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Program Report

Public Economics

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In the three years since the last report on the NBER's public economics program, national policy debates have drawn attention to a number of questions that are central to the research of program members. The tax policy debate of 1993 resulted in substantial increases in marginal tax rates for some households, raising new questions about the incentive effects of tax rates. The emerging debate on a flat tax or a consumption-based alternative to the federal income tax is sure to result in far-reaching discussion of both equity and efficiency issues in the design of tax policy. The recent debate on health care reform generated a host of new research questions concerning the role of government intervention in the marketplace, and the efficacy of particular social insurance policies. Current discussion of proposals to change the level and structure of federal spending on entitlement programs, including Medicare and a variety of programs for low-income, nonelderly households, is also certain to draw heavily on past research, and to stimulate further research, in public economics.

This report summarizes recent work by NBER researchers on a wide range of subjects in public economics. It begins with a survey of work that bears on some of the recent and current federal policy debates, and then proceeds to describe research on a variety of other issues.

Empirical Studies of Taxation and Individual Behavior

The substantial changes in tax rates during the last decade have provided an extraordinary research opportunity for studying the effect of taxation on individual behavior. Researchers have exploited this "natural experiment" in tax policy to analyze behavioral responses. Several widely cited studies suggest that the 1986 reductions in marginal tax rates on high-income households led to substantial increases in their reported taxable income.[1] This effect is important both because it affects revenue estimation, and because the effect of tax rates on taxable income can be an

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important determinant of the efficiency cost of the tax system.[2] While the source of tax-rate-related increases in taxable income is not yet clear, there is evidence of a significant increase in labor supply among married women who experienced large reductions in their households' marginal tax rates.[3] Other empirical studies have considered the effect of marginal tax rates on the decision to realize capital gains,[4] and on the choice between receiving income as taxable wages rather than as fringe benefits.[5] Identifying the channels through which tax rate changes affect individual behavior remains a central item on the program's research agenda.

Several NBER researchers have done related work on individual taxation that is relevant to discussions of tax reform. This includes analyzing the changing nature of the "marriage penalty" in the federal income tax;[6] developing a theory of income taxation when income cannot be measured precisely;[7] and evaluating the efficiency and distributional effects of replacing the current income tax with a value-added tax.[8]

Tax Policy and Saving

NBER researchers also have studied personal saving and how it is affected by tax rates. Several NBER affiliates participated in a project comparing personal saving rates in industrial nations, and summarizing the tax incentives and other public policies that could affect personal saving in these nations.[9]

A number of other studies have described or modeled household saving behavior. One documents the stylized patterns of saving across ages and cohorts in the United

States;[10] others focus on the precautionary motives for household saving;[11] and a third set is concerned with the effects of targeted retirement saving plans, such as Individual Retirement Accounts and 401(k) plans, on personal saving.[12]

Another strand of research on private saving has considered the implications of the ongoing demographic transition in the United States. This includes work describing the current adequacy of young households' retirement saving,[13] as well as research on the link between population aging, economywide rates of saving and dissaving, and the rates of return on various financial assets.[14]

Tax Policy and Corporation Behavior

One of the perennial subjects studied by researchers in the public economics program is the effect of taxation on the financial and other decisions of corporations. In the last three years, NBER researchers have addressed a range of new questions, including how liquidity constraints influence corporate start-up decisions by entrepreneurs;[15] how security transaction taxes affect financial markets and the cost of capital;[16] what role aftertax versus pretax returns play as measures of mutual fund performance;[17] and whether tax policy encourages or discourages firm spending on R and D.[18]

NBER scholars also have continued their work on traditional issues in business taxation and finance, developing new insights on the effect of taxation on firm dividend payout policy;[19] on the choice between corporate and noncorporate forms of organization for productive activity;[20] and on the general question of whether equipment investment yields social externalities that warrant special tax subsidies.[21]

International Tax Policy

One rather specialized issue in corporate tax policy that has emerged in the last decade is the role of taxation in an increasingly global economy. A number of NBER researchers have studied a range of questions about international tax policy, paying particular attention to the taxation of capital income in a global economy.[22] Research in this vein has considered the effect of international tax rules on the location of research and development activities;[23] the impact of tax rules on capital investment and the financial decisions of multinational firms;[24] the viability of capital income taxes in open economies;[25] and the effect of specialized tax rules, such as those governing U.S. firms operating in Puerto Rico, on investment behavior.[26]

A number of other studies have tackled broader questions, for example whether outbound foreign direct investment depresses domestic investment in the nation that undertakes the investment;[27] why domestic saving and investment tend to move roughly in tandem over periods of several years;[28] and the link between tax policy and trade policy in achieving government policy objectives.[29]

Social Insurance

The economic effects of social insurance programs have attracted an enormous volume of research activity during the last few years. The national health care policy debate turned the attention of researchers to a new set of problems in policy design and evaluation. Long-term demographic trends that point toward a growing share of elderly households in the U.S. population make social insurance outlays a critical component of prospective government expenditures.

NBER researchers have analyzed many aspects of social insurance programs. To highlight the range of this work, I first report on research on the effects of government policies involving health care markets, and then consider other topics. In the area of health care, Bureau researchers have asked how wages respond to mandated health insurance benefits for workers;[30] how employer-provided health insurance affects job mobility;[31] how changes from fee-for-service to prospective payment have affected the delivery of health care;[32] and how changes in Medicaid rules have affected the likelihood that newly eligible families receive medical care and experience improvements in their health status.[33] Some work on health insurance has tried to evaluate the welfare gains from alternative insurance regimes;[34] the allocative effects of the current tax subsidies on the demand for insurance;[35] and the degree to which public insurance crowds out its private sector counterpart.[36]

Another set of studies has advanced our understanding of unemployment insurance and its effects on smoothing fluctuations in consumption;[37] of how disability insurance affects labor market behavior;[38] and how programs that afford AFDC eligibility to families with two unemployed parents affect the labor supply of such parents.[39] In the area of social insurance programs primarily directed at the elderly, program members have considered the effect of rising social insurance outlays on the degree to which elderly households

are annuitized;[40] and on their labor market decisions, particularly the decision to retire.[41]

State and Local Public Finance

New interest in shifting responsibilities for programs from the federal government to states and localities has heightened Bureau researchers' attention to a new set of tax policy issues. One group of studies considers the impact of school competition on the relationship between inputs and outputs in public education.[42] These studies analyze competition between public and private schools as well as between public schools in different communities, and provide original and innovative evidence on the real effects of competition. Another line of research looks at the degree to which states and localities can affect the aftertax distribution of income by enacting progressive income tax schedules.[43] A third line of work explores the efficacy of police spending in deterring crime,[44] using the ingenious strategy of tracking crime rates around the time of elections in large cities, when the police force typically is expanding.

Other NBER researchers have investigated capital and infrastructure spending, including the effect of institutions for capital budgeting on state capital spending,[45] and the spillovers across states and localities that result from infrastructure investments.[46]

Environmental Taxes

The revenue potential and efficiency effects of taxing various goods that are perceived as imposing external costs on society have been active issues of public policy debate in the last several years. NBER researchers have considered a number of issues relating to environmental tax policy. At the most general level, there have been advances in building computable general equilibrium models used to analyze environmental taxes[47] and in the theory of tax design in the presence of externalities.[48] Specific environmental taxes singled out for analysis include those on alcohol and tobacco;[49] oil and petrochemical feedstocks;[50] and "Superfund" taxes on a variety of chemical inputs to production processes.[51]

Public Policy and Housing Markets

The effect of public policies, particularly tax and financial policies, on housing markets is central to the emerging tax reform debate, but is also of independent interest. During the last two years, Patric H. Hendershott of Ohio State University has directed an NBER Project on Public Policy and Housing Markets. Research in this project has considered the determinants of household mortgage indebtedness[52] and the impact of housing markets on the wealth accumulation patterns of younger households[53] among other topics. Many of the findings from this project were presented at an October 1994 conference, which was summarized in the Winter 1994/5 *NBER Reporter.*

Political Economy of Tax and Spending Policies

One of the newer, but rapidly growing, areas of research in public economics is the political economy of tax and expenditure policies, including: the effect on spending behavior of electoral institutions, such as term limits;[54] whether fiscal institutions and fiscal constraints affect deficit policy;[55] and general discussions of the political economy of the welfare state.[56] One intriguing line of research that has emerged from this area, and that bears directly on much of the empirical research on social insurance, involves the exogeneity of state-level changes in policy that frequently are the subject of so-called "natural experiment" studies.[57] Without a framework for evaluating why policies change, it is difficult to analyze their effects as if they were laboratory experiments, complete with "control" and "experimental" groups.

Government Service

Researchers affiliated with the NBER's Program in Public Economics have a long tradition of testing their expertise through public service. Since the last program report, Michael J. Boskin and David F. Bradford have completed their service on the Council of Economic Advisers (CEA), and Joseph E. Stiglitz has joined the Council. In addition, Faculty Research Fellow David M. Cutler has returned from his stint as a senior staff economist at the CEA. Lawrence H. Summers, formerly Chief Economist at the World Bank, became Undersecretary for International Affairs, and more recently the nominee as Deputy Secretary at the U.S. Department of the Treasury. Alan B. Krueger is currently the Chief Economist of the U.S. Department of Labor.

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Research Summaries

Measuring and Controlling Inflation

Stephen G. Cecchetti

In many ways, the monetary policy of the last 15 years has been strikingly successful: inflation has fallen dramatically, from well over 10 percent per year in the late 1970s to only about 3 percent in recent years. But this new low-inflation environment brings with it a host of questions that do not arise when inflation is at moderate or high levels. For example, is inflation being measured accurately? And, how can policymakers control the future path of inflation? These questions have guided much of my research over the past several years.

Michael F. Bryan of the Federal Reserve Bank of Cleveland and I studied the measurement of the most popular and commonly used aggregate price statistic in the United States: the Consumer Price Index (CPI). The CPI is the most prominent measure of inflation, and thus has become a focal point in the Federal Reserve's inflation fight. Broadly speaking, there are two problems associated with using the CPI to measure inflation: First, it represents month-to-month price changes that may not reflect changes in long-term trends accurately. Measured changes in the CPI often contain substantial short-run, transitory noise that does not constitute long-term inflation, and can easily mislead the monetary authorities

when making decisions. Second, there is a potential bias in the CPI that results from both the expenditure-based weighting scheme it uses and from the persistent errors associated with measuring certain prices. As a result, measured CPI inflation will not reflect the long-run trend in price changes accurately. Since the IRS code, many government expenditure programs, and numerous private contracts all use the CPI as the basis for their indexation, its proper measurement of long-term price movements is of the utmost importance.

Core Inflation

Core inflation is what remains if we can remove from our calculation of inflation changes in variables such as the weather, or movements in oil and clothing prices, and thus obtain a more reliable measure of the underlying trend in price movements. For example, food prices may rise during periods of poor weather to reflect a decrease in supply, thereby producing transitory increases in an aggregate inflation index. Because these price changes do not constitute longer-term inflation, the monetary authorities would not want to base their decisions on them.

There are numerous solutions to the problems posed by temporary movements in prices. One common technique for measuring core inflation excludes certain prices in the computation of the index, assuming that those prices are highly variable. (This is the "ex. food and energy" strategy, in which the existing index is reweighted by placing zero weights on some components.) But is it right to assume that food and energy prices contain so little valuable information about core inflation that they should be excluded completely from the index? And how can we adjust for price variability outside of the food and energy sectors?

As an alternative, Bryan and I examine the Median CPI:[1] that is, the midpoint of inflation in all of the goods and services that go into the aggregate CPI. To account for the vast differences in expenditure on some goods and services relative to others, we use the weighted median. We construct a simple model of pricesetting that captures the intuition that the types of shocks that cause problems with price measurement are infrequent, and that these shocks tend to be concentrated, at least initially, in certain sectors of the economy.

Removing these transitory elements from the aggregate index can be done easily. The problem is that a large and sudden increase in the price of one good may not be matched immediately by an equivalent decrease in the price of some other good. Instead, the offsetting adjustment will take time. Such a price shock will cause standard measures of inflation, based on the mean of inflation in the prices of individual goods, to move up following the initial shock, and down following the compensating adjustment. But these temporary movements will not be present in the median, because it eliminates the undesirable effects of temporarily high or low prices in specific sectors.

The Median CPI has a number of very desirable properties that make it useful for policymakers and macroeconomists alike. First, it is more closely correlated with past money growth, and delivers better forecasts of future inflation, than either the CPI or the CPI excluding food and energy. Moreover, unlike the CPI, the Median CPI is forecast by, but does not itself forecast, money growth.

Further, the Median CPI stands up to many types of problems that plague the calculation of a price index. Finally, the Median CPI is calculated in a way that protects it against problems such as those caused by the energy price increases of the 1970s, without having to know which sector will next experience a large shock.

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Seasonal Fluctuations in Price Changes

Changes in the seasonal pattern of price changes are a second, but very different, source of short-run price movements. Again these are temporary movements in inflation, but they can create distinct problems for policymakers. For example, early in 1993, the *seasonally adjusted* CPI reversed course and increased at an annual rate of roughly 4.33 percent, about 1.5 percentage points above its average growth rate during the previous six-month period. But over the

next several months, the growth rate of the CPI moderated sharply, averaging less than 2.5 percent annual rate in the final six months of 1993. For the year as a whole, the seasonally adjusted CPI rose only 2.75 percent, about 0.25 percentage points *below* 1992's rate.

A popular interpretation of these events is that the inflationary scare of 1993 was a result of seasonal price increases that were not part of a more persistent inflationary process. In fact, several studies have identified a pattern of large price increases during the first several months of every year followed by a more moderate inflation performance over the balance of the year. Indeed, prior to this recent experience, there was a common belief among economists that prices contained little seasonal variation.

