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# Research Review

## The Adjustment of Nominal Interest Rates to Inflation: A Review of Recent Literature

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### Introduction

Inflation has fallen markedly in the last 2 years, yet nominal short-term interest rates have declined far less. The resulting higher real short term interest rates (the nominal short-term interest rate minus the actual rate of inflation over the maturity of the security) have weakened the credit sensitive sectors of the economy, including agriculture. Thus, a basic understanding of the theoretical and empirical relationship between nominal interest rates, inflation, and inflationary expectations is useful for agricultural decisionmaking.

I briefly review the basic theory of the adjustment of nominal interest rates and inflation in the first part of this article. The main conclusion is that the adjustment of nominal interest rates to changing inflation is probably slow and less than one-for-one, even in the long run. Moreover, the magnitude and speed of adjustment of nominal interest rates to changing inflation will depend on assumptions concerning price flexibility, the formation of price expectations, wealth, institutional constraints, and taxes. I examine selected empirical work on the adjustment of short-term interest rates to changes in inflation in the second part of the article. I examine particularly the empirical work of Fama in this area and the subsequent criticisms. I conclude, based on the theoretical and empirical evidence examined, that the expected real rate has been highly variable both on a cyclical and secular basis. The slow and incomplete adjustment of nominal interest rates to inflation contributes to this result.

### Theoretical Overview

This section first examines the one-for-one adjustment of nominal interest rates in Sargent's classical model with perfectly flexible wages and prices. When the assumptions concerning wage and price

flexibility and expectation formation are altered, changes in inflation will be accompanied by prolonged changes in real income and, therefore, in real interest rates. Moreover, other factors, such as inflation's impact on wealth, financial regulations, innovations, and taxes, also affect the relationship between nominal interest rates and inflation.

### Classical Model with Rational Expectations

Recent empirical work on the relationship between real interest rates and inflation arises from tests of the hypotheses derived from the classical model with rational expectations and critiques of that model. As illustrated by Sargent (56, 57), *ex ante* and *ex post* real interest rates exhibit their least variability when the world is viewed in a classical sense, characterized by rapid wage and price adjustment, the absence of money illusion, and a rational expectations view of price expectation formation and real output determination.<sup>1</sup> In this classical framework, the economy tends towards full employment, with real interest rates determined jointly by many real variables, including the marginal products of labor and capital, the willingness to save in real terms, and the state of fiscal policy.<sup>2</sup> If these variables are nearly constant, the real rate will exhibit relatively mild variability.

Under these assumptions, the major source of variability in real economic variables will result from the errors in forecasting inflation. However, because expectations are rational, long periods of serially correlated errors in forecasting inflation will not exist, as recent forecast errors would be incorporated into forecasting future inflation. Thus,

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<sup>1</sup>Italicized numbers in parentheses refer to items in the References at the end of this article.

<sup>2</sup>Under very narrow assumptions, fiscal policy will not alter real interest rates. These assumptions include (1) the perfect substitutability of Government and private spending, (2) debt neutrality, (3) no impact of fiscal policy on the supply of labor, (4) no long-term monetization of Government deficits, and (5) the absence of portfolio crowding-out or crowding in. These narrow assumptions are analyzed by Buiter (4, 5) and Benjamin Friedman (15).

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the expected real rate should differ from the actual real rate by only a random inflation forecast error term. Moreover, under this classical model with rational expectations, the expected real rate should exhibit only mild variability due to the allegedly mild nature of the business cycle.

In Sargent's model, if the Federal Reserve pursues an expansionary monetary policy, inflationary expectations will increase quickly and accurately (allowing for a random error term) because of rational expectations and frictionless Walrasian markets. The increase in inflationary expectations will raise nominal quantities, such as nominal wages, gross national product (GNP), loanable funds, and interest rates, by the expected increase in inflation, leaving these real quantities unchanged if expectations concerning future inflation prove accurate. If expectations prove inaccurate, real income will change, thereby causing shifts in the relative demand and supply of real financial assets that alter real interest rates. However, because of the relatively short adjustment period for expectations and desired real quantities, real variables will quickly move back towards their longrun equilibrium values.<sup>3</sup>

### Criticisms of the Sargent Analysis

Four main categories of criticisms exist concerning Sargent's conclusion of a rapid approximately one-for-one change between inflation and interest rates. The first line of criticism is the prolonged impact of inflation on real income due to contractual rigidities in labor and product markets, information and adjustment costs, and uncertainty over the true economic structure, particularly when economic relationships change (1, 4, 5, 7, 19, 21, 24, 25, 31, 32, 33). In this view of the world, even with anticipated monetary expansion, the price level will not rise sufficiently, especially in the short run, to leave

real income and real interest rates unaltered (4, 5, 38, 56, 57, 62). Higher real income will lower real interest rates if net saving by consumers responds more to real income change than does the net demand for loanable funds by other sectors. This criticism is particularly valid given the Federal Reserve's strong emphasis on targeting nominal interest rates in the past. The emphasis on targeting nominal interest rates tended to accommodate demand shocks originating in the real sector caused by changing inflationary expectations (8, 22, 27, 40, 54).

A second major criticism is that the Sargent analysis inadequately considers the role of wealth in determining nominal interest rates. Wealth enters the analysis because real savings are normally viewed as a negative function of the level of real financial wealth, whereas the demand for money is often viewed as a positive function of wealth. As real financial wealth increases, there is less incentive to accumulate more. Moreover, as wealth increases, individuals may want to hold more money balances to maintain or reduce portfolio risk (29, pp. 123-46, 65). Therefore, higher inflation, by reducing real financial wealth, should stimulate greater savings out of income and should reduce the demand for money balances, thus placing downward pressure on real interest rates.<sup>4</sup>

The third major criticism is that the Sargent analysis ignores institutional factors concerning financial regulation and innovation. Most narrow monetary aggregates earn no interest or are under interest ceilings, thus, as inflationary expectations increase, the real return from holding money will fall. The lower real return on money balances will

<sup>3</sup>This analysis ignores the costs of higher inflation, such as resource reallocation, as well as increased uncertainty and volatility in real and financial markets. These can ultimately be expected to raise interest rates and lower real economic growth. In addition to raising the absolute level of interest rates, increased uncertainty concerning inflation will likely alter the term structure of interest rate by raising liquidity premiums on longer term debt. These and other costs of inflation are summarized by Frohman, Laney, and Willet (23) and by Hughes (30).

