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## The New Keynesian Synthesis

David Romer

**T**wo beliefs about the economy prompted the departure of Keynesian macroeconomics from classical orthodoxy in the 1930s. The first was that there was widespread involuntary unemployment: many people appeared willing to work, but unable to find employment at the prevailing wage. The second was that fluctuations in aggregate demand were a central source of short-run changes in aggregate economic activity: changes in the government's demand for goods, in the confidence of business leaders, and in monetary and financial markets appeared to have powerful effects on employment and output. A new theory was needed to incorporate these beliefs.

The famous "neoclassical synthesis," which developed over the next three decades, postulated a single explanation of both phenomena: that prices in money units adjusted only slowly to imbalances between supply and demand. The most important of these sluggish money prices was the money price of labor—the nominal wage. Sluggish wage adjustment implied that the demand and supply of labor could be out of balance, and thus that unemployment could arise. Moreover, since it was *nominal* wages that were slow to adjust, the new theory implied that the classical dichotomy between nominal and real variables failed, and hence that movements in nominal variables such as the money supply could have large effects on real variables such as output and employment.

The remainder of the neoclassical synthesis was Walrasian. Markets for goods and labor were competitive, externalities were absent, and information was perfect. The synthesis reached its height with the disequilibrium models of

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the late 1960s and early 1970s, which appended assumptions of completely fixed prices and wages to otherwise Walrasian general equilibrium models (for example, Malinvaud, 1977).

The neoclassical synthesis foundered on what seems, in retrospect, an obvious question: in an environment that is so relentlessly competitive, how can one glaring departure from Walrasian behavior persist? Perhaps the most fundamental message of economics is that in a competitive setting, powerful incentives prod economic actors to adjust prices in response to imbalances between supply and demand.

This question led to the collapse of the neoclassical synthesis, and gradually split mainstream macroeconomics into two schools. One school—real business cycle theory—has abandoned not only the neoclassical synthesis but the premises of Keynesian macroeconomics. Members of this school deny the existence of significant involuntary unemployment and of any important failures of the classical dichotomy (see, for example, Plosser, 1989).

The other school—new Keynesian macroeconomics—also came to recognize that Walrasian microeconomics and the neoclassical synthesis did not provide adequate theoretical foundations for Keynesian macroeconomics. But members of this school believed that the appropriate response was to attempt to determine whether a correct description of the microeconomy would give rise to the phenomena that they believed characterized the macroeconomy. After all, accepting the belief that the labor market was continuously in Walrasian equilibrium would require denying that unemployment was an important phenomenon. And accepting the classical dichotomy would require denying that monetary disturbances had real effects. It would also require giving up a straightforward explanation of how other changes on the demand side—like shifts in government purchases and investment demand—could have substantial real effects. In the absence of sluggish nominal price adjustment, such demand changes affect aggregate real activity only via the impact of the real interest rate and wealth on labor supply, and the idea that these effects were large appeared implausible.

The new Keynesians made more rapid progress in understanding the microeconomics of unemployment than in understanding the microeconomics of nominal price rigidity. But the past five years have seen important breakthroughs in this second area. This paper will describe these breakthroughs, discuss our current understanding of nominal rigidity, and assess the work that remains to be done.

## **Nominal Frictions**

The central element of the neoclassical synthesis was its assumption that prices did not adjust immediately to equilibrate supply and demand. The natural response to the collapse of the synthesis was thus to investigate whether

imperfect price adjustment could be derived from realistic assumptions about the microeconomic environment, rather than assumed.

The resulting research led to a variety of non-Walrasian theories of the operation of markets. Non-Walrasian analyses of the labor market, for example, have suggested that wages might serve a variety of functions other than equilibrating supply and demand. In early implicit contract models, the wage serves as a means for the firm to provide insurance to its workers; in many bargaining models, the wage is the means by which rents are divided between workers and the firm; and in efficiency wage models, the wage affects the productivity of labor.

Models like these have the potential to provide an explanation of unemployment. But they cannot provide an explanation of failures of the classical dichotomy. The models focus on *real* imperfections: workers are concerned about insuring their real living standards; firms and workers are concerned about the real rents they obtain; the productivity of labor depends on the real wage the firm pays; and so on. If the money supply changes in these models, then, just as in completely classical models, all nominal prices change, leaving relative prices and real outcomes (with whatever non-Walrasian features they may involve) unchanged.

Any microeconomic basis for failure of the classical dichotomy requires some kind of nominal imperfection; otherwise, a purely nominal disturbance leaves the real equilibrium (or the set of real equilibria) unchanged.<sup>1</sup> This immediately raises a difficulty. Individuals are ultimately concerned with real prices and quantities: real wages, hours of work, real consumption levels, and the like. Nominal magnitudes matter to them only in ways that are minor and easily overcome. Prices and wages are quoted in nominal terms, but it costs little to change (or index) them. Individuals are not fully informed about the aggregate price level or the money supply, but they can obtain quite accurate information at little cost. Debt contracts are usually specified in nominal terms, but they too could be indexed with little difficulty. And individuals hold modest amounts of currency, which is denominated in nominal terms, but they can change their holdings easily. In no way are nominal magnitudes of great direct importance to individuals. Indeed, the difficulty is revealed by the very word: to call something “nominal” is to say that it is merely a name.