While monthly consumer prices are certainly volatile, there is little obvious seasonal movement in the aggregate data. However, for certain items, such as women's apparel, the seasonal pattern is distinct and very large. This has a practical implication: the practice of constructing a seasonally adjusted aggregate index from select seasonally adjusted disaggregated price indexes may not be sufficient to rid the aggregate series of its seasonal pattern. These observations raise two important questions that I have examined. Has the seasonality in prices changed substantially over the past quarter century? And, is there a better way to calculate a seasonally adjusted aggregate CPI?

In a recent paper, Bryant and I conclude that since World War II, much of the seasonal variability in aggregate prices was obscured by a dominant cyclical variability in prices.[2] Seasonal price movements have become more prominent in the relatively stable inflation environment prevailing since 1982, though.

Beyond this, it appears that seasonality in consumer prices is predominantly, although certainly not entirely, idiosyncratic in nature: that is, the vast majority of the seasonality in one set of individual prices is offset by seasonality in other individual prices, and so does not appear in the aggregate index. Together with the fact that the Bureau of Labor Statistics does not seasonally adjust all of the component price data, this explains why the seasonally adjusted aggregate CPI may still exhibit seasonality. The natural solution to this problem is to seasonally adjust the aggregate index *after* aggregation, not before.

Bias in the CPI

Is there also long-run bias in the measurement of inflation? Several extremely important policy issues revolve around that question. The first is whether a goal of zero inflation literally means zero or whether, because of various biases in the calculation of inflation, some low but nonzero rate of measured inflation is sufficient. The second concerns the effect of linking the indexation provisions in private contracts and government programs to actual CPI inflation rather than to some adjusted CPI that accounts for bias.

There are two general reasons for the long-run trend in the CPI to deviate from an ideal measure of inflation. The first is the result of the weighting scheme the CPI employs that is based on expenditures (that is, weighting bias), while the second is the result of persistent errors in measuring certain prices (that is, measurement bias). The existence of bias implies that *any* fixed-weight price index will not be a perfect long-run target for a policy aimed at aggregate price stability. But how large is the bias in the CPI?

Previous researchers have addressed the issue of bias in price statistics by performing calculations based on highly disaggregated information. This approach at best provides only a broad approximation. Moreover, the bias in the price statistics depends on the severity and origin of supply shocks, on changes in technology and tastes, and on phenomena that vary over time. So the time-invariant estimates derived from these studies are of only limited value to policymakers.

My strategy with Bryan is different.[3] Using a simple statistical framework, we compute a price index that is immune to the weighting bias inherent in the CPI. It is based on work by Stock and Watson,[4] and we label it a "dynamic factor index." Loosely speaking, dynamic factor indexes of consumer prices are constructed by weighting (in a time-varying way) commodities based on the strength of a common inflation signal. Estimates of weighting bias in the CPI are roughly 0.6 percent annually in 1967 to 1992, but the size of that bias varies substantially within subperiods. In fact, since 1981, weighting bias in the CPI as a measure of inflation has been negligible.

The dynamic factor indexes do not account for the potentially important measurement biases that arise when goods are systematically excluded, or when there is a common measurement error, such as a change in aggregate quality that is not being picked up. It is possible to gauge their severity by comparing the dynamic factor indexes computed from commodity

subsets of the data. Assuming that differences between inflation in goods prices and inflation in services prices are entirely a result of measurement bias in the latter category, the measurement bias in the CPI can be estimated. We find that it may have been as high as 0.5 percentage points per year since 1982.

Inflation Policy

Since late 1979, the goal of monetary policy in the United States, as in most industrial nations, has shifted toward the reduction of the level and the variation in inflation. Reducing the variability of inflation requires both that one be able to forecast the future path of the price level, and that one have estimates of what impact policy changes have on that path. Recently, I have examined our practical ability to do these things.[5]

Unfortunately, inflation is very difficult to forecast even at very near horizons. This is because the relationship of inflation indicators to inflation is neither very strong nor very stable. Furthermore, the relationship between monetary policy instruments, such as the Federal Funds rate, and inflation also varies substantially over time and cannot be estimated precisely.

Construction of policy rules can take these difficulties into account. Comparison of the results of price level targeting with nominal income targeting suggest that the difficulties inherent in forecasting and controlling the former provide an argument for focusing on the latter. Nominal income targeting has a type of robustness not shared by price level targeting. Focusing solely on inflation leads to substantial increases in the variability of real output, while focusing on nominal income does not increase the variance of inflation by nearly as much.

Finally, since prices take time to respond to all types of unexpected events, the object of price or nominal income stability implies responding immediately to a shock, rather than waiting for prices to rise before acting. This seems to present monetary policymakers with an unhappy dilemma. Because of long lags in the transmission of their decisions to the price level, policymakers must be forward looking and react quickly to changes in the inflation outlook. Unfortunately, the results of my work demonstrate both how murky, and how unstable, the inflation outlook generally is, and how difficult it is to reduce the variability of prices.

[1] *M. F. Bryan and S. G. Cecchetti, "Measuring Core Inflation," in* Monetary Policy, *N. G. Mankiw, ed. Chicago: University of Chicago Press, 1994, pp. 195–215.*

[2] *See M. F. Bryan and S. G. Cecchetti, "The Seasonality of Consumer Prices," NBER Working Paper, forthcoming.*

[3] *M. F. Bryan and S. G. Cecchetti, "The Consumer Price Index as a Measure of Inflation,"* Economic Review of the Federal Reserve Bank of Cleveland *29 (1993 Quarter 4), pp. 15–24.*

[4] *J. H. Stock and M. W. Watson, "A Probability Model of the Coincident Economic Indicators," in* Leading Economic Indicators: New Approaches and Forecasting Records, *K. Lahiri and G. H. Moore, eds. Cambridge, England: Cambridge University Press, 1991, pp. 63–89.*

[5] *S. G. Cecchetti, "Inflation Indicators and Inflation Policy," NBER Working Paper No. 5161, June 1995.*

The Financing Costs and Insurance Benefits of Social Insurance Programs

Jonathan Gruber

One of the most important trends in government activity over the past 30 years is the increase in the share of the government budget devoted to social insurance programs, including Social Security, Medicare, Unemployment Insurance, and Medicaid. At the federal level, spending on social insurance programs has grown from 13.5 percent of the budget in 1960 to 36.8 percent in 1993. This rapid growth in spending has been paralleled by increased economic research on the effect of social insurance programs on economic behavior. This research has focused primarily on the costs of these government interventions, through distortions to individual and firm decisionmaking. But there are two further important questions about social insurance programs that have remained relatively unexplored. First, what is the effect of different ways of financing social insurance interventions? Second, what are the benefits of these interventions? My research over the past several years has been devoted to addressing these questions.

Financing Costs

Employer Mandates

There are three primary alternatives for financing interventions designed to increase access to insurance for adverse events: providing the insurance publicly, and financing the provision through increased general taxation; subsidizing the individual purchase of the insurance;

and mandating that employers provide the insurance to their workers. The last of these approaches, employer mandates, is particularly attractive to governments as a means of financing social insurance interventions in this era of tight fiscal budget constraints. The U.S. government over the last century has mandated that employers provide workers' compensation coverage to insure workers against workplace injury, offer (unpaid) maternity leave to employees, and pay a minimum hourly wage. And the central feature of the recent Clinton health care reform proposal was employer-mandated provision of health insurance to employees.

A key question about employer mandates is whether they will raise the cost of labor, and thereby lead to layoffs and unemployment. Since workers are getting a valuable benefit at the workplace, such as health insurance, they will be willing to work for a lower wage. In the extreme case in which workers value this benefit at its cost to their employers, then they will work for the same amount of total compensation, with their wages falling to fully offset the cost of the insurance. In this case, mandates will have no effects on employment. Thus, the extent to which the cost of mandated health insurance is shifted to wages is a central question for evaluating the effects of this means of financing government interventions.

Two of my research projects have attempted to answer this question by evaluating the prior experience of the United States with large mandated employer benefits. In the first,[1] I examine the effect of several state and federal laws that mandated the provision of comprehensive coverage for childbirth in employer-provided health insurance plans. These laws raised the costs of employing women of childbearing age, as well as their husbands who covered them in their health insurance plans. I find that the increased insurance costs were shifted fully to these workers' wages, with no effect on total labor supply. As would be expected with a mandate that costs a fixed amount per worker, there was some increase in hours and reduction in employment, but the net of the two remained constant.

In the second,[2] Alan B. Krueger and I study the effects of increases in the cost of workers' compensation insurance, the oldest and largest mandated benefit in the United States. Workers' compensation costs rose dramatically in the 1980s, because of rising medical costs and increased generosity of state legislatures (which set the benefit levels); in some industries, costs rose by over 10 percent of payroll, and by 1987 were as high as 25 percent of payroll. We find, however, that almost all of these increased costs were shifted to workers' wages, and that cost increases had no significant effect on employment.

In some recent related work, I also investigate the labor market effects of the privatization of Social Security in Chile.[3] While financed by payroll taxation rather than employer mandate, the implications of Social Security financing for employment and wages are the same since this was also a program that was financed by employers and provided benefits solely to employees.[4] The dramatic shift in financing under privatization lowered the average payroll tax rate on firms by over 20 percent over several years. Using a sample of Chilean manufacturing plants, I find that this reduction in payroll taxes was fully shifted to wages, with no effect on employment. Thus, my results suggest that mandating employers to provide benefits to their workers, or taxing them to finance these benefits, results in lower employee wages but no fewer jobs.

Subsidies

An alternative to mandating that employers provide health insurance to their workers is to subsidize individual purchase of insurance. The success of any subsidy plan rests critically on the elasticity of demand for insurance (the degree of price responsiveness) by the uninsured. Unfortunately, past literature on this question has suffered from a number of methodological problems, such as the fact that those facing the highest price for insurance (that is, small businesses) may have different demand for insurance for other reasons (that is, they have young workers). James M. Poterba and I surmount these methodological problems to estimate the elasticity of demand for insurance among the self-employed.[5] We do so by using the "natural experiment" provided by a 1986 change in the federal tax code, which subsidized the purchase of insurance by self-employed individuals while holding the tax subsidy constant for employed workers. Thus, we can estimate the elasticity of demand by observing changes in demand for insurance by self-employed, relative to employed, persons. We find that insurance coverage rose dramatically for the self-employed relative to the employed, and our estimates imply that a 1 percent decline in the price of insurance will raise insurance coverage by over 1 percent.

Publicly Provided Insurance

The final alternative is publicly provided insurance, for example the National Health Insurance (NHI) plan established by Canada in the late 1960s. With this approach, the key question again is whether the financing mechanism will lead to widespread employment losses. To address this question, Maria J. Hanratty and I exploit the fact that NHI was introduced on a staggered basis across the Canadian provinces, so that we can observe how employment responded in each province as NHI was introduced.[6] We find, surprisingly, that employment actually rose as NHI was introduced. Our results suggest that the benefits of NHI in terms of improving workers' health or increasing their ability to change jobs may outweigh the costs of the higher taxes required to finance universal coverage.

Insurance Benefits

A noticeable feature of the social insurance literature is its focus on the *costs* of government interventions, in terms of distortions to individual behavior, without much consideration of the *benefits* of these interventions. I have done a number of studies that try to model these benefits explicitly for government interventions in health care and unemployment insurance.

Increased Labor Force Mobility

A distinguishing feature of the current system of health care in the United States is that insurance is linked to the workplace. As a result, individuals may be afraid to leave jobs with health insurance, because other jobs may not offer coverage, individual insurance coverage is quite expensive, and most new insurance policies come with "preexisting conditions exclusions" that limit coverage of existing illnesses. This problem is colloquially known as "job-lock." One potential benefit of government intervention in health insurance markets is that it might alleviate this important distortion to labor mobility.

> "[M]andating employers to provide benefits to their workers, or taxing them to finance these benefits, results in lower employee wages but no fewer jobs."

In joint research with Brigitte C. Madrian, I have investigated this phenomenon in two contexts in which moving out of one's job may be limited by the fear of losing group coverage. The first is the decision to retire before the age of Medicare eligibility.[7] We study the effect of state and federal laws that mandated that workers be allowed to continue their health insurance coverage for some period (up to 18 months) after leaving their jobs. These "continuation of coverage" mandates stipulate that the worker pay only the average group cost of health insurance. This is substantially below the cost of insurance that is purchased individually by a 55–64-year-old, so continuation mandates mitigate the disincentive to retirement that arises from having insurance on the job but not in retirement. We find that the availability of continuation coverage dramatically increases the propensity to retire; one year of coverage raises retirement rates by 15 percent. These sizable effects suggest that there may be even larger responses of retiree health insurance coverage that is more highly subsidized or not time limited.

The second context is the mobility of younger workers.[8] Continuation mandates also provide an alleviation of job-lock for younger workers who want to switch to new jobs but have short-run medical costs that make them reticent to leave their current health insurance plan. We find large effects of continuation mandates for this population as well: providing one year of continuation coverage raises the probability of changing jobs by 10 percent. This finding has two important implications: first, job-lock is a not a trivial phenomenon; and second, much of job-lock arises from short-run concerns that can be alleviated by time-limited public policies such as continuation mandates.

Improved Health Outcomes

Another example of a potential gain from a social insurance intervention is the health benefit of providing public insurance coverage to those currently uninsured. Providing broader insurance coverage may not improve the health of the uninsured population, however, for two reasons. First, the uninsured still may not have access to providers willing to serve them: there is substantial segregation between the population of most need and physicians' offices. Second, there is surprisingly little evidence that health insurance actually is good for health. While the uninsured are generally in worse health than those with insurance, this may reflect not their lack of insurance but the other factors that lead them to be uninsured, such as low incomes. So it becomes important for designing health policy to understand the magnitude of any health

benefits from increases in publicly provided insurance.

