

**Aggregate Demand and Micro Behavior:
A New Perspective on Keynesian Macroeconomics**

by

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Abstract

We analyze the microfoundations for Keynesian aggregate demand effects by considering the link between aggregate demand and firm production decisions under monopolistic competition. Macroeconomic equilibrium is characterized in a simple graphical framework that facilitates comparison of several major approaches to modeling Keynesian microfoundations, including equilibrium theories, “new Keynesian” sticky price models, and more traditional sticky wage approaches. We use this framework to develop an original perspective on aggregate demand effects according to which aggregate demand shocks directly affect the demand conditions and production choices of individual firms. The results require neither nominal rigidity nor expectation errors. Nominal disinflation is ineffective in offsetting the real effects of demand shocks if aggregate demand is insensitive to nominal prices.

1 Introduction

The defining feature of Keynesian economics is that fluctuations in aggregate demand directly affect aggregate employment and output in the short run. The impact of aggregate demand need not operate through changes in the capital stock or labor supply, for example. This feature transcends debates over the importance of money, nominal wage or price rigidity, the multiplier, Say's Law, etc., all of which have been studied in recent years as possible microfoundations for Keynesian aggregate demand effects. Most of this work has attempted to explain why some nominal variables are sticky at the micro level, for then demand shocks affect real output because they distort the price system.¹

We take a different approach in this paper. We look at the *direct* effect of aggregate demand changes on the sales expectations and production decisions of individual firms. Our thesis is that the best way to understand the macroeconomic implications of aggregate demand is to study how changes in aggregate spending directly alter the environment faced by agents who make production and employment decisions. Simply put, we believe that a reduction in aggregate demand reduces output because firms cannot sell as much as they did before, and they therefore cut production to serve their own interests. This direct transmission mechanism linking aggregate demand to firm demand and production decisions does not necessarily require nominal rigidity, although a central question is whether the macroeconomic impact of falling prices on aggregate demand can mitigate the impact of negative demand shocks on microeconomic employment and production decisions.

¹Alternatively, this view can be characterized as emphasizing the inefficiency of short-run price adjustment at offsetting the impact of demand shocks. For recent surveys that address these issues see Blanchard (1990), Gordon (1990), Zarnowitz (1989), and the essays edited by Mankiw and Romer (1991).

Our main contribution is to link two ideas that have been analyzed separately in recent research on Keynesian macroeconomics: imperfect competition and the ineffectiveness of nominal deflation in stimulating aggregate demand. First, we do not assume perfectly competitive firm behavior, because it is inconsistent with microeconomic demand constraints. In a framework of monopolistic competition, we assume that changes in aggregate spending directly affect the demand conditions of individual firms. This feature is common to most of the literature that ties macroeconomics to imperfect competition (see, for example, Blanchard and Kiyotaki, 1987). Firms set prices optimally at every point in time, given marginal cost, but unemployment will exist if aggregate demand is too low. Unemployment may result in wage deflation, leading firms to reduce prices, but lower prices will restore full employment only if they stimulate aggregate demand. This is where the second idea enters: it is not at all clear that nominal deflation, no matter how fast and deep, is capable of curing the problem of insufficient aggregate demand. This point distinguishes our approach most sharply from other work on imperfect competition and macroeconomics. Our approach is very close to the arguments put forward by Keynes himself (although he assumed perfect competition).

In addition to its substantive contribution, our framework permits comparison among several major approaches to modeling Keynesian microfoundations, including equilibrium models with imperfect competition, “new Keynesian” menu cost and sticky output price models, and more traditional Keynesian models with sticky nominal wages. The framework extracts the macroeconomic essence of these approaches by cutting through technical details.

We review the microeconomic foundations of production conditions under monopolis-

tic competition in section 2 and introduce a diagram that characterizes macroeconomic general equilibrium in section 3. In section 4, we interpret recent contributions to Keynesian macroeconomics in our diagrammatic framework, devoting particular attention to the predicted cyclical variability of real wages and how the predictions fare empirically.

Our main results appear in section 5, where we present our preferred version of the model “in the spirit of Keynes.” We show how aggregate demand shocks directly affect firms’ output and employment decisions in a way consistent with profit maximization. The results require neither nominal rigidity nor expectation errors. We discuss the central relevance of theoretical and empirical evidence showing that nominal deflation (or disinflation) need not restore aggregate demand to full employment levels. Since our explanation for Keynesian aggregate demand effects does not rely on subtle structural or behavioral assumptions, we believe that it offers a more general foundation for Keynesian results than can be found in the modern microfoundations literature. Our approach is complementary to other ideas in the literature, however, and it does not deny their empirical relevance in certain environments.

Section 6 summarizes and interprets the paper, identifying several analytical benefits of building Keynesian macroeconomics on imperfectly competitive microfoundations. Future research directions are also considered.

2 Production under Monopolistic Competition

We study the direct link between aggregate demand and the demand conditions facing individual firms as has been done in the monopolistically competitive systems widely used in macroeconomic work on imperfect competition. Layard, Nickell, and Jackman (1991, p.

363) succinctly summarize the advantages of this approach:

The key feature of the economy that is captured by the type of imperfectly competitive model we propose is that demand presents itself directly to firms rather than being mediated by an exogenously given price, as under perfect competition.

Is the assumption that firms operate in a monopolistically competitive environment a sufficiently general description of modern economies to provide the foundation for the production side of a macroeconomic model? The widespread existence of imperfect competition is clear empirically.² We feel there is little danger in ignoring the few perfectly competitive industries for the purposes of this paper. A possibly more problematic concern is the neglect of strategic oligopoly issues in the assumption that all firms operate in a simple monopolistically competitive environment. The approach can be easily generalized by including static (subjective) conjectural variations in the firm's perceived elasticity of its own demand, but this approach may not adequately capture dynamic aspects of strategic oligopoly interactions.³ Some of the literature discussed below introduces more complex aspects of oligopoly behavior without changing our central macroeconomic conclusions. It is difficult to specify a macroeconomic model that accommodates a general theory of oligopoly behavior because, as Schmalensee (1988, p. 660) makes clear, no such unified oligopoly theory exists.

²Papers that find imperfect competition and emphasize the macroeconomic implications of this result include Hall (1986), Domowitz, Hubbard, and Petersen (1986), and Chirinko and Fazzari (1994).

³See the discussion in Geroski (1988). On the nature of perceived demand, see Negishi (1961, 1987).

Specifically, we assume that the firm's demand curve can be represented as

$$D_j = D_j(P_j/P, AD), \quad j = 1, \dots, M, \quad (1)$$

where D_j is the quantity demanded from firm j , P_j is the price set by firm j , P is the aggregate price level, M is the number of firms in the economy, and AD is real aggregate demand, which is assumed exogenous to the individual firm's price and quantity decisions.⁴ Real aggregate demand is the sum of nominal firm demands deflated by the aggregate price level; it acts as a shift parameter for firm demand curves. The link between AD and firm demand is the key mechanism that transmits fluctuations in aggregate spending to the production and employment decisions of individual firms.⁵ Prices of other firms affect the demand of a representative firm j through the aggregate price level $P = g(P_1, P_2, \dots, P_M)$. The function g is homogeneous of degree one in individual firm prices, has nonnegative partial derivatives, and has the averaging property that $g(x, x, \dots, x) = x$ for any common value for firm prices x . Blanchard and Kiyotaki (1987) present a specific function that satisfies these conditions for a model derived from first principles.

To focus most clearly on the key issues we make a number of simplifying assumptions. First, we assume that firms behave as Nash competitors, taking the prices of other firms as given. We can therefore analyze the firm's choice of its own price without specifying the feedback on the aggregate price level.⁶ Second, we assume, like most of the literature,

⁴Blanchard and Kiyotaki (1987), following Dixit and Stiglitz (1977), demonstrate how such a demand system may arise from individual preferences.