<sup>4</sup>Higher inflation and inflationary expectations will reduce wealth through three main channels. First, an increase in the price level will cause a fall in the real value of any given level of nominal financial wealth. An example of this negative wealth effect is the decrease in real money balances caused by anticipated inflation in the basic Sargent model. Second, higher inflationary expectations by raising nominal interest rates will depress prices on Government interest-bearing debt. Thus, to the extent that interest-bearing Government debt is net wealth to the private sector, higher nominal interest rates will depress private wealth (27, 28, 34). Third, if higher inflationary expectations increase the variance of inflationary expectations or reduce expected real profitability due to tax distortions caused by inflation, equity prices will fall, thus further depressing real wealth (2, 12, 35, 60).

create an incentive to reduce money holdings, there by increasing the supply of loanable funds, reducing real interest rates in the short run, and increasing the capital stock and output in the long run (4, 5, 48, 65)

Moreover, when open market interest rates have risen above regulated interest rate ceilings on time and savings deposits, the availability of consumer credit has fallen. During these periods, consumers as savers have taken greater advantage of open market savings instruments such as Treasury bills and money market mutual fund shares. Thus, when higher inflationary expectations have driven nominal interest rates above interest rate ceilings in the regulated market, consumers as a whole have become greater net suppliers of funds to the open market, reducing real interest rates in the open market (42, 50). Continuing deregulation of depository institutions should strengthen the link between inflationary expectations and nominal interest rates by reducing the importance of "non-price" terms (such as loan-to-equity ratios, credit standards, collateral requirements, and loan maturity) in allocating credit and lessening the impact of inflationary expectations on real income by reducing the interest sensitivity of the demand for narrowly defined money (39).

Fourth, the Sargent analysis ignores the joint influence of the tax system and inflationary expectations on nominal interest rates (12, 35, 37). The major influence of the tax system on nominal interest rates is the tax deduction for nominal interest expenses and taxation of nominal interest earnings. This treatment of interest income and expenses forces nominal interest rates to rise by more than the increase in inflationary expectations to maintain a constant, real after-tax interest rate. However, measuring the exact impact of the joint influence of inflation and the tax system is difficult in the presence of inflation's other influences on real income, wealth, and institutional considerations that also determine nominal interest rates. Despite this problem, empirical evidence indicates that reduced form models, which explicitly include average marginal tax rates, predict nominal interest rates better than models that do not (51).

However, several factors suggest that the adjustment of nominal interest rates to higher inflationary expectations will be less than the full amount required to maintain constant, real after-tax interest rates. First, in an inflationary environment, the tax system raises the real tax liability of the firm by underallowing real depreciation expenses and generating inventory profits (12, 35, 46, 60, 61). Because inflation raises the real tax liability of the firm, the demand for loanable funds by corporate borrowers will ultimately not increase by the full increase in inflationary expectations. Second, real government and public utility borrowing is likely to decrease as higher inflation generates higher net real revenues for the Federal Government and as interest rate ceilings and other regulations constrain real borrowing by municipal governments and public utilities (2).

## Empirical Overview

In this section, I examine the empirical work of Fisher and Fama on the adjustment of nominal interest rates to inflation and summarize the major criticisms of Fama's work, particularly by Summers and Miskin. Overall, the empirical work supports the view that nominal interest rates adjust slowly and incompletely to inflation so that real rates are highly variable both cyclically and secularly.

Critiques and extensions of work Fisher did half a century ago comprise the main body of recent empirical work on the relationship of nominal interest rates and inflation. Fisher assessed the impact of inflation on interest rates by examining correlations of the yield on long-term bonds in England and United States with various measures of inflation (13, pp. 418-20). The correlations between contemporaneous bond yields and inflation were negligible, but were substantially larger when an arithmetically declining weighted average of past inflation rates replaced the current inflation rate. For example, from 1898 to 1924, the highest correlation coefficient (0.857) for long-term bonds occurred with a 20-year lag on inflation. For commercial paper, from 1915 to 1927, the optimal lag was found to be 30 years (13, pp. 423-27). Fisher rationalized the long lag not on the grounds of 20 and 30-year lags in inflation expectation formation but through the impact of inflation on real interest

rates and through the impact of past business activity on current economic and credit conditions (55, pp 201-04) Thus, Fisher viewed the adjustment of nominal interest rates to changing inflation as a very longrun process <sup>5</sup>

Fama has produced the best known recent empirical work concerning inflation and nominal interest rates Fama performed two tests on the joint hypothesis of a constant expected real rate and market efficiency Markets are efficient if they fully reflect all relevant available information "Fully reflect" means that security prices should adjust rapidly to new information so the expected return on a security always equals the expected return at market equilibrium Thus, no excess returns can be expected above the equilibrium return and the expected real returns from comparable investments should be equal This analysis implies that forecasts are the most accurate possible, given the information set, because if information could be used more effectively, the opportunity for long-term economic profit would exist To test the efficient markets hypothesis, researchers have employed various definitions of the relevant information set used in determining the expected return The information sets have included merely past data on the time series in question (weak-form efficiency), other easily obtainable information relevant to that series (semistrong efficiency), and costly and difficult-to-obtain insider information (strong-form efficiency) <sup>6</sup>

Fama's first test of the joint hypothesis was a weak form test using correlations of real returns on 1- to 6-month Treasury bills for the 1953 to mid-1971 period Fama concluded that his joint hypothesis

<sup>5</sup>Fisher rationalized these long lags by stating borrowers and lenders tended to form inflationary expectations differently In Fisher's opinion, borrowers alter their expectations more rapidly and more correctly than lenders do Therefore, an increase in inflation will raise the nominal rate of interest, although by less than the rate of inflation expected by borrowers, thus decreasing the *ex post* real rate The falling real rate and increasing profits further increase loan demand and set the business cycle in motion Savers, who form their expectations more adaptively, will eventually perceive the higher inflation and will be less willing to save at all nominal interest rates Furthermore, commercial banks will be less willing to expand the money supply as inflation and higher loan-to-deposit ratios will reduce their willingness to extend new loans The higher interest rates demanded by suppliers of funds will push nominal interest rates upward and expectations of inflation downward for investors reducing investment, overall economic activity, and eventually interest rates (See 3, 13, and 55 for a detailed explanation of the Fisher's business cycle and his empirical work)

<sup>6</sup>For a detailed description of the efficient markets literature and its applications in modeling interest rates, the interested reader should refer to (9, 10, 43, 44, 45, 47, 52, 53, 58, 63)

was supported as the estimated correlations were close to zero In his view, the market had used information on past real Treasury bill interest rates to price Treasury bills so that no longrun returns above the assumed equilibrium constant real return were available Thus, deviations above or below the equilibrium real return will be transitory, and data on past real Treasury bill interest cannot be used to predict the transitory deviations

