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DID IRVING FISHER REALLY DISCOVER THE PHILLIPS CURVE?

BY
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Economic lore has it that, with his 1926 article, "A Statistical Relation between Unemployment and Price Changes," Irving Fisher "discovered the Phillips curve." Did he? This paper argues he did not, for two reasons. One: the statistical relationship between inflation and unemployment that Fisher described in his 1926 article was contemporaneously described by Alvin Hansen, Henri Fuss, John Rotherford Bellerby, and Arthur Pigou in their own studies. Two: the statistical relationship that Fisher, Hansen, Fuss, Bellerby, and Pigou described is substantially different from the statistical relationship that Alban William Phillips described in his famous 1958 paper, as well as the many variations of the Phillips curve in the literature, including today's conventional expectations-augmented Phillips curve. To correct the economic lore, the work of Fisher, Hansen, Fuss, Bellerby, and Pigou on the statistical relationship between inflation and unemployment and Phillips's 1958 paper should be viewed as separate contributions.

I. INTRODUCTION

Economic lore has it that Irving Fisher, not Alban William Phillips, discovered the Phillips curve. Re-evaluation of this bit of lore is in order.

The idea that Fisher discovered the Phillips curve rests on four articles published between 1972 and 1985. The first was a brief note by Arthur Donner and James McCollum, "The Phillips Curve: An Historical Note" (1972), which stated, "Empirical work on the trade-off between inflation and unemployment was, in fact, being carried out by Irving Fisher at least as early as 1926, and possibly before" (p. 323). Less than a year later, the editors of the *Journal of Political Economy* reprinted Fisher's 1926 article under the title "I Discovered the Phillips Curve" (Fisher [1926] 1973). Milton Friedman vigorously advanced the idea that Fisher, not Phillips, deserves credit for the Phillips curve in a 1974 lecture, later published in 1975 as the Institute of Economic

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Affairs (IEA) Occasional Paper 44, "Unemployment versus Inflation? An Evaluation of the Phillips Curve." A decade later, Thomas Humphrey's (1985) "The Early History of the Phillips Curve" refined the 'Fisher discovered the Phillips curve' story. Humphrey credited David Hume and Henry Thornton with providing the theoretical foundations of the Phillips curve, but credited Fisher with providing the first statistical evidence of the inflation–unemployment relationship.

The lore of Fisher and the Phillips curve has been handed down since. Why re-evaluate it? Because the lore is wrong. On two counts. One: the statistical relationship between inflation and unemployment that Fisher described in his 1926 article was contemporaneously described by Alvin Hansen, Henri Fuss, John Rotherford Bellerby, and Arthur Pigou in studies of their own. Two: the statistical relationship that Fisher, Hansen, Fuss, Bellerby, and Pigou described is substantially different from the statistical relationship that Phillips described in his famous 1958 paper about the Phillips curve, as well as the many variations of the Phillips curve in the literature, including today's conventional expectations-augmented Phillips curve.

II. FISHER ON INFLATION AND UNEMPLOYMENT

Let's begin with Fisher (1926). What exactly is Fisher (1926) about? And where does that fit in the body of Fisher's work and the macroeconomics of the time?

Fisher (1926) was the fourth of a series of six empirical studies that examined the effects of price level changes on economic activity. (The other five studies are Fisher 1923, 1924, 1925, 1933a, and 1936.) The larger context of the six studies is the business cycle: Fisher wanted to better understand short-run macroeconomic fluctuations.

The first of the six studies, Fisher (1923), "The Business Cycle Largely a 'Dance of the Dollar,'" examines the effect of price level changes on the volume of trade. The primary point of the study is that business fluctuations are associated with changes in the price level rather than the price level itself. "What concerns business," wrote Fisher, "is not whether prices are high or low but whether they are rising or falling. Thus rising prices stimulate business because the prices a producer can get outrun his expenses for interest, rent, salaries and wages, while falling prices depress trade" (p. 1025). The study presents a plot of a moving average of the rate of change in the general price level with an index of the volume of trade from 1914 to 1922. The correlation between the two variables is strong: 79%. The strong correlation, Fisher wrote, "tells us that business dances attendance on the dollar" (p. 1027).

In Fisher (1924), "Fluctuations in Price Levels," Fisher made three changes to his 1923 effort: he calculated a moving average of the rate of change in the price level with different weights, he used a different measure of the volume of trade (an index constructed by the Harvard Committee on Economic Research), and he calculated the correlation between the two variables for three time periods: 1915 to 1922, 1919 to 1922, and 1920 to 1922. The correlations for the three periods are 86%, 93%, and 94.4%, respectively.

Fisher (1925), "Our Unstable Dollar and the So-Called Business Cycle," investigates the statistical relationship between distributed lags of the rate of change in the price level (the Bureau of Labor Statistics index of wholesale prices) and the volume

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of trade. Much of the article is a discussion of distributed lags. The correlation between the distributed lag of the rate of change in the price level and the volume of trade for 1915 to 1923 is 94.1%. The high degree of correlation prompted Fisher to claim: "It seems certain, humanly speaking, that wherever the dollar—our yardstick of commerce—suffers wide fluctuations in purchasing power, those fluctuations largely predetermine or, at any rate, precede closely related fluctuations in trade" (p. 179).