Thus, if failure of the classical dichotomy is important to fluctuations in aggregate activity, it must be that nominal frictions that appear small at the level of individual households and firms—like the fact that prices are posted in nominal units, or that obtaining accurate information about the aggregate price

<sup>1</sup>In their contributions to this symposium, James Tobin and Bruce Greenwald and Joseph Stiglitz argue that, at the margin, increasing the speed of nominal adjustment may make the real effects of nominal disturbances larger. Even if this is correct, complete and immediate nominal flexibility would render monetary shocks and other aggregate demand disturbances neutral. Thus an understanding of the sources of incomplete nominal flexibility would remain a necessary part of an account of macroeconomic fluctuations.

level involves a cost—somehow have a large effect on the macroeconomy. It is this insight, due to Mankiw (1985) and Akerlof and Yellen (1985), that has led to the recent progress in understanding the microeconomic foundations of the real impact of aggregate demand disturbances.<sup>2</sup>

## Real Rigidities

The issue of whether small frictions can cause nominal disturbances to have large effects on aggregate economic activity hinges on the incentives of individual firms to change their prices when aggregate output changes. As an example, consider an economy-wide decline in output. The question facing a firm when the demand for its product falls as a result of the decline in aggregate output is whether to hold its price fixed and reduce production, or to lower its price and thereby reduce or eliminate the need to reduce output.

This issue can be analyzed using the marginal revenue-marginal cost diagram in Figure 1. The economy begins in equilibrium; thus the representative firm is producing at the point where marginal cost equals marginal revenue (Point A in the diagram). A contraction of economy-wide output shifts the demand curve the firm faces in—at a given price, demand for the firm's product is lower. Thus the marginal revenue curve shifts in. If the firm does not change its price, its output is determined by demand at the existing price (Point B). At this level of output, marginal revenue exceeds marginal cost, and so the firm has some incentive to lower its price and raise output. If the firm changes its price, it produces at the point where marginal cost and marginal revenue are equal (Point C). The area of the shaded triangle in the diagram shows the additional profits to be gained from reducing price and increasing quantity produced. For the firm to be willing to hold its price fixed, the area of the triangle must be small.

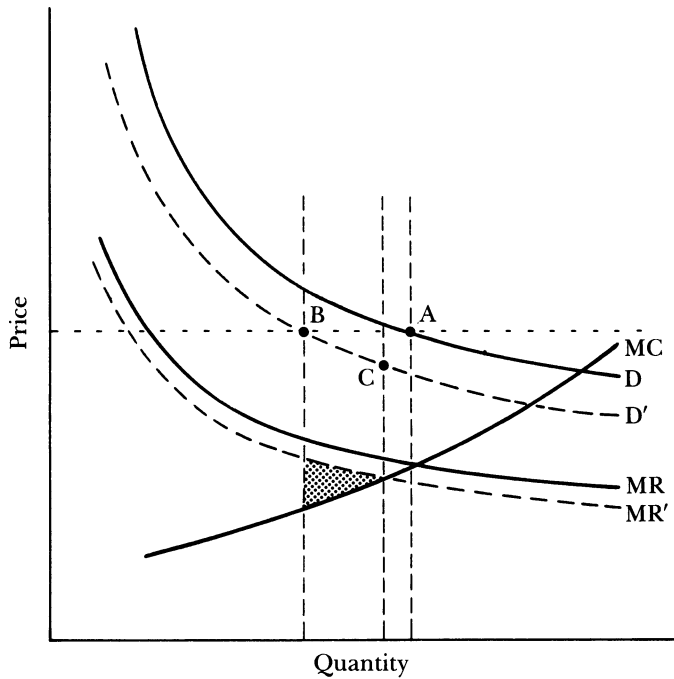
The diagram reveals a crucial point: the firm's incentive to reduce its price may be small even if it is harmed greatly by the fall in demand. The firm would prefer to face the original, higher demand curve, but of course it can only choose a point on the new demand curve. The firm may find that the gains from reducing its price are small even if the shift in its demand curve is large.

If the gains to the firm from cutting its price are indeed small, the behavior of many such firms facing small frictions in price adjustment can cause an aggregate demand disturbance to have large real effects. Suppose that the underlying disturbance is a decline in the money supply or some other adverse aggregate demand shift, and suppose provisionally that firms do not cut their prices in response to this disturbance. In this situation, aggregate real output

<sup>2</sup>The nature of the insight also helps to explain why progress in understanding the non-neutrality of aggregate demand shocks was so slow: it is natural to begin the search for an explanation of a major puzzle by exploring large departures from the prevailing orthodoxy, rather than by looking for large effects from small departures.

