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In This Issue

Program Report

Industrial Organization

Nancy L. Rose

The NBER Program in Industrial Organization (IO), established in 1991, promotes applied economic research on a broad set of questions relating to firm behavior, the organization and operation of markets, and the economic analysis of government regulation. The last decade has provided a wealth of new, interesting, and important questions for industrial organization and regulatory economists to study. There have been substantial changes in market structure in many industries, from sources as varied as merger waves, reorganization of production and distribution, and increased international competition. Market-based institutions increasingly are replacing government regulation or ownership of firms, in industries as diverse as airlines, railroads, electricity, and telecommunications. Even where regulation has been retained, it often has been transformed to replace "command-and-control" with economic incentives and enhanced flexibility. Finally, researchers have developed a wealth of new databases and microeconometric techniques to study firm behavior, including issues such as pricing decisions in differentiated product markets, the effect of search costs on market outcomes, and the determinants of firms' contracting and internal organization decisions, that previously had been subject to only theoretical discussion.

This report describes several broad research themes analyzed by members of the Industrial Organization program. Rather than presenting an exhaustive summary of past research, I have chosen to focus on a set of major topics, and to explain critical findings in each one.

Deregulation, Restructuring, and Market Design: The Case of Electricity

In the late 1980s and the 1990s, throughout the world, basic infrastructure industries including electricity, telephone, natural gas, railroads, and even water distribution have undergone dramatic reorganizations. Government ownership or administrative regulation typically has been replaced with sub-

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stantial reliance on private market mechanisms within much or all of the restructured industry, and "natural monopoly" characterizations have given way to notions of "workable competition." NBER researchers have been active in assessing the consequences of market restructuring and exploring market design issues in a variety of settings. I focus here on the work relating to electricity markets.

The electricity generation, transmission, and distribution industry, long operated as a vertically integrated, publicly-owned or regulated natural monopoly in virtually all markets worldwide, has attracted particular research attention. Catherine Wolfram has taken advantage of a wealth of data created by the United Kingdom's electricity restructuring to test competing models of firm behavior in deregulated markets.[1] She finds that while the two dominant generating firms in the England and Wales have been able to raise the pool price for wholesale electricity above their marginal costs of generation, they appear not to exploit their potential market power fully. Wolfram argues that this may be the result of efforts to reduce the threat of competitive entry or re-regulation. Frank Wolak and Robert Patrick provide further evidence on the potential magnitude of generators' market power in their study of the real-time price sensitivity of electricity demand for a group of industrial customers in the United Kingdom.[2]

A critical issue in the restructure of these markets is how specific institutions may enhance or mitigate the exercise of market power. England and Wales, which rely on an auction mechanism to clear the wholesale power market, provide an important research laboratory for exploring the effect of particular auction rules on market outcomes. Wolfram focuses on the multi-unit character of this auction to model generating firms'

incentives to raise their bid price for a given unit, as a function of the total quantity of generation they bid into the pool.[3] Because the price of all electricity traded through the pool is set by the bid price for the last unit selected to run, a generator that thinks its unit may be marginal has an incentive to increase its bid. This raises the price received on that unit and all inframarginal units it owns. Wolfram's empirical analysis finds behavior consistent with these predictions.

Wolak and Patrick focus on the pool rules that determine capacity payments at peak demand periods.[4] As a result of these rules, generator revenues can include substantial payments intended to reflect the shadow cost of capacity needed for reliable operation of the system during these high demand hours. They also document the incentive that this gives firms to strategically manipulate the amount of generating capacity made available to the power pool during peak periods, and they provide econometric evidence that suggests this behavior is an important mechanism by which the two dominant generators raise their overall profitability.

These studies of the electricity market in England and Wales are important for the information they provide about that market in particular, but they also are of more general interest. Wolak's current research focuses on the broad lessons for market design in a comparative study of restructured electricity markets that includes Australia and New Zealand, a number of Latin American countries, Norway and Sweden, as well as England and Wales. This body of work illustrates how detailed institutional characteristics of a deregulated market may affect its performance.

This research also provides substantial guidance on issues facing policymakers involved in restructuring electricity and other markets across the United States and elsewhere. Within the United States electricity market, the restructuring movement is in its infancy but growing fast; California and a number of New England states are slated to move to a more decentralized, market-based pricing and allocation system in early 1998. Matthew White explores the political and economic determinants of the heterogeneity across states in the timing and intensity of these restructuring efforts.[5] A number of NBER researchers have been active in the design of restructured markets at the state level, and the execution of these varied reforms is likely to provide the data to fuel further research on the role of market institutions on firm behavior and market performance.

Pricing and the Exercise of Market Power

The relationship between firms' marginal costs of production and the prices they charge is a central question in industrial organization. A range of new databases and new research tools have permitted substantial advances in its analysis. One strand of this research uses data on the dynamic pattern of prices within markets to test models of oligopoly behavior. This research is of considerable interest within the I.O. community, as it informs us of the ability of firms to achieve more cooperative, and therefore more profitable, price outcomes. It also is relevant to researchers in macroeconomics, as it may have implications for the counter cyclical behavior of price-cost margins, an important component of some models of macroeconomic fluctuations.[6] Severin Borenstein, in work with Colin Cameron and Richard Gilbert, and with Andrea Shepard, explores these issues using data on retail gasoline markets over time.[7] His research suggests that gasoline retailers exercise at least short-run market power, and that price patterns over seasonal demand cycles are consistent with the predictions of Rotemberg-Saloner style supergame models of sustainable price collusion.[8]

Judith Chevalier and David Scharfstein develop a model in which liquidity constraints can generate countercyclical mark-ups. They find empirical support for its predictions in their study of supermarket pricing.[9] Fiona Scott Morton analyzes a particular event—passage of 1990 legislation establishing a "Most Favored Customer" clause for Medicaid pharmaceutical reimbursements—that may have provided firms with a mechanism for coordinating price increases.[10]

The public availability of detailed microdata on United States airlines, combined with the large number of geographic airline markets to study, has generated a wealth of empirical work on pricing behavior in this sector. NBER researchers have analyzed the determinants of market power; estimated structural models of demand, cost, and mark-ups; and studied the determinants of price dispersion, including the role of competitive price discrimination in generating the huge variation in prices paid by different passengers on the same airline and route that is observed in fare data.[11] My recent work with Borenstein explores the effect of bankruptcy on airline fares.[12] We conclude, in contrast to claims by some industry participants, that there is little evidence that bankrupt carriers harm their more healthy rivals. Indeed, while carriers may lower their prices prior to filing for Chapter 11 bankruptcy protection, their rivals appear to maintain their price level and maintain or increase their passenger volume.

A number of NBER researchers have turned to historical data to test

models of firm behavior and to explore the mechanisms by which firms achieve collusive outcomes. Historical data may be more readily available than contemporaneous data, given firms' concerns about the sensitivity of price data and potential antitrust liability. It also may shed light on firm behavior under different antitrust regimes. Glenn Ellison, for example, has extended Robert Porter's classic analysis of price collusion by 19th century railroads to compare and test the formal predictions of competing supergame models of collusion.[13] Ellison suggests that price patterns in this market are characterized by periods of collusion punctuated by episodic price wars, and that these wars may be triggered by secret price cutting by some market participants.

David Genesove and Wallace Mullin study the exercise of market power in the sugar industry around the turn of the century.[14] Their work compares results from both traditional and "new empirical I.O." techniques for measuring the exercise of market power, explores the use and effectiveness of predatory pricing as an entry deterrent, and chronicles the development of the industry trade association as a device for coordinating pricing behavior. Scott Morton analyzes the determinants of predatory pricing responses to entry in British shipping cartels.[15]

Differentiated Products Markets

NBER researchers have made significant methodological advances in modeling price formation in differentiated product markets. This research involves the specification and estimation of "structural" models of firm behavior, linking models of cost and demand with specific parameterizations of firm behavior in equilibrium. Steven Berry, James Levinsohn, and Ariel Pakes develop and apply a set of these techniques to model the behavior of firms in the U.S. automobile industry.[16] In recent work, they estimate the distributional and welfare effects of the voluntary export restraints that were initiated in 1981 on Japanese cars sent to the United States. Their research suggests that this policy resulted in substantial transfers from U.S. consumers to U.S. auto producers, a relatively negligible effect on Japanese auto producer profits, and an overall U.S. welfare loss.

Timothy Bresnahan, Scott Stern, and Manuel Trajtenberg develop and estimate an alternative discrete choice model to analyze product differentiation and the sources of rents in the market for personal computers.[17] Their results, along with a substantial body of new research on differentiated products markets within the context of the market for new products, is reported in the NBER volume, *The Economics of New Goods,* edited by Bresnahan and Robert J. Gordon.[18]

Internal Organization of Firms

The questions of what a firm is, how its boundaries are determined, and how firms choose to organize their production, have attracted considerable attention from economic theorists in recent years. Despite this, empirical research lags far behind. This results, at least in part, from the difficulty of getting data on the internal choices and operations of firms. If the data problems can be solved, there are a host of exciting empirical research questions to be answered. NBER I.O. program members are beginning to make real inroads on a number of these.

Judith Chevalier and Glenn Ellison have used a novel database on mutual funds to explore a variety of issues that arise in a principal-agent setting.[19] Their studies on the behavior and performance of mutual fund managers, provide interesting insights on a number of agency questions. For example, they find that shareholder responses to variations in fund performance, combined with management contracts that base manager compensation on total fund assets, have strong incentive effects on managerial risktaking. Fund managers, moreover, respond to these incentives differently at year-end. Those who are "ahead" in September adopt more conservative investment strategies relative to those who are "behind." Those behind seem to take on greater risk in a gamble to "catch up" with the market. Chevalier and Ellison currently are extending this research to explore the role of career concerns in structuring incentives and determining fund manager behavior.

The decision of what activities to include within a firm's boundaries is fundamental but not well understood. The generally disappointing performance of diversified enterprises over the past 20 years has generated a substantial debate over the extent to which this reflects the difficulty of managing a diversified corporation well, or is a result of the actions of entrenched managers who pursue their own gain at the expense of shareholders' interests. Andrea Shepard and I use data on chief executive officers' (CEOs) compensation to analyze these competing claims.[20] We document a substantial pay premium for managers of diversified firms, but find that incumbent CEOs who diversify the firm earn less than their counterparts who maintain or increase the focus of the firm's activities. We argue that the data are more supportive of an ability-matching explanation for the pay premium than of managerial entrenchment models.

A number of I.O. program members also have explored the determi-

nants of CEO compensation.[21] Paul Joskow, Shepard, and I argue that variations in executive pay across industries and over time suggest that political hostility to high CEO pay, mediated through regulatory institutions, may limit the compensation of executives in the most politically sensitive industries. Joskow, Wolfram, and I document a similar phenomenon within the electric utility industry. The incentive effects of compensation and the pay-for-performance relationship in executive pay also have attracted research attention.

Finally, a number of I.O. program members are involved actively in the NBER Project on Industrial Technology and Productivity, supported by the Sloan Foundation and described in the Spring 1996 *NBER Reporter*. This research combines traditional data sources with direct access to firms to understand how the organization of production lines, firm decisionmaking, or technology use may influence productivity and efficiency within the firm.

Vertical Organization of Firms

What determines the vertical structure of production: for example, are suppliers and manufacturers linked through common ownership, long-term contracts that may specify a variety of constraints on the parties' actions, or arms-length spot market transactions? The extent to which these choices are motivated by the quest for market power alone or reflect real efficiencies in production has important ramifications for theories of the firm as well as for the design and execution of antitrust policy. Theoretical work emphasizes that the balance between anticompetitive effects and efficiency may be context-specific. Douglas Bernheim and Michael Whinston, for example, explore this tension in a model of exclusive dealing contracts, in which a manufacturer prohibits retailers who carry its products from selling certain other specified products.[22]

Wallace and Joseph Mullin empirically investigate the tension between efficiency and market power motives in an analysis of the U.S. Steel long-term lease of iron ore properties of the Great Northern Railway in 1906.[23] While this lease often has been explained as vertical foreclosure of rival steel firms by U.S. Steel, their analysis suggests that the lease was expected to lower the market price for steel, and that the terms of the lease may be explained best as devices designed to achieve efficient relationship-specific investment.