Fisher (1926) takes a new step: it explores the statistical relationship between the rate of change in the price level and the change in employment. For the rate of change in the price level, Fisher again used a distributed lag of the Bureau of Labor Statistics index of wholesale prices. The change in employment was calculated from an index of employment constructed by the Harvard Committee of Economic Research. The time paths of the two variables are graphed together in the second chart of Fisher (1926); the graph spans the years 1903 to 1925. Fisher reported the correlation between the two variables for the period September 1915 to December 1925: 90%. In footnote 1 of page 791 of the article, he explained that September 1915 to December 1925 was a period of "violent price changes," and, "For periods of less violent price changes the correlation is less" (p. 791). It is the second chart of Fisher (1926) that has prompted economists to declare that Irving Fisher, not A. W. Phillips, discovered the Phillips curve.

Fisher also reiterated his theory of business cycles in Fisher (1926):

> When the price level is rising, a business man finds his receipts rising as fast, on the average, as the general rise of prices, but not his expenses, because his expenses consist, to a large extent, of things which are contractually fixed, such as interest on bonds; or rent, which may be fixed for five, ten, or ninety-nine years; or salaries, which are often fixed for several years; or wages, which are fixed sometimes either by contract or custom, for at least a number of months. For this and other reasons, the rise in expenses is slower than the rise in receipts when inflation is in progress and the price level is rising or the dollar falling. The business man, therefore, finds that his profits increase. In fact, during such periods of rapid inflation, when profits increase because prices for receipts rise faster than expenses, we nickname the profit-taker the 'profiteer.' Employment is then stimulated—for a time at least. (p. 787).

The opposite happens when the price level falls: with the prices of many inputs fixed by contract or custom, falling goods prices cause receipts to fall faster than expenses. Businesses respond by reducing production and employment.

Fisher (1933a) and (1936) brought Fisher (1926) up to date: Fisher (1933a) shows the statistical relationship between inflation and employment through 1932; Fisher (1936) shows the relationship through 1935. In each, Fisher found that the data support his hypothesis that changes in employment follow changes in the price level with a lag.

The six empirical studies, from Fisher (1923) through Fisher (1936), are not anomalies in Fisher's work. They are components of an important and generally underappreciated stream of research in Fisher's extraordinarily productive career: his research on business cycles, or, as he would put it, the "so-called business cycle."

Fisher explored the causes and propagation of business cycles throughout his career. His first and most detailed description of business cycles appears in chapter IV of *The Purchasing Power of Money* (1911). Chapter IV walks readers through the phases of a

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business cycle. The cycle begins with an initial disturbance. (Fisher uses an increase in gold as an example but mentions other potential initial disturbances—other types of monetary disturbance, shocks to business confidence, "short crops" or supply shocks, and invention—later in the chapter.) The initial disturbance causes a change in the price level. The change in the price level then triggers a series of events involving sticky interest rates, credit expansion or contraction (expansion if the price level rises, contraction if it falls), changes in currency and bank deposits, changes in the velocities of currency and bank deposits, and further changes in the price level, all of which lead to changes in the volume of trade. The essence of the description of the business cycle in chapter IV of *The Purchasing Power of Money* is precisely what Fisher presented in 1923 and 1926: with production costs sticky in the short term, fluctuations in goods prices cause fluctuations in profits and, consequently, production and employment. When selling prices increase, profit margins increase and production and employment increase; when selling prices fall, profit margins decrease and production and employment decrease. Indeed, Fisher adhered to this theory of business cycles throughout his career.[1]

A second revised edition of *The Purchasing Power of Money* was published in 1922. Then came Fisher (1923, 1924, 1925, and 1926). Fisher's work on business cycles continued with his book, *Booms and Depressions* (1932) and, on the heels of Fisher (1933a), the fifth of the empirical studies, his article "The Debt-Deflation Theory of Great Depressions" (1933b).

In addition to being important components of Fisher's work on business cycles, the six empirical studies exemplify the importance Fisher placed on empirical research. Fisher regarded theory as valuable only to the degree that it led to empirical analyses of actual data. The six empirical papers not only supported his business cycle theory, they reflected how Fisher thought economics should be done.

III. HANSEN, FUSS, BELLERBY, AND PIGOU ON INFLATION AND UNEMPLOYMENT

Fisher introduced readers to the subject matter of Fisher (1926) with a claim:

> The fact that deflation causes unemployment has been well recognized for many years in isolated instances.… It has likewise been recognized that inflation carries with it a great stimulation to trade and an increase in employment (or decrease in unemployment). And yet, strange as it may seem, when applied to the "so-called" business cycle, these relationships have been almost wholly overlooked. (p. 785)

The claim was wrong. During the years Fisher was exploring statistical relationships between price level changes and changes in economic activity over the business cycle, four other economists— Alvin Hansen, Henri Fuss, John R. Bellerby, and Arthur Pigou—were exploring the same.[2] And all four contemporaneously described

[1]In addition to chapter IV of *The Purchasing Power of Money*, see also Dimand (1993 and 1999) for details on Fisher's theory of business cycles.

