researchers Lead American Economics Association

Three NBER Research Associates are the President, President-Elect, and nominee for President-Elect, respectively, of the American Economics Association (AEA). Peter A. Diamond, an MIT economics professor and member of the NBER's Programs on Monetary Economics and on Economic Fluctuations and Growth, is the current AEA President. NBER President Martin Feldstein, a professor of economics at Harvard University and a member of the NBER's Programs on Aging, Health Care, Public Economics, and Economic Fluctuations and Growth, is President-Elect. He is slated to become the AEA's President in January, succeeding Diamond.

The AEA's Executive Committee also has chosen Daniel L. McFadden as the nominee for President-Elect, to succeed Feldstein. McFadden is a professor of economics at the University of California, Berkeley, and a member of the NBER's Program on Aging.

NBER Announces 2003-4 Nonprofit Fellowships

NBER Research Associate James M. Poterba has announced the recipients of NBER Fellowships for the Study of Nonprofit Institutions for the 2003-4 academic year. This NBER fellowship program is designed to encourage research on nonprofit institutions by NBER Research Associates and Faculty Research Fellows, and to support dissertation research on the same subject by graduate students in economics who work closely with them.

The four graduate students who will receive fellowship support are: Martha Bailey, Vanderbilt University, whose topic is "Nonprofit Organizations Providing Family Planning Services"; Guy David, University of Chicago, who is studying the "Performance of Not-for-profit versus For-Profit Hospitals"; Dan Hungerman, Duke University, for "Behavior of Organized Religious Organizations"; and Peter Katuscak, University of Michigan, for "Managerial Pay in Nonprofit Organizations."

Faculty grants were made to: Joshua Angrist, MIT, and Kevin Lang, Boston University, who will study "A Nonprofit Charter School: Media and Technology Charter School, Boston"; Esther Duflo, MIT, who will focus on "The Effectiveness of Nonprofit Organizations in Developing Countries"; Charles Phelps, University of Rochester, whose research is on "Governance in Not-for-Profit Hospitals and Universities"; David Reiley, University of Arizona, who will analyze "Fundraising Mechanisms Used by Charitable Organizations"; and Michael Rothschild, Princeton University, who will ask "How Does California Produce First-Rate Research Universities?"

Thomas D. Flynn, Director Emeritus, Dead at 90

Thomas D. Flynn, who became a Director of the NBER in 1967 representing the American Institute of Certified Public Accountants as its president, died on April 12 at age 90. He has been a Director Emeritus of the NBER since 1968.

Flynn was a 1935 graduate of Princeton University with a degree in economics. He received his M.B.A. in accounting from the Columbia Graduate School of Business in 1938. After a short stint on the staff of the Federal Trade Commission, Flynn joined the accounting firm Arthur Young & Company in 1940. He rose to senior partner before being named vice chairman of the firm's management committee. When he retired in 1975, Governor Hugh L. Carey of New York named him to head the Municipal Assistance Corporation, an agency set up to help manage New York City's troubled finances. He remained a member of that Board until 1979.

Flynn was also a trustee emeritus of Columbia University. He leaves his wife of 62 years, Harriett Howland Flynn, two daughters, one son, and six grandchildren.

2002 Japan Conference: A Summary of the Papers

The NBER recently published a booklet summarizing the papers and discussions presented at a September 2002 conference in Tokyo. This conference, which has been held annually for the past several years, presents some of the best English language papers on the Japanese economy. This year, there was also a panel discussion on monetary policy in Japan, and a luncheon address by Haruhiko Kuroda, at the time the Vice Minister of the Japanese Ministry of Finance.

The full versions of these papers are available as NBER Working Papers and can be found at:
http://www.nber.org/papers/
An electronic version of this booklet is also available at:
http://www.nber.org/2002japanconf/

Labor Studies

The NBER's Program on Labor Studies met in Cambridge on April 4. Program Director Richard B. Freeman, and Lawrence F. Katz, NBER and Harvard University, organized the meeting. These papers were discussed:

Henry S. Farber, NBER and Princeton University, "The Labor Supply of New York City Cab Drivers"

Muriel Niederle, NBER and Stanford University, and **Alvin E. Roth**, NBER and Harvard University, "Market Culture: How Norms Governing Exploding Offers Affect Market Performance"

Juan Botero, Yale University; **Simeon Djankov**, World Bank; **Rafael LaPorta** and **Andrei Shleifer**, NBER and Harvard University; and **Florencio Lopez-de-Silanes**, NBER and Yale University, "The Regulation of Labor"

Marianne Bitler, RAND; **Jonah B. Gelbach**, University of Maryland; and **Hilary Hoynes**, NBER and University of California, Davis, "What Mean Impacts Miss: Distributional Effects of Welfare Reform Experiments"

Paul Gertler, NBER and University of California, Berkeley; **Manisha Shah**, University of California, Berkeley; and **Stefano Bertozzi**, INSP, Mexico, "Risky Business: the Market for Unprotected Commercial Sex"

Paul Glewwe, University of Minnesota; **Nauman Ilias**, Competition Economics, Inc; and **Michael Kremer**, NBER and Harvard University, " Teacher Incentives"

