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INFLATION THEORY AND POLICY

William D. Nordhaus

January 6, 1976

INFLATION THEORY AND POLICY*

by

William D. Nordhaus

The short-run behavior of aggregate prices is one of the most significant and controversial of macroeconomic variables. In a much-criticized section of the General Theory, Keynes suggested that a capitalist economy in recession would show little price response to changes in aggregate demand. At the other extreme, some monetarists have argued that changes in aggregate demand lead rapidly to price changes. Phillips and his followers lie somewhere between these views, holding that some but not all of an increase in nominal demand ends up in higher prices. Where does this debate stand today? My reading is that, while far from the truth 40 years ago, the truth is coming closer to Keynes every year. The current state of the U.S. economy, and particularly the refusal of wage inflation to moderate significantly in recession, demonstrates how much inflation has been insulated from the pressure of demand.

Much theoretical writing has been devoted to explaining the inflationary process. A useful way to model a Western economy resembles a theory of a "dual-economy." One set of markets, call them auction markets, are the typical competitive supply and demand model, exhibiting flexible prices. Sometimes these are internationally traded goods, or "exposed" goods, as in the Scandinavian inflation model, but this is not essential. Agricultural markets

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are pretty clearly in this mold, as are many security and raw commodity markets. At the other pole lie the administered markets. These tend to be markets where either buyers or sellers have significant market power, and one significant use of that power has been to restrain price movements. The administered markets contain much of the manufacturing, utility, and government sectors, and labor markets are progressively becoming administered.

How do different market structures transmit inflation? Lipsey's original interpretation of the Phillips curve was as a Walrasian adjustment mechanism in a competitive market--wages respond to the disequilibrium in the labor market. The irony is that this seems a better description of price dynamics in an auction market, like the wheat market, than in an administered market like the labor market. A more important criticism is that the Phillips-Lipsey model has not incorporated inflation in a satisfactory manner; the customary modification of the Phillips curve for inflation is to add an equilibrium inflationary correction to the disequilibrium response, but this is an inelegant appendage under the Lipsey interpretation. Why should the response to a given state of disequilibrium vary at different inflation rates? This is similar to arguing that the laws of motion of a pendulum differ depending on its average velocity through space. It seems to me that the original Phillips-Lipsey curve is a reasonable way of representing disequilibrium price dynamics only in auction markets. In auction markets inflationary expectations get built into equilibrium auction good prices through their effect on supply and demand, and built into the time-sequence of auction good prices through interest rates, but inflationary expectations do not get built into the disequilibrium adjustment mechanism for auction goods.

For administered markets we have a great deal of empirical evidence in hand. One area where the evidence is good concerns price behavior in the

administered industrial sector. Wynne Godley, Kenneth Coutts, and I have examined price behavior in all U.K. manufacturing as well as in seven disaggregated industries over the postwar period. The main hypothesis we examined is whether price behavior can be adequately described as "normal pricing"--that is, are prices set on the basis of costs normalized for the cycle. We found, rather surprisingly, that prices were almost completely determined by normal costs. More precisely, once costs have been converted to normal average costs (costs are read off a cost schedule at the normal value of output) there was at most a whisper of an effect of the actual level of demand and costs on actual prices. Just to give an empirical flavor to these observations, we concluded that the effect of the average U.K. business cycle on manufacturing prices (for a given structure of costs) would be less than 0.1% in absolute value. It is unclear whether these limited empirical results should be extrapolated to other administered markets. Eckstein and Wyss, as well as R. J. Gordon, have found very similar price behavior for the manufacturing and nonfood sectors of the U.S., although the U.S. appears to be more sensitive to demand than the U.K.