[2]The author thanks an anonymous referee for the heads-up on Hansen.

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essentially the same relationship between price level changes and changes in employment that Fisher described in 1926.

Hansen began his career researching business cycles. He was likely much influenced by Fisher's theory of business cycles: he devoted a section of the fourth chapter of his PhD dissertation to Fisher's theory of business cycles advanced in *The Purchasing Power of Money* and concluded that the cycle theories most supported by empirical evidence were the theories, like Fisher's, that emphasized prices, profit margins, and credit conditions. Hansen's theory of business cycles was thus quite similar to Fisher's: because wages and rents lag behind goods prices, rising goods prices increase profit margins and production and employment; falling goods prices reduce profit margins and production and employment. Where Hansen's theory differed from Fisher's was on the causes of business cycles. Fisher thought business cycles were caused by exogenous events and thus were not inevitable—hence his phrase the "so-called business cycle." Hansen thought each phase of a business cycle inevitably led to the next phase: "Prosperity inevitably develops into crisis, crisis into depression, depression into recovery, and recovery into prosperity" (Hansen 1920, p. 234).[3]

Hansen's approach to business cycle research was also similar to Fisher's: he valued theory but considered empirical research crucial. In his first published article, "The Sequence in War Prosperity and Inflation" (1920), Hansen examined monthly movements of fifteen variables in the US over the years 1915 to 1919. In his 1921 PhD dissertation, "Cycles of Prosperity and Depression in the United States, Great Britain, and Germany: A Study of Monthly Data, 1902–1908," he compared the monthly movements of a wider variety of investment, industrial, and banking variables in the US, Great Britain, and Germany over a single business cycle.

Then, in his 1923 article, "The Outlook for Wages and Employment," Hansen explored the statistical relationship among wholesale prices, wages, and employment over the business cycle. He calculated annual indexes for wholesale prices, wages, hourly earnings, average weekly earnings, and total employment in the US for the years 1914 to 1922, and presented the index numbers in a series of tables. The index numbers behaved according to his theory of business cycles:

> From 1916 to 1918, the period in which the greatest margin of profit obtained between wages and selling prices, there was an unprecedented volume of employment. Employment peaked in 1917 and 1918. With a narrowing of the profit margin it declined. When the crash came and prices dropped, the margin was reversed and an equally unprecedented volume of unemployment presented itself. (1923, p. 38)

Hansen's empirical work on the relationship between price level changes and changes in employment was not as extensive as Fisher's. Hansen did not plot his price index and employment data in a graph, or calculate the correlation between price level changes and changes in employment. He did not explore the lag between price level changes and changes in employment, and the time frame he examined was short. But, like Fisher, Hansen believed that changes in the price level lead to changes in employment and, like Fisher, found empirical verification for his belief.

[3]Hansen was less dogmatic about the inevitability of business cycles in his 1927 book, *Business Cycle Theory: Its Development and Present Status*.

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While he was chief of the Unemployment Service at the International Labour Office (ILO), Belgian economist Henri Fuss produced three articles between 1925 and 1927 on the statistical relationship between inflation and unemployment.[4] His articles were published in the very journal that published Fisher (1926): the *International Labour Review*.

In his 1925 article, "Unemployment in 1924 and the Beginning of 1925," and his 1926 article, "Unemployment in 1925"—published only two months after Fisher (1926) [5]—Fuss presented time series of unemployment rates and wholesale price levels for a large number of countries. The time series are short—the longest from 1919 to 1925—and are a mix of monthly and annual figures. With few exceptions, the time series show an inverse relationship between changes in the price level and changes in unemployment. For example, Fuss (1926) found that of eleven countries in which the wholesale price index fell in 1925, seven had increases in their unemployment rates, while in two the unemployment rate did not change but remained at high levels; and out of four countries in which the wholesale price index rose in 1925, three had decreases in their unemployment rates (pp. 228–231). Fuss concluded his 1925 article by noting: "Of the many and varied factors affecting the unemployment situation, the general movement of prices, as they alternately rise and fall, frequently appears to be the most important" (p. 223).

In his 1927 article, "Money and Unemployment," Fuss extended his empirical analysis into 1927. He found the same relationship between price level changes and changes in unemployment. He also drew on Fisher (1925) and Fisher (1926) to support his case.

Fuss's empirical work, like Hansen's, was not as extensive as Fisher's. Fuss did not plot his price level and unemployment data in a graph, calculate the correlation between price level changes and unemployment, or explore the lag between price level changes and changes in unemployment. But, like Fisher and Hansen, Fuss believed that changes in the price level lead to changes in unemployment and, like Fisher and Hansen, found empirical verification for his belief.

By the time Fisher (1926) appeared, Alfred Marshall, Ralph Hawtrey, Frederick Lavington, Dennis Robertson, John R. Bellerby, and Arthur Pigou had written extensively about the relationship between price level changes and unemployment over the business cycle. Bellerby had published empirical work on the relationship, and Pigou was in the process of publishing his.