Farber models the labor supply of taxi drivers, suggesting that because income effects in response to temporary fluctuations in daily earnings opportunities are likely to be small, cumulative hours will be much more important than cumulative income in the decision to stop work on a given day. However, if income effects are large because of very high discount and interest rates, then labor supply functions could bend backward and, in the extreme case where the wage elasticity of daily labor supply is minus one, drivers could be target earners. Indeed, earlier studies by other researchers find that the daily wage elasticity of labor supply of New York City cab drivers is substantially negative; they conclude that cab drivers probably are target earners. However, based on new data, Farber concludes that — when accounting for earnings opportunities in a reduced form with measures of clock hours, day of the week, weather, and geographic location — cumulative hours worked on the shift is a primary determinant of the likelihood of stopping work while cumulative income earned on the shift is related weakly, at best, to the likelihood of stopping work. This is consistent with the existence of inter-temporal substitution and is inconsistent with the hypothesis that taxi drivers are target earners.

Many markets have organizations that influence or try to establish norms concerning when offers can be made, accepted, and rejected. An examination of a dozen previously studied markets suggests that markets in which transactions are made far in advance are those in which it is acceptable for firms to make exploding offers, and where it is unacceptable for workers to renege on commitments they make, however early. Still, markets differ in many ways other than norms concerning offers. Laboratory experiments allow **Niederle** and **Roth** to isolate the effects of exploding offers and binding acceptances. In a simple environment, where uncertainty about applicants' quality is only resolved over time, the authors find inefficient early contracting when firms can make exploding offers and applicants' acceptances are binding. Relaxing either of these two conditions causes matching to take place later, when more information about applicants' qualities is available, and consequently results in higher efficiency and fewer blocking pairs. This suggests that elements of market culture may play an important role in influencing market performance.

Botero, **Djankov**, **LaPorta**, **Lopez-de-Silanes**, and **Shleifer** investigate the regulation of labor markets through employment laws, collective bargaining laws, and social security laws in 85 countries. They find that richer countries regulate labor less than poorer countries do, although the former have more generous social security systems. The authors' measures of the political power of the left are associated with more stringent labor regulations and more generous social security systems, although the former result is not robust. Finally, countries with socialist and French legal origin have sharply higher levels of labor regulation than do common law countries. These results are difficult to reconcile with straightforward versions of efficiency and with political power theories of institutional choice, but are broadly consistent with legal theories, according to which countries have pervasive regulatory styles inherited from the transplantation of legal systems.

Bitler, **Gelbach**, and **Hoynes** use experimental data to estimate quantile treatment effects (QTEs) of Connecticut's Jobs First reform. They find considerable evidence of systematic heterogeneity, which is generally consistent with theoretical predictions. Moreover, they find that mean impacts computed for subgroups would not have uncovered a number of important findings. For example, earnings at the very top of the distribution fall, as theory predicts should happen when

more generous policies encourage women to stay on or re-enter welfare. Also, Jobs First has essentially no impact on earnings at the bottom of the earnings distribution: income at the bottom deciles is constant before time limits hit (contrary to large positive mean impacts for a disadvantaged subgroup) and falls after time limits begin to take effect (again contrary to a zero effect using means). These findings suggest cause for concern about the ability of programs like Jobs First to end welfare dependence of significant numbers of women.

Each day close to 20,000 people become infected with the HIV virus worldwide; a large portion of them are infected through unprotected sex with commercial sex workers. While condoms are an effective defense against the transmission of HIV and other sexually transmitted infections, large numbers of sex workers are not using them with their clients. **Gertler**, **Shah**, and **Bertozzi** argue that sex workers are willing to take the risk because clients are willing to pay more to avoid using condoms. Using a panel data set from Mexico, the authors estimate that commercial sex workers received a 23 percent premium for unprotected sex from clients who requested not to use a condom. However, this premium jumped to 46 percent if the sex worker was considered very attractive. These results suggest that the current supply-side policies aimed at educating sex workers about risk and empowering them is not sufficient to significantly increase condom use. Rather, complementary interventions aimed at reducing the demand for not using condoms are needed.

Advocates of teacher incentive programs argue that they can strengthen weak incentives, while opponents argue that they lead to "teaching to the test." **Glewwe**, **Ilias**, and **Kremer** find that existing teacher incentives in Kenya are indeed weak, with teachers absent 20 percent of the time. The authors then report on a randomized evaluation of a program that provided primary school teachers in rural Kenya with incentives based on students' test scores and dropout rates. Students in program schools had higher test scores, significantly so on at least some exams, during the time the program was in place. An examination of the channels through which this effect took place, however, provides little evidence of more teacher effort aimed at increasing long-run learning. Teacher attendance did not improve, homework assignments did not increase, dropout rates did not fall, and pedagogy did not change. However, there is evidence that teachers increased effort at manipulating short-run test scores. Conditional on being enrolled, students in treatment schools were more likely to take tests. Teachers in treatment schools scored higher than their counterparts in comparison schools during the life of the program; they did not retain these gains after the end of the program, consistent with a model in which teachers focused on manipulating short-run scores.