Fama's second test was a semistrong test using data on real returns on 1- to 6-month Treasury bills and the Consumer Price Index (CPI) from 1953 through mid-1971 and subsamples of this period He tested the joint hypothesis that the expected real rate of interest is roughly constant over time and that the market forecast of inflation incorporated in the Treasury bill rate is efficient so that all information used in forecasting inflation is summarized in the relevant Treasury bill rate Fama represented the relationship between inflation and interest rates as  $\% \Delta CPI_t = a + b R_{t-1} + u_t$  where  $CPI_t$  is the CPI in period  $t$  and  $R_{t-1}$  is the nominal interest rate one period earlier for a security with a maturity of one period <sup>7</sup> The intercept term represents the negative of the *ex post* real rate over the sample period Furthermore, for the joint hypothesis of market efficiency and a constant expected real rate, the coefficient  $b$  should not be statistically different from 1 and the residuals should not be autocorrelated If the equilibrium expected real rate is constant, as suggested by a coefficient not significantly different from 1, autocorrelated errors would indicate the market is not using all information efficiently, as errors in forecasting the last period's inflation could be used to improve inflation forecasts in subsequent periods Furthermore, if  $R_t$  implicitly includes all relevant information in forecasting inflation, the explicit addition of more information relating to forecasting inflation, such as lagged inflation, should not improve the equation's forecasting ability

Fama estimated his equation for 1- to 6-month bills over the period from March 1959 to July 1971 The results generally supported his hypothesis in that

<sup>7</sup>Fama used the rate of change in the purchasing power of money which is approximately equal to the negative of the inflation rate However, as Wood pointed out, other than altering the expected signs for the right-hand side variables, the substitution of inflation for the rate of change in the purchasing power of money should not significantly alter the test results Thus, to simplify comparison with the empirical work of others, I used the inflation rate instead of the rate of change in the purchasing power of money

the slope coefficients for the interest rate generally did not significantly differ from 1, the estimated residuals were not autocorrelated, and the addition of the lagged CPI to the model was not statistically significant

### Criticism of Fama's Work by Summers and Wood

As might be expected, the Fama article received extensive criticism because the empirical results indicated a strong link between inflation and interest rates and little variability in expected real interest rates. His results generally implied a weak role for discretionary monetary policy if monetary policy's success depends primarily on sharply altering real interest rates. Subsequent empirical examinations of Fama's work have tested his equation for different sample periods, used real variables in Fama's equation to proxy for real variables influencing the real rate, have substituted different inflation proxies in Fama's equation, have developed reduced-form models for the determination of nominal interest rates with variables representing inflationary expectations and various and real monetary factors, and have real interest rates from different sample periods.

In the most detailed critique of Fama's work, Summers (60, pp 57-61) fit Fama's equation to many more sample periods, including the seventies, and obtained highly variable results in terms of the slope coefficient values and significance as well as freedom from autocorrelation.<sup>a</sup> Summers' results for the post-World War II period are shown in the table. Given the extreme role the sample played in the results, the relationship between inflation and nominal interest rates appears highly variable.

Summers also examined the relationship between inflation and interest rates by modeling inflationary expectations. He modeled expectations under both a

Keynesian (adaptive expectations) framework and a two-stage rational expectations framework to examine how rapidly nominal interest rates adjust to changes in inflationary expectations. These results likewise indicated that expected inflation's impact on nominal interest rates is highly variable over time and is significantly less than 1 even in the post-war period (60, pp 52-61).

The fact that the relationship between inflation and interest rates seems rather weak and variable when one uses quarterly data does not preclude a tight longrun relationship. As mentioned in the introduction, such factors as the reduced demand for money balances, partially accommodating monetary policy, and incomplete real income and price effects may tend to weaken and add to the variability of the shortrun relationship between inflation and interest rates. To examine the relationship between

### OLS regressions of the quarterly inflation rate on 3-month T-bill rates

Period	Constant	$\bar{R}_t$	$R^2$	D-W
1947-79	-0.31	1.14 (12)	0.37	1.18
Omitting controls <sup>a</sup>	-0.06	.31 (14)	1.19	
1947-55	6.33	-2.94 (1.82)	.04	1.37
1956-65	.85	.32 (.33)	.00	1.80
1966-75	-3.32	1.59 (.24)	.51	1.53
Omitting controls <sup>a</sup>	-.43	.96 (.26)	.30	1.74
1950-59	2.06	-.18 (N.A.)	-.02	1.06
1960-69	-1.82	1.12 (.14)	.61	2.07
1970-79	-2.78	1.66 (.19)	.65	1.87
Omitting controls <sup>a</sup>	-2.31	1.56 (.23)	.61	1.85

Notes: Standard errors are in parentheses.  
N.A. = Not available.

<sup>a</sup>These regressions were omitted in the period 1971:3 through 1974:2.

Source: (60, p. 61).

<sup>a</sup>A small amount of autocorrelation could be introduced in the residuals of the Fama equation by transactions costs and changing liquidity premiums. Transactions costs can create autocorrelation by creating a range for the expected rate of return whereby short term portfolio shifts would not increase expected revenue sufficiently to offset the higher transactions costs. Likewise, if the liquidity premium on a security changes, the expected real return on the security will change, possibly introducing autocorrelation in the Fama equation. The role of transactions costs and liquidity premiums in determining interest rates is discussed in Benjamin Friedman (17, 18), Malkiel (41), and Throop (63).

inflation and interest over longer periods (2 - 20 years), Summers used band spectrum regression, a statistical technique which uses moving averages of the data to reduce the impact of random and cyclical factors (60, pp 21-35). Summers found the relationship between interest rates and inflation no stronger in the long run, as all coefficient estimates were far below unity and were once again highly sensitive to changes in the sample period. Summers concluded that money illusion is primarily responsible for the lack of a one-to-one relationship between interest rates and inflation in the long run (60, pp 47-50).

Wood agreed with Summers' conclusion that the relative impact of inflation on nominal interest rates is highly variable and noted that, with the exception of Fama's sample period, the relative variability of inflation has been much greater than the relative variability of nominal interest rates (68, p 11). Wood emphasized that the reduced volatility of inflation during Fama's sample period undoubtedly improved the ability of the market to forecast inflation, thus tending to yield more accurate inflationary expectations. Another contributing factor, according to Wood, was the relatively mild business cycles of the 1953-71 period tested by Fama, thus reducing real income effects on real interest rates.

#### **Other Criticisms by Carlson and by Nelson and Schwert**

Summers' and Wood's rejections of Fama's conclusions were primarily based on their inability to find a tight, statistically stable relationship between inflation and interest rates over various sample periods. In contrast, Carlson, Nelson and Schwert, and other researchers have produced evidence indicating Fama's conclusions are not correct, even for Fama's sample period.