The business or trade cycle theories of Hawtrey, Lavington, Robertson, Bellerby, and Pigou were grounded in Marshall. Like Fisher, Marshall thought fluctuations in the general price level propagate business fluctuations. Also like Fisher, Marshall thought sticky nominal input prices and interest rates were crucial components of business fluctuations. Marshall first wrote about fluctuations in prices, sticky input prices, and business fluctuations in *The Economics of Industry*, published in 1879:

[4]Fuss also produced a study for the ILO: *Unemployment 1920–1923* (Studies and Reports, Series C, No. 8; Geneva, 1924). Fuss referred to this study in each of his three articles.

[5]Fisher (1926) was published in the June issue of the *International Labour Review*; Fuss (1926), in the August issue.

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> It however very seldom happens in fact that the expenses which a manufacturer has to pay out fall as much in proportion as the price which he gets for his goods. For when prices are rising, the rise in the price of the finished commodity is generally more rapid than that in the price of the raw material, always more rapid than that in the price of labour; and when prices are falling, the fall in the price of the finished commodity is generally more rapid than that in the price of the raw material, always more rapid than that in the price of labour. (p. 156)

Hawtrey, Lavington, Robertson, Bellerby, and Pigou developed business cycle theories with their own particular elements and nuances. Hawtrey's was a monetary theory of fluctuations that explored the importance of short-term interest rates and inventories in business fluctuations. Lavington emphasized business sentiment and credit. Robertson emphasized non-monetary factors. Bellerby emphasized money and credit. Pigou explored both real and monetary causes of fluctuations, as well as their propagation, in great depth. But all built their theories on Marshall's foundation, and all posited the same fundamental relationship between price level changes and changes in employment that Fisher posited: because many input prices follow goods prices with a lag, price level increases cause increases in profits, increases in production, and increases in employment; price level decreases cause decreases in profits, decreases in production, and decreases in employment.

In *The Trade Cycle* (1922), Lavington offered rough numerical estimates of price level and unemployment changes in business fluctuations: "On the average of the last seven cycles in this country the general level of wholesale prices rose annually about 4 per cent during the period of prosperity, and fell annually about 4 percent during the following period of depression" (p. 15). He added: "These periodic phenomena … have an interest of their own; … that between boom and depression the volume of unemployment should fluctuate 5 per cent in general, and 10 percent in some constructional trades, is evidently of the very first social importance" (p. 16). Lavington did not provide the data or the source of the data for his calculations.

Bellerby was more thorough. In his report for the International Association on Unemployment, *Control of Credit as a Remedy for Unemployment* (1923), Bellerby explained the relationship among price level changes, profits, production, and unemployment by citing not only Keynes, Lavington, and Pigou, but Fisher's *Stabilizing the Dollar*. He then proceeded to his empirical analysis. His empirical approach was similar to Fuss's. In chapter II of *Control of Credit*, Bellerby presented wholesale price indexes and unemployment rates from July 1920 to July 1922 for Denmark, Finland, Norway, Sweden, and Great Britain. The data conform to the hypothesized pattern: changes in unemployment are inversely related to price level changes.

But Bellerby went further than Fuss. In chapter VI of *Control of Credit*, Bellerby placed two graphs together, one above the other. The top graph showed the time path of an index of wholesale prices in the United Kingdom from 1875 to 1913; the bottom showed the rate of employment in the United Kingdom over the same years (p. 78). "The graphs given on page 78," he wrote, "showing unemployment in comparison with wholesale prices in Great Britain, provide very clear evidence that rapidly falling prices are invariably accompanied by heavy unemployment. It would be possible to

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give similar evidence for every other industrial country of importance" (p. 29). He also used the two graphs as evidence that, once an economy attains a high level of employment, further gains in employment caused by further price level increases are small and decreasing (pp. 78–79).

Bellerby did not graph the change in the price index against the change in employment, or calculate the correlation between changes in the price level and changes in employment. In that, his empirical analysis falls short of Fisher's. But without a doubt Bellerby understood that what mattered in his graphs was not the relationship between the price level and employment but the relationship between *changes* in the price level and *changes* in employment. His understanding is clear from his discussions of prices and employment in *Control of Credit*, including his discussion of the Scandinavian data mentioned above, as well as his discussion of his price level and employment rate graphs.

Pigou examined the inflation-unemployment relationship in his *Industrial Fluctuations* (1927), a sizable volume written before but published shortly after Fisher (1926). *Industrial Fluctuations* explores the causes and propagation of business cycles. Much of the book is theoretical, with particular focus on how business cycle impulses and propagation lead to deviations in the real demand for labor from its trend (p. 22). What also stands out in *Industrial Fluctuations* is the book's extensive empirical analysis.

Pigou calls attention to the empirical relationship between price level changes and changes in unemployment at the very outset of *Industrial Fluctuations*. The first chart in the book—placed before the title page—shows the unemployment rate and the three-year moving average of the unemployment rate in Great Britain from 1850 to 1918. The third chart in the book, presented ten pages later in chapter I, shows a price index for Great Britain from 1860 to 1918 and price indexes for the US and Germany from 1860 to 1908. Introducing readers to the relationship between the two, Pigou wrote: "as will be shown presently, price cycles and industrial cycles are closely connected" (p. 12).