Figure 1

**A Representative Firm's Incentive to Change Its Price in Response to a Change in Aggregate Output**



falls. Thus the situation facing the representative firm is like that depicted in the figure. If the representative firm's incentive to adjust its price is small and there are frictions in price adjustment, then firms' conjectured behavior of holding their prices fixed is indeed an equilibrium. If, on the other hand, the incentive for price adjustment is large, all firms cut their prices; the end result is that the negative aggregate demand shock results only in lower prices.

A firm's incentive to change its price in response to the fall in demand—the size of the triangle in Figure 1—is determined by the responses of marginal cost and marginal revenue to the downturn in aggregate demand. Take marginal cost first. Since less output is being produced, less labor is demanded. With an upward-sloping labor supply curve, this implies a decline in the real wage, and hence in marginal cost.<sup>3</sup> The cyclical behavior of marginal cost also depends on the degree of short-run diminishing returns to labor; if the

<sup>3</sup>If labor is mobile in the short run, the decline in marginal cost takes the form of a downward shift of the marginal cost curve caused by a fall in the economy-wide wage; if labor is immobile, the decline takes the form of a movement along an upward-sloping cost curve. For simplicity, I have not shifted the curve in the figure.

marginal product of labor rises rapidly as labor input decreases, the marginal cost curve is steep even if the real wage is constant. The more marginal cost falls when output declines, the greater the firm's incentive to lower its price.

Now consider marginal revenue. The more the marginal revenue curve shifts to the left, the smaller the firm's incentive to lower its price. The size of the shift of the marginal revenue curve depends on the cyclical behavior of the elasticity of demand. In the figure, the demand elasticity the firm faces at its existing price is assumed not to change when aggregate output changes. In this case, marginal revenue at the existing price (which now corresponds to a lower level of output) is unaffected by the change in economy-wide output. If the elasticity of demand at the existing price falls when aggregate output declines, the shift in marginal revenue is larger; if the elasticity rises, the shift is smaller.

The framework set out in Figure 1 can be used to demonstrate that simply adding imperfect competition and small barriers to price adjustment to the mainstream world view of the 1950s and 1960s is not enough to provide a microeconomic basis for the view that aggregate demand shocks are central to economic fluctuations.<sup>4</sup> The source of the difficulty lies in the labor market. If labor supply is relatively inelastic—surely the prevailing view 20 years ago, and probably the prevailing view today—and if there are no departures from Walrasian assumptions aside from the presence of small barriers to nominal adjustment, then the decline in labor input associated with the decline in production leads to a large fall in the real wage.

In this case, marginal cost falls greatly in recessions. As a result, unless the elasticity of demand also falls sharply, firms' incentives to reduce prices are large. Back-of-the-envelope calculations for a simple model in which imperfect competition is the only departure from Walrasian assumptions show that if labor supply is relatively inelastic, firms' incentives to change their prices in the face of aggregate demand movements of a few percent swamp any plausible barriers to nominal adjustment (Ball and Romer, 1990).

<sup>4</sup>Mankiw's and Akerlof and Yellen's argument that small frictions can generate significant nominal rigidity is often interpreted as follows. An imperfectly competitive firm's profits are a smooth function of the price that it charges. Thus the profits foregone by departing from the optimal price are second order in the size of the departure, and so the cost of failing to change price in response to a shift in aggregate demand is second order in the size of the shift—geometrically, the shaded region in Figure 1 is a triangle. Thus, the interpretation concludes, imperfect competition alone is enough to explain how “small” frictions in price adjustment are enough to cause prices to remain fixed in the face of movements in aggregate demand.

This argument (which neither Mankiw nor Akerlof and Yellen make) rests on a confusion of two uses of the term “small.” What is needed to provide a microeconomic basis for the view that aggregate demand movements are important to macroeconomic fluctuations is a demonstration that frictions that are “small” *in the sense of representing empirically plausible barriers to nominal price flexibility* are enough to keep prices from adjusting fully in response to aggregate demand movements of the size typically observed in cyclical fluctuations. The fact that the necessary frictions are “small” in the sense of being second order in the size of the aggregate demand movements is simply irrelevant to that issue (Reaume, 1991).