Carlson criticized Fama's empirical findings on two major grounds. First, using the Livingston biannual survey data of market participants' expectations of inflation and nominal interest rates for the 1953-75 period, Carlson found a strong procyclical movement in expected real interest rates. The expected real interest rate tended to rise in expansions and to fall in contractions. According to Carlson, the procyclical behavior of real interest rates was due primarily to fluctuations in the expected returns to

capital (6, p 470). However, using survey data as proxies for expected values has shortcomings. The major shortcoming is that all market participants do not need to have rational expectations to drive variables to rational values. If only a few market participants have rational expectations, but control a sizable share of market resources, economic variables can still be driven to levels consistent with rational expectations.

Second, Carlson found that adding the ratio of total seasonally adjusted employment to noninstitutional population to Fama's equation yielded a statistically significant coefficient and caused the coefficient for the 3-month Treasury bill to be statistically different from unity. These statistical findings indicate either that interest rates are not efficient predictors of inflation, because all factors influencing inflation are not being fully incorporated into the interest rate variable, or that the real rate is not constant. If the real rate is not constant, the addition of real variables should proxy for changes in the real rate of interest and be significant in predicting inflation in Fama's equation.

Other more sophisticated studies by Tanzi (61), Peek (51), and Wilcox (67) over similar sample periods, but not identical to Carlson's, that used the actual or modified Livingston survey data also indicated variability in the real rate.<sup>9</sup> These three studies used reduced-form equations to predict the 6- and 12-month bill rates with explanatory variables consisting of the actual or modified Livingston data, the business cycle, monetary and fiscal policy, and relative price shocks. The coefficient estimates were generally of the expected sign and were statis-

<sup>9</sup>Because the Livingston data proxies for unrevealed inflationary expectations, undoubtedly the Livingston data contain some measurement error. One source of measurement error is that all respondents do not respond at the same time, thus, some respondents would have access to later revised data. To the extent that measurement error exists in the Livingston data, some bias would exist in the coefficient estimates in the various reduced-form models for the 6- and 12-month bill where the Livingston data are used as a proxy for inflationary expectations. To produce consistent estimates for inflationary expectations variable, instrumental variables for the Livingston data were generated under various regressive, extrapolative, and rational expectations theories of expectations formation by Lahiri (36), Peek (51), and Tanzi (61). With the exception of the results by Lahiri, the adjusted Livingston data failed to raise significantly the coefficient on the inflationary expectations variable in the various reduced form models estimated by Lahiri, Peek, and Tanzi.

tically significant. With the exception of selected model specifications by Tanzi and Wilcox, the coefficients on the inflationary expectations variables were significantly less than 1 at the 5-percent significance level. Furthermore, when tax considerations were included in the models, none of the models produced a neutral impact of inflation on real after-tax interest rates.

Nelson and Schwert have also criticized Fama's results, noting that Fama's joint test of a constant real rate and market efficiency is weak because the variability of his error term is a composite of the variability of the market inflation forecast error and the variability of the expected real interest rate. Therefore, although the expected real rate may be variable and serially correlated, the error term in the Fama equation may indicate no serial correlation if the randomness of the inflation forecast error dominates the serially correlated *ex ante* real rate. Furthermore, the forecast errors of inflation will be larger if information is not used efficiently to make the best possible forecast. Thus, the serially uncorrelated observed real rates of interest and the serially uncorrelated error term in the Fama equation can be consistent with a variable real rate and market inefficiency as well as with Fama's hypothesis of a roughly constant real rate and market efficiency (49, pp. 479-80).

Furthermore, Nelson and Schwert stated that finding an insignificant value for the dependent variable lagged one period is a weak test to determine whether the interest rate variable contains all the information provided by past inflation rates. If the process generating inflation is not a simple one-period autoregressive stochastic process, the addition of the lagged dependent variable will be a poor test of determining whether interest rates efficiently incorporate all information concerning past inflation. Using univariate and multivariate time series analysis, Nelson and Schwert derived estimates of current inflation and replaced the lagged inflation variable in Fama-type equations with these estimates. The primary empirical results were that the time series predictors of inflation and the lagged error terms were both significant in forecasting inflation in Fama-type equations, thus providing evidence of either market inefficiency or variability in the real rate of interest.

### Further Examination of *Ex Post* Real Interest Rates by Mishkin and by Hafer and Hein

Two major studies of the adjustment of real interest rates to inflation were performed by Mishkin and by Hafer and Hein. Both these studies were performed on observed *ex post* real interest rates under the assumption that if expectations are formed rationally, errors in forecasting inflation should be uncorrelated with available information as well as with actual, real *ex ante* interest rates. If this assumption is true, with the exception of random error, observed real interest rates over time should equal expected real interest rates (26, 46, 59).

The critical question is what time period is necessary for rational expectations to yield the correct underlying specification of the model and to obtain reliable coefficient estimates of the parameters determining real interest rates. Benjamin Friedman believes that a long time is required to obtain rational expectations in the Muthian sense, in which individuals' subjective probability distributions concerning future outcomes are equal to the objective probability distributions generated by the true model. Friedman believes the time is quite long because of the time required for the correct specification of the model to reveal itself, particularly in a dynamic, changing economy. Furthermore, finite sampling problems which exist in estimating the coefficients of the underlying model will lengthen the time necessary to obtain reliable estimates of coefficients (19).

Benjamin Friedman found empirical evidence of interest rate expectations being biased and inefficient in the Goldsmith-Nagan survey data from September 1969 to December 1976 (20). To test for bias, he requested the actual interest rates for six different money market and bond market interest rates on the last day of the quarter against average survey expectations formed 3 and 6 months earlier using Zellner's seemingly unrelated procedure. The results rejected the joint hypothesis of unbiased expectations across the equations at the 90-percent confidence level for the 3-month forecasts and the 99-percent confidence level for 6-month forecasts (20, pp. 456-59). Moreover, the error terms displayed serial correlation indicating inefficient use of information. To further test for the efficient use of information, Friedman examined the stochastic process



generating the actual interest rates and the average expectations in the survey. His results indicated that the actual and expected interest rates were generally generated by different stochastic processes, thus indicating inefficient use of information in forming expectations (20, pp. 459-60). Similarly, Mishkin found inflation forecasts were not used rationally in formulating long-term Government bond yields on a quarterly basis from 1959 to 1969, as market participants in the sixties consistently underestimated inflation in formulating long-term Treasury bond yields (43). The underlying caveat is that empirical tests using observed real rates as proxies for expected interest rates are generally suspect for relatively short sample periods or for longer periods characterized by unusual economic events.

