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The decade the Phillips Curve died

Arnold Kling

Introduction

The 1970s was a tumultuous decade for the American economy and for macroeconomic theory. The breakdown of one of the most important macroeconomic relationships, the unemployment-inflation trade-off known as the Phillips Curve, played a central role in the drama.

Some of the key developments in economic theory and in the economic environment unfolded as follows:

- In 1958, British economic historian A.W. Phillips (1958) published an article documenting an inverse relationship between nominal wage changes and the unemployment rate in England for nearly a century.
- In 1960, Paul Samuelson and Robert Solow (1960) dubbed this relationship the Phillips Curve and suggested that American policy makers could use it as a tool to help decide policies for aggregate demand management.¹
- In 1967, Milton Friedman (1968) gave the Presidential Address to the American Economic Association, in which he challenged the interpretation of the Phillips Curve as a relationship in which causality runs from unemployment to inflation and that the trade-off between unemployment and inflation is stable. Instead, he propounded what became known as the “natural rate hypothesis.”²
- In 1970 a collection of papers that explored the theory of the Phillips Curve, which became known as “the Phelps volume” (Phelps 1970), boosted the natural rate hypothesis.
- In August, 1971, President Nixon abruptly changed economic policy, including the imposition of a three-month freeze on wages and prices. This was followed by other forms of wage and price controls for the next two years.
- In October, 1973, a war in the Middle East resulted in an “oil boycott” by Arab producers unhappy with American policy. This began a period in which the Organization of Petroleum Exporting Countries (OPEC) was apparently able to achieve some success in acting as a cartel, restricting oil output and driving up prices. (See the Chapter 21 by James Hamilton in this *Handbook*).

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- In 1976, Robert Lucas (1976) published “Econometric Policy Evaluation: A Critique.” This paper called into question the stability of relationships, such as the Phillips Curve, if individuals have rational expectations.
- In 1978, the Federal Reserve Bank of Boston (1978) published a conference volume that was devoted to burying the Phillips Curve.

The rest of this chapter will proceed as follows. First, I will use a simple linear model of the inflation-unemployment trade-off to show how dramatically the 1970s diverged from previous macroeconomic performance. Next, I will look at the impact of the 1970s on macroeconomic theory and macroeconomic modeling. Next, I will discuss the macroeconomic thinking that emerged until the recent financial crisis and its aftermath. In a sense, macroeconomics from 1980 through 2008 can be viewed as a long post-mortem on the demise of the simple Phillips Curve in the 1970s. Instead, more complex theories of expectations and aggregate supply were adopted. Finally, I will look briefly at the implications of more recent events for the Phillips Curve.

A simple one-for-one trade-off

The Phillips Curve is supposed to be a curve. That is, at low levels of unemployment, an additional reduction in unemployment is presumed to bring about a larger increase in inflation than is the case at high levels of unemployment. However, the inflation-unemployment trade-off could have been reasonably approximated by a straight line during the 1950s and 1960s.

We can neatly divide the history from the 1950s through the present into thirteen-year periods, starting in 1956. The breakdown of the Phillips Curve took place during the second of those periods.

From 1956 through 1968, inflation averaged 2.19 percent and unemployment averaged 5.0 percent.³ Because the sum of the two is 7.19 percent, a simple linear model of the trade-off is:

$$\text{Inflation} = 7.19 - \text{unemployment}$$

By construction, this linear trade-off means that every one percentage point increase in the unemployment rate lowers the inflation rate by one percentage point. This one-for-one trade-off is not necessarily the empirical estimate that most closely fits the data. However, it works quite well over the 1956–1968 period. Inflation had a mean of 2.19 percent with a standard deviation of 1.11 percent. The standard error of this simple linear model is 0.61 percent, which means that it has an R^2 of close to 70 percent.

Thus, as of 1969, an economist might reasonably have described inflation and unemployment in terms of a one-for-one trade-off, with an average “misery index” (the sum of inflation and unemployment) of 7.19 percent. What took place subsequently, however, was radically different. Table 22.1 presents the performance of this inflation-prediction equation over four thirteen-year periods.

Note that this table uses the simple one-for-one trade-off estimated for 1956–1968, not allowing for any subsequent shifts in average inflation and unemployment. This simple model fit well from 1956–1968 and again from 1995–2007. From 1982–1994, the trade-off exists, but at a higher average level of inflation and unemployment, so that the “misery index” averaged 10.65 percent, compared with 7.19 percent in 1956–1968. However, for the period from 1969–1981, the linear trade-off fails dramatically to predict the behavior of inflation. This is when the dramatic breakdown of the Phillips Curve took place.