Francine Lafontaine explores vertical relations in the context of business format franchising. She analyzes the variety of motives that may give rise to the development of franchising, and studies the way franchisors may act to solve a variety of principal-agent problems, through their choice of implicit and explicit contracts.[24] Her work on McDonald's with Patrick Kaufman, for example, suggests that franchisees earn substantial ex ante rents when they are awarded a franchise. While a variety of theories may explain the existence of ex post profits for franchisees, traditional models would not predict ex ante rents. Lafontaine argues that their presence may be explained by incentive models similar to "efficiency wage" type models, and by liquidity constraints among the potential franchisees most desired by McDonald's.

Auction Markets

Auctions, though typically thought of in conjunction with art and rare collectibles, are an important and common market form. Their use by governments has expanded substantially over the past few decades as auctions have been used to sell Treasury bills, to let procurement contracts, and to allocate property rights in areas as diverse as off-shore oil leases, timber, radio spectrum, and pollution. In the private sector, auctions have been used in markets ranging from real estate to wholesale fish and wholesale used car sales, and are the mechanism selected to set wholesale prices in many deregulated wholesale electricity markets as well. An extensive research program in economic theory has yielded important insights on the design, bidder behavior, and performance of auctions under certain stylized conditions. This research base played a critical role in the design of recent Federal Communications Commission auctions to allocate licenses for "PCS" spectrum. A growing empirical literature has been directed toward understanding the actual performance of different auction designs, the effect of bidder characteristics and auction structure on revenue, the possibility of bidder manipulation, and auction performance more generally.

A number of studies by I.O. program members have explored issues in auction performance, beyond the work described earlier on U.K. electricity auction markets. Robert Porter's research on auctions for off-shore oil and gas leases highlights the role of imperfect and incomplete information in government property auctions.[25] He analyzes firms' strategic responses to informational issues, including both pre-auction effects such as the formation of consortia and joint ventures, and post-auction effects, such as decisions of when and where to initiate exploratory drilling.

David Genesove analyzes the role of imperfect information and search costs on bidder behavior in wholesale markets for used cars.[26] Porter and Douglas Zona develop statistical tests and apply these to data on bids submitted in procurement contract auctions to detect possible bid-rig-

ging by subsets of auction participants.[27] Finally, NBER researchers Paul Joskow and Dick Schmalensee, with Elizabeth Bailey, analyze the market for sulfur dioxide emission permits.[28] They conclude that while the Environmental Protection Agency's auction market is subject to a number of design flaws, the private market rapidly developed an apparently efficient alternative trading mechanism that has rendered these flaws largely irrelevant.

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[2] *F.A. Wolak and R.H. Patrick, "Estimating the Customer-level Demand for Electricity under Real-time Market Prices," presented at the 1997 NBER Summer Institute.*

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Research Summaries

The Evolution of Retirement

Dora L. Costa*

Not only are more men living past age 65 in America today than ever before, but American men also have been abandoning the labor force at ever younger ages. The retirement rate of American men over the age of 64 has risen rapidly from a mere 25 percent at the end of the last century to over 80 percent today. At the same time the very nature of retirement has changed. For most individuals retirement is no longer a time of withdrawal from all activities and of dependence on family and friends; rather it is a time of discovery, personal fulfillment, and relative independence. In the past, such a retirement experience was limited to the wealthy few who could afford it. Now it is an option available to the majority of workers.

That most men now can look forward to a period of personal fulfillment at the end of their working lives is one of the achievements of our century, but such a retirement is expensive, and financing it poses budgetary dilemmas. Approximately 80 percent of elderly households receive over half of their income from Social Security, and Social Security is facing a fiscal crisis. If men continue to abandon the labor force at ever younger ages, the crisis is likely to be even more acute. To understand whether retirement rates will continue to rise, we must examine how retirement has evolved from 1880 to the present. Retirement rates were rising throughout this period. In fact, 41 percent of the long-run rise in retirement rates occurred before the postwar growth of Social Security and private pension plans. In my forthcoming book, *The Evolution of Retirement: An American Economic History, 1880–1990* (University of Chicago Press for NBER, 1998), I therefore investigate the factors that have fostered rising retirement rates.[1]

Income and Retirement

Retirement requires income, whether in the form of state-provided retirement or disability benefits, private pensions, income from other family members, or assets. Researchers have investigated the role that each of these income sources plays in the retirement decision, largely using cross-sectional data for the years after the 1960s. But, because 70 percent of the rise in retirement among men older than 64 occurred before 1960, only large increases in benefits could have enticed those remaining in the labor force to have withdrawn.

Previous researchers have not been able to examine the impact of income on the retirement decision prior to the 1960s because the necessary data has been unavailable. Fortunately, a longitudinal dataset that follows Union Army recruits of the American Civil War from their youth to their death can be generated from census records and from records of the Union Army pension program. At the beginning of the century, Union Army pensions were the most widespread form of assistance to the elderly, serving about a quarter of the population over age 64 in 1900. I estimate the income effect of Union Army pensions on retirement rates.

I find that pensions had a substantial impact on retirement rates both in 1900 and in 1910. My findings suggest that the high labor force participation rates of older men prevailing at the turn of the century arose because retirement incomes were too low to fully support them and, as retirement incomes have risen, so have retirement rates. I attribute much of the long-term increase in retirement rates to the rising incomes of the elderly. Their wages, and hence their savings and pensions, have increased, as have government transfers.

However, increased income is not the sole explanation for the rise in retirement. In fact, I show that the income elasticity of retirement has fallen over time. Whereas rising retirement incomes could explain up to

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90 percent of the increase in retirement rates between 1900 and 1930, they could account for only half of the increase between 1930 and 1950, and for almost none of the more recent increase. Workers now may be less responsive to changes in transfer income because they are no longer close to subsistence levels; instead, they reach retirement age with enough to satisfy their consumption needs. Alternatively, by establishing age 65, and later age 62, as an "official" retirement age, Social Security may have led individuals to want to retire at that age and therefore reduced the effect of income on the work decision. Finally, retirement also has become more attractive because men are less circumscribed in their choice of leisure time activities. Mass tourism and mass entertainment have increased the variety of recreational activities and lowered their price.

Other Explanations

I consider several other explanations for increased retirement rates, including worsening average health of the population. I show that retirement rates rose despite declines in the burden of chronic disease. Between 1910 and 1983, the prevalence of heart disease among men above the age of 64 fell from 75 to 40 percent; that of musculoskeletal disease from 68 to 48 percent; and that of respiratory disease from 42 to 30 percent. Between 1935 and 1992, rates of blindness fell by about one third. The elderly have benefitted from advances in medical technology, fewer occupational hazards, and better conditions in early life. At the same time, health has become less important to the retirement decision. Because we now can better control chronic conditions, and because physical job requirements have been reduced, those in poor health are more likely to participate in the labor force relative to those in good health than was the case in 1900 and in 1910. Age 65 therefore may no longer be as appropriate a demarcation of old age as it was in the first half of the century, when the typical health of a 65-year-old was very poor.

Declines in part-time work, nonfarm self-employment, and farming do explain the rise of retirement since 1880 either. The proportion of 65-to-74-year-old employees who work part-time has risen from 15 percent in 1940 to 47 percent in 1990. The fraction of the labor force that is self-employed has fallen, but only since the 1960s have older self-employed workers been more likely to remain in the labor force than wage and salary workers. The lower retirement rates of farmers relative to non-farmers are also a recent phenomenon. Using longitudinal data on Union Army veterans, I show that in 1900 and 1910 farmers were no less likely to retire than non-farmers and that, upon retirement, farmers moved to a nearby town.

One factor that accounts for up to one-fifth of the increase in retirement rates of men over age 64 since 1900 is the increased duration of unemployment spells. Unemployment within state of residence had a substantial effect on the retirement of men over age 64 in 1900, and on men aged 50 to 64 in 1980. But, the unemployed would not have been able to retire unless they had income sources other than wages. In fact, high unemployment within state of residence was much more likely to induce Union Army veterans versus non-veterans to leave the labor force.

The Retirement Lifestyle

A man who retired in 1880 could expect a very different life from that of a man retiring today. Close to half of retired men in 1880 were living in the households of their children or other relatives, whereas today that figure is only 5 percent. By examining data on the living arrangements of Union Army veterans, I show that, at the beginning of the century, men would have preferred to remain independent of their families. The majority simply could not afford to do so, though. I argue that rising retirement incomes explain the decline in the percentage of men older than 64 living in the households of their children and the narrowing of differences in living arrangements by retirement status since the beginning of the century. But, I also show that changes in income now have a relatively smaller effect on the living arrangements decision than they did in 1910, perhaps because independent living is now relatively inexpensive. The growth of retirement communities in low cost living areas, the declining price of transport and of communication with family members, and the rise in private and state social support services, among other factors, have lowered the price of living alone.

Independent living may be not only cheaper than it was in the past but also more attractive. A leisurely retirement lifestyle is now often made possible by resettlement to a community with a better climate or other environmental amenities, or to one with a low cost of living. As independent living has become more attractive, this in turn may have increased the attractiveness of retirement.

The typical worker now looks forward to retirement (or at least the first few years of it), because retirement has become a time for travel and recreation. Leisure time activities are now pursued more widely across all income classes because of rising incomes and because technological change has not only lowered the price of existing products, but also has created new products that lower

the "quality-adjusted price" of entertainment. Technological advances also have lowered travel time and thereby decreased the time-cost of entertainment. Using consumer expenditure surveys, I show that because recreational goods and leisure are complements, the lower price of recreation (in both time and money) may have increased the demand for retirement.

The elderly in part have financed their retirement through public monies. First it was through Union Army pensions, then in the late 1920s and early 1930s many states provided pensions to the needy aged. These pensions later were replaced by Social Security Old Age Assistance and Old Age Insurance. The growth of all of these programs was made possible by the availability of revenue resources and was spurred in part by increasingly well-organized elderly pressure groups. As the population ages, the elderly may become an even more powerful political force. But, as their numbers rise, it will become increasingly difficult for the young to finance a lengthy retirement for the old. The continued provision of the retirement lifestyle to which we have grown accustomed is increasingly likely to lie with individuals.

[1] *See also "Pensions and Retirement: Evidence from Union Army Veterans,"* Quarterly Journal of Economics *(May 1995); "Agricultural Decline and the Secular Trend in Retirement Rates,"* Explorations in Economic History *(October 1995); "Health and Labor Force Participation of Older Men, 1900–1991,"* Journal of Economic History *(March 1996); "A Theory of Technophysio Evolution, With Some Implications for Forecasting Population, Health Care Costs, and Pension Costs,"* Demography *(February 1997); and "Displacing the Family: Union Army Pensions and Elderly Living Arrangements,"* Journal of Political Economy, *forthcoming December 1997.*

Pricing, Monetary Policy, and Aggregate Fluctuations

Julio J. Rotemberg*

My Ph.D. thesis considered the extent to which firms' reluctance to change their posted prices contributes to business fluctuations and, in particular, makes monetary policy powerful in influencing aggregate output. Ever since, much of my research has been concerned both with the role of monetary policy and with the connection between pricesetting by firms and the evolution of GNP.[1] This article summarizes that research.