Thus, if the classical dichotomy is to fail, it must be that marginal cost does not fall sharply in response to a demand-driven output contraction, or that marginal revenue does fall sharply, or some combination of the two. At a more general level, the incentive to change price in response to a change in economy-wide output can be expressed as a function of two factors: the impact of the change on the firm's profit-maximizing real price, and the cost to the firm of a given departure of its real price from the profit-maximizing level. For the incentive for adjustment in the face of demand-driven fluctuations to be small, either profit-maximizing real prices must respond little to changes in aggregate output—in the terminology of Ball and Romer (1990), the degree of “real rigidity” must be high—or considerable departures from profit-maximizing prices must have only small costs. In the simple model discussed above, the large changes in real wages in response to aggregate output movements cause profit-maximizing prices to be very responsive to output—that is, real rigidity is low—and so the incentive for adjustment is large. Both a smaller cyclical sensitivity of marginal cost and a larger cyclical sensitivity of marginal revenue increase real rigidity, and thus reduce firms' incentives to adjust their prices. In short, a complete model of large real effects of nominal disturbances requires both nominal frictions and real rigidities.

### **Potential Sources of Real Rigidity**

Economic knowledge has not progressed to the point where we have a clear view of what the most important real rigidities are, but recent research has suggested some candidates. Rather than surveying all of them, I will briefly describe four of the most promising. All of them have potentially important implications for subjects far beyond the incentives firms have to change their prices in response to aggregate demand shifts, and all are active areas of research and debate.

The first area of research concerns external economies of scale arising from “thick market externalities” (for example, Diamond, 1982). This work investigates mechanisms through which purchasing inputs and selling final products may be easier in times of high economic activity, when trade is active and markets are functioning well, than in times of low economic activity. These effects act to shift the marginal cost curve down in booms and up in recessions.

A second line of work considers capital market imperfections arising from imperfect information. These models begin by noting that asymmetric information between lenders and borrowers is an obstacle only in seeking external finance. It follows that in a situation of asymmetric information, internal finance is less expensive than external finance. Since firms have higher profits and hence more funds available for internal finance in booms than in recessions, capital market imperfections tend to make the cost of capital



countercyclical; and since capital costs are an important component of overall costs, this acts to make the cost curve move in a countercyclical direction (for example, Bernanke and Gertler, 1989).

A third area of research focuses on the cyclical behavior of demand elasticities in goods markets. There are a variety of reasons that the elasticity of demand might vary in response to aggregate output movements. For example, when aggregate output is high, "thick market" effects may make it easier for firms to disseminate information and for consumers to acquire it. This could act to make the elasticity of demand, and hence the marginal revenue curve, more procyclical, and would thus reduce firms' incentives to adjust their prices in response to aggregate demand movements.

None of these three areas of research concern the labor market. But real rigidities in the labor market appear to be a necessary part of the explanation of the real effects of nominal disturbances. As explained in the previous section, if the labor market were Walrasian and labor supply inelastic, real wages would be highly procyclical. If this pattern held in practice, real rigidities elsewhere in the economy (such as the ones I have just discussed) would have to be extremely strong to overcome the large incentive for adjustment created by sharply procyclical wages. However, although analysts dispute the precise cyclical behavior of real wages, there is no evidence that they are strongly procyclical. The fourth and most important area of research on real rigidities seeks to explain this observation.

At a general level, real wages might not be highly procyclical for two reasons. First, short-run aggregate labor supply could be relatively elastic; such a high short-run elasticity could arise, for example, from intertemporal substitution and from nonconvexities in labor supply. However, such models have found little empirical support (for example, Altonji, 1986). Second, perhaps some type of imperfection in the labor market causes workers to be off their labor supply curves over at least part of the business cycle. For example, efficiency wage models imply that firms set real wages above market-clearing levels. These models thus break the tight link between the elasticity of labor supply and the response of real wages to demand disturbances, and therefore imply that real wages may not be highly procyclical even if labor supply is quite inelastic. Other labor market imperfections, like the imperfect information and bilateral monopoly arising from heterogeneity among workers and jobs, could have similar implications for real wage movements. If real imperfections like these cause real wages to respond little to demand disturbances, they greatly reduce firms' incentives to vary their prices in response to these demand shifts.

In addition, the possibility of substantial real rigidities in the labor market suggests that the channel through which small barriers to nominal adjustment cause nominal disturbances to have substantial real effects may involve stickiness of nominal wages, rather than of nominal prices. If wages do display substantial real rigidity, a demand-driven expansion leads only to small increases in optimal real wages. As a result, just as small frictions in price

adjustment could lead to substantial nominal price rigidity, small frictions in nominal wage adjustment could lead to substantial nominal wage rigidity.

## **Welfare**

In a purely Walrasian economy, the level of output that prevails under full price flexibility is optimal. In this framework, any departure from normal output—whether a boom or a recession—lowers welfare. Moreover, because the private returns to an action equal the action's social benefits, the fact that barriers to nominal price adjustment are small immediately implies that the welfare cost of a nominal disturbance must be small: if the welfare cost exceeded the cost of adjusting prices, the private return to changing prices and thereby preventing the disturbance from having real effects would exceed the cost, and so prices would be changed.