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Table 22.1 Inflation, Unemployment, and a Simple Linear Trade-off Model

	1956–1968	1969–1981	1982–1994	1995–2007	1956–2007
Average Unemployment	5	6.19	6.99	5	5.8
Average Inflation	2.19	7.81	3.66	2.67	4.09
Standard Error	0.61	7.67	3.79	1.04	4.32
Largest Under-prediction	1.4	12.33	6.34	1.68	12.33
Largest Over-prediction	-0.84	none	none	-1.09	-1.09

Notes: An underprediction is when the inflation rate exceeds what would have been predicted, given the unemployment rate, by the simple linear trade-off. Within a thirteen-year period, the largest underprediction is the amount of the underprediction in the year where this value is the highest. Similarly for the largest overprediction, where an overprediction is when the inflation rate falls below what would have been predicted, given the unemployment rate, by the linear trade-off

From 1973 to 1974, inflation climbed from 9 percent to 12 percent, while unemployment increased also, from 4.9 percent to 5.6 percent. This perverse behavior may have been the result of the breakdown of the wage-price control regime that was in place from 1971 through 1973. Otherwise, even in the 1970's in years when inflation went up unemployment went down, and vice-versa.

Late in the 1970s, the inflation rate shot up, going from 5.0 percent in 1976 to 6.7 percent, 9.0 percent, and 13.2 percent in 1977, 1978, and 1979, respectively. This painful acceleration took place in spite of the fact that the unemployment rate was 7.0 percent, 6.1 percent and 5.8 percent in 1977–79, respectively. The simple linear trade-off would have predicted inflation of 1.4 percent or less in those years. However, the worst year for the linear trade-off would have been 1980, when the unemployment rate of 7.2 percent implied almost zero inflation, while actual inflation was 12.35 percent.

The great debates

The Phillips Curve provoked vigorous debate among macroeconomists, both before and after the simplest empirical version broke down. This debate focused on considerations of both theory and econometric methods.

Keynesians interpreted the Phillips Curve as a model of inflation. The macroeconomic models treated inflation as resulting from the combination of a wage-setting equation and a price-markup equation. In the wage-setting equation, there is a Phillips Curve trade-off between the rate of increase in nominal wages and the unemployment rate. In the price-markup equation, prices are set as a markup over unit labor costs, which are affected primarily by wages.

The price-markup equation serves to align real wages with average productivity of labor. Thus, the real wage does not have a marked cyclical tendency according to the standard macroeconomic models of the late 1960s and early 1970s.

The wage-setting equation determines the change in nominal wages, and consequently the rate of inflation. The theory is that as unemployment gets lower, workers are in a stronger bargaining position, and they are able to extract larger wage increases.

Although low aggregate unemployment gives workers stronger bargaining power in an individual industry, in the economy as a whole this wage bargaining is a zero-sum game. The real wage is determined by the price mark-up, so that the only thing that wage negotiations achieve overall is a higher rate of inflation.

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Given this view of the inflation process, Keynesian economists in the 1960s favored “incomes policies” to restrain inflation. Labor unions individually were attempting to increase their relative wages, but collectively the effect was to increase overall inflation. It seemed to make sense for government to discourage this unproductive competition for income shares.

Both the non-monetarist view of inflation and the implication that government should play a role in the process of setting wages were opposed by Milton Friedman. His Presidential Address to the American Economic Association in 1967 was a significant attack on the Keynesian theory of the Phillips Curve. Friedman proposed that we begin with a notion of a “natural rate of unemployment,” which he defined as

the level that would be ground out by the Walrasian system of general equilibrium equations, provided there is imbedded in them the actual structural characteristics of the labor and commodity markets, including market imperfections, stochastic variability in demands and supplies, the cost of gathering information about job vacancies and labor availabilities, the cost of mobility, and so on.

(Friedman 1968: 8)

One property of the natural rate of unemployment is that the average real wage is at an equilibrium level. There should be no tendency for real wages to rise or to fall.

Friedman argued that if the monetary authority attempts to drive the unemployment rate below the natural rate, it must cause an increase in prices, with wages lagging behind. This will temporarily increase labor demand. However, workers will be unsatisfied with real wages *ex post*, and they will demand higher nominal wages going forward. If the monetary authority remains passive, then real wages and employment return to their natural levels. On the other hand, if the monetary authority persists in trying to drive down unemployment, it has to raise the inflation rate still further, until workers start to ask for even higher rates of wage increases. The more persistent the monetary authority, the higher will be the rate of inflation.