Price Rigidity and Monetary Policy

In some ways, the hypothesis that firms are reluctant to change their prices plays the same role as the hypothesis of wage rigidity in traditional Keynesian models. Both imply that expansionary fiscal or monetary policies raise GNP. The difference is that with wage rigidity, firms are only willing to raise their output if their marginal cost of production falls as a result of a decline in real wages. By contrast, firms that were not willing to raise prices will increase their output in response to expansionary monetary and fiscal policies even if doing so raises their marginal cost of production. Thus, the existence of price rigidity can rationalize the observation that real wages tend to increase (albeit slightly) when real GDP rises.[2]

In my early work, I also show that this hypothesis is broadly consistent with the relationship between monetary aggregates and GDP.[3] Another way to gauge whether price rigidity explains the effects of monetary policy is to use the recent explosion of research on how the Federal Reserve System conducts monetary policy.[4] This research allows one to identify monetary policy disturbances through movements in interest rates that are different from those that would represent the "usual" reaction of the Fed to economic circumstances. A good way of ascertaining the empirical relevance of the theory is thus to analyze whether it correctly predicts the way the economy reacts to these monetary disturbances.

It turns out that the theory is remarkably successful in this regard.[5] Because there are good reasons to believe that exchange rate movements are linked to price movements, Alberto Giovannini and I analyzed whether a model of this type could help us to interpret the empirical movements in the dollar/deutschemark exchange rate. While the enormous volatility of exchange rates makes it difficult to explain more than a small fraction of their movements, we find some empirical corroboration for the model in these data.[6] There are thus a number of dimensions in which the hypothesis of price rigidity helps to explain aggregate output fluctuations.[7]

More recently, I have returned to the sort of model I considered in my early work. This was prompted by some research that Michael Woodford and I did on the characteristics of business cycles.[8] We discovered that various definitions of the United States business cycle, including the one that is implicit in the NBER chronology of business cycle peaks and troughs, have a very simple statistical property. Periods in which the economy is in a recession, and troughs

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in particular, turn out to coincide with periods in which the current level of output is significantly below the level that it can be expected to reach within the next two years. In other words, troughs have the property that simple statistical models predict a high growth rate of output from this point onwards. This accords with common sense and with the way that newspapers talk about recessions since, after all, their discussion of recessions often refers to the expectation of a recovery.

There is also a conceptual advantage in measuring the business cycle by using the expected change in output as opposed to more traditional measures, including the unemployment rate. The unemployment rate, in particular, is also subject to noncyclical changes which can be attributed, for example, to changes in the composition of the labor force. Similarly, traditional measures of detrended GNP tend to perform poorly as cyclical measures when technological changes exist which lead to permanent changes in GNP.

Some of my recent work has been devoted to understanding whether this measure of cyclically adjusted output is connected to inflation as predicted by models of price rigidity and, in particular, by the model I originally developed in my thesis.[9] The basic macroeconomic idea behind models of price rigidity is that increases in the money supply raise the demand for output but lead, initially, to only a muted response of prices. This means that output rises temporarily and, as a result, output should be expected to rise less in the future. On the other hand, the muted contemporaneous response of prices implies that prices should be expected to rise substantially. Thus periods in which prices are expected to rise a lot should coincide with periods where output is expected to rise relatively little. Indeed, I find a very strong negative correlation between expected changes in output over the next few years and expected changes in prices over the same time period. This is, in effect, an updated version of the negative correlation between inflation and unemployment that is known as the Phillips curve. However, unlike the Phillips curve, and consistent with the sort of theoretical models I have been interested in, this relationship does not fall apart when applied to empirical data from the 1970s.

My most recent work with Woodford explores the implications of this type of model for the conduct of optimal monetary policy.[10] In other words, we investigate how the Federal Reserve System should let the federal funds rate react to the shocks that impinge on the U.S. economy. We show that, at least in some respects, it is ideal to set interest rates so that inflation is stabilized completely. This reduces the economic effect of price rigidity, both by ensuring that aggregate output is as close as possible to the level it would have reached if prices were flexible and by making relative prices independent of the shocks that impinge on the economy. The problem is that stabilizing the rate of inflation requires that interest rates rise a great deal every time a shock tends to increase inflation. This requires that interest rates be quite volatile. Aside from any other disadvantages of interest volatility, such a policy is only feasible if average inflation and average interest rates are high. Otherwise it would be impossible to maintain positive interest rates in the aftermath of a shock that requires a large reduction in interest rates. Thus we show that complete stabilization of inflation is undesirable. On the other hand, it is possible to set interest rates in such a way that inflation is much more stable than it has been historically while, at the same time, keeping average inflation below 3 percent per year.

Pricing and Macroeconomics More Generally

At least some of the power of price rigidity as an explanation of aggregate fluctuations stems from its ability to explain why firms raise their output in periods where their marginal costs increase. This seems to be a quite robust feature of the increases in output that take place in economic booms. Recently, this has been documented in a series of important papers by Mark Bils,[11] although the fact appears to be have been known for some time: Wesley Mitchell wrote in 1941 that, in business expansions "equipment of less than standard efficiency is brought back into use; the price of labor rises while its efficiency falls; the cost of materials, supplies and wares for resale advances faster than selling prices; discount rates go up at an especially rapid pace, and all the little wastes incidental to the conduct of business enterprises grow steadily larger."[12]

If marginal costs in terms of some price index rise for all firms in booms —that is, if real marginal costs rise— it must be that the ratio of price to marginal cost is falling for the typical firm. In other words, firms are experiencing reductions in the markup of price over marginal cost.[13]

Aside from price rigidity, there can be other reasons for such a change in markups, and I have devoted some effort to understanding these alternate mechanisms. In particular, this motivates my work with Garth Saloner on the behavior of prices in oligopolistic markets. We consider oligopolistic markets in which firms keep their prices high as a result of an implicit understanding. The understanding is that any firm which cuts its current prices triggers a future

period of retaliation where all firms cut their own prices. The result of this understanding is that prices do not rise very much (and might even fall) in response to increases in demand. To see this, consider an industry whose demand increases temporarily. This increase in demand raises current profitability and, if prices in the industry do not change, it also raises the benefits to be had from undercutting the industry price. Because the increase in demand is temporary, the losses from the subsequent retaliation do not grow as much as the profitability of undercutting the current price. Of course, increasing the industry price in response to an increase in demand serves only to raise the relative benefits of undercutting the industry price even more. To stop firms from undercutting the industry price when demand rises, it thus may be necessary to lower the price charged by the entire industry.

Woodford and I show that implicit collusion in oligopolistic industries can explain not only the qualitative but also the quantitative response of the U.S. economy to changes in military purchases.[14] We focus on military purchases because the Korean War, the Vietnam War, and the Reagan buildup have been associated with some of the most dramatic changes in the U.S. fiscal position. As might be expected, these increased purchases are associated with increases in economic activity. What is more novel is that we show that they are associated with increases in the purchasing power of wages. This is inconsistent with the traditional explanations for government-purchases-led expansions and is consistent with the view that, fearful of breakdowns in the collusive understanding, oligopolistic industries allow their prices to fall relative to their marginal cost of production.

This logic of implicit collusion also suggests that firms would raise their prices disproportionately when there are temporary increases in their costs. Such an increase in costs makes firms much less keen on undercutting the industry price. We use this idea to explain why oil price increases lead to such severe economic contractions.[15] Price rigidity, on its own, would tend to predict that the response of the economy to an oil price increase is quite muted, since firms would fail to pass along the increase in their input costs to the buyers of their final output.[16] Thus, implicit collusion, or some other departure from standard models of pricing, seems important for understanding the effects of these cost shifts. Of course, much research is still needed to understand the exact combination of departures from marginal cost pricing that best explains economic fluctuations.

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[1] *An extensive discussion of the connection between pricing and macroeconomics is contained in J. J. Rotemberg and M. Woodford "The Cyclical Behavior of Prices and Costs" in J. Taylor and M. Woodford,* Handbook of Macroeconomics, *forthcoming.*

[2] *J. J. Rotemberg, "Monopolistic Price Adjustment and Aggregate Output,"* Review of Economic Studies *49, (October 1982), pp. 517–531.*

[3] *J. J. Rotemberg "Sticky Prices in the United States,"* Journal of Political Economy *90, No. 6, (December 1982), pp. 1187–1211.*

[4] *For leading examples, see B. S. Bernanke and A. S. Blinder "The Federal Funds Rate and the Channels of Monetary Policy,"* American Economic Review, *82, 4, (1992) pp. 901–921, and J. B. Taylor "Discretion Versus Policy Rules in Practice," Carnegie-Rochester Conference Series on Public Policy 39, (1993), pp. 195–214.*

[5] *J. J. Rotemberg and M. Woodford, "An Optimizing Econometric Framework for the Evaluation of Monetary Policy,"* NBER Macroeconomics Annual *forthcoming.*

[6] *A. Giovannini and J. J. Rotemberg "Exchange Rate Dynamics with Sticky Prices: The Deutsche Mark, 1974–1982,"* Journal of Business Economics and Statistics *7, No. 2, (April 1989), pp. 169–78.*

[7] *For a survey that discusses additional issues surrounding price rigidity see J. J. Rotemberg "The New Keynesian Microfoundations,"* NBER Macroeconomics Annual, *(1987), pp. 69–104.*

[8] *J. J. Rotemberg and M. Woodford "Real Business Cycle Models and the Forecastable Movements in Output, Hours and Consumption,"* American Economic Review, *86, (March 1996), pp 71–89.*

[9] *J. J. Rotemberg "Prices, Output and Hours: An Empirical Analysis Using a Sticky Price Model,"* Journal of Monetary Economics, *37, (June 1996), pp. 505–34.*

[10] *J. J. Rotemberg and M. Woodford, "An Optimizing Econometric Framework for the Evaluation of Monetary Policy,"* NBER Macroeconomics Annual *forthcoming..*

[11] *M. Bils "The Cyclical Behavior of Marginal Cost and Price,"* American Economic Review, *77, (December 1987), pp. 838–57 and M. Bils and J. A. Kahn, "What Inventory Behavior Tells us about Business Cycles," Rochester Center for Economic Research Working Paper 428, September 1996.*

[12] *W. C. Mitchell,* Business Cycles and their Causes, *Berkeley: University of California Press, 1941.*

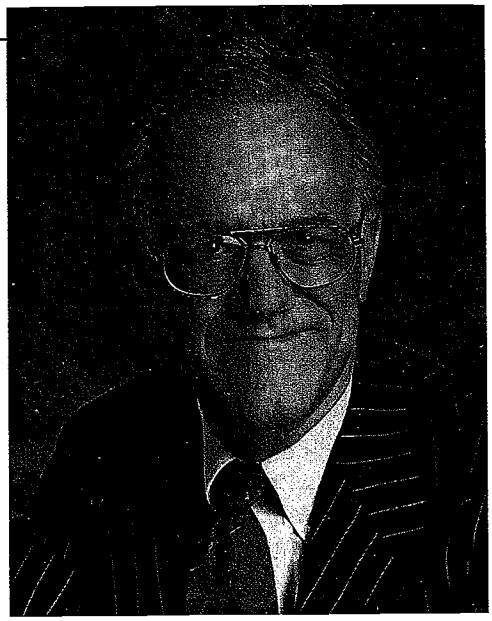
[13] *See J. J. Rotemberg and M. Woodford "Markups and the Business Cycle,"* NBER Macroeconomics Annual, *(1991), pp. 63–129 as well as* Handbook for Economics, *forthcoming, for further evidence of this.*

[14] *J. J. Rotemberg and M. Woodford, "Oligopolistic Pricing and the Effects of Aggregate Demand on Economic Activity,"* Journal of Political Economy, *100, (December 1992), pp. 1153–1207.*

[15] *J. J. Rotemberg and M. Woodford "Imperfect Competition and the Effects of Energy Price Increases Economic Activity,"* Journal of Money, Credit and Banking, *28, (November 1996), pp. 549–77.*

[16] *J. J. Rotemberg "Supply Shocks, Sticky Prices and Monetary Policy,"* Journal of Money, Credit and Banking, *Vol. 15, No. 4, (November 1983), pp. 433–5.*

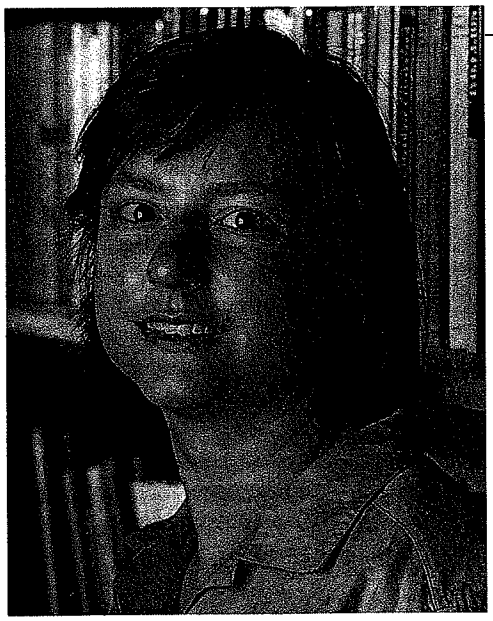
NBER Profile: *John Herron Biggs*



John H. Biggs has been chairman of the NBER's Board of Directors since 1996 and a member of the Board since 1987. He is also Chairman and Chief Executive Officer of TIAA-CREF. Prior to his election to that position in January 1993, Biggs had served as President and Chief Operating Officer of TIAA-CREF since February 1989. He also has served as a CREF Trustee since 1983.