⁵By assuming that firm demand is based on actual rather than expected values of aggregate demand and the aggregate price level, we examine "rational expectations" equilibria. In practice, the dynamics of expectation adjustment are probably important, but our results do not depend on expectation errors. Layard, Nickell, and Jackman (1991, chapter 8) analyze a model with such errors.

⁶Hart (1982) and Frank (1990) take quantity as given as in a Cournot model. Roberts (1987) lets both prices and quantities change in a game theoretic context.

that the firm takes the aggregate price level as exogenous to its own decisions, even though an individual's decision to change price will affect the price index. With a large number of firms any inconsistency introduced by this assumption should be small. Third, the firm produces output Y_j with labor input N_j which costs w per unit (w is the same for all firms). From the production function f_j , we have $Y_j = f_j(N_j)$.

Under these conditions, firms choose P_j^* and Y_j^* to maximize profits. The first-order condition for maximization implies that

$$w/P_j^* = f_j'(N_j^*)(1 - e_j), \quad (2)$$

where e_j is the firm's conjectural inverse elasticity of demand (e_j equals zero under perfect competition). Price and output also satisfy the demand constraint $Y_j^* = D_j(P_j^*/P^*, AD)$, where P^* is the aggregate price level evaluated at optimal firm prices.

At the aggregate level, the equilibrium between nominal aggregate supply and demand follows from the equality of demand and supply for each firm:

$$\sum P_j^* Y_j^* = \sum P_j^* D_j(P_j^*/P^*, AD), \quad (3)$$

Define real aggregate demand and real aggregate output (Y) as

$$\begin{aligned} AD &= \left(\sum P_j^* D_j \right) / P^* \\ Y &= \left(\sum P_j^* Y_j^* \right) / P^*. \end{aligned}$$

We may think of output as measured in market baskets of goods corresponding to the weights implicit in the aggregator function g . The units of the aggregate price level P^* are dollars per unit of output.

The contribution of the j th firm to aggregate output is

$$(P_j^* Y_j^*)/P^* = (P_j^*/P^*)f_j(N_j^*).$$

Although we do not believe it is essential to our main results, we assume that the technology is common to all firms in the sense that each firm makes the same contribution to Y for a given labor input. Define this common technology as $f(\cdot)$. Then $Y = \sum f(N_j^*)$. We impose similar symmetry restrictions on the structure of final demand. All firms face the same conjectural elasticity of demand and, at a relative price of one, demand is equally divided among the M goods produced by the economy. In general macroeconomic equilibrium, therefore, all firms charge the same price, relative prices are unity, and all firms purchase the same amount of labor.⁷ Under these assumptions, aggregate output can be expressed as a function of aggregate employment N^* :

$$Y = F(N^*). \tag{4}$$

This symmetry allows us to discuss the real wage for the economy as a whole and therefore to compare our results with others in the macroeconomics literature, where this symmetry assumption is almost universally invoked. From equation (2) and symmetry we have:

$$\begin{aligned} w &= P_j^* f_j'(N_j^*)(1 - e_j) \\ w/P^* &= (P_j^*/P^*)f_j'(N_j^*)(1 - e_j) \\ w/P^* &= f'(N^*/M)(1 - e). \end{aligned} \tag{5}$$

⁷Again, see Blanchard and Kiyotaki (1987) for a model that satisfies these restrictions. We take seriously the criticism of representative agent models (see Kirman, 1992, for example). The key issue, however, for a theoretical treatment is whether the central results depend in an important way on symmetry. We believe that the implications presented below will generalize to a more realistic environment that recognizes firm heterogeneity, but the first step is to link our ideas to the existing literature.

3 Macroeconomic Equilibrium

We now examine the macroeconomic equilibrium links between output, employment, aggregate demand, and the real wage in a simple graphical framework. In the upper right quadrant of figure 1, we graph equation (5) (added horizontally across firms) as the FM curve in real wage-employment space. It is the locus of employment and real wage combinations that satisfy the optimal pricing condition. The negative slope of FM follows from $f' < 0$. It is important to recognize that FM does not by itself determine labor demand; it is just the marginal product of labor multiplied by one minus the inverse elasticity of demand. In perfect competition ($e = 0$), FM would be the marginal product of labor, which is the standard competitive labor demand curve. But under perfect competition, firms perceive no limit on demand for their products. Their production depends only on technology and the exogenously given real wage.⁸ Under imperfect competition, however, the firm's markup, and therefore the real wage, is endogenous. The FM curve in that case does not provide all the information necessary to determine labor demand. To identify the point on the curve at which firms choose to operate we must analyze the markets for their output. In other words, what we might call "effective" labor demand in this framework is not a schedule in real wage-employment space but a point on the FM locus. This point is the result of the optimal choice of the level of employment and price (given money wages) to maximize profits, subject to the constraint that a firm's supply equals its demand.

With our symmetry assumptions and equilibrium relative prices of unity, the equality of

⁸In Patinkin (1965) and Barro and Grossman (1976), aggregate demand is assumed to impose a limit on labor demand while still assuming perfect competition. The limit on labor demand, however, has no microfoundation in this literature. It must be imposed by an arbitrary rationing scheme on firms that otherwise act as if they can sell all they want at the prevailing price level.

aggregate demand and aggregate supply is sufficient to assure that demand equals supply in each market. Aggregate demand is graphed as a function of price in the third quadrant of figure 1. For the moment we make the conventional assumption that AD is a negative function of price, although this assumption will be criticized later. The aggregate production function (equation 4) is graphed in the fourth quadrant of figure 1. For any price level (such as P_0), aggregate demand determines aggregate output and employment. The price level is endogenous, however; it must be consistent with optimal firm behavior as summarized by the FM curve. To show this relationship graphically we link the real wage in quadrant one to the price level in quadrant three at a given money wage w_0 with the w_0/P curve graphed in the second quadrant. The four quadrants of the graph show the general equilibrium values of the endogenous variables: the price level, the real wage, output, and employment.⁹

4 Varieties of Macroeconomics

With the framework summarized by figure 1 in place, we now contrast several major approaches to explaining fluctuations of aggregate output and employment due to changes in aggregate demand (the source of which we do not explain here). We first discuss equilibrium models and then consider disequilibrium models based on both nominal price and nominal wage rigidity. In the next section we present our preferred model.

⁹We assume here that aggregate demand is independent of the real wage. That is, aggregate demand does not depend on the distribution of income. A link between aggregate demand and distribution is central to some macroeconomic theories, particularly that of Kalecki (see Mott, 1992, for discussion and references). We believe that our model could be generalized to allow an endogenous connection between real wages and aggregate demand without changing our main conclusions.

4.1 Equilibrium Approaches

To study equilibrium models of aggregate fluctuations in the model, we must specify the supply of labor, which is graphed along with the FM curve in figure 2. The NS relation can be interpreted as a conventional neoclassical supply of labor curve. It could also be the outcome of a more complex model of real wage setting behavior in a non-competitive labor market (as in Blanchard and Kiyotaki, 1987, or Lindbeck, 1992), in which case competitive labor supply would lie to the right of NS. This issue is not central to our discussion.

On the assumption of flexible wages and prices, consider the conventional solution to the potential Keynesian problem of insufficient aggregate demand (at points labeled *A* in figure 2). The excess supply of labor, evident in quadrant 1, puts downward pressure on nominal wages, shifting the w/P curve in quadrant 2 inward. With lower nominal wages, firms reduce prices to maintain the optimal markup. Lower prices increase aggregate demand through real balance effects, causing movement along the aggregate demand curve in quadrant 3. Monopolistically competitive firms see an increase in their individual demand and further adjust price, output, and employment to maximize profits. This adjustment continues until the economy reaches a full employment general equilibrium (points *B* in figure 2).¹⁰ If this adjustment process happens quickly, the most interesting macroeconomic questions are answered by looking only at the right-hand side of figure 2. Employment and output are completely determined by the technology and preference relationships summarized by the curves in quadrants 1 and 4. Aggregate demand is irrelevant for all but nominal variables.

