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## *Editorial, NBER Macroeconomics Annual 1998*

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Like past volumes, the 1998 edition of the *NBER Macroeconomics Annual* includes papers studying a variety of aspects of the macroeconomy and macroeconomic policy. Three papers address issues related to the labor market: In the opening paper of the volume, Robert Shimer tackles the question of why U.S. unemployment rates have trended downward since about 1980, concluding that changes in the age composition of the U.S. population are the primary cause. Age is an important determinant of labor-market outcomes not only in the unemployment sphere but also in terms of what people earn: In his paper, Casey Mulligan uses the link between age and wages to try to infer the degree to which people are willing to substitute work effort over time in response to changes in the expected discounted value of future wages relative to current wages. He finds that people's willingness to vary labor supply over time is relatively high, a result with important implications for a variety of policy questions. In the third paper bearing on the labor market, Pierre-Olivier Gourinchas analyzes the impacts of exchange-rate changes on job creation and destruction in sectors sensitive to foreign competition; he finds the puzzling result that exchange-rate appreciations not only increase rates of job destruction in those sectors, as expected, but they also increase rates of job creation as well.

Two papers in the volume focus on firms' behavior, in particular their responses to technical change and changes in opportunities for capital investment. John Shea studies the effects of inventive activity, as measured by R&D expenditures and patents, on outputs and the use of inputs in individual manufacturing sectors. His provocative conclusion is that inventive activity does not seem to be strongly related to sectoral total factor productivity, as usually measured. Simon Gilchrist and Charles Himmelberg study the effects of changes in firms' cash flows on

their rates of capital investment, addressing an ongoing debate of what underlies the correlation between cash flows and investment.

The paper by John Cochrane is perhaps the one that is most directly addressed to policy analysis. Applying the so-called fiscal theory of the price level to the postwar United States, Cochrane asks to what degree the history of U.S. inflation can be explained by fiscal factors alone, and how fiscal policy could have been conducted to achieve a more stable rate of inflation.

Unemployment in the United States exhibited an upward trend through the 1970s and into the recessions of the early 1980s. Since that time, however, the unemployment rate has declined, recently reaching low levels not seen for decades. What accounts for these trends? Demographic change is a leading potential explanation: Because various groups in the population differ in their average unemployment rates, it makes intuitive sense that the economy's overall unemployment rate is affected by changes in the composition of the population. In his paper, Shimer analyzes the relationship of demography and noncyclical unemployment. Empirically, Shimer finds that the age structure of the population is a key determinant of the aggregate unemployment rate; in particular, the aging of the workforce (and the declining share of young workers) can account for much of the decline in U.S. unemployment of the past two decades. By contrast, another important demographic trend, the increasing share of the population with advanced educational attainment, is found not to be a major determinant of unemployment patterns. To help rationalize these findings, Shimer provides a model of the labor market in which noncyclical unemployment reflects the process of searching for an appropriate job match. The model predicts that the aggregate unemployment rate depends on the fraction of young people in the labor force, because young people have the strongest incentive to devote their time to searching for a good match. The educational attainment of the population does not affect unemployment in this model, however, so long as education is simply a signal of employee quality rather than a direct determinant of employee productivity. More generally, Shimer argues that, consistent with the data, there are good theoretical reasons to expect a change in the average level of education to have a smaller effect than changes in the age structure on the level of aggregate unemployment.

Mulligan investigates a different aspect of the labor market, the extent to which people are willing to substitute current work for future work in response to a change in the present value of future wages relative to current wages (that is, when the relative price for work done at different times changes). As Mulligan argues, chronological age is the source of