Monetary Economics

The NBER's Program on Monetary Economics met in Cambridge on April 11. Susanto Basu, NBER and University of Michigan, and Michael Woodford, NBER and Princeton University, organized this program:

Paul Beaudry, NBER and University of British Columbia, and **Franck Portier**, University of Toulouse, "Stock Prices, News, and Economic Fluctuations"
Discussant: Julio J. Rotemberg, NBER and Harvard University

Christina D. Romer and **David H. Romer**, NBER and University of California, Berkeley, "A New Measure of Monetary Shocks: Derivation and Implications"
Discussant: Jeffrey Fuhrer, Federal Reserve Bank of Boston

Andreas Beyer, European Central Bank, and **Roger E. A. Farmer**, University of California, Los Angeles, "Identifying the Monetary Transmission Mechanism using Structural Breaks"
Discussant: Mark W. Watson, NBER and Princeton University

Thomas J. Sargent, NBER and New York University, and **Noah Williams**, NBER and Princeton University, "Impacts of Priors on Convergence and Escapes from Nash Inflation"
Discussant: Tao Zha, Federal Reserve Bank of Atlanta

Sylvain Leduc, **Keith Sill**, and **Tom Stark**, Federal Reserve Bank of Philadelphia, "Self-Fulfilling Expectations and the Inflation of the 1970s: Evidence from the Livingston Survey"
Discussant: Athanasios Orphanides, Federal Reserve Board

Michelle Alexopoulos, University of Toronto, "A Monetary Business Cycle Model with Unemployment"
Discussant: Garey Ramey, University of California, San Diego

A common view in macroeconomics is that business cycles can be decomposed meaningfully into fluctuations driven by demand shocks — shocks that have no short- or long-run effects on productivity — and fluctuations driven by unexpected changes in technology. **Beaudry** and **Portier** propose a means of evaluating this view and show that it is strongly at odds with the data. They show instead that the data favor a view of business cycles driven primarily by a shock that does not affect productivity in the long run. The structural interpretation they suggest for this shock is that it represents news about future technological opportunities. They show that this shock

explains about 50 percent of business cycle fluctuations and therefore deserves to be acknowledged and further understood by macroeconomists.

Conventional measures of monetary policy, such as the federal funds rate, are surely influenced by forces other than monetary policy. More importantly, central banks adjust policy in response to a wide range of information about future economic developments. As a result, estimates of the effects of monetary policy derived using conventional measures tend to be biased. To address this problem, **Romer** and **Romer** develop a measure of monetary policy shocks in the United States from 1969 to 1996 that is relatively free of endogenous and anticipatory movements. To address the problem of forward-looking behavior, the authors control for the Federal Reserve's forecasts of output and inflation prepared for scheduled FOMC meetings. They remove from their measure policy actions that are a systematic response to the Federal Reserve's anticipations of future developments. To address the problem of endogeneity, and to ensure that the forecasts capture the main information the Federal Reserve had at the times decisions were made, they consider only changes in the intended federal funds rate around scheduled FOMC meetings. The series for intended changes spans periods when the Federal Reserve was not exclusively targeting the funds rate. It is derived using information on the expected funds rate from the records of the Open Market Manager and information on intentions from the narrative records of FOMC meetings. Estimates of the effects of monetary policy obtained using the new measure indicate that policy has large, relatively rapid, and statistically significant effects on both output and inflation. The authors find that the effects using the new measure are substantially stronger and quicker than those using prior measures. This suggests that previous measures of policy shocks are significantly contaminated by forward-looking Federal Reserve behavior and endogeneity.

Beyer and **Farmer** propose a method for estimating a subset of the parameters of a structural rational expectations model by exploiting changes in policy. They define a class of models, midway between a vector autoregression (VAR) and a structural model, that they call the recoverable structure. They provide an application of their method by estimating the parameters of a three-equation model of the monetary transmission mechanism using data from 1970:Q1 to 1999: Q4. They first estimate a VAR and find that its parameters are unstable. However, using their proposed identification method, they are able to attribute instability in the parameters of the VAR solely to changes in the parameters of the policy rule. They recover parameter estimates of the recoverable structure and demonstrate that these parameters are invariant to changes in policy. Since the recoverable structure includes future expectations as explanatory variables, their parameter estimates are not subject to the Lucas [24] critique of econometric policy evaluation.

Recent papers have analyzed how adaptive agents may converge to and escape from self-confirming equilibriums. All of these papers have imputed to agents a particular prior about drifting coefficients. In the context of a model of monetary policy, **Sargent** and **Williams** analyze dynamics that govern both convergence and escape under a more general class of priors for the government. They characterize how the shape of the prior influences the dynamics in important ways. There are priors for which the E-stability condition is not enough to assure local convergence to a self-confirming equilibrium. This analysis also tracks down the source of differences in the sustainability of Ramsey inflation encountered in the analyses of Sims (1988) and Chung (1990), on the one hand, and Cho, Williams, and Sargent (2002), on the other.