¹⁰If the NS curve arises from non-neoclassical behavior in the labor market, such as the insider-outsider model surveyed by Lindbeck (1992), an equilibrium such as point *B* may involve involuntary unemployment, but for the classical reason that special bargaining conditions in the labor market keep the real wage above the classical market-clearing level.

Say's Law holds because price adjustment automatically and quickly offsets any potential aggregate demand constraints. The model does not exhibit Keynesian features.¹¹

How can such conclusions be reconciled with the widely held belief that aggregate demand fluctuations affect output? One possibility is that models that predict the economy operates at an equilibrium models independent of aggregate demand are too simplistic (and therefore must be modified by adding, for example, nominal rigidity); a second is that Keynesian economics is fundamentally misguided because aggregate demand plays no essential role in macroeconomic fluctuations. Models of the "real business cycle" variety, of course, reach the latter conclusion. But other approaches explain why aggregate demand considerations may be important even while maintaining full equilibrium assumptions.

One of these approaches assumes that shocks to aggregate demand affect the FM curve. Under perfect competition such effects are excluded because the FM curve is completely determined by technology. But with imperfect competition, aggregate demand could matter for the level of employment by causing movements in the conjectural inverse elasticity of demand. Suppose, for example, that a reduction of aggregate demand causes an increase in the inverse elasticity e ; that is, falling demand causes firms to behave less competitively. In that case, negative demand shocks would push the FM locus down, the equilibrium given by point B in figure 2 would move down and to the left, and output and employment would fall. This aggregate demand effect is indirect: the change in output is not directly the result of lower demand. Rather, lower aggregate demand changes optimal markup behavior, lowers real wages, and reduces employment and output by pushing the system down the NS curve.

¹¹Models of this kind lead Blanchard and Kiyotaki (1987) to conclude that monopolistic competition on its own cannot be responsible for Keynesian macroeconomic results. Similar conclusions are drawn by Weitzman (1985).

Whether or not such aggregate demand effects are “Keynesian” may be an interesting question for the history of macroeconomic thought, but the question is tangential to understanding why aggregate demand matters for real macro activity. The difficulty with this approach is to justify the assumed countercyclical movement of the conjectural inverse demand elasticity both theoretically and empirically. Rotemberg and Woodford (1991, p. 74) point out that the demand elasticity *might* change over the business cycle if preferences are non-homothetic, but they write that “[t]here is little *a priori* reason to expect either direction of deviation from homotheticity, so that markups seem as likely to rise with increased sales as to fall.”

To shore up the microfoundations for this kind of theory, Rotemberg and Woodford (1992) construct a model in which changing expectations of future profits generate countercyclical movement in markups. Their approach illustrates how real business cycle ideas and imperfect competition work together to provide an explanation for demand-induced economic fluctuations. Suppose that a reduction of real aggregate demand causes real interest rates to decline and labor supply to fall through an intertemporal substitution channel. This effect alone will cause output and employment to change in an equilibrium model (from *A* to *B* in figure 3). There are at least two problems with this explanation for the correlation of output and real aggregate demand. First, if the intertemporal elasticity of labor supply is very small, the movement from *A* to *B* cannot explain substantial cyclical fluctuations in employment. Second, between *A* and *B* the real wage moves countercyclically, contrary to the results of most empirical studies.

To address both of these problems, Rotemberg and Woodford (1992) propose endogenous

countercyclical movement of the markup. This movement arises from competitors' strategic interest in maintaining implicit collusion. In a slump, current profits are low relative to expected future profits. The incentive for individual firms to cheat on the implicit collusion therefore falls: the gain from cheating is higher current profits, which are low in a downturn, while the penalty from cheating is the loss of future monopoly profits, which are high relative to current profits in a recession. Equilibrium markups, therefore, can rise in a slump without inducing individual firms to cheat on an implicit collusion agreement. This change shifts the FM curve inward when output and employment fall, leading to an equilibrium like the one indicated by points *C* in figure 3. The markup shift magnifies the output and employment changes beyond what can be explained by intertemporal substitution. If the FM curve shifts enough, the model also predicts procyclical movements of real wages (*A* to *C* in the first quadrant of figure 3). A symmetric analysis explains a boom in output and employment induced by positive aggregate demand shifts.

In contrast to the implicit collusion model, however, one can imagine circumstances in which markups move procyclically. Suppose that competitive pressures rise in a downturn when markets are tight and customers' search efforts increase, making conjectural demand curves flatter.¹² In this case, movements of the FM curve dampen fluctuations generated by intertemporal substitution effects, and the equilibrium model would have an even more difficult time explaining interesting macroeconomic fluctuations. Whether the strength and direction of markup movements are important influences on macro fluctuations is an em-

¹²Steindl (1950) identifies another barrier to countercyclical markups in mature economies. Mott (1992, pp. 119-120) summarizes the argument: "price competition ... is only useful where it is possible to drive out marginal producers. ... Mark-ups become downwardly inflexible because firms with large amounts of fixed capital will be able to fight too strongly in a price war to make it worth anyone's while to engage in such a strategy."

pirical question. Bilal (1987) and Rotemberg and Woodford (1991) find evidence of countercyclical markups. Others (see Domowitz, Hubbard, and Petersen, 1986, and Chirinko and Fazzari, 1994, for example) find acyclical or procyclical markups. Countercyclical markups may be important for some industries, but Lindbeck (1992, p. 224) concludes that “the generality, quantitative importance, and permanence of [markup variations] may be somewhat doubtful” as general explanations for macroeconomic output and employment movements.

4.2 Menu Costs and Nominal Price Rigidity

At least since the work of Modigliani (1944), the Keynesian theory of the effects of aggregate demand on output has been widely viewed as equivalent to the theory of nominal rigidity. Most “new Keynesian” models of imperfect competition have therefore focused on the microfoundations and macro implications of sticky prices. Sticky prices are incorporated in our framework by allowing the economy to operate off the FM curve if firms do not continuously set prices consistent with the markup behavior summarized by equation (5). The effect of a negative demand shock in a model with rigid prices is shown in figure 4. Lower AD reduces output, employment, and the real wage.¹³

The challenge for sticky price models is to explain why it is optimal for firms to keep prices constant when their demand falls. Mankiw (1985) and Blanchard and Kiyotaki (1987) justify such behavior by assuming that firms face fixed menu costs of adjusting nominal prices. If aggregate demand falls, the cost of adjusting prices may be greater than the gain from adjustment. For a range of demand shocks it is therefore optimal for firms to allow

¹³The money wage need not fall all the way to point *B* in the first and second quadrants of figure 4. If it does not, some involuntary unemployment will exist. We address nominal wage rigidity in the next subsection.

the markup to deviate from the FM curve. The standard nominal deflation process that restores aggregate demand to the classical benchmark (point *A* in figure 4) does not operate unless the shock is of sufficient size to induce firms to incur the costs of price adjustment. The key question for the relevance of such models is the range of demand shocks that can occur without price adjustment. Because of imperfect competition, Mankiw (1985) and Blanchard and Kiyotaki (1987) argue that even small menu costs of price adjustment could lead to large output fluctuations. Ball, Mankiw, and Romer (1988) offer empirical support for the implications of the menu-cost model.