New Keynesian models have very different welfare implications. These models imply an asymmetry between demand-driven booms and demand-driven recessions, with booms raising welfare and recessions lowering it. In addition, they suggest the possibility that nominal frictions may lead to an inefficiently high level of volatility and that government stabilization policy may therefore be desirable.

Imperfect competition alone is enough to imply asymmetry between booms and recessions. Under imperfect competition, since marginal cost is below price, the profit-maximizing level of employment is inefficiently low, and the profit-maximizing level of price too high. An increase in output from its equilibrium level, rather than reducing welfare, brings the economy closer to the social optimum. A decline in output, in contrast, moves the economy even further away from the optimum (Mankiw, 1985).

In addition, the inefficiency that arises under imperfect competition implies that prices can remain fixed in the face of a decline in aggregate demand even if the costs of the resulting recession are much larger than the costs of adjusting prices. With imperfect competition, firms' pricing decisions have externalities. The externality can be thought of as operating through aggregate demand. A decision to raise price, for example, through its impact on the aggregate price level, moves the economy up the aggregate demand curve and thereby reduces aggregate output; this decline in output harms other firms by reducing the demand for their goods. Similarly, price cuts by all firms in response to a fall in aggregate demand would prevent aggregate output from falling. But as described above, the individual firm's gain from cutting its own price may be small. Thus it is possible for the fall in aggregate demand to lead unchanged prices and a costly recession even though the barriers to price adjustment are small.

Other theories can lead to similar results. For example, if efficiency wages cause unemployment, it follows immediately that the marginal product of labor

exceeds the marginal value of leisure. Thus again the equilibrium level of output is less than the optimal level, booms and recessions have asymmetric effects on welfare, and small barriers to wage or price adjustment can be enough to cause declines in aggregate demand to result in costly recessions.

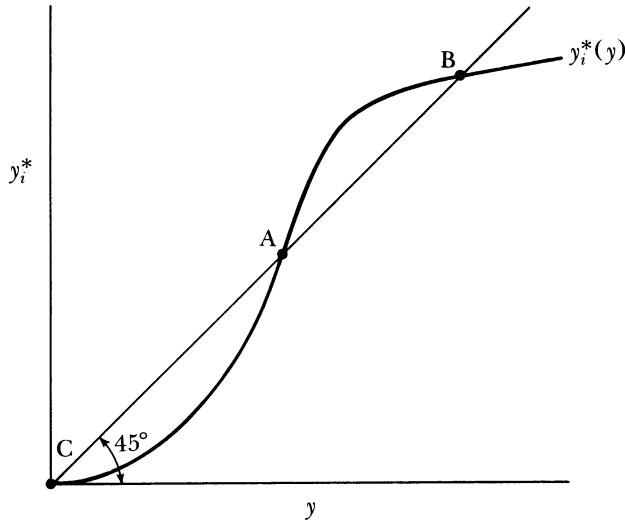
Just as firms' decisions that affect the level of output have externalities, there are generally also externalities from their decisions that affect the volatility of output. Specifically, a policy on the part of one firm of holding its price fixed in response to both rises and falls in aggregate demand increases the magnitude of aggregate fluctuations; this typically harms others in the economy. Thus aggregate fluctuations are inefficiently large, and government stabilization policy has the potential to correct a market failure and increase welfare (Ball and Romer, 1989).

Whether the welfare benefits from correcting such inefficient fluctuations are large is an open question. It is possible that demand-driven output fluctuations cause substantial fluctuations in welfare, but little change in average welfare. But the benefits of stabilization policy could be large if declines in output from its equilibrium level have big welfare costs but increases have only small benefits. This could occur, for example, if the disutility of work is a sharply increasing function of the amount of labor supplied; in this case, the utility costs of the increased labor supply in a boom would largely offset the benefits of the increased production, while the gains from the increased leisure in a recession would be small relative to the costs of the lost production. A second possibility is that reducing the volatility of aggregate demand increases average output. This could occur if aggregate variability has an important impact on firms' choice of capacity, and hence on potential output (Meltzer, 1988). Another channel through which reducing volatility might increase average output is suggested by the traditional view that negative aggregate demand shocks mainly reduce output while positive shocks mainly raise prices. If this view proves correct, it could imply significant welfare gains from countercyclical stabilization policy.

### **“Coordination Failure” and “Hysteresis”**

My earlier discussion of the incentives of firms to adjust prices in response to aggregate demand movements suppressed what appears to be an awkward possibility: real rigidities might be so strong that the incentive to lower price in response to a contraction of economy-wide output is not just small but nonexistent. That is, when output contracts, the intersection of the new marginal revenue and marginal cost curves might occur at a level of output *lower* than the amount now demanded at the old price. The representative firm's incentive would then be to react to the negative aggregate demand shock by raising its price and reducing its output even further.