Using correlation and regression techniques, Mishkin performed many tests on *ex post*, real 3-month Treasury bill rates. Like Fama, his first test examined correlations of observed real interest rates for the 1953:1 to 1979:4 period and found correlations significantly different from zero on an individual and collective basis, supporting the hypothesis that the *ex ante* real rate has varied significantly over most of the postwar period. In his second test, Mishkin regressed observed real interest rates for the sample period 1953:1 to 1979:4 on time variables up to the fourth power and also lagged inflation. The lagged inflation variable represented a subset of all easily available information known at the time the *ex post* interest rate is determined. The coefficient on lagged inflation was negative and significant, indicating, along with the significant time coefficients, that the *ex post* real rate varied over time and adjusted incompletely to inflation on a quarterly basis.

In his third test, Mishkin examined correlations of estimated real rates, nominal rates, and expected inflation. The estimated correlations of the fitted values for expected real interest rates with nominal interest rates and expected inflation were found to be  $-0.67$  and  $-0.86$ , respectively, with expected inflation equal to the nominal rate minus the estimated *ex ante* real rate. Adjusting the real rate for an estimated effective marginal tax rate of 33 percent raised the correlation coefficients to  $-0.80$  and  $-0.96$ . Moreover, the correlation of expected inflation and the nominal 3-month bill rate was found to

be  $0.95$ , which was not surprising as Mishkin's estimate of expected inflation was derived from the nominal interest rate. In short, his correlations support the view that an increase in expected inflation will raise interest rates, but by less than the full amount of expected inflation, thereby lowering the expected real rate particularly on an after-tax basis, at least in the short run.

Mishkin's analysis has several shortcomings. First, his model is based on time trends and is likely a poor approximation of the underlying structural model, particularly as substantial variation in the observed cyclical and secular real rate occurs in his sample period. One could have greater confidence in Mishkin's results if the structure for determining expected real interest rates were specified, not merely made a function of time trends. A more complete specification would reduce the possibility of specification bias through omitted variables. Either a multivariate Box-Jenkins time series approach or an econometric approach similar to the approaches used by Peek, Wilcox, and Tanzi would likely be superior. Mishkin's attempts to explain variation in *ex post* real rates by regressing the *ex post* real rate on lagged inflation and other time series were largely unsuccessful. Mishkin points out that these results are likely due to the greater variability in inflation forecasting errors relative to the variability in the *ex ante* real rate. However, many specifications other than those Mishkin used are possible. A second problem is that the CPI is a poor inflation proxy because of measurement problems, and the derivation of expected inflation from the nominal interest rate probably overstates the actual correlation of expected inflation and nominal interest rates. These criticisms are reviewed in detail by Singleton (59).

Hafer and Hein also examined *ex post*, real interest 3-month Treasury bill rates from 1955:1 to 1979:4. They found the average *ex post* real interest rate in the sixties statistically differed from the average real *ex post* interest rate for the last half of the fifties and throughout the seventies. The researchers also found statistically significant dummy variables for both the last half of the fifties and the sixties in the Fama equation estimated over the 1955:1 to 1979:4 period, further supporting the view the *ex ante* real interest 3-month bill rate was not constant over this period.

However, Hafer and Hein's small sample tests should be viewed with considerable caution. As mentioned earlier, if markets are using information efficiently, observed interest rates should be unbiased predictors of the underlying expected rates over time. The time period necessary for this degree of efficiency to occur will depend on the costs and the availability of information as well as on the degree of structural change in the economy. Given Friedman's and Mishkin's empirical results indicating that market interest rate expectations were biased and inefficient over most of Hafer and Hein's sample period, one should be hesitant in accepting small sample results concerning the longrun average equality of *ex post* and *ex ante* real interest rates.

Other research besides Mishkin's also indicates market participants habitually underforecasted inflation in the sixties and seventies. For example, Carlson found respondents in the Livingston survey underforecasted inflation on a biannual and annual basis from the midsixties to the midseventies (6). Fomby found similar results using *Business Week's* and the American Statistical Association-National Bureau of Economic Research's quarterly macroeconomic surveys for the seventies (14). Market expectations likely underforecasted inflation because of the sudden upsurge in inflation and strong adaptive nature of the inflation forecasts over the period (14, 36; 66). Because of the apparent underestimation of inflation over much of Hafer and Hein's sample period, their results should be viewed with caution.

## Conclusion

The adjustment of interest rates to inflation appears a long process. The lags from inflation to inflationary expectations and the likelihood of significant income and wealth effects along with institutional constraints indicate that the adjustment is likely slow and is insufficient to prevent longrun impacts on real interest rates. Although the empirical work, particularly studies involving *ex post* real rates, should be viewed with some caution, the preponderance of evidence supports this view, particularly concerning after-tax real interest rates. Future adjustments will likely continue to be less than instantaneous. However, the greater use and availability of information, the continued phasing out of interest ceilings, the greater integration of inter-

national money markets, and the shift in 1979 to a monetary policy less concerned with targeting nominal interest rates should speed future adjustments somewhat.

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# Role of Government in a Market Economy

Lowell D. Hill (editor). Ames: Iowa State University Press, 1982, 102 pp., \$12.95.

Reviewed by Stan Daberkow

"What is the proper role of government with respect to agricultural markets?" (p 27) We never learn what the *proper* role of Government is, but the essays in this book do tell us what seven well-known economists think about the Government's role. This book reproduces the Norton Lectures at the University of Illinois from 1979 through 1982. The lecturers were chosen for their variety of views ranging from "free-marketeers" to "anti-oligopolists." The former lament the declining market economy, whereas the latter press for continued consumer and taxpayer safeguards. Market definitions abound throughout the book, while macro-economic, antitrust, export, and agricultural policies are recanted or championed.

*Harold Breimyer* offers a historical treatise on markets and concludes that the role of prices, although progressively subordinated, is still critical. According to Breimyer, we expect prices to distribute final products as well as to allocate factors of production, which in turn determine the distribution of income. These functions depend on the sovereignty of economic units, relatively easy and equitable access to physical resources, and the egalitarian aspects of industrial techniques. Breimyer finds that the second of these tenets is increasingly violated, which means that prices cannot fulfill their "heroic" purpose of guiding the economy. Although not fully developed, Breimyer's observations on Ricardian rents and depletable resources offer further insights into the role of prices.

*Lowell Hill*, the editor, raises the issue of evaluating market performance. Price-setting functions of supply and demand are being usurped by Government legislation, executive action, administrative decisions, and manipulative corporations. However, "there is no well-organized system for evaluating the costs and benefits of individual policy actions" (p 18). Hill argues that, although the perfectly competitive market is the standard by which we often judge all markets, such a comparison is unrealistic.