A native of St. Louis, Biggs earned an A.B. degree in classics from Harvard University and a Ph.D. in economics from Washington University in St. Louis. He began his professional career with the General American Life Insurance Company in 1958, serving in various actuarial management positions for the company until he was appointed Vice President and Controller in 1970. In 1977, Biggs became Vice Chancellor for Administration and Finance at Washington University in St. Louis. He was named President and CEO of Centerre Trust Company, St. Louis, in 1985.

Biggs's wife, Penelope Parkman Biggs, has taught Latin at a small private school in St. Louis. Their son, Henry, is a college professor and the father of two. In his leisure time, Biggs plays golf, squash, and tennis. He and his wife also enjoy the ballet, opera, and the theater.



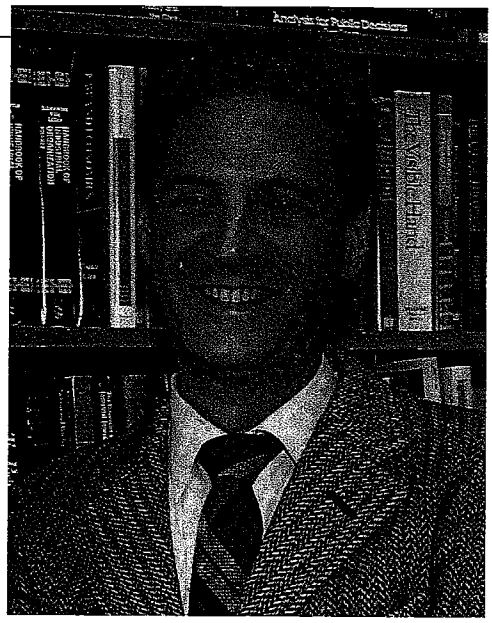
NBER Profile: *Dora L. Costa*

Dora L. Costa is a faculty research fellow in the NBER's programs on the Development of the American Economy and on Aging. She is also the Ford Career Development Associate Professor of Economics at MIT where she teaches economic history and econometrics. Costa received her B.A. in economics and mathematics from the University of California, Berkeley in 1986 and her Ph.D. in economics from the University of Chicago in 1993. She spent 1995–6 at the NBER as an Aging Fellow.

Costa's research focuses primarily on issues in labor economics, demography, and health, as interpreted over the long span of American economic history. Her work has covered a wide range of topics including: retirement; elderly living arrangements; determinants of older age mortality and morbidity; long-term trends in the health of the population; and trends in the consumption of recreational goods. She is the author of numerous articles and a forthcoming book, *The Evolution of Retirement: An American Economic History 1880–1990* (University of Chicago Press for NBER, 1998).

Costa enjoys food, frisbee, National Parks, and weekends at the office. She and Matthew Kahn, an economist at Columbia, will marry at the end of May.

NBER Profile: *Adam B. Jaffe*



Adam B. Jaffe is Coordinator of the Project on Industrial Technology and Productivity of the National Bureau of Economic Research (NBER) and Associate Professor of Economics at Brandeis University. He is also principal investigator for a National Science Foundation research project, funded through the NBER, to compile a comprehensive database on patents and patent citations and to use these data to document the flows of technological knowledge across time, industries, and geographic areas. Jaffe's areas of specialization are the economics of technological change and the economics of regulated industries. He has been a Faculty Research Fellow and a Research Associate of the NBER since 1985.

Jaffe is on leave from Brandeis this year, and is working in the NBER's Cambridge office. Previously, he was Assistant and then Associate Professor of Economics at Harvard University. During 1992–4 he visited the John F. Kennedy School of Government at Harvard. During academic year 1990–1, Prof. Jaffe took leave from Harvard to serve as Senior Staff Economist at the President's Council of Economic Advisers in Washington, where he had primary staff responsibility for energy policy, technology policy, and regulatory policy. Jaffe received his S.B. in Chemistry (1976) and his S.M. in Technology and Policy (1978) from MIT, and his Ph.D. in Economics from Harvard University (1985).

Jaffe is a member of the Board of Editors of the *American Economic Review* and an Associate Editor of the *Journal of Industrial Economics;* Co-organizer of the NBER Science and Technology Policy Research Workshop; and a member of the Economics Roundtable, The Advanced Technology Program, National Institute of Standards and Technology, U.S. Department of Commerce.

He is married to Pam Jorgensen. They and their children, Sonia and Michael, live in Brookline. Jaffe likes to watch birds and to sing renaissance music.

Conferences

The Economics of Aging

The NBER and the Japan Center for Economic Research (JCER) jointly sponsored a conference on "The Economics of Aging" in Kyoto on May 8 and 9. The papers and discussions from the conference 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*.

The agenda for the two-day conference was:

Toshiaki Tachibanaki, Kyoto University, and **Tetsya Maruyama**, University of Pennsylvania, "Promotion, Incentives, and Wages"

Discussant: David M. Cutler, NBER and Harvard University

Richard G. Woodbury, NBER, "The Motivations for Business Retirement Policies"

Discussant: Toshiaki Tachibanaki

Yukiko Abe, Nagoya City University, "Labor Supply of the Japanese Elderly in the 1980s to 1990s and the Employees' Pension Benefits"

Discussant: David A. Wise, NBER and Harvard University

James M. Poterba, NBER and MIT, and **Andrew A. Samwick**, NBER and Dartmouth College, "Household Portfolio Allocation over the Life Cycle"

Discussant: Makoto Saito, Kyoto University

Seki Asano, Tokyo Metropolitan University, "Japanese Public Pension System and the Demand for Private Annuity and Life Insurance"

Discussant: Andrew A. Samwick

Steven J. Venti, NBER and Dartmouth College, and **David A. Wise**, "Choice, Chance, and Wealth at Retirement"

Discussant: Naoyuki Yoshino

Makoto Saito, "Empirical Investigation of Intergenerational Consumption Distribution: A Comparison among Japan, the U.S., and the U.K."

Discussant: Steven J. Venti

Matthew J. Eichner, MIT, "Choice Among Employer-Provided Insurance Plans: Preliminary Evidence"

Discussant: Yukiko Abe

David M. Cutler, "International Variation in Health Care Policies and the Issues Motivating Policy Reform"

Discussant: Makoto Kawamura, Hosei University

Reiko Suzuki, JCER, and **Seiritsu Ogura**, Hosei University, "Distribution of the Cost of Health Care for the Aged in Japan"

Discussant: Matthew J. Eichner

Satoshi Nakanishi and **Noriyoshi Nakayama**, University of Marketing and Distribution Science, "The Effects of Demographic Changes on Economic Variables: A Simulation Analysis"

Discussant: David M. Cutler

Seiritsu Ogura, Hosei University, "What Went Wrong with the Official 1992 Japanese Population Projection?"

Discussant: Richard G. Woodbury

Tachibanaki and **Maruyama** analyze firm data from Japan and investigate the relationship among promotion, incentives, and wages. Given the aging trend in Japanese firms, there is a desire to reduce long-run labor costs. The authors investigate whether Japanese firms induce the highest work-effort from their employees under existing industrial relations systems. They conclude that employees in lower positions are motivated well by the existing Japanese promotion and wage system, while those in higher positions are unaffected by the system.

Most traditional defined benefit pension plans in the United States encourage older workers to retire. For long-service employees, the financial incentive to retire often begins as young as age 55. By age 65, essentially all pension plans encourage retirement. **Woodbury** explores the motivations guiding the design of business retirement policies and, in particular, whether these incentives were implemented deliberately to induce retirement at these ages. His analysis is based on historical business documents relating to pension design, and on interviews with executives at 20 large U.S. corporations. He finds that in most cases, retirement incentives are either unintentional or secondary to the policy's central motivation. The primary policy motivations relate to competitiveness (providing benefits that are similar in structure and value to those at competing employers) and to assuring the financial well-being of retirees. At most companies, the initial design and ongoing evaluation of the pension plans is based on comparative analyses among similar employers, and on the effectiveness of policy provisions in achieving

income replacement objectives.

Abe studies the labor supply of 60–64 year-old Japanese males who are covered by Employees' Pension Insurance (EP). The EP benefits are reduced for working beneficiaries, who are eligible to receive benefits and work. In evaluating the effects of such benefit reduction schemes, Abe incorporates the choice of "work mode" into his analysis. The EP benefit reduction may not apply to those who are self-employed, work in the public sector, or work part-time: about 30 percent of working EP-eligibles. After addressing this issue and controlling for year, age group, EP status, and other personal characteristics, Abe estimates that benefit reduction does discourage labor supply by 60–64 year-old males who are EP-eligible. Further, he finds, the labor force participation rate and the proportion of private sector employees among 60–64 year-old EP-eligibles seems to have increased between 1983 and 1988, and has stayed more or less constant between 1988 and 1992.

Poterba and **Samwick** analyze the allocation of household financial portfolios in the United States. They distinguish between age and cohort effects using data from the Federal Reserve Board's Survey of Consumer Finances. They show that cohort effects have an important effect on the estimated age profiles for the ownership and portfolio shares of both financial and nonfinancial wealth. Age profiles vary considerably across different assets, and for a given asset, across cohorts. They discuss the implications of their results for the application of the life cycle model to the components of wealth, for the prospective retirement income security of the baby boom generation, and for the effects of taxation on asset allocation.

Asano examines the effects of public pension benefits on individual Japanese households' choices of life insurance and private annuities. He uses two waves of micro data obtained in 1990 and 1994, which provide a unique opportunity to observe the effects on households' asset allocation of declining social security benefits, changes in total asset value, and changes in expectations. He finds that the intended level of total annuities was raised on average by about 4 million yen from 1990 to 1994, which more than compensated for reduction of public pension benefits. Also, compared to 1990, the age profile of mean total annuities became flatter in 1994 across all age groups: younger generations began to accumulate personal annuities. The age profile of mean total life insurance stayed quite flat and stable in both periods, but intragenerational variations widened up to twice the level of 1990.

Venti and **Wise** show that at all levels of *lifetime* earnings, there is enormous dispersion in the accumulated wealth of families approaching retirement. Some households with low incomes, and a significant proportion of high income households, save little. A substantial proportion of low income households save a great deal, though. Very little of this dispersion can be explained by chance differences in individual circumstances—"largely outside the control of individuals"—that might limit the resources from which saving plausibly might be made, Venti and Wise write. They also find that investment choice is not a major determinant of the dispersion in asset accumulation. It matters about as much as chance events that limit the available resources of households with the same lifetime earnings. They conclude that the bulk of the dispersion must be attributed to differences in the amount that households choose to save. The differences in saving choices among households with similar lifetime earnings lead to vastly different levels of asset accumulation by the time retirement age approaches.