Figure 2  
**Coordination Failure**



In this situation, more than one “normal” level of output exists. Consider again Figure 1. In the initial position, the economy is in equilibrium: the representative firm is producing the amount that it would produce if it could set its price freely. If a fall in the money supply with other firms’ prices unchanged creates an incentive for the representative firm to raise its price and cut output further, this means that the firm’s optimal output is changing more than one-for-one with the average amount produced by other firms. As long as optimal output is a continuous function of the average output of other firms and there is some limit to firms’ ability to produce, there must be at least two other equilibrium output levels. This is shown in Figure 2.

Figure 2 plots a representative firm’s optimal output ( $y_i^*$ ) as a function of the average amount produced by other firms ( $y$ ). At any point where  $y_i^* = y$ —the reaction function intersects the 45° degree line—the representative firm wants to produce the average amount that other firms are producing, and so the economy is in equilibrium. Point A shows the initial position: the economy is in equilibrium, and the representative firm’s optimal output moves more than one-for-one with average output. Assuming some limit to firms’ ability to produce, the reaction function must cross the 45° line again at some higher level of output (Point B). And, since output cannot be negative, there must be a third intersection at some point below A (Point C). In addition, if there are positive externalities from higher output, as under imperfect competition, we can make welfare rankings of the various equilibria: the equilibria with higher output are superior.

Models with multiple, welfare-ranked equilibria are known as coordination failure models (Cooper and John, 1988). They have the potential ability to

provide an account of economic fluctuations without any reliance on barriers to price adjustment, to explain “underemployment equilibria,” and to rationalize a variety of government interventions to “coordinate” moves to superior equilibria.

But coordination failure alone does not provide a persuasive account of fluctuations. The models have no role for nominal variables, and in the absence of *any* barriers to nominal price adjustment, there is no reason for a nominal disturbance to affect the real allocation. A nominal shock in a coordination failure model does not affect the set of equilibrium real allocations. Thus the models do not provide a basis for the view that monetary and other aggregate demand shocks are a critical source of fluctuations in aggregate economic activity.

In fact, if there are frictions in price adjustment, the question of whether there are multiple levels of equilibrium output or simply small incentives for firms to adjust prices in the direction that move the economy toward a unique long-run equilibrium is relatively unimportant. In either case, nominal shocks have real effects, and those effects are likely to be long-lasting, since the forces acting to return output to its initial level are weak.

Even the question of whether shocks have *permanent* effects does not hinge on the issue of whether there is a unique equilibrium level of output. In the absence of some mechanism through which short-run output movements change equilibrium levels of output, the effects of any given disturbance eventually disappear, either as the economy returns gradually to the unique equilibrium level of output, or as it is shocked randomly among the different equilibrium levels. In the presence of such a mechanism, on the other hand, nominal shocks have permanent effects regardless of whether output has one or several equilibrium levels. For example, if technological progress occurs from learning-by-doing, the decline in activity caused by a downward nominal shock and sluggish price adjustment will result in reduced technological progress; output will therefore be lower than it would have been in the absence of the shock even after prices have adjusted fully. Models in which temporary changes—here, aggregate demand movements coupled with temporary barriers to price adjustment—have permanent effects are known as hysteresis models (Blanchard and Summers, 1986).

## What Are the Frictions?

Obstacles to nominal flexibility are central to the arguments I have been presenting. But beyond noting that those obstacles are small, I have said little about the form they might take.<sup>5</sup>

<sup>5</sup>The discussion that follows focuses on imperfect nominal price adjustment. But essentially the same points apply to imperfect nominal wage adjustment, to imperfect information about the price level or the money supply, and to incomplete indexation of debt contracts.

I begin with a negative point: the costs of renegotiating contracts, or of gathering and processing information and estimating the optimal price to charge, or of informing customers and suppliers of a new price, do *not* by themselves constitute costs of nominal price adjustment. The fallacy underlying the common view that these represent costs of changing nominal prices is in thinking of leaving its nominal prices unchanged as the only way that a firm can “do nothing” about its prices. But prices might be adjusted by many simple rules—such as an increase of a given amount each month or indexation to a price index or to nominal GNP—that would involve no renegotiation, decision, or communication costs once put into place. To put it another way, the fact that (for example) it is costly to inform customers of nominal price changes is a consequence, not a cause, of the fact that nominal prices are usually left unchanged.

Mankiw focuses on “menu costs”—the technological costs of changing nominal prices. (The standard example, of course, is the cost incurred by a restaurant in printing new menus—hence the name.) But menu costs cannot account for the microeconomic evidence on the nature of firms’ pricing policies. The behavior of L. L. Bean catalog prices, documented by Kashyap (1991), illustrates the difficulties. Bean issues over 20 catalogs a year, yet only changes prices in two of the catalogs (Fall and Spring). Even in these catalogs, most prices are usually not changed. Neither fact supports the view that the barrier to price adjustment is the cost of printing and posting a new price. In addition, the size of price changes varies tremendously, and small price changes are as likely as large changes to be followed quickly by an additional change. Finally, the frequency of price changes is low: on average, the price of a good is changed only after inflation has eroded the real price by about 10 percent. Only an extremely large cost of price adjustment, or an extremely small cost of failing to charge the price that would be optimal in the absence of adjustment costs, can reconcile this finding with a “menu cost” view. Other studies of the microeconomics of price adjustment report similar findings (Carlton, 1986; Cecchetti, 1986).