most predictable changes in individual wages. Wages are expected to rise when individuals are young, they remain roughly constant from 35 to 45 years of age, and they fall thereafter, particularly after age 55. Mulligan uses this fact to measure the extent to which people respond to expected wage increases by postponing work. Consistent with the idea that intertemporal substitution of work is important, hours worked do increase over time when workers are young, they are roughly constant in middle age, and they decline as people approach retirement age. Mulligan argues that a given percentage increase in wages is associated with a larger increase in hours (so that the measured degree of intertemporal substitution is greater) once one makes some corrections to previous studies. Taking account of the greater share of work time devoted to on-the-job training by young people, for example, leads to a higher estimate of the growth rate of hours over the life cycle and a lower estimate of the growth rate of compensation per hour of work, leading to a higher estimate of the intertemporal elasticity of substitution. After making this and other corrections, Mulligan concludes that intertemporal substitution is more important than is generally acknowledged. He provides additional evidence for this conclusion by studying the work behavior of AFDC recipients, whose transfer income predictably declines when the youngest child in the family turns eighteen.

In theoretical analyses of macroeconomics, fluctuations in aggregate economic activity are often attributed to stochastic technical progress. Despite this common practice, we have little concrete knowledge about how technical change actually affects output, employment, and productivity in individual sectors of the economy. Shea addresses this issue by using R&D activity and rates of patenting as proxies for technical change within a sample of industries. Using VAR analysis and his proxies for technical change, Shea is able to trace out the effects of technical progress on industry output and inputs. He shows that, typically, technical change leads to increases in both inputs and outputs, but that the link between the proxies for technical change and measured changes in total factor productivity is weak (except when technical progress takes place in process-intensive industries). This finding casts doubt on approaches which equate changes in measured TFP (i.e., the Solow residual) with technological change, as opposed to such factors as variation in the utilization of inputs.

While changes in exchange rates appear to have only modest effects on the economy as a whole, Gourinchas shows in his paper that they can have important effects on export-oriented and import-competing sectors. Not surprisingly, an appreciation of the U.S. dollar increases job destruction and reduces employment in both types of sectors. What is

much more surprising is that job creation increases as well when the dollar appreciates, so that the labor market in these sectors becomes more “turbulent.” Similarly, a depreciation depresses both job creation and job destruction in sectors vulnerable to foreign competition, creating a job-market “chill.” As Gourinchas shows in a formal model of the labor market, these results pose a puzzle for existing theories of job creation and destruction. In particular, existing models are designed to rationalize the observation that declines in economic activity resulting from aggregate shocks are associated with increases in job destruction and *reductions* in job creation. But why should job creation fall when the economy as a whole produces less, while job creation rises when the reduction in output is confined to sectors that are negatively affected by an exchange-rate appreciation?

Gilchrist and Himmelberg revisit the question of whether the observed correlation between firm cash flows and rates of capital investment is the result of imperfections in capital markets, or instead reflects a tendency of cash flow to act as a signal of future profitability. Using a novel approach for measuring a firm’s opportunity to invest profitably (which is based on the deviation of the firm’s sales-to-capital ratio from that of the industry as a whole), Gilchrist and Himmelberg conclude that cash flow matters primarily because capital markets do not work perfectly. An implication is that much of the correlation of investment and GDP is the result of these imperfections, rather than being due to changes in the marginal profitability of investment.

Cochrane’s paper attempts to apply the “fiscal theory of the price level” in the postwar U.S. context. An interesting and important claim of the paper is that it is impossible to know for certain whether fiscal policy or monetary policy has played the central role in determining the U.S. price level. Thus, rather than attempting to test the fiscal theory, the paper focuses instead on providing a “fiscal reading” of U.S. inflation history, including a discussion of ways in which the fiscal authority might have stabilized the price level to a greater degree than occurred. That it is possible to interpret U.S. inflation as being the result of fiscal policies is perhaps surprising, given that the real surplus of the government has historically been positively associated with inflation. (For example, the Reagan deficits were associated with inflation that was much lower than in the 1970s.) One might expect instead that a fiscal-centered story would imply that inflation must rise when there are large *deficits*. In fact, what the theory requires is that prices adjust to ensure that the real value of the debt equals the expected present value of future surpluses. Cochrane shows that a fiscal interpretation of U.S. inflation history thus becomes possible once one recognizes that high current real

surpluses have historically been associated with large expected future deficits. Following an unexpected increase in the surplus, prices must therefore rise to reduce the value of the government debt and satisfy the government's intertemporal budget constraint. Interestingly, this reading suggests that postwar U.S. fiscal policy would have had to change very little to stabilize the price level.