Woodford (1991) pursues a different approach, but one that is logically linked to the menu-cost literature. He assumes that the optimal markup is not unique as a function of employment (as we have assumed in constructing the FM locus). Rather, optimal markups lie in an interval for any given level of output because firms face “kinked” demand curves and marginal revenue is discontinuous. Woodford assumes that prices remain rigid as long as demand shocks do not push markups outside the optimal range. Demand changes can result in real output and employment fluctuations of the kind depicted in figure 4. The question again arises, however, whether kinked demand curves are sufficiently widespread to provide a general explanation of Keynesian macro effects. Indeed, as Woodford (1991, p. 79) states, the key test is to cross check the assumptions of the model against micro studies of firm behavior. To our knowledge, no such studies have been undertaken.

In summary, it is clear that price stickiness can explain Keynesian effects of aggregate demand shocks. Recent work has shored up microeconomic explanations for why prices might be sticky, relying especially on imperfect competition to show that small price adjust-

ment costs might result in large demand-induced fluctuations in output (see, for example, Mankiw, 1985 and Blanchard and Kiyotaki, 1987). Empirical evidence on price adjustment, however, has been criticized as inconsistent with menu-cost models and a number of theoretical objections have been raised to this approach, even among economists who view Keynesian macroeconomics favorably.¹⁴ We now consider alternative microfoundations for Keynesian macroeconomic results.

4.3 Wage Contracts and Nominal Rigidity

In contrast to the new Keynesian emphasis on price stickiness, much of the earlier mainstream Keynesian literature was based on the rigidity of nominal wages. This approach seemed consistent with the analytical assumption of a fixed nominal wage unit adopted by Keynes (but only through chapter 18 of the *General Theory*). It can be analyzed in our framework as follows. Suppose aggregate demand falls and nominal wages are sticky. If firms continue to set prices optimally, the economy will move to an equilibrium like the one depicted by *B* in figure 5. Optimal markup behavior keeps the economy on the FM locus, but rigid nominal wages force the system off the labor supply curve. The result is involuntary unemployment, which is almost always presented as a short-run state. Unemployment will eventually put downward pressure on money wages and optimal markup behavior will then induce firms to cut nominal prices. In the standard framework, lower nominal prices stimulate aggregate demand (a strong assumption to which we return in the next section), and the economy returns, in the long run, to points *C* in figure 5. Demand shocks have

¹⁴Gordon (1990, pp. 1146-1147) provides an excellent survey of problems with menu-cost models and gives references to other literature. We compelling find Gordon's point that firms' costs of output adjustment are likely to be at least as large as the costs of price adjustment

real effects in short-run disequilibrium states when nominal wages are sticky, but not in a long-run flexible wage equilibrium.

There are at least two reasons why such models are not much discussed in the recent literature. First, there is a widespread view that sticky nominal wages lack adequate microfoundations (some of the arguments are summarized by Romer, 1993). Most attempts to explain wage rigidity (implicit risk-sharing contracts and efficiency wage theory without nominal adjustment costs, for example) lead to real, not nominal, rigidity. Rigid real wages may cause unemployment, but the existence of rigid real wages alone does not explain why aggregate demand shocks have real effects on output and employment. There are less formal microfoundations for sticky nominal wages, such as the relative wage model of Taylor (1980), which has been recently emphasized by Tobin (1993). Sticky nominal wages can also arise from such misperception models as that of Friedman (1968) and those developed in the new classical macroeconomics. Although the literature has not reached a consensus on the reasons for sticky nominal wages, sticky wage microfoundations appear at least as strong as those for sticky prices emphasized by the new Keynesian research.¹⁵

The second reason why these models were largely abandoned over the last decade is that sticky wage models based on perfectly competitive microfoundations imply countercyclical real wages (as Keynes assumed in the *General Theory*). The empirical failure of this prediction led to the rejection of old Keynesian wage contract models and contributed to the downfall of the new classical “nominal misperception” approach. Real business cycle models claimed empirical support from studies that found procyclical real wages. In a competi-

¹⁵Gordon (1991) reaches similar conclusions. Explicit wage contracts without “COLAs” exist (consider academic salaries), but these contracts themselves require explanation. Akerlof and Yellen (1985) use “new Keynesian” efficiency wage ideas to motivate nominal wage stickiness.

tive framework, this requires that employment fluctuations arise from shifts of the demand for labor curve (technology shocks) rather than from movements along the labor demand curve due to sticky nominal wages. New Keynesians took up this challenge by searching for models that allowed important aggregate demand effects on real output without requiring countercyclical real wages, leading them to emphasize price rather than wage stickiness (see figure 4).

If one accepts imperfectly competitive microfoundations for production and employment decisions, however, countercyclical real wage movement need not arise from sticky wage models of aggregate demand fluctuations. If the marginal product of labor and the markup are constants, then the FM locus in figure 5 would be horizontal. A negative aggregate demand shift would cause output and employment to fall even though firms' optimal pricing policies would allow no change in the real wage.¹⁶

The imperfectly competitive model can even accommodate some degree of declining marginal costs (as long as they fall more slowly than marginal revenue), suggesting that the FM locus could be upward sloping and demand shocks would cause procyclical real wages.¹⁷ Similar real wage patterns could result from a systematic fluctuation in the conjectural elasticity of demand or the implicit collusion model. One of the strongest empirical criticisms of standard Keynesian business cycle theory—the absence of countercyclical real wages—is

¹⁶Note that our assumption of theoretical price flexibility need not conflict with findings of substantial empirical price rigidity as in Carlton (1986). If the markup and the marginal productivity of labor are constant, nominal prices remain rigid when there are demand shocks because of nominal wage rigidity. In these circumstances, firms are free to adjust prices, but they optimally choose not to.

¹⁷Weitzman (1982) argues that some degree of increasing returns is essential to explaining involuntary unemployment. Chirinko and Fazzari (1994) find that returns to scale vary from approximately constant to strongly increasing across eleven manufacturing industries. Ramey (1991) even finds evidence of decreasing *marginal costs*.

thus vitiated in a macro model with microfoundations in monopolistic competition (also see Ball, Mankiw, and Romer, 1988, pp. 13-16). We conclude that the implications of sticky nominal wages continue to merit attention in macroeconomic research.

5 A Model in the Spirit of Keynes

All the mechanisms linking aggregate demand to production and employment that we have thus far discussed undoubtedly have some empirical support. Some industries at some times have surely experienced a reduction in competitive pressures during a slump, and adjustment costs have no doubt prevented some firms from lowering prices in a recession. We are not satisfied, however, that these mechanisms are sufficiently widespread or of an adequate empirical magnitude to account for the macroeconomic impact of aggregate demand fluctuations. Similar concerns are expressed in some of the literature cited above. In this section we present our main contribution: an explanation for Keynesian aggregate demand effects that we believe is simpler, more general, and more direct than those offered in the literature surveyed above. In many ways our model is similar to the approach of Keynes in the *General Theory*.

Our approach has two main parts. First, we show that imperfectly competitive firms optimally reduce output when faced with lower aggregate demand. Wage and price adjustment at this microeconomic level will not offset these demand effects. Second, we consider the macroeconomic effects of nominal adjustment on aggregate demand through real money balances, interest rates, and the financial system. We conclude that these macroeconomic effects are not likely to restore aggregate demand to a level consistent with full employment.

The combination of these ideas provides an original perspective on Keynesian macroeconomics that explains persistent real effects of aggregate demand fluctuations.