Using survey data on expectations, **Leduc**, **Sill**, and **Stark** examine whether the post-war data are consistent with theories of a self-fulfilling inflation episode during the 1970s. Among commonly cited factors, oil and fiscal shocks do not appear to have triggered an increase in expected inflation that was subsequently validated by monetary policy. However, the evidence suggests that, prior to 1979, the Fed accommodated temporary shocks to expected inflation, which then led to permanent increases in actual inflation. The authors do not find this behavior in the post-1979 data.

To reproduce the high variation of employment and low variation of real wages observed in the post-war U.S. data, many business cycle models must assume that there are high price markups and that agents have high labor supply elasticities. The problem with these assumptions is that microeconomic evidence indicates that markups and labor supply elasticities are generally low. To eliminate the need for these assumptions, **Alexopoulos** introduces a labor market friction into a monetary general equilibrium model with limited participation. In the model, firms imperfectly observe their workers' effort levels; detected shirkers forgo an increase in their compensation; and households make their decisions about their level of monetary deposits for the period before seeing the shocks to the economy. The estimated model is able to account for the observed variation in employment and real wages over the business cycle, and is consistent with the existing evidence about the qualitative responses of the U.S. economy to fiscal and monetary policy shocks.

Higher Education

The NBER's Working Group on Higher Education met in Cambridge on May 2. Charles T. Clotfelter, NBER and Duke University, organized this program:

Julie B. Cullen, NBER and University of Michigan; **Mark C. Long**, George Washington University; and **Randall Reback**, University of Michigan, "Jockeying for Position: High School Student Mobility and Texas' Top-Ten Percent Rule"
Discussant: Caroline M. Hoxby, NBER and Harvard University

Richard A. Jensen, University of Notre Dame, and **Marie Thursby**, NBER and Georgia Institute of Technology, "The Academic Effects of Patentable Research"
Discussant: Jerry R. Green, NBER and Harvard University

Sandy Baum, Skidmore College, and **Eben Goodstein**, Lewis and Clark College, "Affirmative Action for Guys? The Consequences of Gender Imbalance in College Applications"
Discussant: Linda Loury, Tufts University

Malcolm Getz and **John J. Siegfried**, Vanderbilt University, "Where Do the Children of Professors Attend College?"
Discussant: Christopher Avery, NBER and Harvard University

Larry D. Singell, Jr., and **Joe A. Stone**, University of Oregon, "For Whom the Pell Tolls: Market Power, Tuition Discrimination, and the Bennett Hypothesis"
Discussant: Bridget T. Long, Harvard University

Beginning in 1998, all high school students in the state of Texas who graduated in the top 10 percent of their class were guaranteed admission to any public higher education institution, including the University of Texas. While the goal of the policy was to improve access for disadvantaged and minority students, the use of a school-specific standard to determine eligibility could have unintended consequences. Students may benefit from switching schools near the end of their high school career in order to change their peer reference group and to increase the chances of being in the top 10 percent. In their analysis of student mobility patterns before and after the policy change, **Cullen**, **Long**, and **Reback** find evidence that these strategic moves did occur.

Jensen and **Thursby** examine concerns about whether recent changes in patent policy that increased the ability and the incentives for U.S. universities to patent inventions have been detrimental to academic research and education. They analyze a model in which a researcher allocates time between applied and basic research, given administration choices of salary and teaching load. The choice depends on a "composite" marginal rate of substitution of applied-for-basic research which takes into account both the utility of each type of research and its productivity in generating income and prestige. In equilibrium, if license income is the same whether the researcher remains in the university or not, an increase in the share of income leads to no change in optimal teaching load or salary, or to a change in opposite directions. A decrease in the portion of patentable knowledge that can be used in education either has no effect on the optimal teaching load or salary, or causes them to move in opposite directions. Results on the quality of education are typically ambiguous because changes in the teaching load induce changes in research that have an opposite effect on educational quality.

Using data from 13 liberal arts colleges, **Baum** and **Goodstein** test for affirmative action for men in the college admissions process. Despite the relative shortage of men in the applicant pools, except for some formerly female institutions, gender either has no effect on the probability of admission or there is a slight preference for women. The authors do find, however, that the bottom quartile of both the applicant and acceptance pools, as measured by academic record, is disproportionately male. As a result, even with a gender-blind admissions policy, the lower tail of college classrooms is likely to be dominated by men.

To ask whether the best-informed consumers of higher education — the faculty — make different choices from other similarly endowed consumers, **Siegfried** and **Getz** compare the pattern of colleges chosen by 5,592 children of college and university faculty with the pattern chosen by the children of non-faculty families of similar socioeconomic status. The patterns are remarkably different. The children of faculty are more likely to choose research universities and even more likely to choose selective liberal arts colleges. This evidence is consistent with the view that the level of information makes a difference in the choice of college.

Are federal Pell grants "appropriated" by universities through increases in tuition — consistent with what is known as the Bennett hypothesis? Based on a panel of 71 universities from 1983 to 1996, **Singell** and **Stone** find little evidence of the Bennett hypothesis among either public or lower-ranked private universities. For top-ranked private universities, though, increases in Pell grants appear to be *more* than matched by increases in net tuition. The behavior most consistent with this result is price discrimination that is not purely redistributive from wealthier to needier students.