In two recent papers, Janet Currie and I note that the United States already has experience with a substantial increase in public insurance coverage for the poor under its Medicaid program. At one time tied to receipt of cash welfare, this program is now available to all pregnant women and young children with incomes under 133 percent of the poverty line; in some states, availability has been extended to those with incomes up to twice the poverty line.[9] We first examine the effect of extended coverage for pregnant women on the health of their newborns.[10] This has the advantage that there are two precisely measured and objective indicators of health for newborns: birthweight and infant mortality. We find that increased Medicaid eligibility led to significant decreases in the incidence of low birthweight births and infant deaths. Our estimates suggest that the 20 percent increase in Medicaid eligibility for pregnant women during the 1980s led to a 7 percent fall in the infant mortality rate.[11]

We then extend this methodology to examine the medical utilization and health outcomes of children made eligible for Medicaid during 1984–92.[12] We find that making children eligible for Medicaid lowers their likelihood of going without a doctor's visit over a one-year period and increases the frequency of visits in office-based settings. We also find that expanded eligibility is associated with a drop in child mortality. Furthermore, we find an equalization effect of Medicaid: the effects are larger on black children, who start from a position of using fewer health services and being in worse health. Overall, then, our results suggest that there are substantial health benefits from increasing public insurance coverage of low-income populations.[13]

Consumption Smoothing

Unemployment insurance (UI) is a classic example of a program in which past research has documented the distortions caused by increased benefits generosity, for example an increase in the duration of spells of unemployment.[14] In the absence of private insurance markets for unemployment, though, generous UI systems yield important benefits in terms of smoothing the consumption of workers during their spells of unemployment. But there has been little emphasis on measuring these benefits.[15]

I investigate the consumption smoothing benefits of UI by modeling the change in consumption of workers who leave their jobs as a function of the generosity of their UI benefits.[16] I find that workers with more generous UI benefits reduce their consumption by much less than workers with less generous benefits. During 1968–87, the average unemployed person reduced food consumption by 7 percent upon losing his or her job. My estimates imply that this fall in consumption would have been 22 percent, or over three times as large, if there were no UI available. I also find that the benefits of the UI program in terms of smoothing consumption are concentrated on those workers for whom unemployment is a surprise, and who as a result have not otherwise prepared to maintain their consumption (with savings or other forms of "insurance").

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[1] *J. Gruber, "The Efficiency of a Group-Specific Mandated Benefit: Evidence from Health Insurance Benefits for Maternity," NBER Working Paper No. 4157, September 1992, and "The Incidence of Mandated Maternity Benefits,"* American Economic Review *(June 1994), pp. 622–641.*

[2] *J. Gruber and A. B. Krueger, "The Incidence of Mandated Employer-Provided Insurance: Lessons from Workers' Compensation Insurance," NBER Working Paper No. 3557, December 1990, and in* Tax Policy and the Economy, Volume 5, *D. F. Bradford, ed., 1991. Cambridge, MA: MIT Press, pp. 111–143.*

[3] *J. Gruber, "The Incidence of Payroll Taxation: Evidence from Chile," NBER Working Paper No. 5053, March 1995.*

[4] *This is a point of some confusion in the literature on the economics of mandates; see J. Gruber, "Payroll Taxation, Employer Mandates, and the Labor Market: Theory, Evidence, and Unanswered Questions," Mimeo, MIT, November 1994.*

[5] *J. Gruber and J. M. Poterba, "Tax Incentives and the Decision to Purchase Health Insurance: Evidence from the Self-Employed," NBER Working Paper No. 4435, August 1993, and "The Elasticity of Demand for Health Insurance: Evidence from the Self-Employed,"* Quarterly Journal of Economics *(August 1994), pp. 701–734.*

[6] *J. Gruber and M. J. Hanratty, "The Labor Market Effects of Introducing National Health Insurance: Evidence from Canada," NBER Working Paper No. 4589, December 1993, and* Journal of Business and Economics Statistics *(April 1995), pp. 163–174.*

[7] *J. Gruber and B. C. Madrian, "Health Insurance Availability and the Retirement Decision," NBER Working Paper No. 4469, September 1993, and* American Economic Review, *forthcoming.*

[8] *J. Gruber and B. C. Madrian, "Limited Insurance Portability and Job Mobility: The Effects of Public Policy on Job-Lock," NBER Working Paper No. 4479, September 1993, and "Health Insurance and Job Mobility: The Effects of Public Policy on Job-Lock,"* Industrial and Labor Relations Review *(October 1994), pp. 86-102. See also B. C. Madrian, "Employment-Based Health Insurance and Job Mobility: Is There Evidence of Job-Lock?"* Quarterly Journal of Economics *(February 1994), pp. 27–54.*

[9] *These "Medicaid expansions" are described in detail in A. S. Yelowitz, "The Medicaid Notch, Labor Supply and Wel-*

fare Participation: Evidence from Eligibility Expansions," Quarterly Journal of Economics, *forthcoming.*

[10]*J. Currie and J. Gruber, "Saving Babies: The Efficacy and Cost of Recent Expansions of Medicaid Eligibility for Pregnant Women," NBER Working Paper No. 4644, February 1994.*

[11]*At the same time, constraints on physician access do matter for health outcomes; see J. Currie, J. Gruber, and M. Fischer, "Physician Payments and Infant Mortality: Evidence From Medicaid Fee Policy," NBER Working Paper No. 4930, November 1994, and* American Economic Review, *forthcoming.*

[12]*J. Currie and J. Gruber, "Health Insurance Eligibility, Utilization of Medical Care, and Child Health," NBER Working Paper No. 5052, March 1995.*

[13]*At the same time, of course, these expansions are quite costly; for a discussion, see D. M. Cutler and J. Gruber, "Does Public Insurance Crowd Out Private Insurance?" NBER Working Paper No. 5082, April 1995.*

[14]*See, for example, B. Meyer, "Unemployment Insurance and Unemployment Spells,"* Econometrica *(1990), pp. 757–782.*

[15]*For a notable exception, see D. S. Hamermesh "Social Insurance and Consumption: An Empirical Inquiry,"* American Economic Review *(1982), pp. 101–113.*

[16]*J. Gruber, "The Consumption Smoothing Benefits of Unemployment Insurance," NBER Working Paper No. 4750, May 1994.*

Industrial R and D: Determinants and Consequences

Bronwyn H. Hall

In modern industrial economies, technical change and innovation are considered to be a major impetus behind economic growth and improvements in the standard of living. Although many "actors" are important in creating a climate in which innovation can flourish, in a market economy it is primarily private firms that deliver the benefits of scientific research and technological innovation to consumers. For this reason, I and other economists have focused on understanding and measuring the forces that determine individual firm performance in this area, and on evaluating the effectiveness and direction of industrial research.

Economic analysis of industrial R and D has led many to question whether private firms have an incentive to undertake the amount of R and D that is optimal for society as a whole.[1] This causes us to ask by how much the private returns to R and D fall below the social returns; whether our capital market and corporate governance systems do a good job of encouraging R and D investment and innovation; how effective such government policies as the R and D tax credit are; and how our performance and policies compare to those of other large developed economies. My own recent research has examined: the consequences of U.S. capital market structure and the corporate restructuring wave of the 1980s for the performance of R and D; the effectiveness of the R and D tax credit in inducing firms to increase their R and D spending; the contribution of industrial R and D both to productivity growth and to the private returns of individual firms during the recent past; and comparisons of U.S. firm performance in this area with that of France and other countries.

The Market for Corporate Capital and Industrial R and D

During the past decade many observers viewed the wave of restructuring and downsizing in the U.S. manufacturing sector as inimical to investment in R and D in that sector. Some went so far as to argue that the market for corporate control had a serious negative impact on companies' long-term investment, which in turn contributed to the decline of the United States in global competitiveness. Beginning with a study for a 1987 NBER Conference on Corporate Takeovers, I have investigated the evidence behind this argument in a series of papers, and reached the conclusion that the picture has been greatly overdrawn. Still, there is no doubt that a variety of external forces led simultaneously to an increase in leverage and a reduction in R and D investment in certain sectors.[2]

The financial restructuring of U.S. public corporations can be divided loosely into three classes of activity: ordinary merger or acquisition activity; leveraged buyout or going private transactions; and large shifts in the balance sheet toward debt without going private. During the 1980s, the relationship among these three activities and the R and D activities of the firm varied substantially, with only the third being clearly associated with declines in R and D spending. Ordinary merger activity unaccompanied by changes in leverage seems to have gone on throughout the period without having much impact on firms' R and D policies. After a merger, the typical firm had an R and D-to-sales ratio that was equal to a size-weighted average of the intensities of the two merging firms.[3] Not only does this imply that mergers are not necessarily

negative for R and D investment, but it also indicates that cost-saving on R and D was probably not the primary motive for these mergers.

Leveraged buyouts and going private transactions increased dramatically during the 1980s, but the potential impact on R and D spending was minuscule, for the simple reason that most of these took place in sectors where R and D investment historically had not been an important part of business strategy (food, textiles, auto parts, tires, fabricated metals, and miscellaneous manufacturing). In ten years, the total amount of annual R and D investment involved was less than 0.5 percent of annual industrial R and D spending during the period.

However, leveraged restructurings in which the firm was not taken private also increased during the 1980s, and these transactions often were followed by substantial declines in R and D investment throughout the period and particularly in the latter half: for example, the decline in R and D intensity for such firms was about 0.8 percent (from 3.4 to 2.6) for 1982 to 1987. The firms involved were primarily in sectors with relatively stable long-horizon technologies (petrochemical, steel, autos) that have been under pressure from foreign competition. Case study evidence does not generally support the view that these foregone investments would have been highly productive for the firms in question. The aim of these restructurings seems to have been shrinking excess capacity in these industries.[4]

Thus, rather than interpreting the corporate restructuring wave as negative for R and D and other long-term investments, it makes more sense to view the two phenomena, increases in leverage and declines in investment, as joint consequences of the higher overall cost of capital during this period and changes in the relative price of debt to equity.[5]

The Returns to R and D During the 1980s

To provide another perspective on the factors affecting changes in R and D investment strategy in U.S. manufacturing during the 1980s one needs to take a closer look at the ex ante and ex post returns to these investments. Ex ante, the stock market signals its expectations of the future profitability of investment in particular firms and sectors via the discrepancy between the market value of existing capital and the book value of the underlying assets (albeit with considerable random error). During the 1980s, the ratio between the market value of ordinary capital and the book value of that capital for the average firm rose from somewhat less than one toward one in most manufacturing sectors.[6] The implication of this finding is that the wave of restructuring and downsizing that we experienced during the period had the effect of removing less productive firms and capital from the sector.

In contrast, changes in the ratio between the market value and the book value of capitalized R and D expenditure varied widely across sectors in ways consistent with the restructuring scenario: in the traditional medium technology sectors of nonpharmaceutical chemicals and petrochemicals, metals, transportation equipment, and machinery, the value of R and D rose from below one to close to one during the period, as the sectors shrank. In pharmaceuticals it has remained above unity throughout most of the past 20 years (through 1991). However, in the electrical, scientific instruments, electronics, and computing sectors, the value of capitalized R and D fell precipitously, becoming close to zero at the end of the 1980s in the electronics and computing sectors. This result admits of two (related) interpretations: either the expected return to future investments in these industries is very low, or the past investments have experienced a much faster depreciation of economic returns than the rate at which they are traditionally capitalized (15 percent).

Ex post results on the contribution of R and D investment to firm revenue support this interpretation. They show that the contribution of R and D to sales growth was low during the 1970s and the first half of the 1980s but has increased recently, except in the electrical industry and in the large-firm part of the computing, machinery, metals, and motor vehicle industries. The overall explanation for these findings is that the very substantial restructuring of the manufacturing sector during the 1980s raised the valuation of ordinary capital (and of R and D capital in the medium-technology sectors). At the same time entry by smaller firms and new technology coupled with a speedup in product cycles eroded the profits in the electrical and computing sectors, leading to a substantial decline in the valuation of their investments.[7] It is noteworthy that although the private returns in these sectors have been low, the benefits that have spilled over to consumers have been large: almost all of the productivity gains in the computing and electronics sectors have gone to the purchasers of their products rather than to the industry itself. This is another piece of evidence of the

gap between the private and social returns to R and D.[8]

Market Myopia Toward R and D

The argument that a liquid market for corporate capital such as the United States experienced during the 1980s is not a market that encourages investment in innovation often goes hand-in-hand with complaints about short-termism in U.S. equity markets. That is, analysts are focused on short-term earnings rather than on the potential payoff from long-term investments, and this discourages firms from undertaking them. One way to examine this claim is to measure the discount rate that investors implicitly are applying to the cash dividend streams they expect to receive from holding the shares in a company. Do they penalize firms that have low current earnings and high R and D investment rates?

The answer to this question is no.[9] Although it is perfectly true that the average discount rate that investors apply to the future cash dividends of firms is somewhat higher than the rate at which they discount Treasury bills and bonds (as earlier researchers have found), it is lower than average for firms with either higher R and D investment or higher capital spending, and higher than average for firms with high current earnings.[10] In addition, this discount rate seems to have fallen somewhat during the 1980s, suggesting that investors have become less myopic, if anything. In some respects, this finding is the mirror image of the findings discussed earlier: if anything, investors in the late 1970s and early 1980s were overly optimistic about the future profits to be earned from R and D investments in some sectors, leading to a tendency to discount such investments at a low rate.