5.1 Production, Demand, and Wages

We begin by assuming that firms set prices, choose production levels, and decide how many workers to hire in a monopolistically competitive environment. The constraints on firms' choices arise from their technology, demand curves, and input costs (nominal wages in our model). Profit maximization under these conditions implies that the price-cost markup is set according to (5) and that firms operate on the FM locus (in contrast to models with sticky prices). If aggregate demand falls, demand curves shift inward, and firms choose to hire fewer workers and produce less output. To make the results consistent with evidence suggesting acyclical behavior of the real wage, we also assume that firm markups and marginal costs are independent of the level of employment, leading to a horizontal FM locus as depicted in the first quadrant of figure 6 (this assumption is not essential for our result). Reduced aggregate demand causes the economy to move from A to B . Because firms continue to operate on the FM curve, their pricing and employment decisions are optimal. (We discuss the horizontal AD curve below.)

The movement from A to B in the first quadrant of figure 6 and the resulting unemployment are similar to the effects of sticky wages, shown in figure 5. What can workers do *directly* about the real wage and the problem of unemployment? The answer is nothing. The unemployed may offer to work for lower nominal wages, and the firms may accept these offers. But if nominal prices are flexible, optimizing firms will cut prices in proportion to any fall in nominal wages, preventing the real wage from declining, as Keynes suggested in

the early chapters of the *General Theory* (also see the recent discussion by Kregel, 1988, and Tobin, 1993). Microeconomic analysis alone cannot explain how the economy might be dislodged from *B* in figure 5, nor can it offer a cure for the involuntary unemployment associated with this point.

5.2 Macroeconomic Effects of Deflation: The Slope of Aggregate Demand

Although falling wages cannot directly increase employment, there may be an *indirect* benefit of nominal wage declines and the corresponding fall in prices if these changes lead to macroeconomic effects that stimulate aggregate demand. This is, of course, the standard assumption in most of the modern literature. But Keynes rejected this assumption in chapter 19 of the *General Theory*, and we believe his reasoning remains valid.

Generalized deflation will solve the problem of unemployment if and only if deflation increases aggregate demand. In the imperfectly competitive model, we have demonstrated that inward shifts in demand curves due to reductions aggregate demand might drive employment below the classical level without any change in the real wage; real wages might even be lower in an unemployment state than at full employment (if *FM* slopes upward). Unemployment occurs because aggregate demand is not high enough, and deflation can solve the problem only if it stimulates aggregate demand. This point is central to understanding Keynesian macroeconomics, but it has not received the attention it deserves, probably because of the nearly universal and mostly unquestioned assumption that aggregate demand curves slope downward in price-output space.¹⁸

¹⁸The results in this subsection can be generalized to apply to disinflation, as well as deflation, for an economy that begins with a positive equilibrium rate of inflation. See Tobin (1975), Caskey and Fazzari (1987), and Delong and Summers (1986).

Virtually all macroeconomic models assume that deflation increases aggregate demand because falling prices with a fixed nominal money stock raise real balances. While Keynes recognized the benefits for demand from higher real money balances, he thought they would be more than offset by static and dynamic effects of falling prices that would depress demand in the aggregate.¹⁹ Perhaps the most important of these perverse effects of deflation in modern economies is the redistribution of wealth and income from debtors to creditors if debt contracts are set in nominal terms. Almost by definition, debtors have higher propensities to spend than creditors. The redistribution of real wealth caused by deflation therefore lowers aggregate demand, as emphasized by Tobin (1975, 1993), and deflation lowers the value of collateral relative to nominal debt commitments.²⁰ The impact of deflation on credit also has a flow dimension. Lower nominal incomes reduce real cash flows relative to real debt service commitments, increasing the possibility of insolvency. These “debt deflation” effects are likely to lead to tighter credit conditions and lower aggregate demand.²¹ By incorporating debt-deflation effects into a conventional IS-LM-Phillips Curve model, Caskey and Fazzari (1987) show that greater price flexibility can reduce output following negative demand shocks can *reduce* output. In addition, as argued by DeLong and Summers (1986), actual deflation leads to anticipated deflation if expectations are “rational”

¹⁹This is not the place to go into a detailed discussion of Keynes’s arguments in chapter 19. Recent literature on this point contains further exposition of Keynes’s original ideas. See, in particular, Kregel (1988), Greenwald and Stiglitz (1993), and Tobin (1993).

²⁰In recognizing the importance of the distinction between debtors and creditors, we are, of course, rejecting the representative agent approach. A completely rigorous treatment would require construction of a general equilibrium model with borrowing and lending in addition to the microfoundations assumed in our simple benchmark model. We do not undertake this formidable task here, emphasizing instead “reduced-form” properties of the link between aggregate demand and the price level.

²¹The term “debt deflation” originated with Irving Fisher (1933). Minsky (1975, 1982) emphasizes the central role of finance in the determination of aggregate demand. Much of the growing theoretical and empirical literature on liquidity constraints and capital market imperfections implies that financial conditions can constrain aggregate demand. See Caskey and Fazzari (1987) for references.

or “adaptive.” In the absence of perfect Fisher effects on interest rates, faster deflation can raise expected real interest rates, dampen expenditure, and prevent the standard stabilizing impact of lower prices on aggregate demand.

Against these destabilizing effects stand the real balance (Pigou) effect and the fall in nominal interest rates caused by higher real money balances (ironically, in the light of chapter 19 of the *General Theory*, often called the “Keynes effect”). How strong are these channels empirically? In spite of the crucial importance of this question for macroeconomics, very little has been done to provide an answer. Caskey and Fazzari (1992) construct a small dynamic macromodel, calibrated to parameters from various empirical studies of the U. S. economy, to explore the role of price flexibility on output. In a model in which all destabilizing sources of falling prices or declining inflation are excluded, they find that output losses due to demand shocks are not much affected by the responsiveness of the inflation rate to the state of output and employment. In particular, the effect of assuming that the inflation rate is completely unresponsive to output and employment gaps compared to assuming that the inflation rate responds as predicted by empirical estimates reduces the cumulative output loss arising from a representative demand shock by only 0.65 percent over the 10 quarters following the shock. This difference results from the Keynes and Pigou effects alone, using parameter values that are favorable to the size of their stabilizing influences. When Caskey and Fazzari (1992) allow only a subset of the destabilizing influences mentioned above to operate at their estimated strength, the destabilizing effects of lower inflation dominate the standard stabilizing channels, and faster inflation responses to output gaps magnify the output loss from demand shocks.

This striking influence of disinflation on aggregate demand does not arise because the destabilizing effects are exceptionally strong empirically. Rather, it is better explained by the very weak empirical basis for the standard stabilizing channels. Of course, the Pigou real wealth effect was never taken very seriously as an important empirical feature of modern economies. The propensity to consume out of real wealth is small, and outside financial assets are a small fraction of aggregate wealth.²² The empirically measured impact of the Keynes effect, however, is also weak. There is no clear evidence that lower real interest rates stimulate consumption at all, which questions the relevance of the Keynes effect for two thirds of aggregate demand. Recent estimates reported in Fazzari (1993) imply that a two hundred basis point decline in real interest rates would raise business fixed investment by only about 0.2 percent of aggregate demand over a five-year horizon. Housing investment may be more interest responsive, but it was less than 4 percent of U. S. aggregate demand in 1992. We also must be concerned with slips in the term structure of interest rates that may prevent reductions in the short-term rates, induced by liquidity effects of real money balances, from translating into changes in the interest rates that matter for long-term investment and housing expenditure.

We conclude that, as a first approximation, the aggregate demand curve in the third quadrant of figure 6 should be horizontal. That is, a change in the nominal price level by itself has no net impact on aggregate spending. This crucial issue requires more research, and results are likely to differ across time periods and countries. But we find no empirical

²²Greenwald and Stiglitz (1993, p. 36) write “[t]he enormous attention that the real balance effect has received over the years hardly speaks well for the profession. Quantitatively, it is surely an n th order effect, one calculation put it that, even at the fastest rate at which prices fell in the Great Depression, it would take more than two centuries to restore the economy to full employment. And in the short run even its sign is ambiguous.”

basis for the nearly universal assumption that lower prices stimulate spending.²³ Recently, other authors have reached similar conclusions (see, for example, Howitt, 1986, DeLong and Summers, 1986, Greenwald and Stiglitz, 1993, and Tobin, 1993). If lower prices or reduced inflation have any effect on aggregate demand, they seem to reduce it, as Keynes concluded nearly a half century ago.