International Trade and Organizations

The NBER's Working Group on International Trade and Organizations met in Cambridge on May 3. Gordon Hanson, NBER and University of California, San Diego, organized the meeting. These papers were discussed:

Patrick Legros, Princeton University, and **Andrew F. Newman**, University College, London, "Competing for Ownership"

Pol Antràs, NBER and MIT, "Incomplete Contracts and the Product Cycle"

Tahir Andrabi, Pomona College; **Maitreesh Ghatak**, London School of Economics; and **Asim Ijaz Khwaja**, Harvard University, "Subcontractors for Tractors: Theory and Evidence on Flexible Specialization, Supplier Selection, and Contracting"

Dalia Marin, University of Munich, and **Thierry Verdier**, DELTA, Paris, "Globalization and the Empowerment of Talent"

Legros and **Newman** show that vertical integration may be chosen by managers to the detriment of consumers, even in the absence of monopoly power in either supply or product markets. This effect is most likely to occur when demand is initially high and there is a negative supply shock, or when demand is low and there is a positive demand shock. Therefore, there is a need for scrutiny of vertical mergers even in the absence of market power. This result is robust to the introduction of active shareholders who may oppose the merger and to other extensions.

The incomplete nature of contracts governing international transactions limits the extent to which the production process can be fragmented across borders. In a dynamic, general-equilibrium Ricardian model of North-South trade, the incompleteness of contracts leads to the emergence of product cycles. Goods initially are manufactured in the North, where product development takes place. As the good matures and becomes more standardized, manufacturing shifts to the South, benefiting from lower wages. Following the property-rights approach to the theory of the firm, the same force that creates product cycles — that is, incomplete contracts — opens the door to a parallel analysis of the determinants of the mode of organization. As a result, a new version of the product cycle emerges, in which manufacturing shifts to the South first within firm boundaries, and only later to independent firms in the South. Relative to a world with only arm's length transacting, allowing for intrafirm production transfer by multinational firms accelerates the shift of production towards the South, while having an ambiguous effect on relative wages. **Antràs** also discusses several microeconomic implications of the model and relates them to the empirical literature on the product cycle.

Andrabi, **Ghatak**, and **Khwaja** develop a simple model of flexible specialization under demand uncertainty. A buyer faces multiple suppliers with heterogeneous quality who have the option of selling to other buyers. The more specific a seller's assets are to the buyer, the lower is his flexibility to cater to the outside market, and this cost is greater for higher quality suppliers. Therefore, even if a buyer typically prefers high quality suppliers, some low quality suppliers might be kept as marginal suppliers because of their greater willingness to invest more in assets specific to the buyer, especially in the presence of contracting problems and high uncertainty. Andrabi, Ghatak, and Khwaja examine a primary dataset on contracts between the largest tractor assembler in Pakistan and its suppliers and ask how the extent of asset specificity and other supplier characteristics affect contractual outcomes, such as prices and distribution of orders. They find that the more dedicated suppliers are indeed of lower quality.

Globalization has been identified by many experts as a new way for firms to organize their activities and as the emergence of talent as the new stakeholder in the firm. **Marin** and **Verdier** examine the role of trade integration for the changing nature of the corporation. International trade leads to a "war for talent." This makes it more likely that in the integrated world economy an organizational equilibrium emerges in which control is delegated to lower levels of the firms' hierarchy, empowering human capital. Furthermore, trade integration leads to waves of outsourcing and to convergence in corporate cultures across countries.

Health Care

Members of the NBER's Program on Health Care met in Cambridge on May 9. Program Director Alan M. Garber, of Stanford University, organized the meeting. These papers were discussed:

Jonathan S. Skinner and **Douglas O. Staiger**, NBER and Dartmouth College, "Technological Innovation and Health Outcomes: A New Look"

Ahmed W. Khwaja, Duke University, "Some Economic Consequences of Being (Medi)Careless"

M. Kate Bundorf and **Laurence C. Baker**, NBER and Stanford University, "The Market Level Effects of Health Plan Quality Measurement and Reporting"

Nancy Beaulieu, NBER and Harvard University, "Externalities in Overlapping Supply Networks"

Derek S. Brown, Duke University; **Gabriel Picone**, University of South Florida; and **Frank A. Sloan**, NBER and Duke University, "Do Routine Eye Exams Improve Vision?"

There are a variety of models that seek to explain the process of technological innovation, but less is understood about the nature of innovation and diffusion in health care. Most models of technological innovation imply convergence; gradually, even the laggard adopters of new technology catch up to the innovators. And, while different hospitals or regions may develop their own strategies for treating specific diseases, the productivity of their strategies — that is, their quality-adjusted price — should exhibit convergence over time. Using Medicare data on 2.6 million heart attack patients during 1989-2000, **Skinner** and **Staiger** find first that the rapid technological gains occurring during the late 1980s and early 1990s have flattened by the late 1990s; indeed the quality-adjusted price has risen since 1995. Second, in considering regional differences in mortality costs and outcomes, the authors find no evidence of convergence with respect to productivity during this period. The evidence favors long-term differences across states in their propensity to adopt new technology; states likely to adopt hybrid corn in the 1930s and 1940s were most likely to adopt the use of highly effective and low cost beta-blockers in the 1990s.