Do firms price labor in the same way that they price goods? Up until the time of Keynes, wages over the business cycle were assumed to be determined by the classical relation between the marginal value product and the wage. Even though Keynes later admitted that cyclical movements in the real wage were anticlassical, he did not purge this last vestige of classical thought from the General Theory; indeed this anachronism is still embalmed in most modern macroeconomic textbooks. A close examination of the cyclical movement in wages reveals that they parallel prices in the trend toward normal pricing. In the modern terminology, Phillips curves are apparently becoming much flatter in the short run, and it is clear that in deep recessions the marginal impact of unemployment on wage inflation is very small.

At the same time, recent econometric work seems to indicate that wages are more responsive to inflation than in earlier years.

An approach to understanding these phenomena might run as follows: administered wages generally follow the principles of normal pricing, so that cyclical fluctuations are pretty much removed. In bargaining situations, employers are prepared to settle for a wage which will keep their profit margins constant. Obviously, this acts as a much more powerful restraint on wages when an entire industry is not at the bargaining table. Employees keep their eyes both on competing groups and on their expected growth of real income. If wages are in line with historical wage differentials, and real incomes grow as expected, after the usual rites of brinkmanship and bravado, the settlement can be reached. (In pure administered wage situations, without bargaining, the determinants would be much the same except that competing wages might be more important.)

This simplified model can be solved for the resulting wage settlement as a function of the lagged wage settlements (as well as entropic elements such as the deviation of wage differentials from a normal pattern), the rate of change of value-added prices, and the rate of change in exogenous prices (that is, the price of imports to the administered sector). Such a bargaining model would predict that an increase in value-added price inflation would eventually be completely passed through into higher wage

inflation. If the increased value-added inflation were completely balanced, then such a solution leaves all real variables (except the real return on non-interest bearing money) unchanged. But an attempt to pass through exogenous price inflation, such as that on oil and food, would be vigorously resisted. Perry's evidence suggests that value-added prices do get fully passed through into wages while only 15 percent of exogenous price inflation (such as that due to food and fuel prices) is passed through.

The administered wage model points to lagged wages and value-added prices as the major fuel for continued wage inflation, while the administered price model point to normal average costs as the main determinant of prices. To complete the system, we need to consider the prices in the auction system. The principles behind auction price determinations are basically the classical principles of competitive supply and demand. The clearest examples are those for raw commodities such as those on international exchanges (copper, zinc, raw fibers, foodstuffs). Recent work in this area points to the importance of international supply and demand factors--demand appears to be at least ten, perhaps fifty times more important in explaining short-run price movements in these auction markets than it is in the administered markets. Auction prices provide much of the noisiness in price behavior over the last four years, with unexplained elements--dramatic shifts in patterns of hedge buying or even speculation--playing a large role in the 1972-75 inflation.

Putting all these elements together we get three basic elements in the aggregate price equation. First, we see demand entering weakly through three routes: through the mark-up in the administered market price equation,

through unemployment in the wage equation, and from auction markets. The nature of the nonlinearities means that all three responses are likely to be very weak when the overall level of utilization is low, but demand inflation is significant in periods of very high utilization. The second major effect is the momentum effect of the current and past rates of wage and value-added inflation in the administered price sector. Recent work indicates that, random shocks aside, the momentum effects dominate price and wage movements over the short run; this implies both that using demand to affect inflation has a small initial effect and that its effects are spread over long periods. A recent study by Wachter, for example, indicates that the mean lag of demand on prices operating through the labor market is in the order of three to five years. The third major determinant is exogenous movements in auction prices. These may be due to a world boom largely outside the control of the national authorities, to variations in weather or ocean currents, to stock building in non-market economies, or to speculative fever.

The model of inflation outlined here is hardly new; Ackley outlined a similar model 15 years ago. Such a model explains relatively well price movements over the last four years (as is shown by R. J. Gordon or by Shoven and myself). Why then have economic forecasts been so far off the mark in recent years? There are basically four reasons for the very poor price forecasts: first, the auction sector has been largely ignored, for differential movements in auction goods prices were insignificant until recently. Second, there appear to have been structural shifts--Phillips curves estimated today look re-

markably different from those estimated five years ago. Third, even with today's models, inflation cannot be predicted with great precision. The exogenous element in auction price was very large over the last four years, and one recent attempt to predict commodity prices shows errors of up to 50 percent in 1973 and 1974. Finally, the normal timing of the price-wage system has been wrenched by a successive tightening and loosening of price and wage controls. Gordon estimates that the loosening of controls in 1974 led to an inflation rate three percent above what would otherwise have occurred.