Saito examines how the consumption goods generated by economic growth have been distributed among generations during the past 30 years in Japan, the United States, and the United Kingdom. He finds that fewer of the fruits of growth are distributed to younger generations, per capita, in Japan and the United States, while younger generations get a larger share in the United Kingdom. Particularly in the United States, the share of the generated resources distributed to the current young generation has deteriorated dramatically. This suggests that without sound economic growth, the living standard of future generations might not be sustained under the existing intergenerational transfer scheme in the United States.

Eichner presents some basic evidence on how employees choose health insurance coverage from a menu of options. He also studies employees who elect to change plans voluntarily. This group consists disproportionately of larger family groups tending to move between two of the more generous coverage options. Movement between plans seems to be associated with higher expenditures both before and after the move, Eichner finds.

Cutler argues that medical systems in the developed world are likely to embark on a "third wave" of health care reform over the next several years. The first wave of reform was the guarantee of universal coverage and the establishment of a very generous insurance package. This was accomplished from the early post-World War II period through 1980. The second wave of reform, beginning in the early 1980s, was the era of overall spending limits. This period was marked by an emphasis on limiting the overall costs of med-

ical care, through global budgets on hospital revenues and fee restrictions on providers. Over time, however, systems with these constraints have fallen, and the inefficiencies associated with overall constraints have become more noticeable. This suggests that a third wave of reform is like to arise, concentrating on microeconomic efficiency and increased use of markets to allocate medical services and health insurance.

Suzuki and **Ogura** investigate the geographic differences in per capita health care costs for the elderly. They find that the differences are more extreme between municipalities than between prefectures, and that controlling the supply of health care does not seem to close these gaps. One reason for this phenomenon is that the elderly in lower income municipalities seem to have longer hospital stays. Furthermore, the smaller the population, the greater the variation in health care costs. These findings cast serious doubt on the qualification of municipalities which are required to act as insurers for most of the elderly under the current Japanese public health insurance system. Suzuki and Ogura also compare individual health care costs of the elderly over a two-year period in several prefectures in Japan. For outpatient care, the bottom 80 percent of the population consumes about half of total health care, and the top 10 percent consumes more than 30 percent of total health care. Furthermore, these intensive consumers of health care tend to be persistent, and Suzuki and Ogura discuss the economic implications of separating them from the rest of the elderly population.

Nakayama and **Nakanishi** analyze the effect of demographic changes and health policy on the health care sector and the economy as a whole. Keeping the present health system, the demand for medical care will be 2.7 times larger in 2010 and 3.2 times larger in 2030 than the demand for medical care in 1990. The forecast of the growth rate of medical care demand is 2.7 percent per annum during the authors' simulation period. Although people will spend more for medical care than at present, the aging of the population will depress their health status. The share of medical expenditures in the whole economy (that is, in GDP) will grow to 11.3 percent, then gradually decline after 2015.

Every five years, the Japanese government publishes an official population projection. The last two official projections predicted a recovery of the Total Fertility Rate (TFR) to 2.0 and 1.8 respectively by the year 2020. The latest projection, published last January, predicted a more modest recovery of 1.6. **Ogura** examines the birth rate population model of the 1992/3 projection, and finds two fundamental problems. First, the model is seriously misspecified and estimation results using the truncated data tend to be very unstable. Second, the projection assumes that structural adjustments are completed by the 1960 cohort. In fact, Ogura estimates that there was a drop of almost 0.3 in TFR between the 1960 and 1964 cohorts. Most likely, the long-run equilibrium TFR at this moment is around 1.4, or the current TFR level. Government claims for future recovery in TFR therefore should not be taken seriously.

International Seminar on International Trade

The biennial joint NBER-CEPR (Centre for Economic Policy Research in London) International Seminar on International Trade (ISIT) was held near Paris on May 23–5. As part of ISIT's objective of promoting research in North America and Europe on new trade and trade related topics, this year's conference, which was organized by Robert Baldwin, NBER and the University of Wisconsin, Madison; Richard Baldwin, NBER and CEPR, Graduate Institute of International Studies, Geneva; and Jaques Thisse, CEPR and CORE at Universite Catholique de Louvain, was devoted to the "new" economic geography field. Papers from the conference will be published as a special issue of the *European Economic Review*. The following papers were presented:

Luca Ricci, International Monetary Fund, "Geography and Comparative Advantage."

Donald Davis, NBER and Harvard University, and **Davis Weinstein**, University of Michigan, "Economic Geography and Regional Production Structure: An Empirical Investigation."

Philippe Martin and **Gianmarco Ottaviano**, CEPR, "Growing Locations: Industry Location in Models of Endogenous Growth."

Paul R. Krugman, NBER and MIT, "The Rise, Decline, and Return of Geographical Concentration."

James Markusen, NBER, and **Anthony Venables**, CEPR, "The Impact of Foreign Direct Investment on Host Economies."

Richard Baldwin, CEPR, "Economic Agglomeration and Footloose Capital."

(Continued on next page)

Diego Puga, London School of Economics, "The Rise and Fall of Regional Inequalities"

Mark Beardsell, Brown University, and **Vernon Henderson**, NBER and Brown University, "High Tech Spatial Evolution"

Konrad Stahl, CEPR, and **Uwe Walz**, University of Bochum, "Firm Heterogeneity an Local Labor Markets"

Gilles Duranton, London School of Economics, "Decentralization, Representative Democracy, and Efficiency"

Riccardo Faini, CEPR, "Skilled Labor, Migration, and Regional Growth"

Pierre-Philippe Combes, CREST-INSEE, "Economic Structure and Local Growth: An Econometric Study on France, 1984–93"

Ricci investigates the relationship between agglomeration of economic activity and the pattern of specialization of countries, as well as the role of comparative advantage versus average productivity. He develops a two-country, three-sector model which includes increasing returns to scale, product differentiation, monopolistic competition, and trade costs. He finds that comparative advantage determines specialization, while competitive advantage (that is, the average efficiency of one location) drives agglomeration. Once endogenous agglomeration effects are taken into account however, an increase in comparative advantage is not necessarily associated with an increase in specialization. Agglomeration in one country reduces its specialization within an increasing-returns-to-scale industry.

There are two principal theories of why countries or regions trade: comparative advantage and increasing returns to scale. Yet there is virtually no empirical work that assesses the relative importance of these two theories in accounting for production structure and trade. **Davis** and **Weinstein** find support for the existence of economic geography effects in eight of 19 Japanese manufacturing sectors, including transportation equipment, iron and steel, electrical machinery, and chemicals. Moreover, they find that these effects are economically very significant. They conclude that while economic geography may explain little about the international structure of production, it is very important for understanding the regional structure of production.

Martin and **Ottaviano** construct a model in which endogenous growth and industry location interact. They show that with global spillovers in R and D, a high growth rate and a high level of transaction costs are associated with relocation of newly created firms to the South (the location with low initial human capital). With local spillovers in R and D, this activity will be agglomerated in the North (the location with high initial human capital), and the rate of innovation will increase with the concentration of firms in the North. This in turn implies that a decrease in transaction costs through trade integration, for example, will increase the growth rate by leading to a higher industrial concentration of firms where the R and D is located. The authors show that industrial concentration improves welfare only for low enough transactions costs and high enough spillovers.

Krugman shows that the relationship between economic and technological progress and the geographical concentration of production is even more complex than we may have supposed. Not only may economic growth first foster then discourage concentration; at later phases, the trend may reverse itself. He suggests that there is an ongoing trend toward ever more differentiated demand. Increasing flexibility of production, essentially attributable to information technology, together with the growth of the world market, makes it possible to meet this demand for variety with a proliferation of goods. Meanwhile, transport costs are probably falling again—if nothing else because an increasing share both of output and of world trade either consists of goods with a high value per pound or of weightless services which can be transported cheaply if they can be transported at all. These propositions suggest that the story of the reconcentration of the U.S. auto industry could play itself out in other situations and circumstances.

In presenting a new analytical framework for assessing the impact of foreign direct investment on host economies, **Markusen** and **Venables** develop a model in which there are several industries that are linked through an input-output structure. The impact of an FDI project is felt in markets for final and intermediate goods, thus creating forward and backwards linkages. Under these circumstances, there is a tradeoff between competition effects, under which multinationals substitute for domestic industry, and linkage effects, creating complementarities. They use the model to show that the net effect of FDI on local industry may be complementary rather than competing, thus acting as a stimulus to host country industrial development. They conclude that their analysis points to the need to broaden the scope of standard project appraisal techniques to encompass linkages between related activities, and also to address the more difficult possibilities raised by cumulative causation.

The "new" economic geography literature focuses on two models: a model based on "footloose labor" and a model based on vertically-linked industries. Both models are complex since they feature demand-linked and cost-linked forces that encourage agglomeration. **Baldwin** presents a simpler model in which agglomeration is driven only by demand-linked circular causality. He analytically identifies the critical level of trade barriers below which the symmetric equilibrium is unstable. He also analytically derives the locational and welfare effects of unilateral liberalization and the formation of a customs union. The model's simplicity suggests that it may be useful for other applications, such as the introduction of endogenous growth and political economy considerations.

Puga analyzes how the degree of regional integration affects regional differences in production structures and income levels. With high transport costs, industry is spread across regions to meet final consumer demand. As transport costs fall, increasing returns interact with labor mobility, and/or with input-output linkages between firms, to create a tendency for the agglomeration of activities with increasing returns. When workers migrate towards locations with more firms and higher real wages, this intensifies the agglomeration. When workers instead do not move across regions, further reductions in transport costs make firms increasingly sensitive to wage differentials, leading industry to spread out again.

Beardsell and **Henderson** examine the spatial evolution of computers and electronic components across 317 metropolitan areas in the United States since the introduction of the personal computer. They start by examining the relative distribution of high-tech employment across cities, how that distribution changes from 1977–92, and how cities move through the distribution. The two industries show no tendency to settle down, nor any tendency of retrenchment during periods of national high-tech employment decline. There is a high degree of persistence in own-industry employment within cities, and no tendency for relative size distributions of high-tech employment to collapse or go bimodal. Overall, computers exhibit more turbulence, with more dramatic big winners and losers among cities. Electronic components seem to be more grounded, perhaps because of greater reliance on local market scale and urbanization economies. In attracting or repelling an industry, urban heterogeneity is important. Large, well educated cities near San Jose have a much greater chance of attracting high-tech employment, and less chance of losing it. For computers, the authors find strong evidence of significant, dynamic, own-industry externalities among non-affiliate plants. Corporate plants in computers seem to be self-reliant and not really influenced by externalities. For electronic components, there is no evidence of own-industry externalities. Agglomeration seems to be driven by urban characteristics and intra- and external-industry demand conditions.

Stahl and **Walz** investigate the simultaneous impact of imperfections in output and input markets on the characteristics and size of regional economic activity. Firms, producing imperfect substitutes, face product-specific demand shocks which translate into firm-specific shocks. The more different the products are, the less correlated the shocks. Larger regions also provide a better hedge for firms. With heterogeneity on the output side, labor demand of firms tends to become more heterogenous, leading to higher training costs for workers in the case of a job loss. Since adjustment costs prove to be higher in larger regions, workers demand higher wages there, imposing higher labor costs on firms. The authors analyze this trade-off and ask what are the resulting firm characteristics in different regions, the interregional wage dispersion, and the impact on the regional distribution of economic activity.

Duranton proposes a framework for comparing centralized and decentralized institutions when the agents populating the economy have a finite horizon. With decentralized institutions, coordination failures arise, and the allocation of factors is not efficient. Too many cities are developed with federalist structures, and economic activity does not agglomerate sufficiently. However, growth may be possible in the long run. On the other hand centralized institutions, for which the author proposes a general model of representative democracy, can manage productive activities efficiently and take full advantage of increasing returns. Still, limited time horizons induce rent seeking, and thus can prevent long-run growth.