Rather than compare entire market systems, one should compare the effects of policy A with policy B on a variety of criteria. He suggests the following criteria: efficiency, price level and stability, response to changes in supply and demand, and incentives. Stressing the direction of incremental movements rather than magnitude, Hill maintains that policy effects do not always have to be quantified. He applies this technique to a proposed national marketing board and cites past research bearing on each criterion. I find this approach overly optimistic. First, not all policymakers will agree on the criteria, for example, the Office of Management and Budget Director may insist on limiting budget exposure. Second, immense pressure will build to quantify the effects on markets and economic agents involved. Third, we are unsure how to aggregate across these diverse criteria. Fourth, as new policy proposals arise, we will inevitably discover that because agricultural economists have not excelled at anticipatory research, analysts are left to their own makeshift, and often hurried, devices.

*John Kenneth Galbraith*, in his characteristically entertaining manner, discusses economic change and the response of economic policy. Noting that "economic policy regularly lags behind compelling historical changes" (p 32), he speculates that past Government response may not work in the future because economic relationships change. At the time of his lecture, policymakers were attempting to deal simultaneously with unemployment, inflation, and international exchange fluctuations. Dismissing several commonly cited culprits such as oppressive taxation, unions, public regulation, and the Organization of Petroleum Exporting Countries, Galbraith identifies three basic factors underlying economic change.

First, worker productivity has declined because of increased demand for leisure. "What is called the work ethic has always been thought exceptionally ethical for the poor. Those who have never experienced hard toil have always been indignant over the casual tendencies of those who have" (p 32). Second, we no longer have occupational limits on

\*The reviewer is an agricultural economist with the Economic Development Division, ERS.

consumption, that is, nearly all income classes have access to most goods and services. Third, certain organizations have successfully escaped market authority. "No industrial country now leaves its farm prices to the market, when farmers dislike their prices, they no longer assail the buyers of their products. They turn their wrath on the government" (p. 35).

Finally, Galbraith examines how monetary policy and fiscal policy have (or should have) accommodated these underlying economic changes, all the while vigorously criticizing monetary policy and defending Keynesian fiscal policy.

*Willard Mueller* presents a spirited case for social control of market power. "The great weight of empirical evidence supports the view that today market power is the rule" (p. 42). He recalls abuses of market power from before the Sherman Antitrust Act through the settlement of the International Telephone and Telegraph case as chronicled in President Nixon's White House tapes. Oligopolistic industries impose excessive costs on consumers through extensive advertising, product proliferation, and inflated costs of manufacturing and distribution. Mueller also maintains that market power creates an inflationary bias in the economy as wages and prices have continued to rise in the face of declining demand. He argues that wage and price controls can work and have worked in the past and that some inefficiencies, price distortions, or resource misallocations are a minor byproduct of controls when compared with high interest rates, high unemployment, depressed profits, and capacity underutilization that accompany monetary or fiscal controls. Mueller delivered his lecture in early 1980 and correctly anticipated the extent of the economic slowdown necessary to arrest inflationary tendencies. However, he did not anticipate or mention the international pressures which often constrain U.S. corporate power.

With *Theodore Schultz*, in 1981, the lecture series abruptly shifted from the dangers of unbridled markets to the unfounded "prosecution of free markets" (p. 73). Schultz claims that the private sector is best suited to perform all economic activities except those in which the Government has a comparative advantage: providing national defense, maintaining civil order and mediating internal conflicts, produc-

ing and reporting agricultural statistics, enforcing grades, weights, and measures, determining property rights during produce exchange, supporting basic agricultural research (although with some reservation), and stabilizing overall prices. "No government which has abolished markets has been successful in modernizing agriculture" (p. 67). Schultz laments the confusion between market failure (often an argument for public intervention) and market disequilibria, which are inevitable in a dynamic economy where one cannot escape risk or uncertainty. He also notes that the concept of externalities is not new to economics and that the regulatory approach is inefficient compared with charging an explicit price for the undesirable byproducts of production. Schultz does not address the issues raised by earlier contributors: the adverse aspects of monopoly or oligopoly tendencies in the agricultural input, processing, and marketing sectors.

*D. Gale Johnson's* lecture develops the theme of U.S. agriculture and the world economy by providing a historical perspective of international agricultural trade. Except for a few years between 1920 and 1970, the United States had not been a net agricultural exporter. Since 1970, U.S. agricultural exports have expanded rapidly, reaching the point where the prosperity of the agricultural industry is a function of world demand. Johnson dismisses three arguments commonly proffered to explain the comparative advantage of U.S. agriculture: high productivity due to favorable climate and land resources, large size of U.S. farms, and one of the highest land-to-worker ratios in the world. These factors existed before 1970 and, therefore, do not satisfactorily explain the recent growth of U.S. exports. Johnson attributes agricultural export growth in the seventies to modifications in U.S. agricultural and exchange rate policies, significant resource adjustment in agriculture since World War II, and the emergence of U.S. agriculture as a high-technology sector. Chief among these factors were the overvalued dollar and the support of U.S. agricultural prices above world levels prior to 1970. Johnson's discussion on maintaining U.S. agriculture's comparative advantage is much too brief. He does not address the issue of exporting processed, rather than raw, agricultural products or the problem of export subsidization by foreign competitors. He does point out that the current inconsistent agricultural trade policy imposes significant costs on

the Nation "It is slightly ironic that we have been willing to undertake domestic programs and policies to achieve resource adjustments for export products but have generally failed to adopt similar measures for products we import or would import in the absence of protection" (p 87)

*Bruce Gardner*, the final lecturer in the series dwells on U S macropolicies and agricultural programs in the eighties His characterization of "supply-side economics" and his comparison of it with the more traditional explanations of how the economy works are interesting, but tentative Gardner believes that, although the agricultural policy proposals of the current administration initially emphasized market deregulation and budgetary constraints, the 1981 Farm Act, with congressional assistance, looked much like the 1977 legislation Gardner's opinion about the role of Government in the economy is clear "I believe that government intervention in the commodity markets as a solution to agriculture's problems over the long term has been a costly delusion" (p 99) Gardner concludes that further deregulation through lower price supports and payments, fewer acreage controls, and less export promotion will not substantially harm

farmers because "the farm sector as a whole is much less affected by commodity programs than was the case twelve to fifteen years ago" (p 101) I suspect, however, that the estimated \$15-\$20 billion U S Treasury outlays on FY 1984 farm price and income supports and export subsidies will reverse that trend Gardner's brief remarks on the income redistribution activities of the Congress and the concept of supply and demand of legislation might well have been expanded

Although the views of each lecturer are interesting and occasionally fascinating, the book lacks a well-focused theme This difficulty stems from the diverse group of individuals involved, the wide variety of topics addressed (market definition, market evaluation, macropolicy, inflation, antitrust policy, agricultural policy, and trade policy), and the rapid change in the focus of economic problems during the time span of the lectures In nearly all cases, the lecturers cited books or articles where their theories, hypotheses, or empirical work had been reported in greater detail Thus, the book serves best as a reference to the past work, interests, and economic philosophies of the seven lecturers



# Economic Analysis and Agricultural Policy

Richard H. Day (editor). Ames: Iowa State University Press, 1982, 368 pp., \$35.00.