Pigou graphically illustrated the statistical relationship between a host of variables in *Industrial Fluctuations*. (He provided the data for the graphs in an appendix.) Most prominent is the statistical relationship between price level changes and unemployment. In chapter XII of part I, Pigou provided a chart similar to Bellerby's, with a crudely de-trended price index placed above an estimated unemployment rate, covering the years 1850 to 1914 for the UK. Of the chart, Pigou wrote:

> It will be seen at a glance that there is consilience between low unemployment and high prices and high unemployment and low prices. Except for the drop in employment between 1860 and 1863, which was, no doubt, due to the cotton famine consequent upon the American Civil War, there is no main movement in one curve unaccompanied by a movement in the opposite sense of the other. (p. 133)

Pigou was uncharacteristically sloppy in the first sentence of that passage. As is clear from the second sentence—and the rest of the analysis in the book—he recognized that what matters is the relationship between *changes* in the price level and *changes* in unemployment. Chapter XXII of part I presents a chart with the rate of change in the price level placed above the inverted unemployment rate. Of this chart, Pigou, citing Fisher (1923 and 1925), wrote:

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> The above results agree in a striking manner with certain conclusions which Professor Irving Fisher has recently published for the United States. Over the period 1915–1923, he found a correlation, as he puts it, of 77 per cent between changes in the *rate of change* in wholesale prices and changes in the *amount* of basic materials produced *seven months later*. Carrying his investigations further, he has more recently found that, if we assume the lag of production behind price change to be, not a single uniform lag for all sorts of commodities, but a lag distributed in accordance with the principles of probability over different lengths of time for different things, there is a correlation of 94 per cent, the mean lag reckoned at 9 ½ months. To test these results he has examined also the periods 1877–99 and 1903–15, and has found in them also a correlation, which, though not so high as that of the war period—when the price factor was obviously of exceptional importance—is still very high. The presence of a time lag in these correlations, to which there is nothing analogous in my chart, may, perhaps, be explained by the fact that Professor Fisher is relating the rate of price change to quantity of production, while I am relating it to quantity of employment: for it is to be expected that changes in production will lag somewhat behind changes in employment. When account is taken of this circumstance, my results and Professor Fisher's are in close accord. (pp. 216–217; italics in original)

Pigou, knowing Fisher (1923 and 1925), took the same step Fisher took at essentially the same time: he explored the statistical relationship between changes in the price level and changes in unemployment. Pigou, like Bellerby, did not calculate the correlation between changes in the price level and changes in the unemployment rate for his data. But he did graph the two variables against each other and was quite clear in explaining what the statistical relationship meant.

Thus, Hansen, Fuss, Bellerby, and Pigou contemporaneously described the same statistical relationship between price level changes and changes in employment that Fisher (1926) described. Such an intellectual event sounds almost freakish. Yet, though remarkable, it was not freakish.

In the first three decades of the twentieth century, research on business cycles flourished. Business cycle research was not simply a specialized topic in the macroeconomics of the time; it was, along with monetary theory, the macroeconomics of the time.[6] It was a macroeconomics that valued theory but especially valued empirical research. And Fisher, Hansen, Fuss, Bellerby, and Pigou—and many others—were deeply engaged in it.

All five shared essentially the same theory of the relationship among changes in the price level changes, profit margins, production, and employment. All five had been exploring statistical relationships between macroeconomic variables for several years. And though Fisher may not have been aware of the work of Hansen, Fuss, Bellerby, and Pigou, the four were well aware of the work of Fisher. That makes it less surprising that the five contemporaneously discovered the same statistical relationship between price level changes and changes in employment.

The statistical relationship they found, however, was *not* the Phillips curve.

[6]See Laidler (1999) and Backhouse (2017).

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IV. THE PHILLIPS CURVE OF A. W. PHILLIPS

There are many Phillips curves in the economics literature. One is the Phillips curve presented by A. W. Phillips in his now famous 1958 article. The rest are the many variations of the curve advanced since Phillips's 1958 article. Let's first address the Phillips curve of Phillips (1958), then we'll turn to the variations.

Phillips (1958) is about wage determination. The context is the business cycle. Specifically, Phillips (1958) is an empirical analysis of the degree that the rate of unemployment affects the rate of change in money wage rates over the business cycle.[7]

It is tempting to consider Phillips (1958) as an extension of Phillips's work on stabilization policy. In 1954, Phillips published "Stabilization Policy in a Closed Economy" and, in 1957, published "Stabilization Policy and the Time Forms of Lagged Responses." But the temptation should be resisted. Phillips (1958) makes absolutely no mention of stabilization policy other than this cryptic remark in the third-to-last paragraph of the article: "it seems from the relation fitted to the data that if aggregate demand were kept at a value which would maintain a stable level of product prices the associated level of unemployment would be a little under 2½ percent" (p. 299). Further, Phillips (1958) makes no reference to Phillips (1954) or Phillips (1957). And, as James Forder (2014, p. 13) notes, Phillips rarely referred to his 1958 article in his later work, either.