Faini develops a simple model of regional development to show that (unskilled) unions will increase wages of unskilled workers and depress growth in both backward and advanced regions. The growth effects of union activity will be felt more strongly in the relatively poor regions, though. He also finds that the negative growth effects of union activity in the backward regions will be more marked when skilled workers are allowed to migrate and the unions cannot precommit to wage policies. However, if unions recognize that a more aggressive wagesetting policy may foster the migration of skilled workers and further depress the demand for unskilled labor, then they will moderate their wage demands, with a beneficial impact on growth. Different wage-

setting institutions may affect the labor market and the growth outcome. With skilled labor migrations, regional unions will have a strong incentive to coordinate their wage requests across regions and to further raise the unskilled wage. Faini concludes that labor market policies designed to foster regional convergence should seek to discourage centralized wagesetting and, under some but not all circumstances, favor (skilled) labor mobility.

Combes shows how the economic structure influences local growth. Then he studies how local sectorial specialization and diversity, competition, average size of plants, and employment density between 1984 and 1993 affected employment growth in 341 French employment zones. He finds that industry and services do not follow the same dynamics. Employment density, competition, and large firms' size always reduce growth in industrial sectors. Specialization and diversity most often have a negative effect on growth, but may also foster the growth of a few sectors. In the service industries, never previously studied, negative specialization effects and positive diversity effects are always observed. Competition and firms' size have a negative impact and density a positive one, with some exceptions.

A broad conclusion coming out of the conference was that researchers in both international trade and economic geography can benefit significantly from learning more about the models and empirical studies in each other's field. The increasing numbers of scholars undertaking research in both fields indicates the validity of this proposition. Furthermore, as economic and political integration between countries and regions continues, the two fields themselves are likely to be integrated to an increasing extent.

20th Annual International Seminar on Macroeconomics

The National Bureau of Economic Research and the European Economic Association jointly sponsored the NBER's 20th Annual International Seminar on Macroeconomics (ISOM) in Switzerland this past June. Andrew K. Rose, NBER and University of California, Berkeley, served as co-chair and conference organizer. Guido Tabellini, IGIER, was co-organizer; Charles Wyplosz, Graduate Institute of International Studies, is the current ISOM co-chair. This year's program was:

Marianne Baxter and **Robert G. King**, NBER and University of Virginia, and **Urbann J. Jermann**, University of Pennsylvania, "Risk and Return Properties of NIPA Components: An International Comparison"

Discussants: Richard H. Clarida, NBER and Columbia University, and Walter Wasserfallen, Studienzentrum Gerzensee

David Backus, NBER and New York University, and **Mario Crucini** and **Chris Telmer**, "Properties of International Relative Prices"

Discussants: Urban J. Jermann, and Philippe Bachetta, Studienzentrum Genzensee

Ansgar Belke, Ruhr-Universitat Bochum, and **Daniel Gros**, Center for European Policy Studies, "Evidence on the Costs of Intra-European Exchange Rate Variability"

Discussants: Tamim Bayoumi, International Monetary Fund, and Jose Vinals, Bank of Spain

Maurice Obstfeld, NBER and University of California, Berkeley, "A Strategy for Launching the Euro"

Discussants: Peter Kenen, Princeton University, Luigi Spaventa, Universita Bocconi, and Charles Wyplosz

Richard H. Clarida, **Jordi Gali** and **Mark Gertler**, NBER and New York University, "Monetary Policy Rules in Practice: Some International Evidence"

Discussants: Marvin Goodfriend, Federal Reserve Bank of Richmond, and Torsten Persson, NBER and Harvard University

Olivier Jeanne, University of California, Berkeley, "Real and Nominal Rigidities Over the Business Cycle"

Discussants: Marianne Baxter, and Lucrezia Richlin, ECARE

Jean Pierre Danthine, University de Lausanne, **John B. Donaldson** and **Thore Johnsen**, Columbia University, "Productivity Growth, Consumer Confidence, and the Business Cycle"

Discussants: Robert Kollman, University of Paris, and Robert G. King

Fabio C. Bagliano, Universita di Torino, and **Carlo Favero**, Universita Bocconi, "Measuring Monetary Policy with VAR Models: An Evaluation"

Discussants: Stefan Gerlach, Bank for International Settlements, and James H. Stock, NBER and Harvard University

Baxter, Jermann, and **King** present some initial measurements of the risk and return characteristics of National Income and Product Accounts (NIPA) components, using the Campbell-Shiller [1988] model (which assumes constant expected returns). They find that the returns to NIPA components are more volatile than aggregate growth rates; and the returns to consumption, investment, and government purchases are very highly correlated with own-country output. The correlations between trade variables and output are weaker. Looking across countries, they find that the correlation between the returns on consumption are very similar to the correlation between the growth rates of these variables.

The variability and persistence of real exchange rates are one of the most striking features of international macroeconomic data. **Backus** and his co-authors examine prices in the G-7 [countries] for 28 manufactured goods, and document both similarities and differences across goods. They find that: 1) dispersion of prices across countries and across industries within countries are of similar magnitudes; 2) relative prices exhibit substantial reversion toward the mean, with half-lives of around two years; 3) there is substantial heterogeneity across goods, so that the standard deviations of prices across countries range from 10 percent for paper and non-ferrous metals to 24 percent for tobacco and 27 percent for petroleum refining.

Belke and **Gros** find that intra-European exchange rate variability has a statistically strong and economically negative impact on employment, production, and investment for EU countries (including France and Germany). They find no similar effect for dollar variability. This result holds up even accounting for the presence of policy variables that might have an impact on exchange rate variability. A more detailed study of an error-correction model for the German labor market confirms that there is a long-run relationship between the variability of the DM and unemployment in Germany.

Obstfeld studies the constraints placed by the Maastricht Treaty on the "conversion" rates at which member currencies will be transformed into the Euro at the start of stage 3 of economic and monetary union (EMU). He shows that the stage 3 bilateral conversion factors for EMU member currencies must correspond to closing market exchange rates as of December 31, 1998; furthermore, currency conversion rates into the Euro cannot be determined until that date. Moreover, official announcements about intended conversion factors will carry no credibility with markets, as market rates must be chosen over any preannounced rates according to the Treaty. Unless there is heavy official intervention in the runup to stage 3, EMU members' bilateral market rates will exhibit excessive volatility and may induce beggar-thy-neighbor policy behavior. On the other hand, exchange-rate targeting may open the door to speculative currency crises. The only feasible solution appears a widely-publicized institutional reform to subjugate national central banks' policies entirely to the goal of intra-EMU exchange stability in the final months of stage 2.

Clarida, Gali, and **Gertler** estimate monetary policy reaction functions for two sets of countries: the "G3" (Germany, Japan, and the United States) and what they call the "E3" (the United Kingdom, France, and Italy). They find that since 1979, each of the G3 central banks has pursued an implicit form of inflation targeting, which may account for the broad success of monetary policy within these countries over this time period. Also, these central banks have been forward looking: they respond to anticipated inflation as opposed to lagged inflation. Policymaking by the E3 has been far less cogent, though. Even prior to the emergence of the "hard ERM," the E3 central banks were influenced heavily by German monetary policy. Perhaps unsurprisingly, at the time of the EMS collapse, interest rates in each of the E3 countries were much higher than domestic macroeconomic conditions warranted. Taken together, the results support the view that some form of inflation targeting may be superior to fixing exchange rates, as a means to gain a nominal anchor for monetary policy.

Jeanne attempts to assess whether money can be an important source of output fluctuations in the framework of the literature on real business cycles. He shows that if labor supply is perfectly competitive, money shocks can explain a substantial fraction of output volatility only if nominal price rigidities are implausibly pervasive and persistent. However, introducing real wage rigidity into the model may reduce considerably the extent of nominal stickiness that is required for money to matter. He argues that given the level of real wage rigidity that is observed in developed countries, only a small degree of nominal stickiness is necessary for money to have large and persistent effects on output.

Danthine, Donaldson, and **Johnsen** analyze the implications of both systematic variations and single episodes of change in the labor productivity growth rate for business cycle phemomena. They also consider pure expectational changes: changes in expectations about the economy's growth rate not accompanied, within the sample period under study, by similar shifts in the actual growth rate of productivity. The context is a standard real business cycle

style model. The authors show that macroeconomic variations induced by agents' changing expectations of their economy's growth rate, in conjunction with standard technology shocks, are consistent with the principal stylized facts of the business cycle. They also demonstrate that if agents' worse case fears are sufficiently extreme, variation induced by growth expectations alone can account for the majority of the variation in their economy's major macroaggregates. Reasonably pessimistic expectations, combined and correlated with standard level shocks, lead to business cycle fluctuations. Growth expectations' induced variation is, in some respects, fundamentally different from the variation induced by standard level shocks. Not only do the growth and level shocks have opposing effects on the enonomy's aggregate investment and labor supply decisions but also, for plausible parameterizations, the frequency of the growth fluctuations also frequently differs substantially from that induced by level shocks.

Bagliano and **Favero** evaluate monetary policy shocks derived from vector autoregression (VAR) models by considering three issues: specification, identification, and the effect of the omission of the long-term interest rate. Specification analysis suggests that only VAR models estimated on a single monetary regime feature parameter stability and do not show signs of misspecification. The identification analysis shows that VAR-based monetary policy shocks and policy disturbances identified from alternative sources show very little correlation but yield similar descriptions of the monetary transmission mechanism. Finally, the inclusion of the long-term interest rate in a benchmark VAR delivers a more precise estimation of the structural parameters capturing behavior in the market for reserves, and shows that contemporaneous fluctuations in long-term interest rates are an important determinant of the monetary authority's reaction function.

These papers will be published in a special edition of the *European Economic Review*.

Science and Technology Policy

The NBER's Project on Science and Technology Policy, directed by NBER Research Associate Adam B. Jaffe of Brandeis University, met on July 14 in Cambridge during the NBER's Summer Institute. NBER Research Associate Paul M. Romer of Stanford University, and David Mowery of University of California, Berkeley, served as organizers of the meeting, along with Jaffe. Forty representatives of universities, government agencies, and other research organizations joined in the discussion of the following papers:

Adam B. Jaffe, and **Manuel Trajtenberg,** NBER and Tel Aviv University, "Knowledge Flows Across Time and Space as Evidenced by Patent Citations"

Samuel S. Kortum, NBER and Boston University, and **Josh Lerner,** NBER and Harvard University, "Stronger Protection or Technological Revolution: What is Behind the Recent Surge in Patenting?"

Wesley Cohen, Carnegie Mellon University, **Richard R. Nelson,** Columbia University, and **John Walsh,** University of Illinois, "Appropriability Conditions and Why Firms Patent and Why They Do Not in the American Manufacturing Sector"

Andrew Toole, Laurits R. Christensen Associates, "The Impact of Federally Funded Basic Research on Industrial Innovation: Evidence from the Pharmaceutical Industry"

Ashish Arora, Carnegie Mellon University, and **Alfonso Gambardella,** University of Urbino (Italy), "The Impact of NSF Support for Basic Research in Economics"

Lee Branstetter, NBER and University of California, Davis, and **Mariko Sakakibara,** University of California, Los Angeles, "Japanese Research Consortia: A Microeconometric Analysis of Industrial Policy"

Jaffe and **Trajtenberg** use evidence from citations in patents to characterize the intensity and time path for knowledge flows across countries. Using a comprehensive database of all U.S. patents assigned between 1963 and 1993 to corporations whose inventors resided in the United States, United Kingdom, France, Germany, or Japan, and all citations to those patents contained in patents from 1977–94 from any of those five countries, they find: 1) there is a clear diffusion pattern to citations, with peak citation intensity occurring approximately 5 years after grant; 2) there is clear localization of citations, with cites from within the country generally coming faster and more intensely than cites from other countries; 3) there are variations across countries in the nature of technology, with Japan relatively more focused on recent technology and Germany relatively more focused on older technology.