Akerlof and Yellen describe the barrier to nominal adjustment as “near rationality.” That is, they suggest that firms simply forego small amounts of profits. But many pricing policies—in fact infinitely many—involve small amounts of lost profits. The issue is why, out of all those policies, firms choose ones that involve considerable nominal rigidity; as Akerlof and Yellen note, the observation that nominal rigidity has only small costs does not help in answering that question. Nonetheless, the suggestion that the friction may take the form of “near rationality” is important: it suggests that the barriers to nominal flexibility need not be purely technological.

What currently appears to be the most promising route starts from McCallum’s (1986) observation that, because goods and labor are usually traded for dollars, not other goods, it is computationally easier to post prices and wages in units of money. In other words, it is natural to use the medium of

exchange as the unit of account. Thus prices are posted in nominal rather than real terms. Menu costs—the physical costs of changing prices—then cause prices not to be adjusted continuously. Computational simplicity and menu costs, by themselves, are unlikely to generate substantial nominal rigidity. But they may have the effect of keeping nominal prices unchanged to *become* equivalent to “doing nothing,” and thereby generate considerable rigidity.

In particular, if prices are normally left fixed, adjusting a price to account for aggregate demand movements (either through price changes or through adoption of some type of indexing mechanism) requires a conscious decision on the part of the price-setter. The barriers to full price flexibility then include not just computation and menu costs, but also the need for price-setters to realize the benefits of adjusting their prices in response to demand shifts. In addition, if most firms adjust their prices only infrequently, the costs to a single firm of adopting a different pricing policy include not just the direct costs but also the costs of explaining to customers what the pricing policy is and how it operates. (Imagine, for example, L. L. Bean including in its catalogs a notice that all prices are indexed to the Consumer Price Index, or automatically increased by a hundredth of a percent per day.) Finally, if prices are posted and wages are paid in dollars and not continually adjusted, individuals may come to attach significance to dollar prices and wages—an unchanged nominal price or wage may come to be viewed as the norm.

The end result is likely to be that costs which in a frictionless world would be associated with changes in real prices—costs of collecting and processing information and reaching a decision, negotiation costs, costs of offending customers and employees who prefer stable prices and wages, and so on—become attached, in part, to changes in nominal prices. Nominal rigidity may therefore be both stronger and more complicated than it would be if computation and menu costs alone were the only frictions.

This analysis suggests that the rate of inflation is an important determinant of the strength of the frictions in price adjustment. If inflation is high, nominal prices are adjusted often, price-setters learn that it is important to adjust their prices to aggregate price level movements, and individuals come to attach no great importance to nominal prices and wages. Theories of price rigidity arising from small nominal frictions therefore predict that the real effects of a given nominal shock are smaller in settings with higher prevailing inflation. This prediction differs from the predictions of competing theories. In traditional Keynesian theories, the degree of nominal rigidity is exogenous; in the Lucas imperfect information theory (Lucas, 1973), the degree of nominal rigidity is determined by the variances of firm-specific and aggregate demand shocks and does not depend on the level of inflation. Ball, Mankiw, and Romer (1988) examine the real effects of aggregate demand movements both across countries and within countries across time periods; they find that, as new Keynesian theories predict, the real effects of demand shifts are smaller in more inflationary environments.

## Directions of Research

The new classical argument that the assumption of nominal rigidity in Keynesian macroeconomics was theoretically incoherent—not just that it lacked microeconomic foundations, but that it was inconsistent with any defensible microeconomic assumptions—has been refuted. At this point, the relevant question is no longer whether such foundations can be provided, but whether models built on those foundations correctly describe reality. Research directed to answering this question is proceeding along three fronts.

A first area of research involves the frictions themselves. As the previous section suggests, there have been only a few studies of price adjustment at the level of individual firms, and their results are puzzling. Moreover, the firms and goods studied are idiosyncratic, and we do not know whether studies of other firms would yield similar findings. In short, economists do not have a good understanding of the price adjustment policies of firms, or even of the considerations that underlie their choices of policies.

The exact nature of the microeconomic frictions in price adjustment is likely to have important implications for nominal rigidity at the macroeconomic level. Caplin and Spulber (1987) present an example in which microeconomic costs of price adjustment do not lead to *any* nominal rigidity in the aggregate. Their key assumptions are that all price changes are increases and that any given firm raises its price whenever aggregate demand has increased by a fixed amount since its previous price increase. They demonstrate that with these assumptions, it is possible for the fraction of firms making price adjustments at any time to vary with the size of nominal shocks in just the way needed to cause the shocks to leave overall real output unchanged.