R and D Tax Policy and the Cost of Capital

The potential for market failure in the allocation of resources for industrial research has led to a desire for further understanding of the cost of capital faced by firms undertaking R and D and of the effects of corporate tax provisions on that cost of capital. Recent research has addressed both these questions. In addition to the normal considerations that apply to the cost of any type of investment, two features of R and D require special consideration: first, the very fact that it typically creates an intangible, highly idiosyncratic and risky asset will tend to increase the effective cost faced by firms. Second, the U.S. tax system contains several features intended to reduce this cost for R and D-performing firms, among them the expensing of most R and D, the rules on the allocation of R and D spending to foreign source income, and most importantly, the incremental Research and Experimentation Tax Credit.[11]

The asset created by R and D is to a great extent intangible knowledge, embodied only in scientists and engineers. Its value is typically difficult to signal to the market ex ante (even if it is known). Therefore we might expect firms to find internal funds much cheaper than external, and equity cheaper than debt (because of the lack of a securable asset) when financing this investment. Whether or not this is true matters, both because many innovative firms find it difficult to generate the earnings necessary for investment and because our tax system has an implicit subsidy for debt financing relative to equity.

It is easy to find evidence for the preference of R and D-intensive firms for equity over debt, but somewhat more difficult to evaluate the importance of the "liquidity" constraint for these firms.[12] There are two reasons for this difficulty: first, in general, finding that investment of any kind is sensitive to cash flow always admits of two interpretations. Either the firm is responding to positive or negative demand shocks that appear as changes in cash flow, or the firm indeed finds internal funds a cheaper source of capital, and so it increases investments when these increase. Second, for R and D investment in particular, adjustment costs are high, and firms have incentives to smooth their investment paths. This fact will moderate any year-to-year responsiveness to liquidity, although at the same time it implies that firms will underinvest even more.[13] In spite of these problems, a series of studies has documented the importance of liquidity constraints for R and D investment by U.S. firms.[14]

Evidence that firms are not able to capture all the returns to R and D investments, in spite of the legal mechanisms available, including patenting and trade secret protection, implies that society as a whole would be better off if we could induce firms to perform more R and D. The R and D tax credit, which has been a feature of the U.S. tax system since 1981, is the most prominent and wide-ranging of the government policies designed for this purpose.[15] Before 1985, most researchers found relatively weak evidence that firms responded to the tax credit by increasing their R and D spending.[16] Most attributed this to the fact that the effective tax credit faced by most firms amounted to a reduction of 5 percent in the marginal

cost of R and D, rather than the statutory rate of 25 percent.

New results suggest that by 1990 the tax credit has become more effective, in that the amount of additional R and D spending induced by the credit has been greater than the cost in foregone tax revenue.[17] This has occurred in spite of the fact that the effective credit rate is small, because the average tax price elasticity for R and D spending is around one in the short run, and also because it has taken firms some time to adjust to the continuing presence of the tax credit in our corporate tax system.[18]

International Comparisons

Many questions about the role of the government and institutional environment in promoting innovation are difficult to answer by studying the experience of a single country. The conclusion that U.S. firms probably were investing and disinvesting "correctly" on average during the 1980s, given the behavior of the stock market, real interest rates, and other macroeconomic factors does not really answer the question of whether other environments might elicit a more socially productive level of investment. To explore such questions as these, we have begun a collaboration with colleagues in several European countries that differ in various ways from the United States.

The initial results of this project are described in a comparative study using about 1000 manufacturing firms each from France and the United States.[19] We find that the contribution of R and D to sales productivity growth declined during the 1980s in France as well as in the United States. The simultaneity among sales growth and both R and D and ordinary investment is somewhat higher in the United States than in France, possibly reflecting the greater importance of liquidity constraints for investment in the United States. Future work will incorporate comparisons to the United Kingdom, Germany, and Japan.

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[1]*See R. R. Nelson, "The Simple Economics of Basic Scientific Research,"* Journal of Political Economy *(1959), pp. 297–306; and K. Arrow, "Economic Welfare and the Allocation of Resources for Invention," in* The Rate and Direction of Inventive Activity, *R. R. Nelson, ed. Princeton: Princeton University Press, 1962, pp. 609–625. Empirical evidence on the topic has been surveyed by Z. Griliches, "The Search for R and D Spillovers," NBER Reprint No. 1758, November 1992, and* Scandinavian Journal of Economics, *(1992).*

[2]*See B. H. Hall, "The Effect of Takeover Activity on Corporate Research and Development," NBER Reprint No. 1091, December 1988, and in* The Economic Effects of Takeover Activity, *A. J. Auerbach, ed. Chicago: University of Chicago Press, 1988; and "The Impact of Corporate Restructuring on Industrial Research and Development,"* Brookings Papers on Economic Activity *(1990:1), pp. 85–136; and "Corporate Restructuring and Investment Horizons,"* Business History Review *68 (Spring 1994), pp. 110–143.*

[3]*See B. H. Hall, "The Effect of Takeover Activity . . ." and "The Impact of Corporate Restructuring . . . ," ops. cit.*

[4]*See the evidence reviewed in B. H. Hall, "Corporate Restructuring . . . ," op. cit. For a different way of looking at the same phenomenon, see M. C. Jensen, "The Modern Industrial Revolution, Exit, and the Failure of Internal Control Systems,"* Journal of Finance *48 (1993), pp. 831–850.*

[5]*This point also has been made by M. M. Blair and R. E. Litan, "Corporate Leverage and Leveraged Buyouts in the Eighties," in* Debt, Taxes, and Corporate Restructuring, *J. B. Shoven and J. Waldfogel, eds. Washington, DC: Brookings Institution, 1990.*

[6]*See B. H. Hall, "Industrial Research During the 1980s: Did the Rate of Return Fall?" NBER Reprint No. 1858, March 1994, and* Brookings Papers on Economic Activity: Microeconomics *2 (1993), pp. 289–344; and "The Stock Market Valuation of Research and Development Investment During the 1980s,"* American Economic Review *83 (May 1993), pp. 259–264, for the evidence discussed here.*

[7]*See B. H. Hall, "The Stock Market Valuation . . . ," op. cit.*

[8]*See B. H. Hall, "The Private and Social Returns to Research and Development: What Have We Learned?" paper presented to the American Enterprise Institute/Brookings Institution Conference on the Contributions of Research to Economic Growth and Society, Washington, DC, October 1994 (forthcoming in the conference volume); and Z. Griliches, "Productivity and the Data Constraint,"* American Economic Review *84 (1994), pp. 1–43 for more detailed discussion.*

[9]*See B. H. Hall and R. E. Hall, "The Value and Performance of U.S. Corporations,"* Brookings Papers on Economic Activity *(1993:1), pp. 1–50.*

[10]*See, for example, R. Mehra and E. C. Prescott, "The Equity Premium: A Puzzle,"* Journal of Monetary Economics *19 (1985), pp. 145–161.*

[11]*For a review of the foreign source income allocation rules for R and D intensity in the cross section, see J. R. Hines, Jr., "International Taxation,"* NBER Reporter, *Fall 1994, pp. 10–15.*

[12]*For evidence that leverage is inversely correlated with R and D intensity in the cross section, see M. S. Long and I. B. Malitz, "Investment Patterns and Financial Leverage," in* Corporate Capital Structures in the United States, *B. M. Friedman, ed. Chicago: University of Chicago Press, 1985; and B. H. Hall, "Research and Development Investment at the Firm Level: Does the Source of Financing Matter?" NBER Working Paper No. 4096, June 1992.*

[13]*See B. H. Hall and F. Hayashi, "Research and Development as an Investment," NBER Working Paper No. 2973, May 1989; Z. Griliches, B. H. Hall, and A. Pakes, "R&D, Patents, and Market Value Revisited: Is There a Second (Technological Opportunity) Factor?"* Economics of Innovation and New Technology *1 (1991), pp. 183–202; S. Lach and M. Schankerman, "Dynamics of R&D and Investment in the Scientific*

Sector," Journal of Political Economy *97 (1988), pp. 880–904; and J. L. Bernstein and M. I. Nadiri, "Financing and Investment in Plant and Equipment and Research and Development," in* Prices, Competition, and Equilibrium, *M. H. Peston and R. E. Quandt, eds. Oxford, England: Philip Allan, 1986, pp. 233–248, for evidence that R and D spending is relatively smooth within firms and displays high adjustment costs.*

[14]See B. H. Hall, "Research and Development Investment at the Firm Level . . . ," op. cit., and C. P. Himmelberg and B. C. Peterson, "R&D and Internal Finance: A Panel Study of Small Firms in High Tech Industries," Review of Economics and Statistics *(1994), pp. 38–51.*

[15]Many countries have similar measures, including Canada, France, and Japan among the G-7 countries.

[16]See R. Altshuler, "A Dynamic Analysis of the Research and Experimentation Credit," National Tax Journal *41 (1988), pp. 453–466; R. Eisner, S. H. Albert, and M. A. Sullivan, "The New Incremental Tax Credit for R&D: Incentive or Disincentive?"* National Tax Journal *37 (1984), pp. 171–183; and E. Mansfield, "The R&D Tax Credit and Other Technology Policy Issues,"* American Economic Review *76, pp. 190–194.*

[17]See B. H. Hall, "R and D Tax Policy During the Eighties: Success or Failure?" in Tax Policy and the Economy, Volume 7, *J. M. Poterba, ed., Cambridge: MIT Press, 1993, pp. 1–36; M. N. Baily and R. Z. Lawrence, "Tax Incentives for R&D: What Do the Data Tell Us?" study commissioned by the Council on Research and Technology, Washington, DC (1992); and "Fiscal Policy Towards R&D in the United States: Recent Experience," paper presented to the OECD Meeting on Fiscal Policy and Innovation, Paris, France, January 19, 1995, Paris: OECD, forthcoming.*

[18]See B. H. Hall, "R and D Tax Policy During the Eighties . . . ," op. cit., and J. R. Hines, Jr., "On the Sensitivity of R and D to Delicate Tax Changes: The Case of U.S. Multinationals," in International Taxation, *A. Giovannini, R. G. Hubbard, and J. B. Slemrod, eds., Chicago: University of Chicago Press, 1994. For estimation of an R and D price elasticity that does not rely on the tax treatment, see J. I. Bernstein and M. I. Nadiri, "Interindustry R&D Spillovers, Rates of Return, and Production in High Tech Industries,"* American Economic Review *78 (1988), pp. 429–434.*

[19]See B. H. Hall and J. Mairesse, "Exploring the Relationship Between R and D and Productivity in French Manufacturing Firms," NBER Reprint No. 1962, April 1995, and Journal of Econometrics *65 (1995), pp. 263–293; and "Estimating the Productivity of Research and Development: An Exploration of GMM Methods Using Data on French and United States Manufacturing Firms," in* International Productivity Comparisons, *Wagner, Karin, and van Ark, eds., Amsterdam: Elsevier-North Holland, forthcoming.*

Incomplete Contracts

Oliver D. Hart

Economists have a very well-established theory of market trading, and are on the way to a similarly well-developed theory of contractual transactions. However, the economic analysis of institutions is in a much more rudimentary state. This article discusses a recent literature that tries to provide a framework for thinking about economic institutions such as firms. The basic idea is that firms arise in situations in which people cannot write good contracts, and in which the allocation of power or control is therefore important.[1]

The starting point of this recent literature—which is sometimes called the "incomplete contracting" approach—is that it is prohibitively expensive for parties to write a contract governing their economic relationship that is all-inclusive, that is, that anticipates all the many things that may happen. Instead, parties will write a contract that is incomplete, and that will be revised and renegotiated as the future unfolds. The contract they write can be seen as a backdrop or starting point for such renegotiations, rather than a specification of the final outcome. Thus, the parties look for a contract that will ensure that, whatever happens, each side has some protection, both against opportunistic behavior by the other party and against bad luck.[2]

In a world of incomplete contracts, the ex post allocation of power (or control) matters. Here power refers roughly to the position of each party if the other party does not perform (for example, if the other party behaves opportunistically). These two ideas—contractual incompleteness and power—can be used to understand a number of economic institutions and arrangements. I discuss some of these in the remainder of this article.

The Meaning of Ownership

Economists have written a great deal about why property rights are important, and in particular why it matters, for example, whether a machine is privately owned or is common property. However, they have been less successful in explaining why it matters who owns a piece of private property. To understand the difficulty, consider a situation in which I want to use a machine that you own. I can buy the machine from you or rent the machine from you. If there are no contracting costs, then we can sign a rental agreement that is as effec-

tive as a change in ownership. In particular, the rental contract can specify exactly what I can do with the machine; when I can have access to it; what happens if the machine breaks down; what rights you have to use the machine; and so on. Given this, however, it is unclear why changes in asset ownership ever need to take place.

In a world with contracting costs, though, renting and owning are no longer the same. If contracts are incomplete, not all the uses of the machine will be specified in all possible eventualities. The question then arises; who chooses the unspecified uses? A reasonable view is that the owner of the machine has this right; that is, the owner has residual rights of control over the machine, or residual powers. For example, if the machine breaks down or requires modification and the contract is silent about this, then the owner can decide how and when it is repaired or modified.

Now it is possible to understand why it might make sense for me to buy the machine from you, rather than to rent it. If I own the machine, I will have more power in our economic relationship, since I will have all the residual rights of control. To put it another way, if the machine breaks down or needs to be modified, I can ensure that it is repaired or modified quickly, so that I can continue to use it productively. Knowing this, I will have a greater incentive to look after the machine, to learn to operate it, to acquire other machines that create a synergy with this machine, and so on.

The Boundaries of Firms

A long-standing issue in organization theory concerns the determinants of the boundaries of firms. Why does it matter if a particular transaction is carried out inside a firm, or through the market, or via a long-term contract? To put it another way, given any two firms (A and B), what difference does it make if the firms transact through an arms-length contract, or merge and become a single firm?

It is difficult to answer these questions using standard theory for the same reason that it is hard to explain why asset ownership matters. If there are no contracting costs, then the two firms can write a contract governing their relationship that specifies the obligations of all parties in all eventualities. Since the contract is all-inclusive, it is unclear what further aspects of their relationship could be controlled through a merger. This is true whether firm A is buying an input from firm B, or firms A and B sell complementary products and want to save on some duplicative production costs.