In the first two pages of Phillips (1958), Phillips explains his hypothesis: the rate of change in nominal wage rates is determined primarily by the tightness of the labor market. During business cycle expansions, when the demand for labor increases relative to the supply of labor and the unemployment rate falls, employers bid more aggressively for labor, and nominal wage rates increase; and the lower the unemployment rate, the greater the rate of increase in nominal wages. During business cycle contractions, when the demand for labor decreases relative to the supply of labor and the unemployment rate rises, employers bid less aggressively for labor. Workers, however, are reluctant to accept wage cuts. Consequently, nominal wages fall slowly even as the unemployment rate increases. The relationship between the rate of change in nominal wage rates and the unemployment rate, Phillips thus hypothesizes, is inverse and nonlinear. The remaining fifteen pages of Phillips (1958) present the statistical relationship between rate of change in nominal wage rates and the unemployment rate over the periods 1861 to 1913, 1913 to 1948, and 1948 to 1957. As we know, the statistical relationship supported the hypothesis. The statistical relationship is the Phillips curve of Phillips (1958).

Though the context of the statistical relationship described in Fisher (1926)—and by Hansen, Fuss, Bellerby, and Pigou—and the statistical relationship described in Phillips (1958) is the business cycle, the two statistical relationships are very different. Fisher (1926) is about how changes in the general price level cause changes in employment. It describes the statistical relationship between the rate of change in the price level and the change in employment—or, for a clearer comparison to Phillips (1958), the unemployment rate. Phillips (1958) is about wage changes, not price level changes. It describes the statistical relationship between the unemployment rate and the rate of

[7]Brown (1955) contains much of what is in Phillips (1958).

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change in nominal wages. In Fisher (1926), the change in employment (or the unemployment rate) is the dependent variable and the rate of change in the price level is the independent variable; in Phillips (1958), the rate of change in nominal wages is the dependent variable and the unemployment rate is the independent variable. The statistical relationship of Fisher, Hansen, Fuss, Bellerby, and Pigou is definitely not the Phillips curve of Phillips (1958).

At best, one might argue that the statistical relationship of Phillips (1958) complements the statistical relationship of Fisher, Hansen, Fuss, Bellerby, and Pigou. The five argued, again, that price increases generate business cycle expansions primarily because nominal wage rates, interest rates, and other input prices are sticky, and that expansions ultimately come to an end when nominal wage rates, interest rates, and other input prices increase and "catch up to" goods prices. A logical extension of the empirical work of Fisher, Hansen, Fuss, Bellerby, and Pigou would thus be an investigation of the statistical relationship between the unemployment rate and the rate of change in nominal wages—that is, Phillips (1958).

But it would be wrong to interpret Phillips (1958) that way. Phillips made no reference to the work or the ideas of Fisher, Hansen, Fuss, Bellerby, or Pigou. Neither should one have expected him to. Between 1926 and 1958, macroeconomics changed dramatically. As Roger Backhouse (2017) points out, with the persistently high unemployment in Britain in the 1920s followed by the Great Depression, macroeconomists began to think of unemployment as more than a problem of the business cycle. The *General Theory* and the Keynesian revolution reinforced the shift in perspective, to say the least, and the business cycle became a specialized topic within macroeconomics. The 1920s business cycle research of Fisher, Hansen, Fuss, Bellerby, Pigou, and many others was left behind—including by Hansen, Fuss, Bellerby, and Pigou. Hansen moved on to explore other aspects of business cycles before developing his ideas on secular stagnation in the 1930s. Bellerby proceeded to investigate how monetary policy might be used to stabilize credit cycles; his interests then shifted to agricultural economics. Pigou and Fuss continued to study unemployment, but were among the economists who became convinced that unemployment was more than a problem of the business cycle. In short, Hansen, Fuss, Bellerby, and Pigou moved on to other problems and left their study of the empirical relationship between price level changes and unemployment by the wayside.

V. OTHER PHILLIPS CURVES IN THE LITERATURE

In a 1987 article, Nancy Wulwick argued that there are three Phillips curves in the economics literature: (i) the curve of Phillips's famous 1958 article; (ii) "the Walrasian Long Run Phillips model, or the Phillips–Lipsey model"; and (iii) "Friedman's Short Run Walrasian Phillips model." James Forder, in more recent and more thorough work (2014a, 2014b), argues that Wulwick's list of Phillips curves is too narrow and too short.[8]

[8]Forder (2014a, 2014b) contradicts Wulwick (1987) on many points, the most significant being the profession's response to Phillips (1958). Wulwick (1987) claims the economics community "rapidly" and "readily" accepted Phillips's Phillips curve. Forder shows quite clearly that it did not.