Applications for U.S. patents by

U.S. inventors have increased more since 1985 (in either absolute or percentage terms) than in any other decade this century. The conventional wisdom is that U.S. patent holders have fared much better since the establishment by Congress in 1982 of the Court of Appeals of the Federal Circuit. **Kortum** and **Lerner** ask whether this institutional change, which should increase the propensity to patent inventions, explains the burst in U.S. patenting. Using both international and domestic data on patent applications and awards, they conclude that the jump in patenting may reflect an increase in U.S. inventive activity, spurred by either new technological opportunities or by advances in the management or technology of performing research itself.

Using data gathered by the 1994 Carnegie Mellon Survey on Industrial R and D in the U.S. manufacturing sector and, for comparison, those gathered by the 1983 Yale Survey on Appropriability and Technological Opportunity Conditions in the United States, **Cohen, Nelson,** and **Walsh** examine how firms appropriate their profits attributable to innovation, how they change those strategies over time, and why firms patent. They find that in most industries, firms use a range of mechanisms to protect a given innovation, particularly lead-time, secrecy, and complementary capabilities. Relative to the other appropriability mechanisms, it turns out, patents are no more effective in 1994 than in 1983, despite considerable strengthening of their legal enforcement since the early 1980s. The clearest change since 1983 is that firms now rely much more heavily on secrecy in protecting their product innovations than they had previously. Consistent with that, the fear of disclosure of information is now one of the most important reasons for not applying for a patent, while in 1983 the most important reason given was the ease of legally inventing around the patent. The key reasons for patenting, other than the prevention of copying, are to prevent other firms from patenting a related invention (that is, patent blocking); for use in negotiations; and to prevent suits. Patent blocking is a much more pervasive motive than previously thought.

Building a foundation of basic research knowledge through Federal sponsorship has been an explicit and well articulated goal of U.S. national research policy since the end of World War II. Although billions of Federal dollars are being spent each year to support our national research enterprise, little has been done to understand how the resulting stock of public knowledge affects industrial productivity. **Toole** explores the direct productivity impact of U.S. government funded basic research on pharmaceutical innovation. He finds that the stock of public basic research is a key factor in bringing new therapeutic compounds to market. He also finds that public basic research and private R and D are complementary in the production of new compounds, with the estimated return to public research being 43 percent greater than the return to private R and D. Moreover, access to the stock of public basic research leads to industry-wide increasing returns to scale in the discovery and development of new compounds.

Arora and **Gambardella** study the relationship between NSF funding and the publications of U.S. economists using data on 1473 applications to NSF during 1985–90, 414 of which were awarded a research grant. They find that even after controlling for reviewer scores and the observed quality of the principal investigator (PI), the institutional affiliation, sex, and geographical location of the PI affect the likelihood of successfully getting an NSF grant. Past performance also affects expected budget received through the probability of being selected and in an indirect way: PIs with better track records ask for larger budgets; thus, a PI with a better track record has a higher probability of being selected, and given selection, gets a constant fraction of a larger requested budget. The effect of NSF funding seems to be more pronounced at earlier stages of the economists' careers. For example, for a selected young PI, an additional $10,000 grant would produce 10 more (quality-adjusted) publication units. In turn, this corresponds to one single-authored paper in *The Journal of Money, Credit and Banking* or *The Canadian Journal of Economics*. The marginal product of NSF funding (given selection) is close to zero for those who received their Ph.D. between 5 and 15 years earlier, and is somewhat higher for senior researchers.

Branstetter and **Sakakibara** undertake the first large-sample study of Japanese government-sponsored research consortia which uses firm-level data on research inputs and outputs to measure the impact of participation on the ex-post research productivity of the firm. They find that frequent participation in these consortia has a positive impact on research expenditure and research productivity. Further, they find that part of this impact arises from the increased knowledge spillovers that take place within these consortia. Not only are these results useful in providing empirical evidence on the theory of research joint ventures, but they also shed light on the question of what role Japanese "industrial policy" played in Japanese technological innovation during the 1980s.

1997 Franco-American Seminar

Nearly 50 economists from the United States, Canada, and Europe met in Cambridge on July 23–25 during the NBER's Summer Institute for the annual Franco-American Seminar. This year's meeting, on "Medical Care Output and Productivity," was organized by David M. Cutler of NBER and Harvard University and Jacques Mairesse, NBER and INSEE. Five papers were presented and discussed:

Pierre-Andre Chiappori, Frank Durand, and **Pierre-Yves Geoffard,** DELTA, "Moral Hazard and the Demand for Physician Services: Lessons from a French Natural Experiment"

Benoit Dervaux and **Herve Leleu,** Catholic University of Lille, "Productive Efficiency of Hospital Services and Quality of Care"

Stephane Jacobzone, INSEE-CREST, "A Hedonic Insight into the Pricing of French Prescription Drugs"

Cecile Fortanier, Jean-Paul Moatti, and **Louis-Andre Gerard-Varet,** Universite de la Mediterranee, "A Research and Development Case in the Biotechnology Field: Cell Therapy"

Alberto Holly, University of Lausanne, "Health Insurance and Health Care Utilization in Switzerland"

Chiappori and his co-authors study the demand for medical care. They use a longitudinal dataset on 4578 individuals followed over a two-year period. The dataset contains two subgroups: one (3869 individuals) for which a copayment rate of 10 percent for physician visits was introduced in 1994; and another (889 individuals) for which no change occurred during the period under study. The authors find that the introduction of a copayment rate of 10 percent did not modify the number of visits per agent, except for physicians' home visits. This suggests that demand may be fairly inelastic if there are only small changes in relative price.

Dervaux and **Leleu** first gauge the bias caused by omitting quality of care in the specifications of a hospital's production function. Then they check for economies of scale and scope in the provision of hospital care. Finally, they assess the indirect costs of training interns. They conclude that incorporating quality of care alters estimates of the ideal ward size. However, they find no connection between the size of a hospital and the efficiency or productivity of its wards.

The introduction of new goods and technologies may bias price indexes. Technological factors also may be affected by environmental and regulatory characteristics, as is often the case in health care. **Jacobzone** uses a linked dataset on French prescription drugs which includes 14 years of firms' products (1980–93) covering about 30 percent of the market. He finds that using estimates that do not correct for product quality leads to a downward bias averaging 20 to 30 percent for the official drug price index.

Fortanier examines the development of new biotechnologies and its regulation in France. He focuses particularly on bone marrow transplantation. He concludes that traditional regulatory models are not likely to work well in the case of new biotechnology products, and that new regulatory processes should recognize the bargaining among the different participants in biotechnology development.

Holly analyzes how different plans affect the utilization of health care services in Switzerland. His data come from the 1992–3 Swiss Health Survey. The main health insurance plans at that time were: 1) a "basic insurance" plan; 2) a complementary "semi-private" insurance plan; and 3) a complementary "private" insurance plan. These plans varied along several dimensions: coverage of inpatient and outpatient services; coverage of allied health personnel; and payment system of care providers for each procedure or service.

Bureau News

Montgomery is Chief Economist at Labor Department

Edward B. Montgomery, who has been a member of the NBER's Program in Labor Studies since 1989, became the Chief Economist of the U.S. Department of Labor in January 1997. He is the latest in a succession of NBER Research Associates to fill that office: he follows Lisa M. Lynch of Tufts University; Alan B. Krueger of Princeton University; and Lawrence F. Katz of Harvard University. Montgomery is on leave from his teaching post at the University of Maryland and from the NBER.

1997 Summer Institute

Over 1100 economists from universities and organization in 21 countries attended the NBER's 19th Annual Summer Institute. This year's program was funded primarily by a grant from the Lynde and Harry Bradley Foundation, with additional support from the National Science Foundation and the National Institute on Aging. The papers presented at dozens of different sessions during the four-week summer institute covered a wide variety of topics. A list of all papers and work in progress can be obtained by writing to: Summer Institute Catalogue, NBER, 1050 Massachusetts Avenue, Cambridge, MA 02138-5398.

Economic Fluctuations and Growth Program Meeting

Nearly one hundred members and guests of the NBER's Program on Economic Fluctuations and Growth, representing universities and central banks from around the world, gathered in Cambridge on July 19 for the group's annual summer research meeting. Valerie Ramey, NBER and University of California, San Diego, and David H. Romer, NBER and University of California, Berkeley, organized the meeting and chose these papers for discussion:

Steven J. Davis, NBER and University of Chicago, and **John C. Haltiwanger,** NBER and University of Maryland, "Sectoral Job Creation and Destruction Responses to Oil Price Changes and Other Shocks"
Discussant: Michael Horvath, Stanford University

Joao Gomes and **Jeremy Greenwood,** University of Rochester, and **Sergio Rebelo,** NBER and University of Rochester, "Equilibrium Unemployment" (NBER Working Paper No. 5922)
Discussant: Monika Merz, Rice University

Francesco Daveri, University of Brescia, and **Guido Tabellini,** Bocconi University, "Unemployment, Growth, and Taxation in Industrial Countries"
Discussant: Xavier Sala-i-Martin, NBER and Universitat Pompeu Fabra

Alwyn Young, NBER and University of Chicago, "The Razor's Edge: Distortions and Incremental Reform in the People's Republic of China"
Discussant: Robert E. Hall, NBER and Stanford University

Raghuram Rajan, NBER and Northwestern University, and **Luigi Zingales,** NBER and University of Chicago, "Financial Dependence and Growth" (NBER Working Paper No. 5758)
Discussant: Charles Jones, Stanford University

Nobuhior Kiyotaki, NBER and University of Minnesota, and **John Moore,** London School of Economics, "Credit Chains"
Discussant: Mark Gertler, NBER and New York University

Davis and **Haltiwanger** study the effects of oil price changes and other shocks on the creation and destruction of U.S. manufacturing jobs from 1972 to 1988. They find that: 1) Oil shocks account for about 20–25 percent of the cyclical variability in employment growth under their identifying assumptions, twice as much as monetary shocks. 2) Employment growth shows a sharply asymmetric response to oil price ups and downs, in contrast to the prediction of standard equilibrium business cycle models. 3) The two-year employment response to an oil price increase rises (in magnitude) with capital intensity, energy intensity, and

product durability. 4) The response to monetary shocks rises with product durability and the fraction of employment in young plants. 5) Job destruction shows much greater short-run sensitivity to oil and monetary shocks than job creation in every sector with the clear exception of young, small plants. 6) Oil shocks generate important reallocative effects. A positive oil shock of one standard deviation leads to a four-year cumulative increase in job reallocation that exceeds 3 percent of employment; 85 percent of this response reflects greater job reallocation within manufacturing.

Gomes, Greenwood, and **Rebelo** develop a model of the natural rate of unemployment. Their model of frictional unemployment is consistent with the key regularities of unemployment over the business cycle. In the model, the return to a job moves randomly. Agents can choose either to quit and search for a better job, or to continue working. Search generates job offers that agents can accept or reject. Two distinguishing features of this work relative to the existing business cycle literature on labor market fluctuations are: 1) the decision to accept or reject jobs is modeled explicitly; and 2) there is imperfect insurance against unemployment.

Daveri and **Tabellini** argue that increases in unemployment and slowdowns in economic growth are related, because they stem from a common cause: an extremely high cost of labor. In industrial countries, labor costs have gone up for many reasons, but one is particularly easy to identify: higher taxes on labor. If wages are set by strong and centralized trade unions, an increase in labor taxes is shifted onto higher real wages. This has two effects. First, it reduces labor demand, and thus creates unemployment. Second, as firms substitute capital for labor, the marginal product of capital falls. Over long periods of time, this in turn diminishes the incentive to accumulate and thus to grow. Thus high unemployrnent is associated with low growth rates. The effect of labor taxation differs sharply in countries with different labor market institutions, though. Using data for 14 industrial countries between 1965 and 1991, the authors find that a rise of about 9 percentage points in labor tax rates can account for a reduction in the EU growth rate of about 0.4 percentage points a year, about one-third of the observed reduction in growth between 1965–75 and 1976–91, and a rise in unemployment rates of about 4 percentage points.