Friedman (1968: 11) concluded, “there is always a temporary trade-off between inflation and unemployment; there is no permanent trade-off.”

Implicitly, this analysis reverses the causality from the Keynesian norm. Rather than think in terms of causality running from unemployment to inflation, we are to think of causality as running from *unanticipated* inflation to lower unemployment. The monetary authority can cause an increase in inflation. At first, this will be unanticipated, reducing real wage rates and increasing employment. However, once inflation becomes anticipated it will have no effect on real wage rates or employment.

The logic of Friedman’s argument posed an immediate challenge to the conventional wisdom in macroeconomics. It stimulated more research and analysis of the microeconomic foundations of the trade-off between inflation and unemployment, with the Phelps volume a prominent early example. It also caused some macroeconometric modelers to adopt the concept of a natural rate of unemployment. Wage growth was measured relative to expected inflation (typically measured as an average of recent past inflation). If unemployment was low, wages would grow faster than expected inflation. If unemployment was high, wages would grow more slowly than expected inflation. The unemployment rate at which wages would grow at exactly the rate of expected inflation was called either the “natural rate” or, more literally, the “non-accelerating inflation rate of unemployment,” or NAIRU.

While mainstream economists adopted the idea of the NAIRU, they did not adopt Friedman’s policy prescriptions. Unlike Friedman, they took the view that they could recognize when unemployment was above the NAIRU, in which case they believed that

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policies to raise aggregate demand were warranted. In addition, mainstream economists continued to advocate incomes policies as a means of controlling inflation.

Incomes policies were given a thorough trial for two years, starting in August of 1971, when President Nixon announced a three-month freeze on wages and prices. Although there was some improvement in both inflation and unemployment in 1972, the overall verdict on these policies was negative. They distorted markets and were administratively unworkable.

On the theoretical front, Robert Lucas and others challenged the idea of even a temporary trade-off between inflation and unemployment. They argued against the simple model of inflation expectations as backward-looking. Instead, suppose that at the other extreme workers have “rational” expectations, in that they do their best to anticipate all factors that could affect inflation going forward, including future actions by the monetary authority.

If workers have “rational” expectations, then on average they should not be surprised by monetary expansion. This means that the unanticipated component of inflation should be small and not under the control of the monetary authority. Combining rational expectations of inflation with Friedman’s view that only unanticipated inflation affects employment, the conclusion is that the unemployment cannot be affected by monetary policy.

The arguments of Lucas and others created a revival of classical economics, in which monetary policy affects inflation without affecting unemployment. Anticipated money growth produces only inflation, and under rational expectations all but the purely random fluctuations in money growth are anticipated.

Against this revived classical economics, Keynesians argued that episodes of high unemployment, such as the Great Depression, are difficult to explain within a classical paradigm. Surely, they argued, workers in the 1930s were not making persistent large errors about inflation that caused them to insist on overly high real wage rates.

Part of the rational expectations revolution was directed against the large macroeconomic models. The Lucas Critique suggested that the models would create the illusion that monetary policy could affect output, because the models were fit on the basis of backward-looking expectations. However, if activist monetary policy were to be tried and economic agents began to take anticipated policy into account, then the models would break down.

With respect to forecasting key economic variables, the macroeconomic models did suffer major breakdowns in the 1970’s. Jeremy Siegel noted that

Almost every one of the nearly two dozen of the nation’s top economists invited to President Ford’s anti-inflation conference in Washington in September 1974 was unaware that the U.S. economy was in the midst of its most severe postwar recession to date. McNeese, studying the forecasts issued by five prominent forecasters in 1974, found that the median forecast overestimated gross national product (GNP) growth by 6 percentage points and underestimated inflation by 4 percentage points.
(Siegel 2002: 212)⁴

The rational expectations hypothesis changed the lens through which macroeconomists looked at data. Rational expectations introduced some similarities between the theory of the behavior of macroeconomic variables and that of financial variables in an efficient market. In an efficient market, with all past information reflected in forecasts, prices of long-term financial instruments, most notably common stocks, should approximately follow a random walk. Similarly, under plausible assumptions about consumer preferences, economists argued that macroeconomic variables, such as consumer spending, should follow a random walk (Hall 1978).