5.3 Keynesian Unemployment

Upon joining the assumptions of imperfectly competitive markets and a flat AD curve, we may find the economy in the situation like the one depicted by point *B* in figure 6. Firms rationally believe that their demand conditions depend on aggregate demand, and aggregate demand is insufficient to induce full employment. Moreover, firms recognize that the AD curve is flat. Indeed, there is little theoretical justification and virtually no empirical evidence to believe otherwise. In this case, nominal deflation induced by unemployment has no effect on output or employment. The unemployment at *B* need not therefore be viewed as the result of sticky wages. The problem facing the economy is insufficient aggregate demand, which cannot be overcome by falling wages and prices when AD is insensitive to price.

6 Concluding Remarks

By linking an imperfectly competitive model of production and employment to aggregate demand that is insensitive to price changes we have shown how weakness in aggregate

²³An important factor ignored in our discussion and in most of the cited literature is the impact of lower prices on international trade. This effect may, in the absence of offsetting exchange rate movements, induce a negative relation between the aggregate price level and aggregate demand. Of course, no such effect can operate in the world economy as a whole, where demand gained by one country through real exchange rate changes is demand lost by another. This issue also deserves more research attention.

demand can cause persistent weakness in macroeconomic activity. Lower aggregate spending feeds directly into lower expected and actual demand for monopolistically competitive firms. These shifts in demand induce firms to reduce production and employment and, in general, to change prices. Unemployment increases, but reductions in nominal wage rates do not restore full employment, directly or indirectly. Firms' optimal pricing behavior transforms lower nominal wages into lower prices, keeping real wages constant for a given level of aggregate demand and thereby eliminating any direct effect of nominal wages on employment. The standard assumption that lower nominal prices stimulate aggregate demand—and therefore that wage declines indirectly raise employment through macroeconomic channels—has neither strong theoretical justification nor any empirical basis in recent research. In this environment Keynesian aggregate demand effects arise and persist even in the absence of nominal rigidity. These effects do not rely on subtle cyclical changes in demand elasticities or competitive structures, nor do they require expectation errors. Such changes and errors may exist and they may influence macroeconomic outcomes, but on the basis of theory and empirical evidence we do not believe that they are the primary reasons why the economy responds to changes in aggregate demand.

In most respects, this approach to understanding the macroeconomic impact of aggregate demand changes follows the analysis in the *General Theory*. There are, however, at least three advantages of the imperfect competition framework we adopt compared to the perfect competition assumption of Keynes (and most of the Keynesian literature up to 1980). First, real wages need not move countercyclically when output movements arise from demand shocks. Indeed, as the special case of a horizontal FM locus in figure 6 illustrates, real

effects from a negative aggregate demand shock need not result in any distortion of the real wage relative to its full employment level.

Second, the link between costs and prices is the explicit result of optimizing behavior by firms. In contrast, perfectly competitive models leave unresolved Arrow's (1959) question of "whose job it is to set prices." This approach also validates Keynes's claims about the inability of workers to lower real wages by accepting reduce nominal wages in the face of unemployment.

Third, and in our view most important, imperfect competition makes clear how changes in aggregate expenditure affect the demand conditions, and therefore the production decisions, of individual firms. Under perfect competition firms act as if they can sell all they want at the prevailing price. Changes in macro aggregate demand, by assumption, can have no direct impact on the quantity demanded as perceived by competitive firms at the microeconomic level. That is why, after Keynes, attempts to provide microfoundations for changes in aggregate supply as the result of demand fluctuations relied on the indirect link between aggregate demand and distortions of the real wage due to nominal rigidity.²⁴ In contrast, imperfectly competitive firms recognize that they cannot sell all they want without changing their price, and it is natural to link changes in demand curves at the micro level to changes in the aggregate level of demand. In the monopolistically competitive environment, reduced output can be explained as the *direct* result of firm responses to an aggregate demand shock without requiring a change in the real wage.

While these points indicate progress, we recognize that our analysis leaves some im-

²⁴Alternatively, some papers have motivated cyclical unemployment by changes in competitive firms' demand uncertainty. See Balvers and Miller (1992) for discussion and further references.

portant questions unanswered. First, if falling wages do not increase employment, will workers continue to accept reduced nominal wages in states of unemployment? When wage movements do not clear the labor market, one must reconsider the dynamics of wages. We conjecture that insider-outsider considerations might limit wage declines at constant unemployment rates, perhaps allowing wage reductions only when unemployment rises. Second, while our concern here is to understand how recessions and unemployment arise from insufficient demand, a complete model must also deal with what happens if the system faces excess demand. Generalizing the model to handle excess demand might be accomplished by introducing asymmetries into the response of aggregate demand to price changes. Inflationary pressures may choke off excess demand at full employment, at least when inflation rises substantially, even though disinflation does not do much to stimulate demand. We leave development of these ideas to future research. Nonetheless, we believe that the perspective presented here is a direct and general link between aggregate demand and macroeconomic fluctuations.

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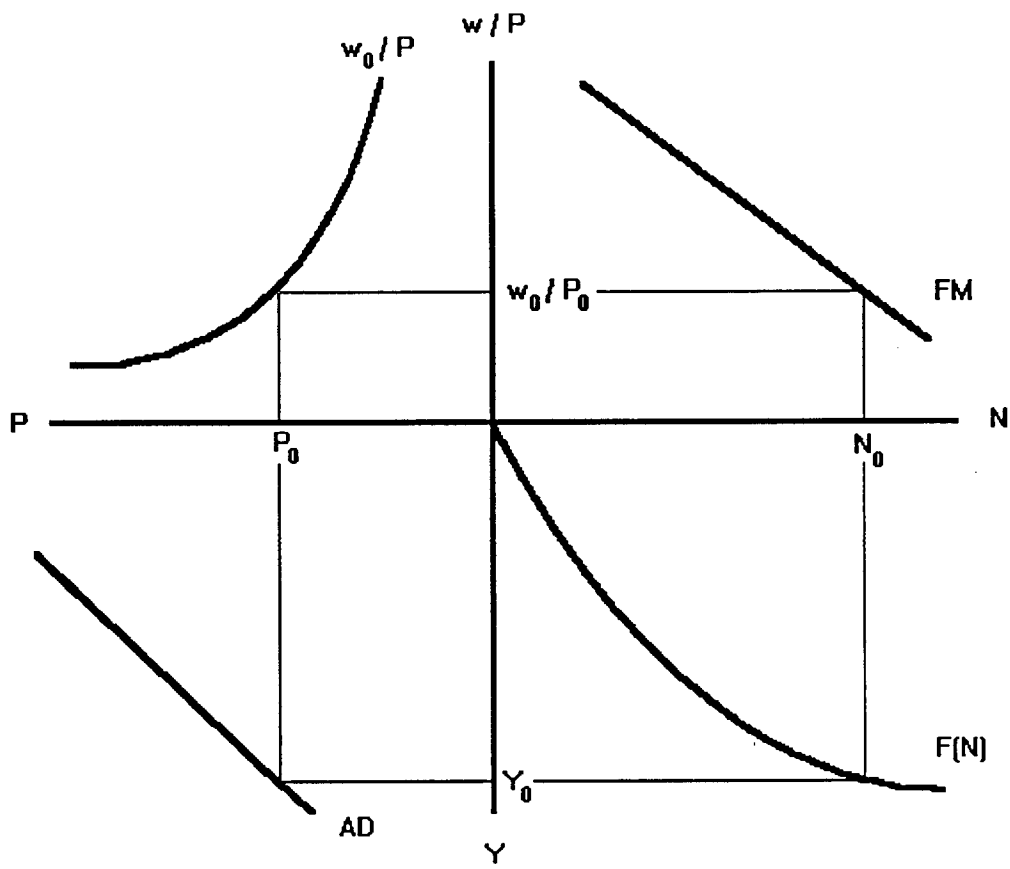