We want to thank once again the National Bureau of Economic Research, and especially its highly efficient conference department, for making the conference and this resulting volume possible. Our gratitude also goes to the National Science Foundation for its continued financial support. Finally, we would like to extend special thanks to Cedric Tille for his meticulous editorial assistance.

Ben S. Bernanke and Julio J. Rotemberg



# Abstracts

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## *Why Is the U.S. Unemployment Rate So Much Lower?*

ROBERT SHIMER

The U.S. unemployment rate is so much lower because the population is so much older. This paper argues that in the absence of the baby boom, the unemployment rate would neither have increased from 1957 to 1979, nor have fallen in the subsequent two decades. The paper also considers other demographic changes: The most quantitatively significant is the increased educational attainment of the labor force. Since more-educated workers have lower unemployment rates, it might appear that this should have (counterfactually) caused a secular decline in unemployment. However, there are theoretical reasons to believe that an increase in education will not translate into a reduction in unemployment, and independent empirical evidence tends to support this view.

## *Substitution over Time: Another Look at Life-Cycle Labor Supply*

CASEY B. MULLIGAN

Most studies of the intertemporal substitution of work use life-cycle data, and from those studies many have concluded that intertemporal labor substitution is unimportant for macroeconomics. This paper takes another look at life-cycle data and argues that a consideration of measurement errors, taxes, on-the-job training, older workers, hours reporting bias, and all of the "margins" composing aggregate labor supply over the life cycle suggests that substitution over time may be very important for macro fluctuations. The life-cycle data used include fairly standard male cross-section and panel-data samples as well as a sample of women experiencing the termination of AFDC benefits as their youngest child turns 18 years old.

## *Exchange Rates and Jobs: What Do We Learn from Job Flows?*

PIERRE-OLIVIER GOURINCHAS

Currency fluctuations provide a substantial source of movements in relative prices that is largely exogenous to the firm. This paper evaluates empirically and

theoretically the importance of exchange-rate movements on job reallocation across and within sectors. The objective is (1) to provide accurate estimates of the impact of exchange-rate fluctuations and (2) to further our understanding of how reallocation shocks propagate through the economy. The empirical results indicate that exchange rates have a significant effect on gross and net job flows in the traded goods sector. Moreover, the paper finds that job creation and destruction comove positively, following a real-exchange-rate shock. Appreciations are associated with additional turbulence, and depreciations with a "chill." The paper then argues that existing nonrepresentative agent reallocation models have a hard time replicating the salient features of the data. The results indicate a strong tension between the positive comovements of gross flows in response to reallocation disturbances and the negative comovement in response to aggregate shocks.

### *Investment: Fundamentals and Finance*

SIMON GILCHRIST AND CHARLES HIMMELBERG

Financial variables such as cash flow and cash stocks are robust and quantitatively important explanatory variables for investment at the firm level. A large body of recent empirical work attributes these findings to capital-market imperfections. This interpretation is controversial, however, because even in the absence of capital-market imperfections, such financial variables may appear as an explanatory variable for investment if they contain information about the expected marginal value of capital. In this paper, we show how structural models of investment with costly external finance can be used to identify and quantify the *fundamental* vs. the *financial* determinants of investment. Our empirical results show that investment responds significantly to both fundamental and financial factors. Point estimates from our structural model imply that, for the average firm in our sample, financial factors raise the overall response of investment to an expansionary shock by 25%, relative to a baseline case where financial frictions are zero. Consistent with theory, small firms and firms without bond ratings show the strongest response to financial factors, while bond-rated firms show little if any response, once we control for investment fundamentals.