Khwaja uses microdata on a longitudinal sample of individuals from the Health and Retirement Study and conducts a computer- simulated thought experiment comparing the trends and outcomes under the status quo to a world without Medicare. Further, Khwaja analyzes the effect of Medicare on life-cycle health related behaviors, that is, alcohol consumption, smoking, and exercise. The simulations from the model show that, in the absence of Medicare, the health outcomes fall marginally while the utilization of medical care falls dramatically. Further, in the absence of Medicare alcohol consumption, smoking, and exercise also increase. This suggests that Medicare induces significant moral hazard — that is, over-consumption of medical care — with small consequent effects in terms of improving health outcomes. Medicare also provides an incentive to reduce the risky habits of smoking and alcohol consumption. But the largest benefit of Medicare is in terms of mitigating financial loss, especially for the elderly. The presence of Medicare reduces out-of-pocket medical expenditures by large amounts. Thus, in sum the benefits of Medicare are primarily in terms of providing financial protection against illness. There is a small benefit in terms of improving health outcomes, because of better access to care. But Medicare leads to over-consumption of medical care. Finally, Medicare also seems to generate the right incentives vis-à-vis the health related habits.

A number of studies suggest that collecting and publicly reporting quality data about health plans is of limited value because consumers make little use of the information in their health plan choices. However, this does not address another possible beneficial effect of collecting quality data: health care providers may respond to the information, independent of the extent to which it is used by consumers, resulting in improvements in the practice of medicine. **Bundorf** and **Baker** investigate the extent to which reporting on quality among managed care plans within an area affects area-level health care delivery patterns. They study a nationally representative sample of individuals with employer-sponsored health insurance living in metropolitan areas during 1996-9. The authors consider four services: breast cancer screening for women 52-69; cervical cancer screening for women 21-64; eye exams for diabetics; and annual check-ups for adults. They find that area-level reporting on health plan quality is associated with area-level utilization of some, but not all, measured services. Rates of screening for cervical cancer and eye exams for diabetics were higher in markets with a greater proportion of HMOs participating in HEDIS (Health Plan Employer Data and Information Set) quality measurement. Mammogram and physical exam rates, in contrast, appear not to have been affected by HEDIS quality measurement and reporting activity. The implication is that health plan quality measurement and reporting activity may drive changes in health care delivery, improving the quality of care throughout a market. This suggests that collection of quality data can have beneficial effects on health care even if consumers do not actively use health plan quality information when making health plan choices. However, some measures of quality may be more effective than others in stimulating

change in provider behavior.

Beaulieu develops a model and presents evidence of a spillover, or free-riding externality, that may arise when managed care organizations (MCOs) have overlapping provider networks and compete on non-price characteristics. With overlapping provider networks, quality improvements initiated by one MCO may spill over and improve the quality of other MCOs sharing the same provider network. Since the quality of all products potentially improves, less differentiation is achieved by the MCO making the initial investment. This free-riding externality reduces the return on investment in quality improvement by increasing the costs of differentiation. Beaulieu presents evidence on the degree of physician network overlap for health plans competing in the same market. She confirms that MCOs with broader provider networks are less likely to invest in quality improvement activities that might spillover to other MCO plans. Consistent with the finding on health plan investment, a second analysis shows that MCOs with tighter provider networks, and MCOs that operate in markets with lower degrees in network overlap, have higher performance on HEDIS quality measures. One implication of the model is that the degree of exclusivity of a MCOs provider network is a strategic organizational choice that interacts with the MCOs' product choice.

Picone, **Brown**, and **Sloan** use a longitudinal national sample of Medicare claims linked to the National Long-Term Care Survey (NLTCS) to assess the productivity of routine eye examinations. Although such exams are widely recommended by professional organizations for certain populations, there is limited empirical evidence on the productivity of these preventive services. The authors measure two outcomes, the ability to continue reading, and blindness or low vision. They find a statistically significant and beneficial effect of routine eye exams for both outcomes. The marginal effects for reading ability are large but declining in the number of years with annual visits. Effects for blindness are smaller for the general population, but larger for diabetics.

Market Microstructure

The NBER's Working Group on Market Microstructure met in Cambridge on May 16. The meeting was organized by Bruce Lehmann, NBER and University of California, San Diego; Andrew Lo, NBER and MIT; Matthew Spiegel, Yale University; and Avanidhar Subrahmanyam, University of California, Los Angeles. These papers were discussed:

Ronald L. Goettler, **Christine A. Parlour**, and **Uday Rajan**, Carnegie Mellon University, "Welfare in a Dynamic Limit Order Market"
Discussant: Michael Goldstein, Babson College

Joel Hasbrouck, New York University, "Trading Costs and Returns for U.S. Equities: The Evidence from Daily Data"
Discussant: Kenneth Kavajecz, University of Pennsylvania

Ronnie Sadka, Northwestern University, "Momentum, Liquidity Risk, and Limits to Arbitrage"
Discussant: Jonathan Lewellen, NBER and MIT

Ingrid M. Werner, Ohio State University, "Institutional Trading Costs on Nasdaq: Have They Been Decimated?"
Discussant: Robert Battalio, University of Notre Dame