Reviewed by Allen B. Paul\*

Geoffrey Shepherd is a scholar, teacher, and advisor of solid achievement and wide influence. Many economists know him through his textbooks on prices, marketing, and agricultural policy. Now we have an attractive volume of 23 wide-ranging essays in his honor. The book was conceived on his 80th birthday by students and colleagues. About half of the essays have been published before, but some of these were revised for this volume. The other half are newly written or were adapted from unpublished papers.

The essays are preceded by a chapter authored by two of Professor Shepherd's sons. It provides a biographical sketch of the man ranging from his boyhood years in England to his teens in the harsh farming plains of Saskatchewan, Canada, to his long academic years at Ames, Iowa, and to his latter-day consulting assignments in Japan, Burma, Venezuela, Vietnam, Peru, Indonesia, and Paraguay. This chapter will provide a fresh view of Geoffrey Shepherd to many readers. The volume includes an appendix giving a complete list of Shepherd's numerous writings from 1929 to 1975.

The essays are of a generally high quality, but they cover a disparate set of topics. This choice results from the editor's decision to reflect the full range of Shepherd's interests in one volume. Each essay forms a separate chapter classified under one of four sections. The sections are entitled values, analysis, and policy, the quantitative approach, research, technology and resources, and markets and development.

All chapters in the first section have been published before. They include the 1955 and 1956 articles by Shepherd in the *Journal of Farm Economics* and an excerpt from a Michigan State bulletin by Glenn Johnson on what an economist can say about values, the 1978 Snyder Memorial Lecture by Kenneth Boulding on some building blocks for creating a normative science, as suggested by the course of agricultural policies, the 1976 American Agricul-

tural Economics Association Fellow's Lecture by Lauren Soth on what agricultural economists can contribute to public policy, a 1979 essay by Harold Breimyer for the National Planning Association on mental images that guide the thinking of agricultural economists, and a 1952 article by W. K. McPherson in the *Journal of Farm Economics* on the family farm as a policy goal.

The previously published articles in the second section include a paper combining the 1942 and 1944 articles in *Econometrica* and the *Review of Economics and Statistics* by Gerhard Tintner, giving a simple explanation of why there are business cycles, and a 1954 article by Karl Fox in the *Review of Economics and Statistics* on the measurement of demand. Fox also has added some historical and methodological discussions to his original article. The newly available essays include a paper by George Judge on the theory and practice of econometrics that argues for using prior information as well as sample information for estimation and hypothesis testing, a paper by Walter Fisher and Paul Kelley proposing a new method for selecting representative firms in linear programming, and a paper by Wen-Yuan Huang, Earl Heady, and Reuben Weisz describing recent models that combine a large-scale econometric model and a large linear programming model, involving two-way communication between them. Such hybrid models are proposed to answer questions about temporal and spatial attributes of production, prices, income, and related variables.

Most chapters in the third section are relatively new. T. W. Schultz provides a paper, originally given to a 1979 seminar in Chile, arguing that each major Latin American country should aim at having its own first-rate national agricultural research enterprises. The enterprises would produce valuable public goods and should be paid for on public account.

R. T. Shand gives his own interpretation of the 1979 joint study by the Indian Planning Commission and the Australian University. On the basis of

\*The reviewer is a senior economist with the National Economics Division, ERS.

his Indian experience, he questions most of the generalizations in the development literature on the impacts of the new crop varieties on production and income distribution. George Ladd reports on a cooperative study with university animal scientists using a product-characteristic approach to technical change. They applied ideas from Kelvin Lancaster's seminal work in 1971 to animal breeding. Robert Wisner reports on a study of the economics of gasohol which shows its relative costliness. Finally, John Timmons provides a chapter that was presented at a water resources seminar in 1969 explaining the concept of water quality in economic terms. It shows the varied nature of demand requirements and methods for managing supplies of different qualities to meet the different requirements.

Three chapters in the last section have appeared in print before. A paper by Richard Day, originally presented at the 1979 meetings of the International Association of Agricultural Economists, argues for a centralized economic policy of intervention based on the view that man's cognitive powers are limited and that economic systems tend toward disequilibrium rather than equilibrium. A 1958 article by Arthur Hanau, reprinted in English from the *Agrarwirtschaft*, gives the rationale for what later became the Common Agricultural Policy (CAP). A 1965 paper by G. Boddez, first presented at the Flemish Economic Congress in Louvain, explains the complex problems of the CAP as seen at that date. Boddez anticipated many of the difficulties facing the CAP today.

Then, there is a paper by Edward Schuh discussing the importance of foreign influences on the U.S. economy operating through capital markets and commodity markets. This subject apparently is overlooked by most analysts and policymakers. A paper by Frank Meissner argues that investments in capital-intensive marketing technologies in poor countries are unfortunate. To make economic progress, existing public markets should be modernized, services should be provided to entrepreneurs, and in-service training programs should be provided to wholesalers and retailers. Appropriately, the final essay is an adaptation of the 1968 and 1969 reports by Shepherd based on his experience as economic advisor in Peru. It sorts out the real problems of the country from popular perceptions of the problems,

and it defines the most effective role of government as one of facilitating private marketing enterprises and of providing essential information.

So much for the book's contents. A few general comments should be made. First, while the volume honoring one of the most productive and influential scholars of our times is not a *Festschrift* in the usual sense of a collection of original writings for the occasion (although it has some of this quality), most of the papers would be fairly inaccessible if it were not for this volume. Second, while old articles are included, their age does not necessarily erode their relevance. For example, Tintner's cogent demonstration in the early forties of how speculative dealings in several different asset markets interact to cause booms and busts appears more relevant now than during the fifties and sixties when *we* were lured into believing that business cycles could be closely controlled.