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In part because a random walk became an interesting “null hypothesis” for a number of macroeconomic variables, economists began to examine more closely the properties of time-series data. What they found was that many macroeconomic variables did not exhibit stationary behavior. They did not tend to revert to a long-run mean or even to a long-term trend. Instead, deviations in, say, the level of real GDP, tend to persist. Only if one takes the first difference of GDP, that is the change between the level one quarter and the level the next quarter, will the series be stationary.

This poses a problem for empirical macroeconomics that has never been completely solved. Studying data in levels, ignoring nonstationarity, introduces spurious correlations. On the other hand, studying data in differences, in order to work with stationary time series, tends to amplify the noise in the data relative to the signal, resulting in weak estimates for the effect of any one variable on the other.

For the Phillips Curve, this means that if one uses the change in the inflation rate as the dependent variable (which would correct the nonstationarity in the inflation time series), the measured effect of any other variable, such as the unemployment rate, will tend to be quite small. The effect of the unemployment rate on inflation is likely to be cumulative and diffuse over time. Differencing the inflation data tends to obscure any such diffuse cumulative effects.⁵

In short, by 1980, macroeconomic models in general, and the Phillips Curve in particular, had at least three strikes against them. First, their forecasting experience had been dismal in the 1970s. Second, they were vulnerable to the Lucas Critique, which suggested that the parameters in the models would not remain stable if individuals were forming forward-looking expectations in a rational way. Finally, the modelers were not able to treat nonstationary data in a satisfactory way, leading to concerns that the relationships represented by the model coefficients were spurious.

The long post-mortem

For most macroeconomists, the 1970s was a traumatic decade, and the profession spent the next quarter century attempting to explain and recover from this episode. Only a minority clung to a Phillips Curve with backward-looking expectations.

Those who would still defend the Phillips Curve faced the challenge of explaining the combination of high rates of inflation and unemployment in the 1970s. The stories that were most widely proposed to account for this period included oil price shocks, other supply factors, and chronic over-optimism on the part of the Federal Reserve.

In the 1970s, there were two spikes in the price of oil. The first began with the Arab oil embargo in October of 1973. The impact of this adverse supply shift may have been exacerbated by the regime of price controls, which resulted in gasoline lines and other symptoms of allocative inefficiency. Another spike took place after the Iranian revolution of 1979 and during the Iran–Iraq war that began in 1980. (Once again see the Chapter 21 by James Hamilton in this *Handbook*.)

In textbook macroeconomics, an oil shock shifts the aggregate supply curve upward. In theory, this should cause a one-time increase in the price level and reduction in aggregate output. However, with wage–price feedback effects, one could argue that it would lead to an increase in the rate of inflation, not just a one-time jump in the price level.

In general, the 1970s was a period of a “productivity slowdown.” The trend growth rate in labor productivity declined, in part because of the reduction in energy supplies but also perhaps because of other factors. For example, the entry of the Baby Boom generation

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into the labor force created a relative excess of inexperienced workers, which could cause productivity growth to decelerate.

Finally, and perhaps most important, the Federal Reserve probably took an overly optimistic view of the economy, particularly the NAIRU. If, based on experience in the 1960s, the Fed thought that the NAIRU was somewhere between 4 and 5 percent, while the actual NAIRU may have been somewhere around 6 percent, the Fed would have committed the exact mistake that Friedman had warned about in his 1967 address. That is, by aiming for an unemployment rate below the natural rate, the Fed produced ever-increasing inflation, while continually falling short of its (unrealistic) goal of lower unemployment.

In fact, Friedman's anti-Keynesian heterodox views of 1967 became the fallback position of those still committed to the Keynesian Phillips Curve view in the 1980s and 1990s. They incorporated the NAIRU into their thinking, and they took a pessimistic view that the NAIRU was close to 6 percent, until the late 1990s when it appeared that the economy could tolerate lower unemployment rates without causing inflation to accelerate.⁶ Those who continued to work with macroeconomic models made sure that the models satisfied the theoretical expectation that in the long run money growth would drive inflation but be neutral with respect to employment. However, they continued to employ backward-looking models of expectation formation, so that their models still embodied a short-run trade-off between inflation and unemployment.