Other assumptions about the microeconomic features of the frictions, however, have very different implications for macroeconomic behavior. For example, firms' adjustment policies may contain an important element of fixed timing; that is, to some extent a given firm may change its price after a fixed length of time has passed, rather than after aggregate demand has changed by a fixed amount. If such pricing policies are coupled with considerable real rigidity, nominal disturbances will have real effects that are not only large but also long-lasting. In this case, the fraction of firms changing prices responds little to a shock, and the real rigidities cause the firms that do adjust to make only small price changes (for example, Blanchard, 1983). Given how critically the macroeconomic consequences of nominal shocks hinge on the specifics of firms' price adjustment policies, studies of the barriers to price adjustment are clearly a pressing subject for research.

The second area of research is real rigidities. The existence of factors that cause firms to desire only small changes in their relative prices in response to demand-driven movements in aggregate output is necessary if demand shocks are to have substantial real effects, rather than effects primarily on prices; those real rigidities most likely must include reasons for large movements in



employment and hours to be accompanied by only small changes in real wages. Efficiency wages, thick market externalities, capital market imperfections, the cyclical behavior of demand elasticities, and a variety of other potential sources of real rigidity are active subjects of theoretical and empirical research.

Studying microeconomic phenomena like frictions and real rigidities, however, is unlikely to be enough. If we study microeconomic phenomena without attention to the macroeconomic phenomena we are trying to understand, we may reasonably conclude that the small frictions in nominal adjustment are unimportant. But when we turn to the macroeconomy, we will then be puzzled by the large real effects of aggregate demand shocks. Understanding how microeconomic properties of the economy give rise to observed macroeconomic phenomena is a realistic goal. But uniting microeconomics and macroeconomics may not be: the simplifications that are useful in understanding most microeconomic phenomena may be fatal to efforts to understand macroeconomic fluctuations.

Therefore, a third avenue of research, perhaps the most obvious and fundamental, is to examine the macroeconomic evidence concerning the effects of monetary and other aggregate demand disturbances. Studies of whether aggregate demand movements are central to real fluctuations have long been a major focus of macroeconomic research. Given their difficulty and the importance of the issue they address, they will surely remain so.

## Conclusion

Schools of thought concerning macroeconomic fluctuations can be usefully classified according to their answers to two questions. The first is whether the classical dichotomy fails; the second is whether the economy possesses non-Walrasian features that are important to fluctuations beyond assumptions of failure of the classical dichotomy. The resulting two-by-two classification is shown in Figure 3.

Virtually all of macroeconomics as of the middle of the 1970s fits into the lower left-hand box of the diagram. In Keynesian and monetarist theories, in disequilibrium models, and even in Lucas's imperfect information theory, the only important departure from Walrasian assumptions is the presence of some imperfection—generally either sluggish adjustment of nominal prices or wages, or imperfect information about real and nominal disturbances—that causes nominal disturbances to have real effects.

The remaining three boxes of the diagram show the three major current schools of thought concerning economic fluctuations. All three schools disagree with the unchallenged view of 15 years ago concerning the answer to at least one of the two questions considered in the diagram. Real business cycle theories—which are based on the premises that the economy is essentially Walrasian and that the classical dichotomy holds—are shown in the upper left-hand

Figure 3

**Schools of Macroeconomic Thought**

|                                    |     | Does the economy have important non-Walrasian features?                           |                               |
|------------------------------------|-----|---|-------------------------------|
|                                    |     | No  | Yes                           |
| Does the classical dichotomy fail? | No  | Real Business Cycle Theories  | Coordination Failure Theories |
|                                    | Yes | Traditional Keynesian and Monetarist Theories; Lucas Imperfect Information Theory | New Keynesian Theories        |

corner of the diagram. What I call “coordination failure” models are at the upper right. I include in this school both multiple equilibrium models—for example, Diamond’s model of thick market externalities—and models in which real imperfections are central to fluctuations but there is a unique equilibrium. This school assigns a central role to non-Walrasian characteristics of the economy, but none to nominal disturbances. Finally, the models that have been the main subject of this paper, which rest on the belief that both failure of the classical dichotomy and non-Walrasian elements of the economy are essential to the business cycle, are in the lower right-hand box of the diagram.

Of the three active areas of work shown in Figure 3, only new Keynesian models provide an explanation of the importance of nominal disturbances to the real economy; and, as I suggested at the outset, they also provide the most plausible explanation of why other aggregate demand shocks matter. Thus, unless new empirical work overturns the widely shared view of the importance of monetary and other aggregate demand shocks, the analysis described in this

paper will be a necessary part of any complete model of macroeconomic fluctuations.

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