But since contracts are incomplete, it is possible to explain why a merger might be desirable. Consider the well-known example of Fisher Body, which for many years supplied car bodies to General Motors (GM). For a long time, Fisher Body and GM were separate firms linked by a long-term contract. However, in the 1920s, GM's demand for car bodies increased substantially. After Fisher Body refused to revise the formula for determining price, GM bought Fisher out.[3]

Why did GM and Fisher Body not simply write a better contract? Arguably, GM recognized that, however good a contract it wrote with Fisher Body, situations similar to the one it had just experienced might arise again; that is, contingencies might occur that no contract could allow for. GM wanted to be sure that next time around it would be in a stronger bargaining position; in particular, it would be able to insist on extra supplies, without having to pay a great deal for them. It is reasonable to suppose that ownership of Fisher Body would provide GM with this extra power by giving it residual control rights over Fisher Body's assets. At an extreme, GM could dismiss the managers of Fisher Body if they refused to accede to GM's requests.[4]

Of course, although the acquisition increased GM's power and made GM more secure in its relationship with Fisher Body, it arguably had the opposite effect on Fisher Body. That is, Fisher Body may have had more to worry about after the merger. For example, if Fisher Body's costs fall, GM is now in a stronger position to force a reduction in the (transfer) price of car bodies, hence reducing the return to Fisher managers. Anticipating this, Fisher managers may have less incentive to figure out how to reduce costs. Thus, there are both costs and benefits from a merger.[5]

Together with Sanford J. Grossman and John Moore, I have developed a theory of the firm based on the idea that firm boundaries are chosen to allocate power optimally among the various parties to a transaction.[6] This work argues that power is a scarce resource that never should be wasted. One implication of the theory is that a merger between firms with highly complementary assets enhances value, and a merger between firms with independent assets reduces value. If two highly complementary firms have different owners, then neither has real power, since neither can do anything without the other. It is then better to give all the power to one of the owners through a merger. On the other

hand, if two firms with independent assets merge, then the acquiring firm's owner gains little useful power, since the acquired firm's assets do not enhance their activities. The acquired firm's owners lose useful power, though, since they no longer have authority over the assets they work with. In this case, it is better to divide the power between the owners by keeping the firms separate.

Financial Securities

A. Debt

Suppose you have an interesting idea for a business venture, but do not have the capital to finance it. You go to a bank to get a loan. In deciding whether to finance the project, the bank is very likely to consider not only the return stream from the project, but also the resale value of any assets you have or will acquire using the bank's funds; in other words, the bank will be interested in the potential collateral for the loan. In addition, the durability of your assets and how quickly the returns come in are likely to determine the maturity structure of the loan. The bank will be more willing to lend long-term if the loan is supported by assets such as property or machines than if it is supported by inventory, and if the returns arrive in the distant future rather than right away.

These observations fit in well with the ideas of incomplete contracts and power. The bank wants some protection against worst-case scenarios. If there is very little collateral underlying the loan, then the bank will worry that you will use its money unwisely or, in an extreme case, disappear with the money altogether. Similarly, if the collateral depreciates rapidly or the returns come in quickly, then the bank would be unhappy with a long-term loan: it would have little protection against your behaving opportunistically when the collateral was no longer worth much, or after the project returns had been realized (and "consumed"). Basically, the bank wants to ensure a rough balance between the value of the debt outstanding and the value remaining in the project, including the value of the collateral, at all times.

Moore and I have developed a theory of debt finance based on these ideas, and derived results about the kinds of projects that will be financed.[7]

B. Equity

Investors who finance business ventures sometimes take equity in the venture rather than debt. Unlike debt, equity does not have a fixed set of repayments associated with it, with nonpayment triggering default. Rather, equity-holders receive dividends if and when the firm chooses to pay them. This potentially puts equity-holders at the mercy of those running the firm, who may choose to use the firm's profits to pay salaries or to reinvest rather than to pay out dividends. Thus equity-holders need some protection. Typically, they get it in the form of votes. If things become bad enough, equity-holders have the power to remove those running the firm (the board of directors) and replace them with someone else.

However, giving outside equity-holders voting power brings costs as well as benefits. Equity-holders can use their power to take actions that ignore the (valid) interests of insiders. For example, they might close down an established, family-run business or force the business to terminate long-standing employees. Philippe Aghion and Patrick Bolton have analyzed the optimal allocation of power between insiders and outsiders.[8]

Dispersed Power

So far I have supposed that those with power wield it. That is, I have assumed that owners will exercise their residual control rights over assets; for example, equity-holders will use their votes to replace a bad manager. However, if many people hold power, then no one of them may have an incentive to be active in exercising this power. Then it is important that there be automatic mechanisms for achieving what those with power are unable or unwilling to do by themselves.

A leading example of dispersed power is the case of a public company with many small shareholders. Shareholders cannot run the company themselves on a day-to-day basis, so they delegate power to a board of directors and to managers. This creates a free-rider problem: an individual shareholder does not have an incentive to monitor management, since the gains from improved management are enjoyed by all shareholders, whereas the costs are borne only by those who are active. Because of this free-rider problem, the managers of a public company have a fairly free hand to pursue their own goals: these might include empire-building, or the enjoyment of perquisites.

Two "automatic" mechanisms can improve the performance of management: debt (in combination with bankruptcy) and takeovers. Debt constrains managers. If a company has a significant amount of debt, then management is faced

with a simple choice: reduce slack—that is, cut back on empire-building and perquisites—or go bankrupt. If there is a significant chance that managers will lose their jobs in bankruptcy, then they are likely to choose the first option.

Takeovers provide a potential way to overcome problems involving collective action among shareholders. If a company is badly managed, then there is an incentive for someone to acquire a large stake in the company, improve performance, and make a gain on the shares or votes purchased. The threat of such action can persuade management to act in the interest of shareholders.

The view of debt as a kind of constraint can explain the types of debt that a company issues (for example, how senior the debt is, or whether it can be postponed).[9] The possibility of takeovers can explain why many companies bundle votes and dividend claims together—that is, why they adopt a one share–one vote rule. One share–one vote protects shareholder property rights: it maximizes the chance that a control contest will be won by a management team that provides high value for shareholders, rather than high private benefits for itself.[10]

Bankruptcy

Of course, if a company takes on debt, then there is always the chance that it will go bankrupt. If there were no contracting costs, then there would be no need for a formal bankruptcy procedure, because every contract would specify what should happen if some party could not meet its debt obligations. However, in a world of incomplete contracts, there is a role for bankruptcy procedure. A bankruptcy procedure should have two main goals: First, a bankrupt company's assets should be placed in their highest-value use. Second, bankruptcy should be accompanied by a loss of power for management, to ensure that management has the right incentive to avoid bankruptcy. Aghion, Moore, and I have been working on a procedure that tries to meet these goals, and at the same time avoids some of the inefficiencies of existing U.S. and U.K. procedures.[11]

Our basic idea of the procedure is that a bankrupt company's debts are canceled and the company is put up for auction (the auction would be supervised by a judge, say). However, in contrast to a standard auction, noncash bids are permitted. A noncash bid allows existing management, or any other management team for that matter, to propose a reorganization plan. As an example of a noncash bid, incumbent management might offer former claimants shares in a new (debt-free) company managed by the old management team. Alternatively, managers might offer former claimants a combination of shares and bonds in the post-bankruptcy company.

At the same time that bids are being made for the company, an automatic debt–equity swap takes place. Senior creditors of the company receive equity in the new (post-bankruptcy) company, while junior creditors and former shareholders receive options to buy equity (the exercise price of the options issued to each class is set equal to the amount owed to classes senior to that class).[12] After the bids come in—three months might be allowed for this—another month or so is allowed for option-holders to exercise their options. The final step in the process is that the company's equity-holders (that is, those people who hold equity in the company at the end of the fourth month) vote on which of the various cash and noncash bids to select. Once the vote is completed, the winning bid is implemented and the firm emerges from the bankruptcy process.

This procedure has the advantage relative to Chapter 7 of the U.S. Bankruptcy Code that it allows for the firm to be restructured as a going concern if this is efficient. It has the advantage relative to Chapter 11 of the U.S. Bankruptcy Code that bargaining between different claimant groups with possibly conflicting interests is avoided: instead the firm's future is decided by a simple vote by a homogeneous class of shareholders.

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[1]*For a more extensive discussion of this literature, see O. D. Hart,* Firms, Contracts, and Financial Structure, *Oxford, England: Oxford University Press, forthcoming in late 1995. This article is based on the introduction to this book.*

[2]*The incomplete contracting approach borrows a great deal from the earlier transaction cost literature. See, in particular, R. H. Coase, "The Nature of the Firm,"* Economica *4 (1937), pp. 386–405; B. Klein, R. Crawford, and A. Alchian, "Vertical Intergration, Appropriable Rents, and the Competitive Contracting Process,"* Journal of Law and Economics *21/2 (1978), pp. 297–326; and O. Williamson,* The Economic Institutions of Capitalism, *New York: Free Press, 1985.*

[3]*For interesting and informative discussions of the GM–Fisher Body relationship, see Klein, Crawford, and Alchian, op. cit.; and B. Klein, "Vertical Integration as Organizational Ownership: The Fisher Body–General Motors Relationship Revisited,"* Journal of Law, Economics and Organization *4/1 (1988). pp. 199–213.*

[4]*There has been some debate about whether GM did in fact increase its*

power over Fisher Body by buying Fisher Body out. See R. H. Coase, "The Nature of the Firm: Influence," Journal of Law, Economics and Organization, *4/1 (1988) p. 45.*

[5]*Sometimes the costs of a merger will exceed the benefits. This may explain why GM did not merge with A. O. Smith, which has supplied a significant fraction of its automobile frames for many years. For a discussion of the A. O. Smith case, see Coase, "The Nature of the Firm: Influence," op. cit.; and Klein, "Vertical Integration as Organizational Ownership . . . ," op. cit.*

[6]*See 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; and O. D. Hart and J. Moore, "Property Rights and the Nature of the Firm,"* Journal of Political Economy *98 (1990), pp. 1119–1158. See also Hart,* Firms, Contracts, and Financial Structure, *op. cit., Chapters 2-4.*

[7]*O. D. Hart and J. Moore, "A Theory of Debt Based on the Inalienability of Human Capital," NBER Reprint No. 1963, April 1995, and* Quarterly Journal of Economics *109 (1994), pp. 841–879; and "Default and Renegotiation: A Dynamic Model of Debt," MIT Working Paper No. 520, 1989. For related work, see P. Aghion and P. Bolton, "An 'Incomplete Contracts' Approach to Financial Contracting,"* Review of Economic Studies *59 (1992), pp. 473–494; and P. Bolton and D. Scharfstein, "A Theory of Predation Based on Agency Problems in Financial Contracting,"* American Economic Review *80 (1990), pp. 94–106.*

[8]*See Aghion and Bolton, "An 'Incomplete Contracts' Approach. . . ," op. cit.*

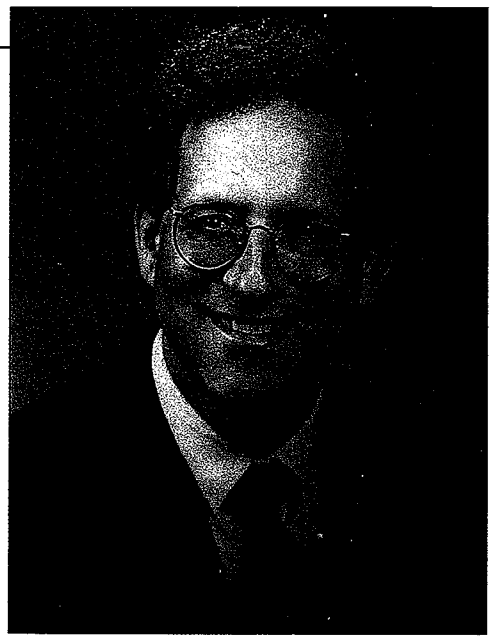
[9]*O. D Hart and J. Moore, "Debt and Seniority: An Analysis of the Role of Hard Claims in Constraining Management," NBER Working Paper No. 4886, October 1994, and* American Economic Review, *(June 1995), pp. 567–585; and O. D. Hart, "Theories of Optimal Capital Structure: A Managerial Discretion Perspective," NBER Reprint No. 1806, September 1993, and in* The Deal Decade: What Takeovers and Leveraged Buyouts Mean for Corporate Governance, *M. Blair, ed. Washington, DC: The Brookings Institution, 1993, pp. 19–43. See also M. Jensen, "Agency Costs of Free Cash Flow, Corporate Finance and Takeovers," American Economic Review 76 (1986), pp. 323–329.*

[10]*S. J. Grossman and O. D. Hart, "One Share–One Vote and the Market for Corporate Control,"* Journal of Financial Economics *20 (1988), pp. 175–202. See also M. Harris and A. Raviv, "Corporate Governance: Voting Rights and Majority Rules,"* Journal of Financial Economics *20 (1988), pp. 203–235.*

[11]*P. Aghion, O. D. Hart, and J. Moore, "The Economics of Bankruptcy Reform," in* The Transition in Eastern Europe, *O. J. Blanchard, K. A. Froot, and J. D. Sachs, eds. Chicago: University of Chicago Press, 1994; "Improving Bankruptcy Procedure,"* Washington University Law Quarterly *72 (1994), pp. 849–872; and "Insolvency Reform in the United Kingdom: A Revised Proposal,"* Insolvency Law and Practice *11/3 (1995), pp. 4–11.*

[12]*The use of options in the debt–equity swap is based on an idea of Lucian Bebchuk. See A. L. Bebchuk, "A New Approach to Corporate Reorganizations,"* Harvard Law Review *101 (1988), pp. 775–804.*

NBER Profile: *Stephen G. Cecchetti*



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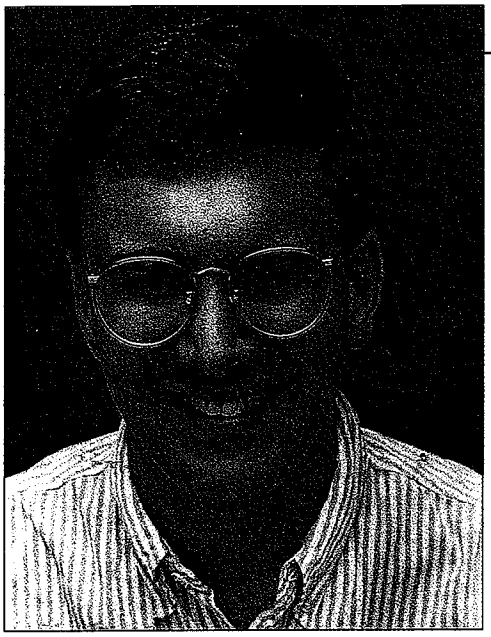
Over the past ten years, Cecchetti has published over 30 articles in scholarly journals, covering specific aspects of banking, securities markets, financial economics, inflation and price measurement, monetary policy, macroeconomic theory, and resource economics. He also serves as the editor of the *Journal of Money, Credit, and Banking.*

Cecchetti's wife, Ruth Charney, is a professor of mathematics at Ohio State University. They have two sons: Daniel, 8, and Ethan, 4. Cecchetti often can be seen pitching at Little League games, or chasing Daniel down ski slopes in northern New England.