Young argues that one of the perils of gradualist reform is that, by its nature, it creates long lasting opportunities to obtain economic rents. This allows for a prolonged battle to capture, and then protect, these rents, leading to the creation of new distortions in the economy. Focusing on the experience of China, Young explains that under the central plan raw material prices were kept low and final goods prices high, generating substantial surpluses in manufacturing and processing industries, which funded the government budget. As central controls were relaxed, local governments throughout China moved to develop manufacturing industries in an attempt to capture the rents implicit in the centrally mandated price wedges. The elimination of central controls over prices and the growth of interregional free marketing threatend industrial profit margins and led to interregional trade conflicts, as local governments tried to control prices and limit "foreign" competition using a variety of administrative and physical barriers to trade. Thus, although the Chinese economy has become more open internationally, it has become more fragmented internally.

Does the state of development of a country's financial markets affect economic growth? A number of studies have identified a positive correlation between the level of development of a country's financial sector and the rate of growth of its per capita income. As has been noted elsewhere, the observed correlation does not necessarily imply a causal relationship. **Rajan** and **Zingales** examine whether financial development facilitates economic growth by scrutinizing one rationale for such a relationship: that financial development reduces the costs of external finance to firms. Specifically, they ask whether industrial sectors that are relatively more in need of external finance develop disproportionately faster in countries with more developed financial markets. They find this to be true in a large sample of countries over the 1980s. They show that this result is unlikely to be driven by omitted variables, outliers, or reverse causality.

Kiyotaki and **Moore** study how shocks propagate through networks of firms which borrow from, and lend to, each other. In particular, they investigate how a small, temporary shock to the liquidity of some firms may cause a chain reaction in which other firms get into financial difficulties, thus generating a large, persistent fall in aggregate activity. Also, they look at the aggregate effects of creditors' postponing the debt of delinquent debtors, rather than liquidating their assets. They show that, although it may be bilaterally efficient for a creditor and a debtor in one link of a credit chain to reschedule debt, postponement can have serious social consequences because no new liquidity is injected into the system. Finally, they demonstrate that firms may decide privately not to insure against the risk of default by their debtors, even though such insurance may be available.

Social Security Project Meeting

On August 6, participants in the NBER's Project on Social Security, under the direction of Bureau President Martin S. Feldstein, met in Cambridge to discuss recent research in their field. They were joined by a number of representatives of government agencies that have a particular interest in Social Security and its possible reform. The day's program was:

Martin S. Feldstein, NBER and Harvard University, and **Andrew Samwick,** NBER and Dartmouth College, "The Economics of Prefunding Social Security and Medicare Benefits" (NBER Working Paper No. 6055)

Jan Walliser, Congressional Budget Office, "Understanding Adverse Selection in the Annuities Market and the Impact of Privatizing Social Security" and "Privatizing Social Security While Limiting Adverse Selection in Annuities Markets"

Gordon P. Goodfellow and **Sylvester J. Schieber,** Watson Wyatt Worldwide, "Social Security Reform: Implications of Individual Accounts on the Distribution of Benefits"

Kent Smetters, Congressional Budget Office, "Investing the Social Security Trust Fund into Equity: An Options Pricing Approach"

Gary S. Becker, University of Chicago, and **Tomas Philipson,** NBER and University of Chicago, "Mortality Contingent Claims, Health Care, and Social Insurance" (NBER Working Paper No. 5760)

Rodrigo Cifuentes, Harvard University, and **Salvador Valdes-Prieto,** Catholic University of Chile, "Forced Saving and Pension Reform in the United States"

Antonio Rangel, Harvard University, and **Richard J. Zeckhauser,** NBER and Harvard University, "Social Security Reform: Efficiency Gains versus Intergenerational Redistribution"

Feldstein and **Samwick** present a detailed analysis of the economics of prefunding benefits for the aged, focusing on Social Security but indicating some of the analogous magnitudes for prefunding Medicare benefits. They use Census and Social Security information to model the transition to a fully funded system based on mandatory contributions to individual accounts. The funded system would permanently maintain the level of benefits now specified in current law and would require no new government borrowing (other than eventually selling the bonds that are officially in the Social Security trust fund). During the transition, the combined rate of payroll tax and mandatory saving rises initially by 2 percentage points (to a total of 14.4 percent) and then declines so that, in less than 20 years, it is less than the current 12.4 percent payroll tax. They show that the combination of higher pretax wages and lower payroll taxes could raise wages net of income and payroll taxes by more than 35 percent in the long run. Further, a small increase in the mandatory saving rate would reduce the risk of receiving less than the scheduled level to less than 1 percent.

Individuals who expect to live longer are likelier to buy annuities; this "adverse selection" forces insurance companies to charge higher premiums than average survival probabilities would imply. **Walliser** calculates the degree of adverse selection in a characteristic sample of the U.S. population, with survival probabilities based on income, race, and marital status. He finds that the annuity premiums for 65-year-old males exceed those based on average survival probabilities by 7 to 10 percent. Second, adverse selection increases with the age of the annuitant. Third, the adverse selection problem is smaller in the annuities market for females than in the market for males. Although eliminating Social Security may reduce the increase in annuity prices induced by adverse selection by 1 to 2.5 percentage points, it cannot remove it entirely. Moreover, a significant share of the measured adverse selection is attributable to the positive correlation between longevity and income, and cannot be eliminated with a mandatory annuity that increases with the income of the annuitant.

Goodfellow and **Schieber** conclude that there are virtually no policy options, including personal saving accounts, that are likely to provide currently promised Social Security benefits to the baby boomers without substantially higher contribution rates than we are now incurring. Some baby boomers are likely to see reduced benefit levels relative to current law promises, and these are likely to be largest for the middle cohorts of the baby boomers. In the long term, though, Social Security reforms, including some level of personal account funding, would lead to improved benefit levels for significant segments of future retiree populations.

Using an options pricing approach, **Smetters** analyzes the three basic allocations of risk among generations from investing the Social Security trust fund into equity. That approach produces surprisingly sharp and robust "equivalency relationships."

These equivalency relationships not only identify identical fiscal policies —thereby unmasking the intergenerational redistribution of various risk allocations—but they also enable a precise calculation of their value. He shows that the *defined-contribution* (DC) risk allocation—in which there is no intergenerational risk shifting—is consistent with the commonly-stated "shell game" scenario that involves a swap between private and public pensions with no price effects. The current-law *defined-benefit* (DB) approach, and the approach being implied by some proposals to invest the trust fund into equity, uses the payroll tax to smooth equity gains or losses across generations in order to fix the benefit level. This is mathematically equivalent to an intergenerational transfer on a pay-as-you-go basis of put and call stock options (that is, a futures contract) that insures that the equity portion of the trust fund performs as expected. This creates an instant windfall for current workers, contracts the expected-value budget constraints for all future workers, and reduces national saving relative to the baseline policy of maintaining the current payroll tax rate. Most importantly, the DB allocation places an actuarial tax liability on future workers that is equivalent to keeping the trust fund invested in bonds and instead raising the same expected revenue by increasing the payroll tax on *only* future workers—a result that holds for any value of risk aversion. Indeed, future generations would be better off if the explicit payroll tax is increased immediately so that current workers participated in maintaining their own future level of benefits. This equivalency result is ironic given the strong political resistance to increasing the payroll tax under the current-law DB system, especially by those advocating trust fund investment into equity as an alternative. In the *asymmetric* (ASY) risk allocation, trust-fund equity returns below expectation are buffered with an increase in the payroll tax, while returns in excess of the payroll tax are met with an increase in benefits (rather than a reduction in taxes as in the DB approach). This is a more extreme form of the DB approach and is mathematically equivalent to an intergenerational transfer on a pay-as-you-go basis of only put options that insure that the equity portion of the trust fund performs *at least* as expected. Smetters prices and compares the ASY plan with the DB plan and discusses how the results might change if markets are incomplete. He argues that the complete market analysis underlying the options pricing approach might, under certain conditions, overstate the actuarial costs associated with these three risk allocations but that there are also very compelling reasons why the complete-market analysis might understate the true costs.

Becker and **Philipson** analyze the impacts of savings and longevity on "mortality contingent claims," defined here as income measures, such as annuities and life insurance, under which earned income is contingent on the length of one's life. The post-war increase in mandatory annuity and life insurance programs, as well as the rapid increase in life expectancy at older ages, motivates a better understanding of the effects that mortality contingent claims have on health investments. Furthermore, annuity income involves moral hazard effects through increasing longevity; among other things, this introduces a positive interaction between public programs for health care and income support for the elderly, programs that have grown enormously in developed countries.

Cifuentes and **Valdes-Prieto** show that a mandate to save for old age in funded accounts has a substantial positive impact on saving and the capital stock. They summarize the mechanics of pension reform and describe the two main challenges faced by Social Security in the United States, namely that current benefit and contribution rates are unsustainable, and that the pay-as-you-go financing method has been shown to be vulnerable to demographic shocks. Finally, they propose a pension reform package for the United States where the reforms needed to deal with these two challenges are made politically viable by compensating perceived and actual losers with the gains obtained from mandating savings for old age in funded accounts.

Bureau Books

Macro Annual, Volume 12

NBER Macroeconomics Annual 1997, Volume 12, edited by Ben S. Bernanke and Julio J. Rotemberg, is now available from the MIT Press for $20.00.

This latest volume in the annual series includes the papers and discussions presented at last spring's conference in Cambridge. The first two papers in the volume, by Marvin Goodfriend and Robert King and Julio Rotemberg and Michael Woodford, respectively, focus on various issues in monetary policy; another paper by Peter Klenow and Andres Rodriguez reviews the revival in growth economics; one study by Michael Gavin and Roberto Perotti considers fiscal policy in Latin America; in their paper, Bureau President Martin Feldstein and co-author Andrew Samwick consider the economics of prefunding Social Security and Medicare benefits; and, a final paper by Christopher Carroll and Wendy Dunn analyzes the effect of unemployment expectations on household balance sheets. Given the wide range of topics, this volume should be of interest to anyone with a background in economics.

Bernanke and Rotemberg are research associates in the NBER's Programs in Economic Fluctuations and Growth and Monetary Economics. Bernanke teaches at the Woodrow Wilson School at Princeton University; Rotemberg teaches at Harvard Business School.

The following volume may be ordered directly from the University of Chicago Press, Order Department, 11030 South Langley Avenue, Chicago, IL 60628-2215, 1-800-621-2736. Academic discounts of 10 percent for individual volumes and 20 percent for standing orders for *all* NBER books published by the University of Chicago Press are available to university faculty; orders must be sent on university stationery.

The Regionalization of the World Economy

The Regionalization of the World Economy, edited by Jeffrey A. Frankel, is now available from The University of Chicago Press for $43.00. In recent decades the world economy has undergone increasing "regionalization": regional trading alliances, such as currency blocs, free trade areas (FTAs), and regional trade arrangements have become prevalent. Economists agree that regionalism is likely to characterize the world economy for some time. In late October of 1995, Frankel organized an NBER conference to study economic regionalism. *The Regionalization of the World Economy*, which includes both theoretical and empirical studies of the topic, is the product of that conference.

The volume addresses several large questions. Why do countries adopt FTAs and other regional trading arrangements? To what extent have existing regional arrangements actually affected patterns of trade? What are the welfare effects of such arrangements? Several chapters that focus on the econometric exploration of the effects of regional arrangements make extensive use of the gravity model of bilateral trade, and the volume includes a chapter that explores the theoretical foundation of the gravity model.

This volume should interest trade policymakers as well as international economists. Frankel, currently on leave from the NBER as a member of the Council of Economic Advisers, was director of the NBER's Program in International Finance and Macroeconomics and a professor of economics at the University of California, Berkeley when he organized this conference.

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