Figure 1

Macroeconomic Equilibrium

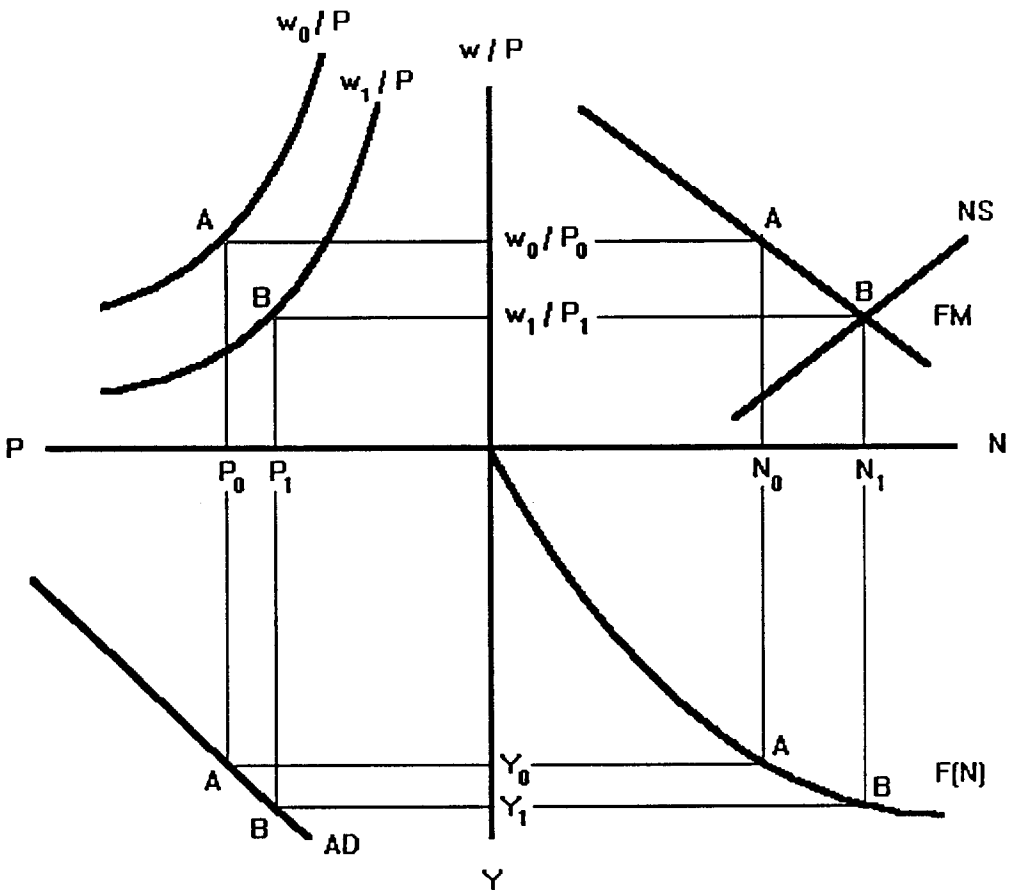


Figure 2

Adjustment to Classical Full Employment

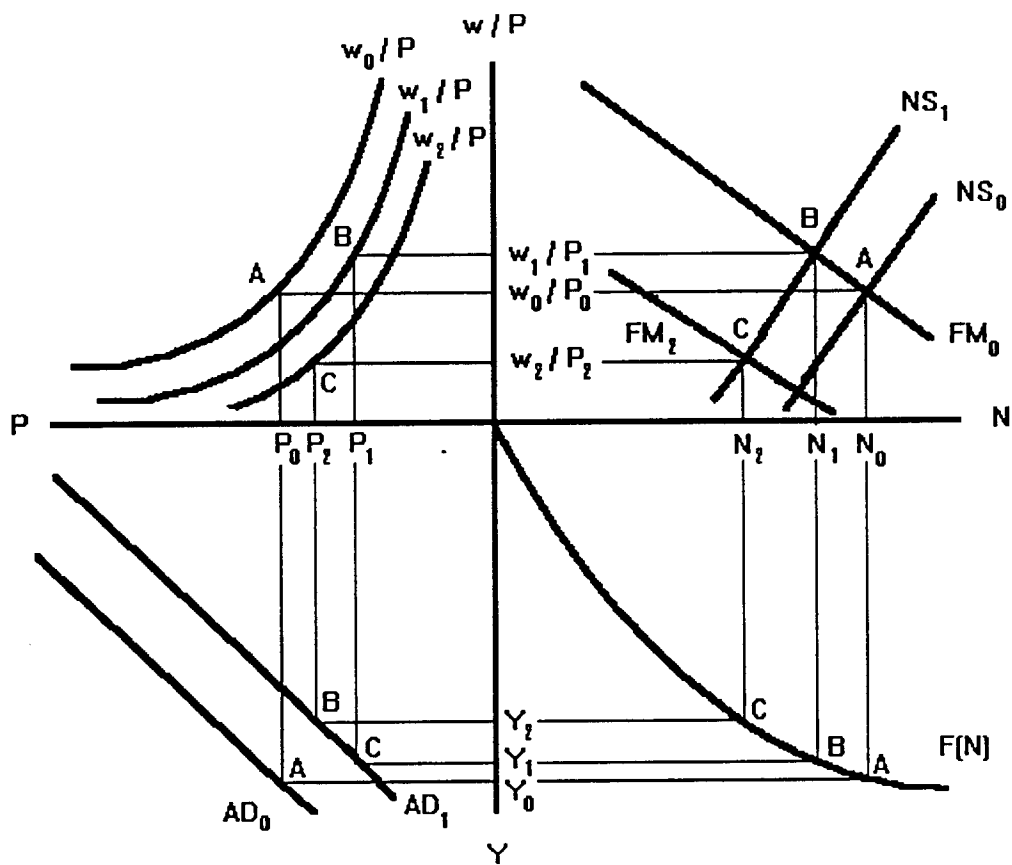


Figure 3

Implicit Collusion