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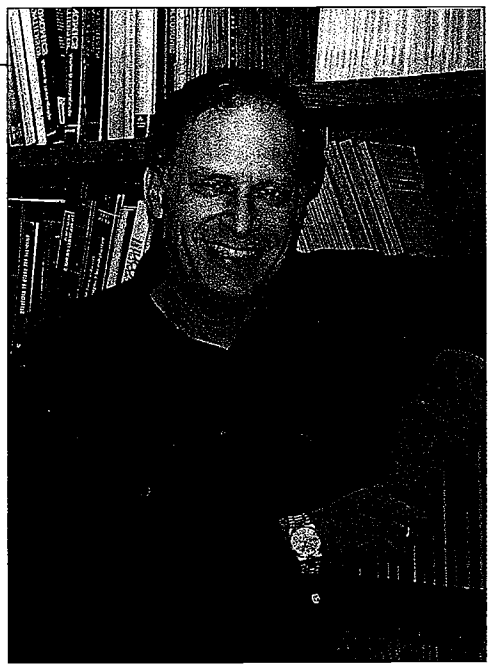
Gruber's wife, Andrea, holds a Masters of Divinity from Harvard University. She is currently working at home, caring for their infant son, Samuel. Jon and Andrea enjoy the theater and spectator sports, and used to like to travel.

NBER Profile: *Oliver D. Hart*



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nomic theory, mathematical economics, theory of the firm, and law and economics. He is a fellow of the Econometric Society and the American Academy of Arts and Sciences, and his work has been published in a number of prominent journals.

Hart is married to Rita Goldberg, who teaches in the literature concentration and the extension school at Harvard, and who is a contributing writer at the *Boston Book Review*. They have two sons, Daniel (18), who will be a freshman in communications at the University of Miami (Florida) next year, and Benjamin (12), who is at the Clarke Middle School in Lexington, MA. Hart enjoys swimming, playing tennis, and going to the theater.

Conferences

Health and Welfare During Industrialization*

Participants from the Americas, Europe, and the Pacific Rim convened in Cambridge on April 21–22 for an NBER Conference on Health and Welfare During Industrialization. The overall project responsible for this gathering seeks to answer one of the longest-lived and most important questions in economic history: how does industrialization affect the health and welfare of a population? The question, originating in the 19th-century standard of living debate over the lives of the working class during England's Industrial Revolution, is being addressed in the project using evidence from eight countries and a vast array of data ranging from records on nutrition and stature to statistics on morbidity and mortality. NBER Research Associates Richard H. Steckel, Ohio State University, and Roderick Floud, London Guildhall University, organized this program:

Stanley L. Engerman, NBER and University of Rochester, "The Standard of Living Debate in International Perspective"
Discussant:
Robert E. Gallman, NBER and University of North Carolina

Dora Costa, NBER and MIT, and **Richard H. Steckel,** "Long-Term Trends in Health, Welfare, and Economic Growth in the United States"
Discussant:
Clayne L. Pope, NBER and Brigham Young University

Roderick Floud, and **Bernard Harris,** University of Southampton, "British Industrialisation and Changing Stature, 1750–1990"
Discussant:
Peter Temin, NBER and MIT

Lars Sandberg, Ohio State University, and **Richard H. Steckel,** "Was Industrialization Hazardous to Your Health? Not in Sweden!"
Discussant:
Timothy Guinnane, Yale University

David Weir, University of Chicago and National Opinion Research Center, "Economic Welfare and Physical Well-Being in France, 1750–1990"
Discussant:
Robert A. Margo, NBER and Vanderbilt University

Stephen Nicholas, University of Melbourne, and **Paul Johnson,** London School of Economics, "Health and Welfare of Women in the United Kingdom, 1790–1920"
Discussant:
Jane Humphries, Cambridge University

Gail A. M. Honda, University of Chicago, "Differential Structure, Differential Health: Industrialization in Japan, 1868–1946"
Discussant:
Peter Timmer, Harvard University

Sophia Twarog, United Nations, Geneva, "Heights and Living Standards in Germany, 1850–1940"
Discussant:
John Brown, Clark University

J. W. Drukker and **Vincent Tassenaar,** University of Groningen, "Heights and Health in the Netherlands"
Discussant:
Joel Mokyr, Northwestern University

Christine de Souza, Monash University, and **Stephen Nicholas** and **Greg Whitwell,** University of Melbourne, "Height, Health, and Economic Growth in Australia, 1860–1940"
Discussant:
Michael R. Haines, NBER and Colgate University

Engerman opened the conference with a sweeping analysis of standard of living indicators in historical perspective from the 17th century to the present. Beginning at least as far back as William Petty's estimates of national income in 1665, economists and historians have wrestled with various measures of economic and social progress. Population, used as a proxy for economic growth and living standards in the 18th century, was followed by mortality, life expectation, real wages, literacy, occupational structure, per capita income, and the Human Development Index (HDI). Over the past two de-

cades, height has risen to prominence as a measure of standard of living. Height at specific ages, Engerman explained, is evolving into an important measure because of the relative ease of access to data, the generally high correlation between height and income, and the physiological relationships among nutrition, disease, and height. He then posed the foremost question of the conference and its 400-year historiographical precedent: Can one measure be fully satisfactory in capturing the standard of living? Engerman concluded by suggesting that perhaps the best strategy is to accept the specific contribution of each indicator while maintaining an awareness of its inherent complexities and difficulties.

Costa and **Steckel**'s work on long-term trends in economic growth and health in the United States synthesized previous evidence on stature and mortality in the 19th and 20th centuries and new evidence on body mass index (BMI), lean body mass, waist–hip ratio (WHR), and prevalence of chronic conditions. Regarding previous evidence, perhaps the most perplexing problem of secular trends in height in the United States concerns the decline in average height of white, native-born soldiers in the 19th century during what was considered to be a period of economic prosperity. Many theories for this 19th-century decline in health have been proposed, such as greater exposure to infectious diseases, greater inequality in distribution of income, and deterioration in diet. To date, there has been no strong consensus. Costa discussed BMI—defined as weight in kilograms divided by the square of height in meters—which may turn out to be an even stronger determinant of productivity, morbidity, and mortality than height. She then introduced WHR, a measure of abdominal body fat, which has been shown to be a good indicator of risk of death, especially risk of fatal heart disease. All of these measures have been shown to be related to chronic conditions: improvements in these measures have been accompanied by a decline in chronic conditions over the past century.

Floud and **Harris** discussed changes in height, health, and welfare in Britain over the past 250 years. Harris elucidated three main topics on British health: general debates over indicators of the standard of living, secular trends in adult male heights, and the impact of exogenous events on children's heights. Much of the standard of living controversy has focused on the measurement of real wages, the rate of decline in mortality, the opportunities for education, and levels of literacy in industrializing Britain. Out of this debate has emerged an interest in heights. Given the controversial nature of British economic historiography, it is not surprising that much of the original work on 18th- and 19th-century adult male heights has been challenged on both data quality and methodology. Harris showed that although World War I had little impact on children's heights, there were definite improvements in children's height during World War II. He concluded by demonstrating that the HDI for Britain exhibited slow and steady improvement over the past 250 years.

Sandberg and **Steckel** note that the case of Sweden provides an interesting contrast to those of the United States and Great Britain. Industrialization in Sweden was late, rapid, and remained largely semirural. After 1870, improvement in health accelerated and continued with industrialization, with the exceptions of downturns during World War I and the Spanish influenza pandemic. Sandberg argues that this relatively smooth upward trend was caused largely by the spread of industrialization to rural and semirural areas. Thanks to limited urbanization, the short stature and poor health of inhabitants witnessed in the "veritable pest-hole" of Stockholm in the mid-19th century did not become a national phenomenon. Moreover, the disparities in health between the North, whose population was taller than the national average, and Stockholm began to disappear by the late 19th century. By the 1930s regional and class differences in height had vanished, because of better nutrition, better medical care, and government-financed public health measures.

Weir delineated characteristics of France's economic development that set it apart from other European countries. Slow population growth caused by restrained marital fertility and a wider distribution of property ownership led to an overall gradual transformation of the economy, although there were significant regional differentials. As an example, Weir points to the striking urban–rural differences in meat consumption per capita throughout the 19th century; the decided advantage was in urban areas, especially in Paris. He attributes this to nonwage income spent in cities, as well as to the urban advantage in human capital and industrial wealth. During the 19th century, heights of conscripts into the French army improved slowly and steadily, whereas declines in mortality slowed considerably. In the 20th century, all indicators exhibited accelerated progress. It is

most difficult to assess human welfare of the French for 1780–1820, according to Weir, because of the complexity introduced by the Revolution, legal reform, war, and the Continental Blockade.

Nicholas and **Johnson** focus on the welfare of women in the United Kingdom. The data they use comprise detailed records of women either accused or found guilty of criminal offenses in the United Kingdom between 1817 and 1874. These data represent the working class as a whole, since the women were not hardened criminals, but rather ordinary working people who occasionally "supplemented their incomes by theft." In 1785 to 1815, female living standards as measured by height deteriorated relative to those of males, because fewer household resources were allocated to female infants and children. After 1815, female and male heights exhibited roughly the same trajectories of decline followed by improvement. These parallel patterns were largely the result of factors exogenous to the household, such as decreasing real wages and improved public works.

Honda began by outlining the salient features of Japan's prewar industrialization, 1868–1940. She investigates how heavy militarization and the differential structure of the economy—a widening gap in productivity and real wages between the traditional and modern sectors—affected the health of the Japanese people. She argues that frequent military aggression and heavy investment in defense kept government investment in public welfare low and resulted in minimal improvement in health during this period: life expectancy stagnated, infant mortality rates remained high, and millions succumbed to new diseases ushered in by contact with foreign environments. Furthermore, the differential structure of the economy was reflected in a "differential structure of health." Over time, industrial prefectures exhibited greater average heights and lower mortality and fertility rates, but higher stillbirth rates than agricultural prefectures. Honda concludes that Japan today is a model of health, with the highest life expectancy and lowest infant mortality rates in the world. These postwar health gains are equally if not more astonishing than postwar improvements in the economy.

Twarog's paper describes health and living standards in Wurttemberg. Wurttemberg was representative of the "average" German industrialization experience, lagging behind the early and heavy industrialization of the Ruhr, but more industrialized than such areas as lower Bavaria and East Prussia, which remained largely agricultural through 1940. The regional differentiation of Germany's industrialization also led to regional differences in heights. Unlike other European countries, however, those born in urban areas were taller than those born in rural areas. The urban advantage was attributed to good public health infrastructures, higher income, and better medical care. Regions exhibiting the shortest recruits and highest infant mortality were associated with lack of breastfeeding practices, or unusual ones, whereby the infant would not be given the breast if it was crying.

Drukker and **Tassenaar** presented a short sketch of three major geographical and socioeconomic regions in the Netherlands: the modern urban region of Noord-Holland and Zuid-Holland; the modern agricultural provinces of Zeeland, Groningen, and Friesland; and the remaining traditional rural regions of the east and southeast. There were significant differentials in mortality among regions beginning in 1800, with traditional rural regions exhibiting the lowest rates, modern urban regions the highest, and differentials converging over time beginning in the mid-19th century. In average height, tallest conscripts were from the traditional rural regions, and the shortest from modern urban areas, with differentials roughly increasing over time. These results have important implications for the hotly debated question of "retarded industrialization" in the 19th century. The striking differentials in welfare among the people indicate that the inequality in wealth and the nature of poverty were significantly different during this period, when compared with conditions during the "Golden Age" (1600–75) and the "Golden Age of Managed Capitalism" (1960s).

The final paper of the conference, by **de Souza, Nicholas**, and **Whitwell,** sheds new light on Australia's historical standard of living debate. It is commonly thought that the "golden age" of 1860–90 was followed by a period of economic decline through 1940. Whitwell demonstrates that these assumptions must be reassessed, using new evidence on heights of men and women enlisting in the Australian Army in the Boer War and in World Wars I and II. The drop in average conscript height in the 1870s and 1880s suggests that the decline in living standards began at least a decade before 1890. Furthermore, the stable height levels from 1890 to 1919 indicate sustained living standards during the three decades prior to World War I, although average height in 1919 had not recovered to levels observed 50 years earlier. In studies

of regional differences in the heights of schoolchildren during the early 20th century, it was found that "the more Australian the child is, the better the specimen." That is, the native-born child of Australian parents was on average taller and heavier than the native-born child of immigrant parents and the immigrant child.