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Forder (2014a) found eight Phillips curves in the literature, including the Phillips curve of Phillips (1958), which, as we have discussed, is a wage change relationship.[9] The other seven, briefly, are:

1. The full employment–price stability Phillips curve

A percolating issue in macroeconomics in the second half of the 1950s was "creeping inflation." Some economists asked whether full employment and price stability are compatible goals for macroeconomic policy and used the Phillips curve as a framework for investigating the degree that they are. Paul Samuelson and Robert Solow (1960) is the most notable example. Forder (2014b) stresses a point that is well worth repeating: contrary to many later assertions, Samuelson and Solow (1960)—and the work along the lines of Samuelson and Solow that followed—did not claim the Phillips curve was a stable menu of inflation-unemployment options, or advocate inflation as a means of reducing unemployment.

2. The econometric wage change Phillips curve

Economists also used the Phillips curve as a basis for econometric investigations of the causes of wage changes. Some used econometric techniques to gauge the effect of unemployment on wage changes. Some added variables such as profits and productivity to their econometric analyses.

3. The policy proposal Phillips curve

A number of economists incorporated the Phillips curve in models to estimate the effects of different government policies—not monetary or fiscal but incomes, labor market, and tax policies. In studies of this type, the Phillips curve was "assumed to exist in order to investigate some other question" (Forder 2014a, p. 8).

4. The rational-actor Phillips curve

Some Phillips curves were theoretical rather than empirical. If there was an inverse relationship between wage changes and unemployment, economists wanted to know why. Some, such as Edmund Phelps (1969), employed rational-actor microeconomic theory to try to explain why. This work was yet another twist on the Phillips curve.

5. The stagflation Phillips curve

Forder found that through most of the 1960s, the term "Phillips curve" was almost always used as a label for the relationship between wage changes and unemployment. Only after 1968 was the term routinely applied to the relationship between inflation and unemployment. Phelps (1967) and Friedman (1968) may well have prompted the change.

The advent of stagflation hastened the change in terminology. Economists began to treat the Phillips curve as, in Forder's words, "the relation between *just* inflation and

[9]A point Forder reiterates in Forder (2017).

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unemployment" (2014a, p. 9). To some, stagflation meant a breakdown of the inflation-unemployment Phillips curve. To others, it meant the Phillips curve had shifted. And they tried to explain why it had shifted. Changing inflation expectations was but one of many explanations offered.

6. The econometric inflation-unemployment Phillips curve

Explanations for the shifting inflation-unemployment relationship were econometrically tested. Hence, another Phillips curve.

7. The further departures Phillips curve

Phillips curves were also incorporated into models to explore a further range of issues in the 1970s, such as European monetary union, political business cycles, and policy credibility. As in the case of the 'policy proposal' Phillips curve, a Phillips curve—in this case an inflation-unemployment Phillips curve—was assumed to exist for the purpose of exploring a different problem.

One might quibble with Forder's taxonomy of Phillips curves. Perhaps his taxonomy can be condensed in some way without too much damage. But the point for our purposes here is that the statistical relationship between price level changes and changes in employment described by Fisher, Hansen, Fuss, Bellerby, and Pigou is quite different from every one of the Phillips curves that Forder identified in the literature. The Fisher, Hansen, Fuss, Bellerby, Pigou relationship is not a wage change-unemployment relationship. Its concern is not stagflation, or whether both full employment and price stability are achievable. It is not a means of evaluating the effects of tax or labor policies. It is not about a monetary policy trade-off. The Fisher, Hansen, Fuss, Bellerby, Pigou relationship is about how unemployment behaves during cyclical fluctuations caused by price level changes.

But another Phillips curve must be added to the list:

8. The expectations-augmented Phillips curve

Today the term "Phillips curve" most frequently refers to the expectations-augmented Phillips curve—or, in homage to Phelps (1967) and Friedman (1968), the Friedman–Phelps expectations-augmented Phillips curve.[10] The expectations-augmented Phillips curve expresses the rate of inflation as a function of the expected rate of inflation, the deviation between the unemployment rate and the natural rate of unemployment, and supply shocks. It argues that, in the absence of any supply shock, inflation will exceed expectations when unemployment is below the natural rate and fall below expectations when unemployment exceeds the natural rate.

The expectations-augmented Phillips curve explores the relationship between inflation and unemployment in the context of monetary policy. It frames the question: To what degree, if any, do changes in monetary policy push inflation and

[10]For example, see Kevin Hoover's (2008) "Phillips Curve" entry in *The Concise Encyclopedia of Economics*. We should also note that Sargan (1964) provided an expectations-augmented Phillips curve argument before Phelps and Friedman.

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unemployment in opposite directions —or in other words, to what degree, if any, is money non-neutral?

Like the other Phillips curves in the literature, the expectations-augmented Phillips curve is very different from the inflation-unemployment relationship described by Fisher, Hansen, Fuss, Bellerby, and Pigou. The context of the expectations-augmented Phillips curve is monetary policy, not the business cycle. And the order of causation in the expectations-augmented Phillips curve runs from the unemployment rate to inflation, not from inflation to unemployment. The difference is hardly trivial. A theory that X causes Y is fundamentally different from a theory that Y causes X.

The expectations-augmented Phillips curve is particularly important to the story of Irving Fisher and the Phillips curve. For it was during the 1970s, when the expectations-augmented Phillips curve was becoming a staple of monetary macroeconomics, that the 'Fisher discovered the Phillips curve' claim was advanced. The primary purveyor of the claim was Milton Friedman.