Ekkehart Boehmer, New York Stock Exchange, and **Gideon Saar** and **Lei Yu**, New York University, "Lifting the Veil: An Analysis of Pre-Trade Transparency at the NYSE"
Discussant: Chester Spatt, Carnegie Mellon University

Ruediger Fahlenbrach and **Patrik Sandas**, University of Pennsylvania, "Bid-Ask Spreads and Inventory Risk: Evidence from the FTSE 100 Index Options Market"
Discussant: Amber Anand, Syracuse University

Goettler, **Parlour**, and **Rajan** provide an algorithm for solving for equilibrium in a dynamic limit-order market. The authors formulate a limit-order market as a stochastic sequential game and use a simulation technique based on Pakes and McGuire (2001) to find a stationary equilibrium. Given the stationary equilibrium, they generate artificial time series and perform comparative dynamics. They then can compare transaction prices to true or efficient prices. Because of the endogeneity of order flow, the midpoint is not always a good proxy for the true price. The authors also find that the effective spread is negatively correlated with transactions costs and uncorrelated with welfare. They explicitly determine investor welfare in their numerical solution. As one policy experiment, they evaluate the effect of changing tick size.

Hasbrouck examines various approaches for estimating effective costs and price effects using daily data. Then he compares the daily-based estimates with corresponding estimates based on high-frequency TAQ data. The best daily-based estimate of effective cost is the Gibbs sampler estimate of the Roll model. The correlation between the best daily-based estimate and the TAQ value is about 0.90 for individual securities and about 0.98 for portfolios. Daily-based proxies for price effect costs are more problematic, though. Among the proxies Hasbrouck considers, the illiquidity

measure (Amihud (2000)) appears to be the best: its correlation with the TAQ-based price impact measure is 0.47 for individual stocks and 0.90 for portfolios. Hasbrouck then extends the Gibbs estimate to the full sample covered by the daily CRSP database (beginning in 1962). The CRSP estimates exhibit considerable cross-sectional variation — consistent with the presumption that trading costs vary widely across firms — but only modest time-series variation. In specifications using Fama-French factors, the Gibbs effective cost estimates are found to be positive determinants of expected returns.

Sadka demonstrates the importance of liquidity for asset pricing, especially for understanding the momentum anomaly. First, systematic liquidity *risk*, rather than the absolute level of liquidity, is shown to be important in explaining the cross-sectional variation of expected returns. Moreover, momentum returns can be attributed partially to compensation for liquidity risk. Second, seemingly profitable momentum strategies that earn superior risk-adjusted returns (in absolute value) in fact are associated with low levels of liquidity. Therefore, the liquidity *level* of momentum portfolios suggests possible limits to arbitrage.

Werner uses unique order data to compare trading costs for institutional orders routed to Nasdaq sell-side dealers pre- and post-decimals. Her results show that average execution-value-weighted trading costs have declined by 20 basis points compared to open mid-quotes, by 16 basis points compared to the quotes at order arrival (effective half-spreads), and by 1 basis point compared to mid-quotes at the close (realized half-spreads). The reduction in effective half-spreads represents a 22 percent reduction in average institutional trading costs, which corresponds to $69 million in total cost savings for one week's worth of institutional orders. The results are robust to controlling for order, stock, trading, and dealer characteristics. Moreover, fill rates have improved and duration has not increased significantly. Werner also documents differences in trading costs by order type: effective half-spreads for market orders are now 52 basis points and for marketable limit orders 42 basis points, while limit orders enjoy a 46 basis point spread gain on average.

Boehmer, **Saar**, and **Yu** investigate an important feature of market design: pre-trade transparency, defined as the availability of information about pending trading interest in the market. They look at the way the NYSE's introduction of OpenBook, which enables traders off the exchange floor to observe depth in the limit-order book in real time, affects the trading strategies of investors and specialists, and influences informational efficiency, liquidity, and returns. The authors find that traders attempt to manage the exposure of their limit orders: the cancellation rate increases, time-to-cancellation shortens, and smaller orders are submitted. The new information that OpenBook provides seems to cause traders to prefer to manage the trading process themselves, rather than to delegate the task to floor brokers. The authors also show that specialists' participation rate in trading declines, and the depth they add to the quote is reduced, consistent with a loss of their information advantage or with being "crowded out" by active limit-order strategies. There is an improvement in the informational efficiency of prices after the introduction of OpenBook. Greater pre-trade transparency leads to some improvement in displayed liquidity in the book and a reduction in the execution costs of trades. The authors find that cumulative abnormal returns are positive following the introduction of OpenBook, consistent with the view that improvement in liquidity affects stock returns.