While the exact details of price behavior may differ from that painted here, the broad vision seems to accord with much recent empirical work. Unfortunately, it is quite difficult to describe a theory which can underpin the reality--leading to the description of administered pricing as a phenomenon in search of a theory. After three decades, the major intellectual problem continues to be the fact that so little of the response to demand shifts comes through prices and wages. Although some economists continue to argue that price movements are underestimated because of errors of measurement (through price shading in recession and vice versa), there is little evidence that the errors are substantial. Indeed the aggregate transactions price index of Stigler and Kindahl shows less cyclical sensitivity than the corresponding official price index. Moreover, the pervasiveness of price stickiness across time and space casts doubt on behavioral explanations that rely on the weakness of forces of selection to drive out nonoptimizing behavior without showing why such nonoptimizing behavior arises in so many situations in the first place.

Early explanations of normal pricing (such as Sweezy or the more

elegant Phelps-Winter model) relied on the structure of competitive forces. In Phelps-Winter, for example, firms respond with quantity because customers will emigrate to other firms if they do not. This class of explanation fails to explain why prices respond so much more completely and rapidly to cyclical changes in costs than to cyclical changes in demand. A more recent rationale elaborated by Okun embeds wage and price behavior in a search theoretic framework. Price stability on the part of a firm is seen as part of a more general trend toward standardization of product; when I drive into a MacDonalds, I know not only the menu, quality, and speed of service, but also the prices. The "normal" pricing rule can be interpreted as a form of implicit long-term contract, where the consumer is willing to pay slightly more, averaged over the cycle, for such a standardized product because of the reduction in necessary search costs. Why is normal pricing the standardized product that so many firms sell? A normal pricing rule is an equitable-sounding and easily-understood rule. Such a rule might well be the solution to an optimization problem in which the variance of prices is minimized subject to an average profits constraint. The new view of sticky prices as a service is a revolutionary reversal of populist views of Means and his followers. Unfortunately, the new view has not been tested (nor are refutable hypotheses clearly stated).

The "dual economy" view of inflation has important implications for macroeconomic theory and policy. Thus the empirical description of the inflation transmission process casts doubt on extreme neoclassical and monetarist views of inflation. One such contention is that inflation is everywhere a monetary phenomenon.

Presumably, in plain English, this means that the money supply exerts a direct influence on the evolution of prices. In analyzing this question, one must be extremely careful to separate out the reduced-form effect from the structural effect. In the model outlined in the present paper, and neglecting second-order effects, money affects the price level only through its effect on aggregate demand. Thus in the normal price model, money does not enter directly into the structural equation, but enters only through factor prices, while in the auction market money enters only by affecting excess demand. On the other hand, in a reduced form equation, all modern models except the extreme Keynesian depression models have money as an important determinant of aggregate demand, which influences demand curves in the auction markets and unemployment in the Phillips curve. Thus, money should be insignificant in a properly specified structural price equation, while in a reduced form price equation money should be a powerful variable.

The distinction between reduced form and structural equations helps explain much recent econometric work. Reduced form price equation with money have performed surprisingly well. Yet in structural equations, such as in Nordhaus-Godley, there is no perceptible influence of reversible cyclical factors in price determination and there is no room for money to exert a direct role in price determination in the administered price sector. R. J. Gordon has found that a bivariate reduced form price equation with money is highly significant with a very long lag, (much longer than is consistent with popular monetarist writings), but that adding money to the structural equation shows very little independent influence of money outside of the influence on the structural variables.