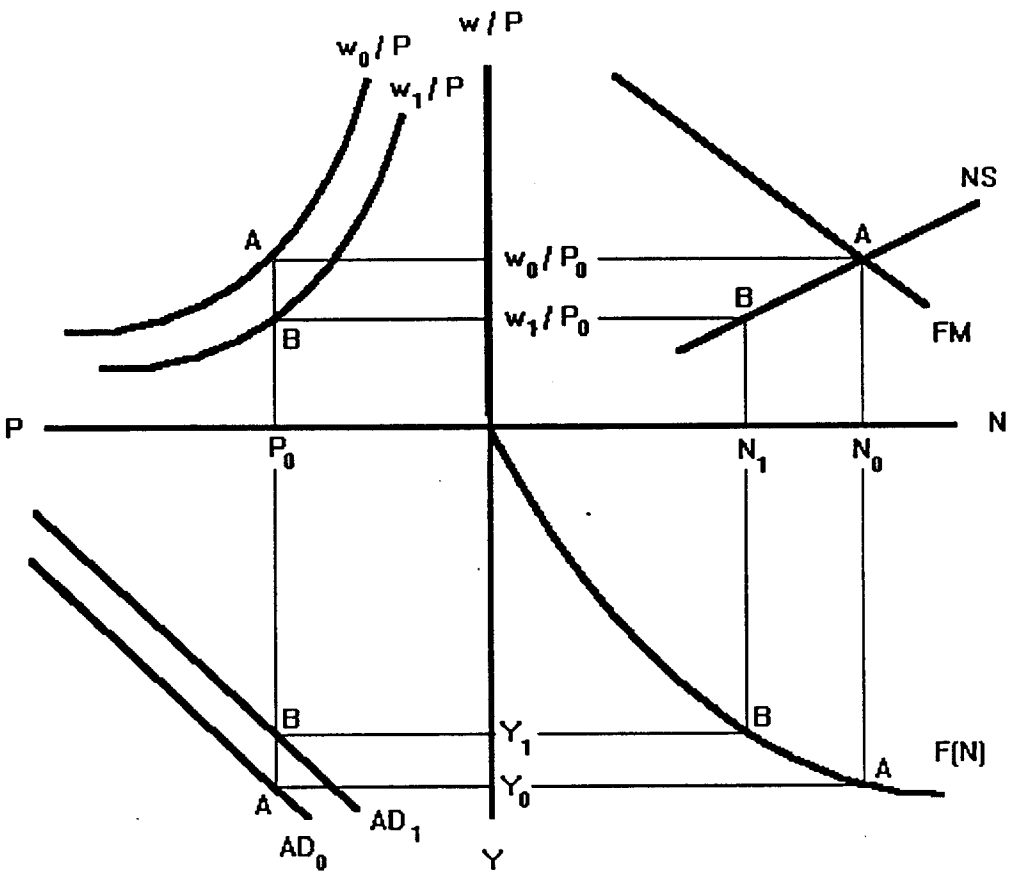


Figure 4

Sticky Prices

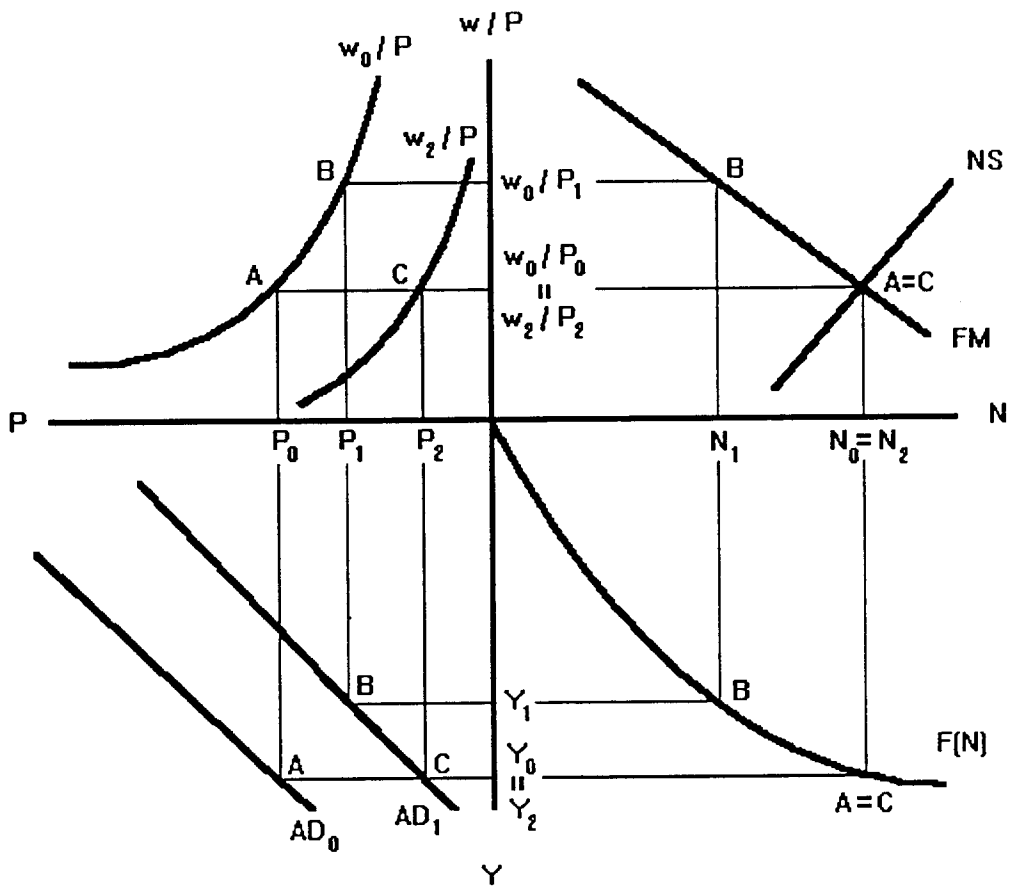


Figure 5

Sticky Nominal Wages

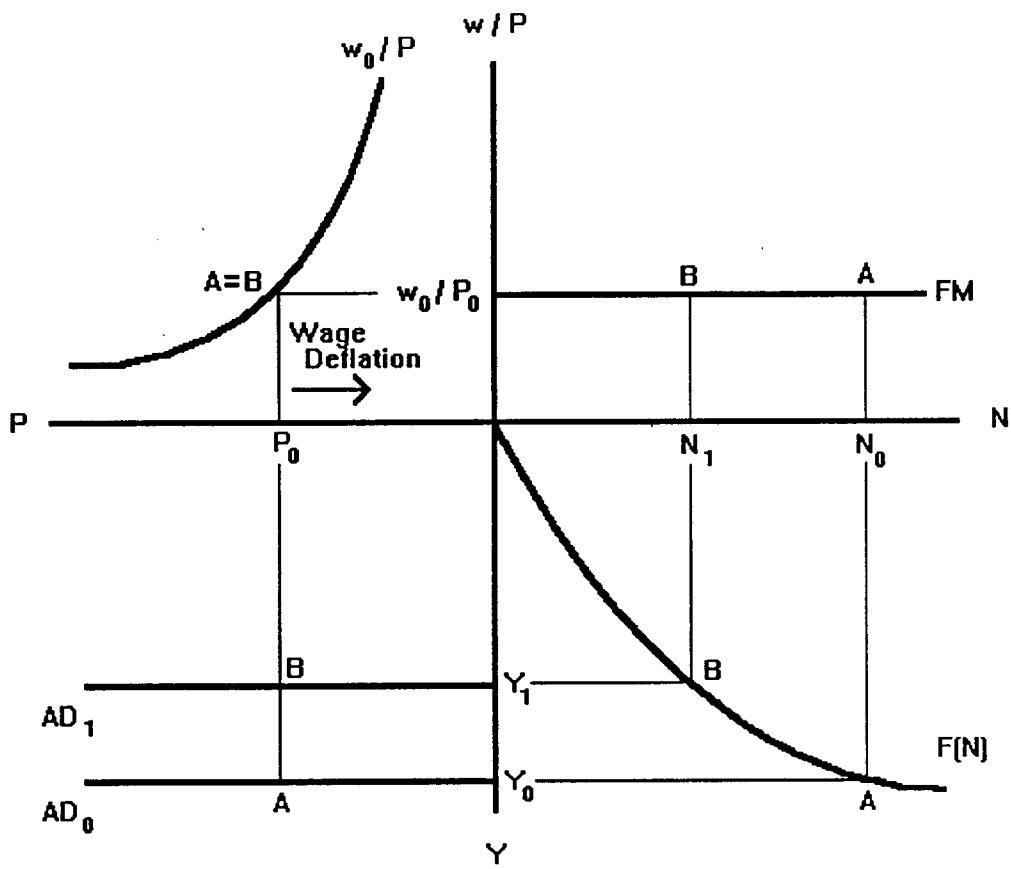


Figure 6

Demand Shocks in a Keynesian Model