The complete proceedings of this conference will be published as an NBER volume by the University of Chicago Press. Its availability will be announced in a future issue of the *NBER Reporter.*

**This report was prepared by Gail A. M. Honda, University of Chicago. An expanded version of it will appear in* The Newsletter of the Cliometric Society *10/2 (July 1995).*

URC: Financial Risk Assessment and Management

Nearly 60 economists met in Cambridge on May 8 and 9 for an NBER–Universities Research Conference on Financial Risk Assessment and Management. Kenneth J. Singleton, NBER and Stanford University, organized this program:

Christopher Géczy, University of Chicago;
Bernadette Minton, Ohio State University; and
Catherine Schrand, University of Pennsylvania, "Why Firms Hedge: Distinguishing Among Existing Theories"

Discussants:
Sheridan Titman, Boston College, and
David S. Scharfstein, NBER and MIT

Jacob Boudoukh,
Matthew Richardson, and
Robert F. Whitelaw, New York University; and
Richard Stanton, University of California, Berkeley, "Pricing Mortgage-Backed Securities in a Multifactor Interest Rate Environment: A Multivariate Density Estimation Approach" *and* "A New Strategy for Dynamically Hedging Mortgage-Backed Securities"

Discussants:
Yacine Ait-Sahalia, NBER and University of Chicago, and
Stanley E. Zin, NBER and Carnegie–Mellon University

Dilip Madan and
Haluk Unal, University of Maryland, "Pricing the Risks of Default"

Discussants:
Ehud Ronn, University of Texas, Austin, and
George M. Constantinides, NBER and University of Chicago

Mark Grinblatt, University of California, Los Angeles, "An Analytic Solution for Interest Rate Swap Spreads"

Discussants:
Robert Litzenberger, Goldman Sachs, and
Chi-Fu Huang, Long-Term Capital

Andrew Karolyi, Ohio State University, and
René M. Stulz, NBER and Ohio State University, "Why Do Markets Move Together? An Investigation of U.S.–Japan Stock Return Comovements Using ADRs"

Discussants:
Robert F. Stambaugh, NBER and University of Pennsylvania, and
John H. Cochrane, NBER and University of Chicago

Harold Y. Kim, Princeton University, and
Jianping Mei, New York University, "What Makes the Stock Market Jump? An Analysis of Political Risk on Stock Returns"

Discussants:
Kenneth R. French, NBER and Yale University, and
Joseph Cherian, Boston University

Jesus Saá-Requejo, University of Chicago, "The Dynamics of the Term Structure of Risk Premia in Foreign Exchange Markets"

Discussants:
Robert J. Hodrick, NBER and Northwestern University, and
David K. Backus, NBER and New York University

Yaacov Z. Bergman, Hebrew University, Jerusalem;
Bruce D. Grundy and
Zvi Wiener, University of Pennsylvania, "Theory of Rational Option Pricing: II"

Discussants:
Kaushik Amin, Lehman Brothers, and
Steve Grenadier, Stanford University

Robert F. Engle, NBER and University of California, San Diego, and
Joshua Rosenberg, University of California, San Diego, "Hedging Options in a GARCH Environment"

Discussants:
Jose Lopez, University of Pennsylvania, and
Torben Andersen, Northwestern University

Using data on the *Fortune* 500, **Géczy, Minton,** and **Schrand** test the implications of theories of hedging behavior. They view corporate decisions about hedging in a two-part framework: 1) recognizing the potential maximization of value that comes from reducing variance; and 2) identifying the most cost-effective product for reducing variance. They find that firms' hedging decisions are related positively to R and D expenditures, debt-to-equity ratios, and analyst following, and negatively to short-term liquidity and inventory turnover. Also, conditional on the decision to hedge, firms with higher debt-to-equity ratios and lower book-to-market values are more likely to choose interest rate derivative instruments than currency- or commodity-based products.

Boudoukh, Richardson, Stanton, and **Whitelaw** develop an approach to the pricing of mortgage-backed securities (MBS) based on the relationship between MBS prices and interest rates. They find that weekly MBS prices from January 1987 to May 1994 are a function of the level and slope of the term structure. As a test, they then use this estimated relationship to hedge the interest rate risk of MBSs. Their hedging results compare favorably with other commonly used hedging methods.

Madan and **Unal** model the risk of default as composed of arrival and magnitude risks. Using monthly data for rates on certificates of deposits offered by S&Ls during 1987–91, they show that market expectations of lower payouts conditional on default after 1989 were reasonable. The arrival risks of default reflect spreads that are related negatively to equity values and positively to the volatility of equity returns.

Grinblatt argues that liquidity differences between government securities and short-term Eurodollar borrowings explain the spreads on interest rate swaps. He finds that the interest rate swap spread for a particular maturity is the annuitized equivalent of the value of liquidity. He also estimates his model using weekly data from January 1988 through February 1992 on the "term structure of swap spreads."

Karolyi and **Stulz** explore the factors that influence intraday and overnight covariances of stock returns across countries. Using data from the Institute for Study of Securities Markets for 1988 to 1992, they construct the returns for a portfolio of Japanese stocks and a matched sample portfolio of U.S. stocks. They find that announcements of U.S. macroeconomic news, shocks to the yen/dollar exchange rate and Treasury-bill returns, and industry effects have no measurable influence on the correlations between U.S. and Japanese returns. However, large shocks to broad-based market indexes (for example, the Nikkei Stock Average and Standard & Poor's 500 Stock Index) positively affect both the magnitude and the persistence of the return correlations.

Kim and **Mei** investigate the possible market impact of political risk. They focus on the equity market in Hong Kong for two reasons: the political situation is fluid, unpredictable, and characterized by definitive events; and the market movements are volatile. They find that political developments in Hong Kong have a significant impact on its market volatility and return.

Saá-Requejo develops a model that characterizes the dynamics, the term structure, and the predictability at various horizons of risk premiums in foreign exchange and bond markets, and the interrelations between the risk premiums of these markets. The model also characterizes the random processes followed by the exchange rate, the term structure of interest rates earned in the two currencies, and the interdependencies between these processes. Finally, he shows that there may be cross-sectional restrictions on the term structure of forward risk premiums.

Bergman, Grundy, and **Wiener** study the properties of option prices. Although an upward shift in the term structure of interest rates always will increase the value of a call, a decline in the present value of the exercise price can be associated with a decline in the call price. The authors provide a new bound on the values of calls on dividend-paying assets.

Engle and **Rosenberg** analyze models of S&P 500 index volatility in terms of their ability to hedge options positions that are sensitive to the term structure of volatility. They find that the most effective hedge is a Black–Scholes (BS) delta–gamma hedge, while the BS delta–vega hedge is the least effective. The most successful volatility hedge is GARCH components delta–gamma, suggesting that the GARCH components estimate of the term structure of volatility is most accurate. The success of the BS delta–gamma hedge may be caused by mispricing in the options market over the sample period.

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The Economics of Aging

An NBER Conference on "The Economics of Aging," organized by Program Director David A. Wise, also of Harvard University, took place on May 12 and 13. The program was:

Matthew Eichner, MIT;
Mark B. McClellan, NBER and Harvard University; and
David A. Wise, "Insurance or Self-Insurance? Variation, Persistence, and Individual Health Accounts"
Discussant:
Jonathan Gruber, NBER and MIT

Alan M. Garber and
Thomas E. MaCurdy, NBER and Stanford University, "Cause-Specific Mortality Among Medicare Enrollees"
Discussant:
Angus S. Deaton, NBER and Princeton University

David M. Cutler, NBER and Harvard University, and
Mark McClellan, "Determinants of Technology Change in Medical Practice"
Discussant:
Jonathan Gruber

Michael D. Hurd, NBER and State University of New York, Stony Brook, and
Daniel L. McFadden, NBER and University of California, Berkeley, "Subjective Beliefs and Saving"
Discussant:
Axel H. Börsch-Supan, NBER and University of Mannheim

James M. Poterba, NBER and MIT;
Steven F. Venti, NBER and Dartmouth College; and
David A. Wise, "Lump-Sum Distributions from Retirement Savings Plans: Receipt and Utilization"
Discussant:
John B. Shoven, NBER and Stanford University

Angus S. Deaton and
Christina Paxson, NBER and Princeton University, "Measuring Poverty Among the Elderly in India and the United States"
Discussant:
B. Douglas Bernheim, NBER and Stanford University

Hilary W. Hoynes, NBER and University of California, Berkeley, and
Michael D. Hurd, "Imputed Wealth, Subjective Survival Probabilities, and Social Security Wealth"
Discussant:
James Smith, RAND

Burton H. Singer, NBER and Princeton University, and
Carol D. Ryff, University of Wisconsin, Madison, "Social Hierarchies and Health: Pathways to Diverse Outcomes"
Discussant:
Axel Börsch-Supan

Douglas O. Staiger, NBER and Harvard University, "The Covariance Structure of Mortality Rates in Hospitals"
Discussant:
David Meltzer, NBER and Brigham and Women's Hospital

Kathleen M. McGarry, NBER and University of California, Los Angeles, "Inter Vivos Transfers in the HRS and AHEAD: A Comparison Across Surveys"
Discussant:
James Smith

Brigitte C. Madrian, NBER and Harvard University, "Health Insurance and Retirement Behavior"
Discussant:
James H. Stock, NBER and Harvard University

Eichner, McClellan, and **Wise** explore the feasibility of catastrophic health insurance established in conjunction with individual health accounts (IHAs). Under this plan, the employer establishes both a high-deductible health insurance plan and an IHA. Employee health care costs below the deductible then are paid out of the IHA; costs above the deductible are paid by the insurance plan. Assets remaining in the account when the employee retires are available for other purposes. The authors conclude that such a plan is feasible. Further, they believe that such a plan could be structured to increase retirement savings.

Garber and **MaCurdy** describe a method for developing cause-specific mortality rates, and apply it to data on Medicare eligibility and claims filed. They find that overall mortality rates calculated this way closely approximate mortality rates from "Vital Statistics." They also attempt to develop life tables for elderly individuals who have one or more chronic diseases.

Using panel data on all elderly heart attack patients in the United States from 1984 to 1991, **Cutler** and **McClellan** find that real spending per heart attack patient rose by 4 percent annually. Essentially all of that expenditure growth was associated with the diffusion of intensive cardiac technologies: catheterization, bypass surgery, and angioplasty. The prices paid for a given intensity of treatment actually

have declined. The authors also show that some cities and hospitals are technological "leaders," using all of these technologies more frequently, while others appear to be "followers." When a hospital acquires a new technology, its use increases dramatically. This increasing intensity includes both a one-time shift within two years of adoption, and a long-term increase in intensity growth.

Hurd and **McFadden** use the Asset and Health Dynamics (AHEAD) survey to analyze survival probabilities. The average responses correspond well to standard life tables, and vary as expected with known risk factors. However, the individual responses show considerable dispersion, and there are many extreme responses. The authors then test personal survival curves in terms of their ability to add to standard life table information and to explain savings behavior.

Poterba, Venti, and **Wise** use data from the Employee Benefits Supplement to the 1993 Current Population Survey and the first wave of the Health and Retirement Survey to summarize the incidence and disposition of lump-sum distributions from pension plans. They find that while less than half of all lump-sum distributions are rolled over into IRAs or other retirement saving plans, large distributions are substantially more likely to be saved than smaller ones. Consequently, more than half of the dollars paid out as lump-sum distributions are reinvested.

Deaton and **Paxson** explore the sensitivity of poverty counts to variations in assumptions about child costs and economies of scale, using data from the United States and from six large Indian states. The authors argue that the official poverty counts in the United States are compromised by unrealistically high costs of children and by unrealistically high economies of scale. They discuss how economies of scale and child costs can be estimated from the data, using identifying assumptions that label private goods and adult goods, and they make calculations based on the 1990 Consumer Expenditure Survey.

Hoynes and **Hurd** report on the results of imputing asset values in the AHEAD data. Their methods increase the dispersion and mean of nonhousing assets, yet have little effect on the median. One explanation for this is that the nonrespondents are a mixture of less-well-to-do people who do not know the value of their assets, and well-off people who do not want to disclose the value. Housing wealth is reduced by the authors' methods, because the former type of nonresponse dominates.

Singer and **Ryff** put forth a theoretical and empirical framework based on life histories, dynamics of people within and between multiple social hierarchies, and a structure linking socioeconomic stratification to psychosocial dynamics and their physiological underpinnings that result in disease and death. The authors then analyze the onset of severe depression, focusing on the features of life histories that provide the basis for a resilience that leads to recovery and subsequent psychological well-being.

Staiger uses annual data from 1974–87 for 492 large hospitals on standardized mortality rates for Medicare admissions in both specific diagnoses and in the aggregate. He finds that 75 to 90 percent (depending on the diagnosis) of the variance in mortality is entirely transitory. The remaining nontransitory component of mortality is fairly persistent, though. Measured mortality appears to be a product of: 1) measurement error; 2) a fairly transitory diagnosis-specific component; and 3) a very permanent hospital component that is common across diagnosis. Finally, although these mortality measures have changed over time (particularly during the 1970s), there is no obvious evidence that they tended to converge or diverge across hospitals, or that they changed in any interesting way during the 1980s.

McGarry uses data from AHEAD to document the current use of home health care among the population aged 70 and over. She explores the role of financial compensation from parents to children as one method of encouraging children to provide care, and controls for factors such as income and wealth that may affect access to services. She finds that the provision of time to help elderly parents probably is not related to the opportunity cost of the child's time. Nor is such care exchanged for financial transfers from the parent to the child. Rather, the provision of care stems largely from the type of care required by the parents and the gender of their children. Children provide help with housekeeping chores, but are less likely to help with personal care needs, such as dressing and bathing. Sons provide care to parents if they have no sisters, but the presence of even one sister drastically reduces the probability that a son will supply his time to help. Children who live with their elderly parents provide help at a much greater rate, and supply many more hours on average, than those who do not.