In general, however, this was not the path followed by academic macroeconomists. In the economics journals, the macroeconomics that emerged after the 1970s was very different from that which preceded it. Whereas pre-1970s macroeconomics might have been cavalier about microeconomic foundations, post-1970s macro was meticulous about microfoundations. Whereas pre-1970s macroeconomic models took the issue of expectations casually, using past behavior as an indicator of expectations for future behavior, post-1970s macroeconomic modeling tried to address the Lucas Critique and rational expectations. Whereas pre-1970s macroeconomics ignored the relationship between inflation and money growth, post-1970s macroeconomics treated inflation as determined by the rate of money growth, with possible allowances for wage or price stickiness that in turn can lead to fluctuations in output.

A useful snapshot of post-1970s macroeconomics was written by Olivier Blanchard (2008), shortly before the financial crisis worsened in 2008. Blanchard pointed out that post-1970s economics initially diverged, with the more radical of the classical revivalists proposing what became known as the Real Business Cycle model, in which economic fluctuations are determined by productivity shocks rather than by changes in aggregate demand. The other camp, labeled New Keynesian, developed microeconomic models that might explain wage and price stickiness.

In Blanchard's view, there was in the decade prior to the financial crisis of 2008 a softening of the disagreement between the two macroeconomic camps. According to Blanchard, all agreed that the evidence for the significance of demand shocks was too strong to be ignored. At the same time, all agreed that methodological critiques of the rational expectations advocates should be dealt with. The result was a convergence toward using rigorous neoclassical models to analyze the effects of Keynesian-type nominal rigidities. According to Blanchard (2008: 8), this emerging consensus includes, "A Phillips-curve like relation, in which inflation depends on both output and anticipations of future inflation."

I should emphasize that this is not a pre-1970s Phillips Curve. It includes explicitly forward-looking measures of inflation. It does not present the monetary authority with a menu of choices for unemployment and inflation. At best, the newer models can describe

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what sorts of policy rules serve to amplify or dampen fluctuations in the face of various sorts of external shocks.

One common finding is that targeting the rate of inflation can be a useful rule. Of course, if a model is driven by nominal rigidities, then giving participants a predictable path for the price level is likely to be the best policy rule. Thus, the policy implications derived from these models are pretty much “baked in” to the assumptions.

Recent developments

Has the Phillips Curve returned? We saw earlier that the simple, one-for-one linear trade-off estimated on the basis of 1956–1968 experience fits the 1995–2007 period remarkably well. For that span, we do not need to rely on models of expectations or even a NAIRU in order to explain movements in inflation.

From 2004 through 2007, inflation averaged 3.4 percent. With the onset of a new, deep recession, inflation fell to about 1.4 percent on average in 2008 and 2009. With the high rate of unemployment, the simple linear trade-off would have expected inflation to average about -0.4 percent in 2008 and 2009. The simple trade-off is correct in predicting lower inflation, but it over-estimates the extent of the decline.

Many economists expect inflation to remain low because of the weak economy, which suggests at least an implicit belief in the Phillips Curve. Financial markets appear to share this view, based on the inflation expectations that can be inferred from comparing yields on inflation-indexed Treasury bonds with comparable nominal bonds.

On the other hand, the consensus that Blanchard saw in 2008 appears to have evaporated. Bitter arguments have erupted between Keynesians and neoclassical economists in web postings and occasionally in newspaper opinion columns.⁷

The disputes over policy are also highly charged. Keynesian economists have tended to support fiscal stimulus and “quantitative easing” of monetary policy, while neoclassical economists have expressed vociferous opposition.

Thus, while the 1970s may be gone, they are not forgotten. The doubts about the stability of the Phillips Curve, and hence about the reliability of macroeconomic models and about the effectiveness of policies to increase aggregate demand, are still salient to many economists.

Notes

- 1 Humphrey (1985) points out that the fame that Samuelson and Solow gave to Phillips was perhaps undeserved. Humphrey lists many antecedent discussions of the inflation–unemployment trade-off, going back to David Hume.
- 2 Phillips himself may have been closer to the Friedman view than to the Samuelson–Solow view. See Leeson and Young (2008)
- 3 These figures are derived from data downloaded from the Bureau of Labor Statistics web site in November of 2010. Inflation is measured as the December–December percent change in the all-urban Consumer Price Index. Unemployment is measured as the annual average of the civilian unemployment rate.
- 4 Siegel cites McNees (1992).
- 5 There was much more work done in the 1970s and later on macroeconomic methodology. The interested reader should examine topics such as vector autoregression and cointegration.
- 6 For a defense of the Phillips Curve and of the view that the NAIRU was 6 percent, see Fuhrer (1995).
- 7 Some of the arcane academic dispute even found its way into a Congressional hearing. See Solow (2010).

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