A recent strand of neoclassical thinking, associated with the writings

of Lucas, Sargent, and Wallace, questions the efficacy of short-run macroeconomic policy because of the view of price dynamics. If expectations are rational and if prices and wages are flexible, policy is unable to "fool" people into allowing a deviation of unemployment or demand from the equilibrium rates even in the short run. These theories allow only a "learning lag" between policy and complete price flexibility (the learning lag represents the necessary time for producers or consumers to learn that the real variables such as unemployment or output have changed). In light of the fact that many policies are announced in advance--so that learning lags must be brief--and that the lags of output and prices in response to policy are so long, it is hard to understand how these theories could be seen as more than intellectual exercises. Put differently, is it plausible that the fall in capacity utilization over the current recession is either a fall in the "natural rate of utilization" or that it is unknown to the producers who actually leave the capacity idle?

A third major implication of the dual economy model is for international trade. Some recent work has stressed the importance of internationally determined prices in the transmission of inflation over national borders. According to the "law of one price," with fixed exchange rates, the world price level determines the price level in individual countries directly. This mechanism explains the puzzle as to the simultaneous outbreak of inflation in so many countries. Some monetarists have even pushed this to an extreme by arguing that price flexibility in individual countries will be a perfect substitute for floating exchange rates.

In terms of the dual economy model, these views seem to argue that the auction market is the dominant sector, and further that prices in the

auction market are set in world markets. Although no careful study of this proposition has been made, it seems clear that the significance of the "law of one price" is over-emphasized. Clearly labor does not have one price, and outside of true auction markets there appears to be sufficient product differentiation and transport and tariff costs so that world prices exert but little influence on domestic prices in the short run. Godley, Coutts, and I have examined seven manufacturing industries in the U.K. to see whether the world price exerted any effect as against the normal pricing rule. We found on average the effect of the price of competing imports in the same industry was about one-tenth as strong as would be predicted by the law of one price. Similarly, Gordon found no room for competing export or import prices in his study of aggregate price behavior in the U.S. I believe that these results cast suspicion on recent theories which rely on rapid adjustment of prices to either world prices or to demand.

The dilemma for policymakers in choosing between inflation and output is not only cruel but becoming crueler. Indeed, the inability to control both inflation and unemployment within acceptable institutions is the major flaw of Western economies today. The aversion to inflation has led Western countries into a recession of huge proportions, yet the inflation has hardly abated. Given the long lags in response, one must marvel at the steely nerves of politicians who sacrifice ten percent of output today for a point or two in the inflation rate spread over the next five years. But in the long haul, there is a tension in a system where democratically-elected policymakers must choose between today's output and employment and next year's inflation. This kind of choice has led to political business cycles in the past and is embodied in the 1975 U.S. energy bill where politicians would only bite the bullet of price decontrol as long as the price explosion would come after November 1976.

Given the increasingly cruel dilemma and the unsatisfactory response of policymakers to the dilemma, it is tempting to search for new ways of controlling inflation. The ideal form of inflation-control is one which reduces all nominally-denominated values by the same percent without changing any relative prices or real magnitudes. The Achilles heel of past price-wage policies (except the relatively innocuous guideposts) has been that they confused inflation policy with income redistribution. By concentrating on individual sectors, they have attempted to change relative prices and aroused the fierce resentment of individual groups. Whether the 1962 steel controversy was justified or not, it can hardly be seen as distributionally neutral. The current contractionary route to deflation has even graver distributional consequences.

There is probably no such ideal anti-inflation policy, but economists have shown little inventiveness in designing durable antidotes to inflation other than recessions. One serious suggestion is an inflation tax, which would penalize firms or workers to the extent that they deviated from a national norm. Such a mechanism would allow the decentralized decisions of which economists (and some politicians) are so fond. It would allow adjustment of relative prices, and when inflation rate is at the norm it would leave relative prices unchanged. Most important, such a measure would directly affect the bad--inflation--rather than first pummeling goods like output and employment.