### *What Do Technology Shocks Do?*

JOHN SHEA

The real-business-cycle literature has largely ignored the empirical question of what role technology shocks actually play in business cycles. The observed procyclicality of total factor productivity (TFP) does not prove that technology shocks are important to business cycles, since demand shocks could generate procyclical TFP due to increasing returns or other reasons. I address the role of technology by investigating the dynamic interactions of inputs, TFP and two observable indicators of technology shocks: R&D spending and patent applica-

tions. Using annual panel data on 19 U.S. manufacturing industries from 1959 to 1991, I find that favorable R&D or patent shocks tend to increase inputs, especially labor, in the short run, but to decrease inputs in the long run, while tilting the mix of inputs towards capital and nonproduction labor. Favorable technology shocks do not significantly increase measured TFP at any horizon, except for a subset of industries dominated by process innovations, suggesting that available price data do not capture productivity improvements due to product innovations. Technology shocks explain only a small fraction of input and TFP volatility at business-cycle horizons.

### *A Frictionless View of U.S. Inflation*

JOHN H. COCHRANE

Financial innovation challenges the foundations of monetary theory, and standard monetary theory has not been very successful at describing the history of U.S. inflation. Motivated by these observations, I ask: Can we understand the history of U.S. inflation using a framework that ignores monetary frictions? The fiscal theory of the price level allows us to think about price-level determination with no monetary frictions. According to this approach, the price level adjusts to equilibrate the real value of nominal government debt with the present value of surpluses. I describe the theory, and I argue that it is a return to pre-quantity-theoretic ideas in which money is valued via a commodity standard or because the government accepts it to pay taxes. Both sources of value are immune to financial innovation and the presence or absence of monetary frictions. I then interpret the history of U.S. inflation with a fiscal-theory, frictionless view. I show how the fiscal theory can accommodate the stylized fact that deficits and inflation seem to be negatively, not positively correlated. I verify its prediction that open-market operations do not affect inflation. I show how debt policy has already smoothed inflation a great deal.





Robert Shimer

PRINCETON UNIVERSITY

# Why Is the U.S. Unemployment Rate So Much Lower?

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*In a well-known paper in one of the inaugural issues of the Brookings Papers, Robert Hall posed the question, "Why is the Unemployment Rate So High at Full Employment?" (Hall, 1970). Hall, writing in the context of the 3.5% unemployment rate that prevailed in 1969, answered his question by explaining that the full-employment rate was so high because of the normal turnover that is inevitable in a dynamic economy. . . . Today [in 1986], four years into an economic recovery, the unemployment rate hovers around 7%. Over the past decade, it has averaged 7.6% and never fallen below 5.8%. . . . While some of the difference between recent and past levels of unemployment has resulted from cyclical developments, it is clear that a substantial increase in the normal or natural rate of unemployment has taken place. (Summers, 1986)*

## 1. Introduction

In November 1997, the U.S. unemployment rate fell to 4.6%, the lowest level since 1973. This monthly report was not a fluke; the aggregate unemployment has remained below 4.7% for six months, for the first

The title is intended to recall Hall (1970) ("Why is the Unemployment Rate So High at Full Employment?") and Summers (1986) ("Why is the Unemployment Rate So Very High Near Full Employment?"). The wording of this title reflects the recent decline in the unemployment rate in the United States. Explaining the cross-sectional behavior of unemployment, e.g. why the U.S. unemployment rate is so much lower than Europe's, is beyond the scope of this paper.

I have benefited from discussions with and comments and suggestions by Daron Acemoglu, Ben Bernanke, Alan Krueger, Greg Mankiw, Richard Rogerson, Julio Rotemberg, Martin Gonzalez Rozada, Robert Topel, Paul Willen, Mike Woodford, and seminar participants at Chicago, MIT, NYU, and the NBER Macroeconomics Annual 1998 Conference. Thanks also to Steve Haugen for help with some of the data, and to Mark Watson for providing me with Staiger, Stock, and Watson's (1997) series for the NAIRU. Financial support from the National Science Foundation Grant SBR-9709881 is gratefully acknowledged.