Finally, the volume displays a good cross-section of what agricultural economists do. But what they do reflects different methodological predispositions. These predispositions influence the selection of topics, the results obtained, and the conclusions drawn. Readers who are concerned with how we gain valid knowledge will see a variety of approaches in these essays. For example, the clarity, rigor, and simplicity of Shepherd's approach is replicated in several chapters dealing with a variety of economic problems. On the other hand, the utter complexity of the evolving human experience sketched in Day's essay, which leads him to advocate a new brand of behavioral economics, calls for very involved modeling of economic phenomena. Perhaps the involved modeling described by Huang, Heady, and Weisz is a foretaste. Yet, does the current state of economic understanding warrant such effort? Bigger and more intricate models may not yield better policy advice.

How far removed are we from Boulding's law of political irony that says that "almost everything that you do to hurt people helps them and everything you do to help people hurts them" (p. 43)? Boulding playfully announced this dictum on observing that the unintended side effects of farm programs turned a bad public policy into a good one. He had taught that farm programs redistributed income in favor of richer farmers. But, it gradually

dawned on him that the overall effects were astonishingly successful. It enlarged average U S per capita income without reducing the share going to the poor. The unanticipated effects of price policy were to reduce uncertainty, thus stimulating investment to modernize agriculture and thereby increasing productivity and forcing the rural poor to seek employment in the cities where they became more productive than before. Apparently, we still do not understand well enough the crucial bearing of

uncertainty on the organization of production and output. Yet, do we know enough about the real costs of rapid population movements?

On this questioning note, I can commend this volume as a good vehicle for serious thought about important methodological issues in our profession. It could serve this purpose in graduate courses and elsewhere.

# Agricultural Research Policy

Vernon W. Ruttan. Minneapolis: University of Minnesota Press, 1982, 370 pp., \$32.50 (cloth), \$13.95 (paper).

Reviewed by Lyle P. Schertz\*

A limited, but yet significant, number of agricultural economists have studied the economic costs and benefits of agricultural research. Vernon Ruttan, professor at the University of Minnesota, is one of these economists. Ruttan has also focused on related but broader topics—the organization of research institutions and the management of agricultural research—the topic of his most recent book.

Most of his manuscript relates to biological and technical research, but not exclusively. Important portions of the book relate to economic research.

I consider this book as part of the sustained effort by many—including Theodore Schultz, Sterling Wortman, George Harrar, and F. F. Hill—to search out the rightful role of research in agricultural development in lower income countries. It is fitting that a book focused on the art of organizing and conducting agricultural research be written by Ruttan. His experiences with the Tennessee Valley Authority, Purdue University, the Council of Economic Advisers, the International Rice Research Institute, the University of Minnesota, and the Agricultural Development Council provide him with unique perspectives about these topics.

The text is organized into twelve chapters. It focuses on induced innovation and incorporates many concepts included earlier in *Agricultural Development: An International Perspective*, published in 1971 with Hayami, and later in *Food Policy* in 1977. Ruttan describes selected national agricultural research systems. Focusing on the art and requirements of managing research institutions, he discusses the fostering of scientific creativity, improvement of reviews of research programs, location and size of research institutions, mix of private and public research, project versus grant funding, and ways to allocate public money. Chapter 10 is a good reference, for it summarizes past research by economists on the economic costs and benefits of agricultural research. Subsequent chapters focus on social sci-

ence research and consider moral responsibilities confronting researchers and research administrators in recent years.

Many economists will want to become acquainted with this book, especially if they are engaged in interdisciplinary work, caught up in the USDA land-grant research planning processes, considering employment where they will be surrounded by biological and technical researchers or administrators of such research, or aspire to be administrators of research. The book will also appeal to economists interested in initiating research focused on why our society does not invest more in agricultural research when the findings documented in chapter 10 indicate that returns from additional investments in U.S. agricultural research would greatly exceed the costs.

Economists who now have administrative responsibilities or have recently been in administrative positions in the Economic Research Service and in departments of agricultural economics at U.S. universities will also want to be acquainted with the book. The book (1) helps readers understand the evolutionary nature of the U.S. agricultural research system, (2) stimulates them to view U.S. agriculture in a developmental context, with technology as an important force influencing development, and (3) suggests that building research institutions is a tedious, difficult task requiring everyone's best skills and intentions, administrators as well as practitioners, and (4) reminds everyone that the time required to erode research capacity can be quite short relative to the time required to build or rebuild such capacity.

Ruttan is a careful writer. He does not make combative statements. But he is not meek in his pronouncement of judgment on the 1978 reorganization of ERS. He feels that the new organization did not clearly distinguish between staff and analytical functions, and he concludes that one of the outcomes was "further erosion of the analytical capacity that is needed in order to maintain the effectiveness of the staff function" (p. 325).

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The book stimulated me to think more about how our agricultural economics research institutions, and ERS in particular, might build for the future. Some of Ruttan's comments touch on questions critical to ERS. For example, Ruttan argues that "a major problem becomes how to renew the intellectual vigor of the mature research institute." He advises

If a research system is to remain a valuable social asset, it must also devote resources to reinvestment in institutional capacity, to the enlargement of its physical and intellectual capital (p. 47)

This [leadership capability of mobilizing and allocating resources] means not only acquiring the necessary human and financial resources, but also performing the more difficult task of creating an institutional environment in which these resources can become productive (p. 49)

Ruttan has little patience for the concept of hiring outstanding people and letting them "do their own thing" (p. 48), "leadership must be sensitive to changing social goals, and it must effectively transmit their implications to the scientific staff" (p. 49). His rationale is based on the notion that many of our problems require "concerted research efforts," which I presume to mean research activity requiring in some cases several people and often more than one discipline. Many problems are of such a nature, and I applaud Ruttan's nudging of administrators to learn and to lead. But, it is not at all clear that administrators have a monopoly on being able to identify and define such problems.

Administrators have special responsibilities, to see that researchers have opportunities to demonstrate leadership skills as well. I agree with Ruttan that administrators have a special responsibility to identify and define problems and, after the ideas are tested and found appropriate, to lead people to engage in the needed work. But I wonder if another need—the need to decentralize the control of some resources so that individual researchers can have the flexibility to identify, define, and respond to such problems—might even be of greater significance or, at least of equal, importance.

Administrators have a proclivity to centralize decisionmaking, even with respect to allocating money for support activities for professionals. Even when decentralization is pursued, it stops somewhere between those at the top of the hierarchy and those producing the primary products of the research organization. One reason university economists work hard to obtain contract money is to escape the inflexibilities imposed by centralized budget controls. These controls often limit activities important in accomplishing research objectives.

These reactions to Ruttan's admonitions about research leadership illustrate why I think many economists will want to read *Agricultural Research Policy*. The book is stimulating and encourages critical thinking about the way the research institutions to which economists belong and to which they relate are organized, managed, and led, and how researchers participate in building and rebuilding such institutions.