Fahlenbrach and **Sandas** study the determinants of the bid-ask spreads for index options using a sample that consists of all trades and quotes for the European style options and the futures on the FTSE 100 stock index from August 2001 to July 2002. They compute two measures that show that bid-ask spreads in their sample are economically large. First, they show that the reservation spreads for a liquidity provider who hedges the delta risk of a bought or sold index option by trading index futures is on average only 47 percent of the observed spread. Then they show that, on average, the spread for a synthetic index futures contract is 8-14 times the spread for the actual index futures contract, even after adjusting for differences in trading volume and contract size. The authors estimate fixed effects regressions for a panel of options and show that 42 percent of the variation in the daily average spreads is driven by order processing and inventory costs. The results show that inventory risk is an important determinant of spreads for index options, but that the compensation for inventory risk together with order processing costs does not explain all systematic variation in the observed spreads. The authors reject the null that all fixed effects are equal to zero for both calls and puts. The fixed effects vary systematically with option characteristics; for example, out-of-the-money options have wider spreads and in-the-money options have narrower spreads than predicted by these regressions. One interpretation is that the spreads include a mark-up above the marginal costs of providing liquidity for at least some of the options in this sample.

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Glaeser is a research associate of the National Bureau of Economic Research and a professor of economics at Harvard University.

Means-Tested Transfer Programs in the United States

Means-Tested Transfer Programs in the United States, edited by Robert A. Moffitt, is available from the University of Chicago Press for $95.00. In just the last ten years, we have seen means-tested transfer programs — programs for which some test of resources is required for recipients — such as Aid to Families with Dependent Children (AFDC), replaced by Temporary Assistance to Needy Families (TANF). At the same time, the Earned Income Tax Credit (EITC) has grown from a minor program to one of the most important for low-income families, and Medicaid has greatly expanded its eligibility to new groups. This NBER Conference Report covers all nine major U.S. means-tested programs, discussing each program's institutional history, current rules and caseloads, expenditures, and recipient characteristics; it also summarizes recent research. The result is a "one-stop source" for information and analyses that have not been put together in a single accessible volume before.

Moffitt is an NBER Research Associate and a professor of economics at Johns Hopkins University.

Labor Markets and Firm Benefit Policies in Japan and the United States

Labor Markets and Firm Benefit Policies in Japan and the United States, edited by Seiritsu Ogura, Toshiaki Tachibanaki, and David A. Wise, is available from the University of Chicago Press for $99.00. This is the fourth volume resulting from a collaboration between the NBER and the Japan Center for Economic Research (JCER); its thirteen papers feature analyses of important features of employment practices and fringe benefit systems in Japan and the United States. The book opens with a general assessment of the recent rise in the U.S. economy and the prospects for remaining at the "peak." Following an extensive exploration of labor markets in Japan, chapters six through eight deal with health and pension issues in the United States. The final four chapters examine benefit policies in Japan. As with all volumes in this series, the papers collected here are primarily investigations of discrete topics rather than comparisons between the two countries —studies undertaken in part to produce a critical mass of empirical data that will allow such comparisons in the future.

Ogura is associated with the Japan Center for Economic Research. Tachibanaki is a professor at the Institute of Economic Research of Kyoto University. Wise directs the NBER's Program on Aging and is a professor of economics at Harvard's John F. Kennedy School of Government. Together the three also coedited the most recent JCER-NBER collaboration, *Aging Issues in the United States and Japan*, published in 2001.

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9631	Pravin Krishna Devashish Mitra	Reciprocated Unilateralism: An Interest-Group Approach
9632	Jennifer Hunt	Teen Births Keep American Crime High

Paper	Author(s)	Title
9633	Raghuram Rajan Julie Wulf	The Flattening Firm: Evidence from Panel Data on the Changing Nature of Corporate Hierarchies
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9648	Rasmus Fatum Michael Hutchison	Effectiveness of Official Daily Foreign Exchange Market Intervention Operations in Japan
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Paper	Author(s)	Title
9651	Randall Morck	Why Some Double Taxation Might Make Sense: The Special Case of Inter-corporate Dividends
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9662	Ashoka Mody Assaf Razin Efraim Sadka	The Role of Information in Driving FDI Flows: Host-Country Transparency and Source Country Specialization
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Paper	Author(s)	Title
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9679	Edward P. Lazear	Firm-Specific Human Capital: A Skill-Weights Approach
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9687	Luis Bertola Jeffrey Williamson	Globalization in Latin America Before 1940
9688	Kosali Ilayperuma Simon Robert Kaestner	Do Minimum Wages Affect Non-wage Job Attributes? Evidence on Fringe Benefits and Working Conditions
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9692	Alejandro Ibarra-Yunez	Spaghetti Regionalism or Strategic Foreign Trade: Some Evidence for Mexico

Paper	Author(s)	Title
9693	Ann Dryden Witte Magaly Queralt	Impacts of the Eligibility Expansions and Provider Reimbursement Rate Increases on Child Care Subsidy Take-Up Rates,Welfare Use, and Work
9694	Steven Shavell	Economic Analysis of Accident Law
9695	Steven Shavell	Economic Analysis of Property Law
9696	Steven Shavell	Economic Analysis of Contract Law
9697	Steven Shavell	Economic Analysis of Litigation and the Legal Process
9698	Steven Shavell	Economic Analysis of Public Law Enforcement and Criminal Law
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9718	Josh Ederington Arik Levinson Jenny Minier	Footloose and Pollution-Free
9719	Luis Garicano Thomas N. Hubbard	Specialization, Firms, and Markets: The Division of Labor Within and Between Law Firms

Paper	Author(s)	Title
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