IV. MILTON FRIEDMAN AND THE LORE THAT IRVING FISHER DISCOVERED THE PHILLIPS CURVE

Friedman began his 1975 IEA paper with this:

> The discussion of the Phillips curve started with truth in 1926, proceeded through error some 30 years later, and by now has returned back to 1926 and to the original truth.… I choose the year 1926 not at random but because in that year Irving Fisher published an article in the *International Labor Review* under the title "A Statistical Relation between Unemployment and Price Changes." Fisher's article dealt with precisely the same phenomenon that Professor A.W. Phillips analysed in his celebrated article in *Economica* 32 years later. Both were impressed with the empirical observation that inflation tended to be associated with low levels of unemployment and deflation with high levels. (p. 1)

Friedman then noted: "There was, however, a crucial difference between Fisher's analysis and Phillips', between the truth of 1926 and the error of 1958, which had to do with the direction of causation. Fisher took *the rate of change of prices* to be the independent variable that set the process going" (ibid.; italics are Friedman's). Friedman then explained away the difference in the order of causation. He argued that unanticipated increases in nominal demand "would be absorbed by increases (or faster increases) in employment and output rather than by increases (or faster increases) in prices" (pp. 1–2).

There are two problems immediately in Friedman's 1975 IEA paper. The first is that Fisher (1926) and Phillips (1958) did *not* deal deal with "precisely the same phenomenon." Again: Fisher (1926) dealt with how price fluctuations precede fluctuations in employment; Phillips (1958) dealt with wage changes. Contrary to Friedman's claim, Phillips did not address inflation at all. As Forder (2017) states, "If Phillips had been principally interested in the relationship of inflation and unemployment, he would have estimated that relationship" (p. 506n6).

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The second immediate problem in Friedman's 1975 IEA paper concerns the order of causation. That the order of causation runs from unemployment to inflation was fundamental to Friedman's expectations-augmented Phillips curve. Friedman maintained the order consistently, beginning with his 1968 presidential address to the American Economic Association, in which he described the string of events following a monetary stimulus by the central bank. As people find themselves with more cash balances than they desire and interest rates begin to fall, Friedman explained, spending and income increase. What happens next? "Much or most of the rise in income will take the form of an increase in output and employment rather than in prices" (1968, p. 10). Friedman continued to maintain after his 1975 IEA paper that the order of causation runs from unemployment to inflation. The 1975 IEA paper makes up the bulk of chapter 12 of the 1976 and subsequent editions of his *Price Theory* book (Friedman [1962] 2007). In a segment of his 1977 Nobel Lecture describing the shifting expectations-augmented Phillips curve, Friedman refers readers to chapter 12 in *Price Theory* for a fuller discussion (1977, p. 458).

But, as we have seen, Fisher argued that the order of causation ran from inflation to unemployment as consistently as Friedman argued that the order of causation ran from unemployment to inflation. Fisher was explicit about the order of causation between inflation and employment in chapter IV of *The Purchasing Power of Money*, in his 1923, 1924, and 1925 articles, and again in his 1933 and 1936 articles. And he was explicit about the order of causation in his 1926 article. After analyzing his charts of the data, Fisher stated: "We may, therefore, feel certain that changes in the price level do definitely foreshadow or anticipate changes in employment" (1926, pp. 791–792).

Fisher scholar Robert Dimand has also noted Fisher's argument that causation ran from inflation to output and employment, not the reverse. Comparing Fisher's empirical articles with Phillips (1958), Dimand wrote: "Fisher assumed causality from inflation to output and unemployment, since the price changes happened first, while A. W. Phillips (1958) considered the tightness of the labor market, as measured by unemployment, as a cause of changes in money wage rates" (1993, p. 168). Summarizing Fisher's empirical work, Dimand wrote: "Redirecting the attention of business cycle researchers from the price level to its rate of change, Fisher conducted path-breaking statistical analysis to support his theory that economic fluctuations followed, not a cycle, but the dance of the dollar" (p. 170).

Milton Friedman took much liberty with Fisher (1926). In doing so, he helped promulgate the notion that Fisher "discovered the Phillips curve."

VIII. CONCLUSION

So, contrary to economic lore, Irving Fisher did not discover the Phillips curve. As we have seen, the statistical relationship between inflation and unemployment that Fisher described in his 1926 article was contemporaneously described by Alvin Hansen, Henri Fuss, John R. Bellerby, and Arthur Pigou in their own studies. Further, the statistical relationship that Fisher, Hansen, Fuss, Bellerby, and Pigou described is substantially different from the statistical relationship that A. W. Phillips described in his famous 1958 paper, as well as the many variations of the Phillips curve in the

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literature, including today's conventional expectations-augmented Phillips curve. In no way does our finding diminish the significance of Fisher (1926) or Phillips (1958). Rather, our finding suggests that Fisher (1926)— accompanied by the contemporaneous work of Hansen, Fuss, Bellerby, and Pigou—and Phillips (1958) should be viewed as separate contributions to economics.

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