Medicare is provided only to individuals and not to their dependents. Thus, if individuals have dependents, they will still face a health insurance cost associated

with retiring at age 65. Comparing the retirement behavior of individuals whose spouses are also eligible for Medicare with the retirement behavior of individuals whose spouses are not eligible for Medicare, **Madrian** finds that (conditional on the age difference between spouses) men with Medicare-eligible spouses are much more likely to retire than men without Medicare-eligible spouses. This is true even among men whose wives have never worked and who therefore would not be affected by the financial incentives associated with a wife's retirement or by joint retirement considerations.

Also attending this conference were: Robin L. Lumsdaine, NBER and Princeton University; Richard Suzman, National Institute on Aging; and Richard Woodbury, NBER. These papers and their discussion will be published by the University of Chicago Press. The availability of the volume will be announced in a future issue of the *NBER Reporter.*

Geography and Ownership as Bases for Economic Accounting

The NBER's Conference on Research in Income and Wealth sponsored a meeting on "Geography and Ownership as Bases for Economic Accounting" in Washington on May 19–20. Robert E. Baldwin, NBER and University of Wisconsin; Robert E. Lipsey, NBER and Queens College; and J. David Richardson, NBER and Syracuse University, organized this program:

Robert E. Baldwin, and **Fukunari Kimura,** Keio University, "Measuring U.S. International Goods and Services Transactions"

Discussant:
Guy V. G. Stevens, Federal Reserve Board

Fukunari Kimura and **Robert E. Baldwin,** "Supplementing the Cross-Border Trade Account Framework: Transactions Between Japanese and Foreigners"

Discussant:
Michael Plummer, Brandeis University

Linda Low, National University of Singapore;
Eric D. Ramstetter, Kansai University; and
Henry Yeung, University of Manchester, "Accounting for Outward Direct Investment from Hong Kong and Singapore: Who Controls What?"

Discussant:
Rachel McCulloch, Brandeis University

K. C. Fung, University of California, Santa Cruz, "Accounting for Chinese Trade: Some National and Regional Considerations"

Discussant:
Marcus Noland, Institute for International Economics

Eric Fisher, Ohio State University, "A Generational Measure of the Current Account Related to the Well-Being of Japan"

Discussant:
Jon Haveman, Purdue University

Magnus Blomström, NBER and Stockholm School of Economics;
Robert E. Lipsey; and
Eric D. Ramstetter, "Multinational Firms in World Production"

Discussant:
Raymond J. Mataloni, U.S. Bureau of Economic Analysis

David Greytak, Syracuse University;
J. David Richardson; and
Pamela J. Smith, University of Delaware, "Intranational, Interregional Trade Data: What Can We Learn from the United States in 1963?"

Discussant:
Cletus Coughlin, Federal Reserve Bank of St. Louis

Deborah L. Swenson, NBER and University of California, Davis, "The Effect of U.S. State Tax and Investment Promotion Policy on the Distribution of Inward Direct Investment"

Discussant:
Michael Wasylenko, Syracuse University

John B. Mutti, Grinnell College, and
Harry Grubert, U.S. Department of the Treasury, "The Significance of International Tax Rules for Sourcing of Income: The Relationship Between Income Taxes and Trade Taxes"

Discussant:
Kristen Willard, Columbia University

Mark Doms and
J. Bradford Jensen, U.S. Bureau of the Census, "A Comparison Between OperatingCharacteristics of Domestic and Foreign-Owned Manufacturing Establishments in

the United States"
Discussant:
Keith Head, University of British Columbia

William J. Zeile, U.S. Bureau of Economic Analysis, "Imported Inputs and the Domestic Content of Production by Foreign-Owned Manufacturing Affiliates in the United States"
Discussant:
David Hummels, University of Michigan

Baldwin and **Kimura** discuss two ways to supplement the standard balance-of-payments framework for portraying U.S. international transactions. Both proposals focus on the ownership (U.S. versus foreign) of those firms undertaking international trade and transactions through foreign affiliates. One measures these activities in terms of the volume of sales and purchases, while the other measures them in terms of their value-added component.

The second paper, by **Kimura** and **Baldwin,** estimates net sales by the Japanese to foreigners at both macroeconomic and sectoral levels. The estimated figures confirm the often-claimed asymmetry between inward and outward foreign direct investment (FDI) by Japan. In addition, the authors show that the activities of commercial affiliates of Japanese firms abroad, particularly those of the foreign branches of general trading companies, play an important role in Japanese international transactions.

Low, Ramstetter, and **Yeung** survey information on outward investment from Hong Kong and Singapore, hoping to show the implications of accounting for FDI by geographical source as opposed to by country of ultimate beneficial owner. A very large portion of the FDI from these economies comes from foreign-controlled firms; thus, accounting for FDI by country of ultimate beneficial owner would result in much smaller estimates of FDI from these countries than using geographical source. Although there are a number of foreign-controlled investors in Hong Kong and Singapore who have the ability to act quite autonomously, they do not constitute a majority of the foreign-controlled investors in those economies. This suggests that there is little economic rationale for *not* accounting for FDI from these two economies by country of ultimate beneficial owner.

Fung describes China's trade as characterized by three features: high incidence of re-exports via Hong Kong; high incidence of trade related to foreign investment; and high incidence of "illegal" trade, most notably with Taiwan. In 1993, 67 percent of China's exports were re-exported via Hong Kong; 34 percent of China's imports were re-exported via Hong Kong from the rest of the world. If re-exports and re-export markups are taken into account, then the bilateral U.S.–China trade deficits have to be adjusted downward by about 40 percent on average. Further, 74 percent of China's imports from Hong Kong in 1993 are related to outward processing. Finally, Fung finds that illegal direct exports from Taiwan to Mainland China were about 60 percent of legal indirect exports in 1992.

Fisher applies his 1995 concept of the aggregate generational current account to data from Japan for the last two decades. A generation's net foreign assets are the present value of its expected net transfers from abroad; the aggregate generational current account is the annual change in the sum of these accounts across all current and future generations. Fisher shows that the present value of Japan's net foreign assets has risen markedly in the last two decades. Also, he examines the deleterious effects for Japan of continued strength in the yen or higher world interest rates.

With many firms now involved in production outside of their home countries, measuring production by ownership can yield quite different figures from measuring by location (geography). **Blomström, Lipsey,** and **Ramstetter** compare both types of measures for the United States, Japan, Sweden, Germany, and other countries receiving direct investment. They find, among other things, that both ownership- and geography-based shares for Japan have been increasing, but the former much more rapidly than the latter, as Japanese firms have begun to expand their overseas production rapidly. Both the outward and the inward investment data point to some growth over the 1970s and 1980s in the share of world output accounted for by multinational firms. But most of their output is still in their home countries; internationalized, or overseas output is almost certainly well below 10 percent of total world output.

Using data for regions of U.S. states in 1963, **Greytak, Richardson,** and **Smith** provisionally conclude that such data provide insights into the structure of trade among "free trade" areas (that is, the degree of "home market bias").

These data can be valuable for exploring the determinants and adjustment of nations to freer trade.

Swenson examines the change in the geographic distribution of foreign employment across U.S. states between 1980 and 1992 to determine the effects of wage differences, or differences in the tax and promotion environment. She finds that overall foreign employment is not affected measurably by taxes, while foreign *manufacturing* employment is concentrated in regions with lower tax rates. The distribution of manufacturing employment among states within a region also appears to be influenced by taxes. The differential responsiveness of total versus manufacturing foreign employment suggests that investment distinctions determine the geographical distribution of employment.

Mutti and **Grubert** ask how rules for determining the source of income alter the form in which taxable income is reported, and the location of production internationally. The effect of these policies is less transparent than for statutory rates, but they have become increasingly important because of the decline in the U.S. corporate tax rate in 1986, and the larger share of firms that have excess foreign tax credits. For such firms, the sales source rules provide a significant benefit by treating a portion of export income as foreign source. Treating royalties as foreign-source income may create an even more important incentive, favoring affiliate production by high technology firms with excess foreign tax credits: the affiliate can pay royalties that reduce its foreign tax burden and let the parent claim a larger foreign tax credit.

Doms and **Jensen** use newly available plant-level data on foreign-owned U.S. manufacturing establishments in 1987 to compare the operating characteristics of foreign- and domestic-owned plants. They show that foreign-owned establishments are larger, pay higher wages, and are more capital and technology intensive than the average U.S.-owned firm. When other observable plant characteristics are included, the differences decrease but remain statistically significant. The authors further decompose domestic-owned plants into those owned by U.S. multinationals, those owned by large U.S. firms with low foreign-asset-to-total-asset ratios, and those owned by small U.S. firms. Plants owned by U.S. multinationals pay the most, are the most capital and technology intensive, and the most productive, followed by foreign-owned plants, plants owned by large domestic-oriented firms, and plants of small domestic firms. This suggests that multinationals possess firm-specific advantages allowing them to overcome the costs of FDI.

Zeile uses new data from the Bureau of Economic Analysis's 1992 benchmark survey of FDI in the United States to measure the domestic content and sourcing behavior of foreign-owned U.S. manufacturing affiliates, together with comparable measures for domestically owned U.S. companies. He finds that affiliates with owners in Japan or Germany have significantly lower domestic content, and significantly higher imports in their purchased intermediate inputs, than domestically owned companies in comparable industries. The difference is particularly pronounced in machinery-type industries. In contrast, the average domestic content for British-owned affiliates is barely distinguishable from that of domestically owned companies in comparable industries. Further, Japanese-owned affiliates display a high tendency, whereas British- and French-owned affiliates display a low tendency, to source their intermediate inputs from their respective home countries. Intrafirm imports account for a very large share of the imported inputs of Swiss- and Japanese-owned affiliates.

These papers and their discussion will be published by the University of Chicago Press. The availability of the volume will be announced in a future issue of the *NBER Reporter.*

International Seminar on Macroeconomics

The NBER's 18th annual International Seminar on Macroeconomics took place at the Deutsche Bundesbank in Frankfurt on June 19 and 20. Co-chair Jeffrey A. Frankel, of the NBER and Institute for International Economics, along with organizers Kenneth S. Rogoff, of the NBER and Princeton University, and Charles Wyplosz, Institut Européen d'Administration des Affaires (INSEAD), set the general theme of "Wages, Politics, Saving, and International Income Correlations." The two-day program was:

Peter Boone, London School of Economics, "Politics and the Effectiveness of Foreign Aid"

Discussants:

Barry Eichengreen, NBER and University of California, Berkeley, and
Eric van Wincoop, Boston University

Christina H. Paxson, NBER and Princeton University, "Saving and Growth: Evidence from Microdata"

Discussant:
Orazio Attanasio, NBER and Università di Bologna

Andrew Scott, Oxford University, "Consumption, Credit, and Interest Rates in the United Kingdom"

Discussants:
Ben S. Bernanke, NBER and Princeton University, and
Heinz Herrmann, Deutsche Bundesbank

Stephen G. Cecchetti, NBER and Boston College, and
Anil K. Kashyap, NBER and University of Chicago, "The Interaction of Seasonal and Business Cycle Factors: Evidence from International Data"

Discussants:
Paul Soderlind, University of Stockholm, and
James H. Stock, NBER and Harvard University

Graham Elliott, University of California, San Diego, and
Antonio Fatás, INSEAD, "The Dynamics of the Current Account"

Discussants:
Philippe Bacchetta, Studienzentrum Genzensee, and
Stephen G. Cecchetti

Laura Bottazzi, Bocconi University;
Paolo Pesenti, Princeton University, and
Eric van Wincoop, "Wages, Profits, and the International Portfolio Puzzle"

Discussants:
Jean-Pierre Danthine, University of Lausanne, and
Linda Tesar, NBER and University of California, Santa Barbara

Alessandra Casella, NBER and Columbia University, "Voting and Power Sharing in the European Union"

Discussants:
Giorgio Basevi, University of Bologna, and
Torsten Persson, NBER and Institute for International Economic Studies

Christopher M. Schmidt and **Klaus F. Zimmerman,** University of Munich, "The Labor Market Impacts of Immigration: A European Perspective"

Discussants:
Michael Burda, INSEAD, and
Juan Dolado, CEMFI

Boone analyzes the effectiveness of foreign aid programs, by estimating how three stylized political/economic regimes—labeled populist, rent-seeking, and laissez-faire—would use foreign aid. Using data on flows of nonmilitary aid to 96 countries, he finds that models of rent-seeking political regimes best predict the impact of foreign aid. Aid does not significantly increase investment and growth, nor benefit the poor, as measured by improvements in indicators of human development, but it does increase the size of government. Boone also finds that the impact of aid does not vary according to whether recipient governments are liberal democratic or highly repressive. But liberal political regimes and democracies have 30 percent lower infant mortality on average than the least free regimes. One implication of this is that short-term aid targeted to support new liberal regimes *may* be a more successful means of reducing poverty than current programs.

There is a positive correlation between rates of economic growth and rates of saving across countries. Standard growth models often imply that saving drives growth, while life-cycle models and models of consumption with habit formation imply the reverse: that higher growth results in higher saving rates. **Paxson** uses data from the United States, Britain, Taiwan, and Thailand to try to explain the cross-country correlation between saving and growth. She finds some support for life-cycle and habit-formation models, but estimates that increases in growth produce only small increases in aggregate saving rates. The explanation for a large chunk of the correlation between saving and growth lies elsewhere, she concludes.

Scott examines how capital market imperfections influence consumption, and then uses his model to assess cyclical and structural changes in loan supply. U.K. data offer some support for his view of loan market imperfection; the model accounts for many of the rejections of the Permanent Income Hypothesis. In particular, only modestly sloped interest schedules are necessary for consumption to display a close relationship with income. Between 1979 and 1988, there was an 83 percent reduction in capital market imperfections in the United Kingdom. Strong consumption growth in the 1980s ap-