

## New and Old Keynesians

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All Keynesians, whether new or old, would agree on three propositions:

1. During some periods—often extended—an excess supply of labor exists at the prevailing level of real wages (and expectations concerning future wages and prices).

2. The aggregate level of economic activity fluctuates markedly, whether measured by capacity utilization, GDP, or unemployment. These fluctuations are greater in magnitude and different in pattern from any that might be accounted for by short-run changes in technology, tastes, or demography.

3. Money matters, at least most of the time, although monetary policy may be ineffective in some periods (like the Great Depression).

From these three propositions follow certain important policy conclusions; while old and new Keynesians may disagree upon the exact form of their policy recommendations, they would agree generally that government intervention is at least sometimes (many would argue frequently) desirable to stabilize the level of economic activity.

Agreement upon these three propositions, and the associated policy perspective, sets old and new Keynesians apart from advocates of other major schools of macroeconomic thought, including new classical and real business cycle theorists. Both of these, for instance, believe that the labor market and other markets essentially always clear, with wages and prices adjusting quickly to any disturbances; that shifts in the demand or supply curves for labor can explain fluctuations in observed levels of employment; and that the economy's (presumably efficient) responses to shocks can explain these fluctuations in

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output. In the case of real business cycles, the focus is on shocks to technology; for many new classical theories, the focus is shocks to the money supply.

Despite the fundamental differences in views between these different schools, they have agreed upon two methodological premises: that macroeconomics should be grounded in microeconomic principles, and that understanding macroeconomic behavior requires the construction of a (simple) general equilibrium model. The real difference arises here: real business cycles and (to a lesser extent) new classical economists base their theories on simple (we would say simplistic) models of markets that employ perfect information, perfect competition, the absence of transactions costs, and the presence of a complete set of markets. They also often employ a representative agent model.<sup>1</sup> These assumptions often interact: the absence of risk markets is of no import in a world in which all individuals are identical—since there is no one to whom a representative agent can transfer risk. Problems of asymmetric information cannot arise if all individuals are identical. Moreover, the strong assumptions allow market results to be Pareto efficient, despite the fact that economies with imperfect information and incomplete markets are generally not constrained Pareto efficient (Greenwald and Stiglitz, 1986, 1988a).<sup>2</sup> In contrast, modern Keynesians have identified these real world “imperfections” as the source of the problem: leaving them out of the model is like leaving Hamlet out of the play.

The insistence on micro-foundations enhances the ability of economists to distinguish among alternative theories, and helps to set the research agenda. Statistical analyses based on variances and covariances of the principle aggregate time series simply do not have enough power to distinguish among many of the alternative theories. Good macro-theories should do more. A host of other facts clamor to be explained; for instance, good macro-theories must explain why variations in the number of hours worked should take the form of layoffs rather than work-sharing; why layoffs tend to be concentrated among certain parts of the labor force; why investment in general, and inventories and construction in particular, should be so volatile; and more. Beyond that, the micro-foundations from which the aggregate behavior is derived can often be tested directly. A rejection of the underlying micro-hypotheses should suffice to cast doubt on the validity of the derived macro-theory.

<sup>1</sup>For a devastating attack on the underlying methodological premises of the representative agent approach, see Kirman (1992) in this journal.

<sup>2</sup>The term “constrained” in the concept of “constrained Pareto efficiency” is simply inserted to remind readers that the constraints—absence of a complete set of markets, the imperfections of information, and so on—were indeed taken into account. Even when the government faces these constraints, when the economy is not constrained Pareto efficient, there exist interventions in the market which can make all individuals better off. There are, to be sure, innumerable papers in the literature showing that with incomplete markets and imperfect information, the economy may be constrained Pareto efficient. The point of the Greenwald-Stiglitz (1986) paper was to show that these papers all entail special assumptions; and that in general, the market economy is not constrained Pareto efficient.

Incorporating the newer micro-foundations is the principal task ahead of new Keynesians.<sup>3</sup> The challenge is to choose between the myriad of ways in which markets can be imperfect, and to decide on the central questions and puzzles to be explained.

Different strands of research within new Keynesian economics have taken two broadly different approaches.<sup>4</sup> The first argues that nominal price rigidities are the essential way in which market economies differ from the Walrasian Arrow-Debreu model. Without such rigidities, the argument goes, flexible prices would allow the economy to adjust quickly to whatever shocks it experiences, maintaining all the while full employment and economic efficiency. Early work in this area focused on constructing general equilibrium models with price rigidities.<sup>5</sup> More recent work has been concerned with explaining the sources of those price rigidities, as discussed in the paper by Romer in this symposium.

The second strand of new Keynesian literature explores another path suggested by Keynes: that increased flexibility of wages and prices might exacerbate the economy's downturn. This insight implies that wage and price rigidity are not the only problem, and perhaps not even the central problem. This view holds that even if wages and prices were perfectly flexible, output and employment would be highly volatile. It sees the economy as amplifying the shocks that it experiences, and making their effects persist. It identifies incomplete contracts, and, in particular, imperfect indexing, as central market failures, and it attempts both to explain the causes and consequences of these market failures.

Clearly, these two new Keynesian approaches have different implications for how the economy works. The first holds that the classical dichotomy breaks down, allowing monetary policy to have effects other than on the price level, because nominal prices are at least somewhat rigid throughout the economy. The second approach, however, holds that monetary policy has real effects even when wages and prices are flexible.

In addition, the nominal price rigidity theories describe how the economy will recover from a recession as wages and prices *eventually* fall enough that

<sup>3</sup>Some new Keynesians are wont to claim that this insistence on micro-foundations is what distinguishes them from Keynes and the older Keynesians. Though much macroeconomic analysis in the Keynesian tradition in the 1950s and 1960s did stray from a solid grounding in micro-foundations, Keynes himself clearly argued each of his macroeconomic relations on the basis of microeconomic analysis. In fact, we would argue that Keynes did the best he could with the micro-foundations which were available at the time. Macroeconomists of the 1950s and 1960s faced a dilemma: the microeconomics that was fashionable at that time—assuming perfect information, complete markets, and so on—was obviously inconsistent with the spirit of the Keynesian model. It made sense for them to ignore that kind of microeconomics.

<sup>4</sup>There are still other strands emphasizing, for example, imperfect competition or coordination failures.

<sup>5</sup>For example, Hansen (1951), Solow and Stiglitz (1968), Barro and Grossman (1971), and the large subsequent literature surveyed in Benassy (1982).

consumption recovers, or as capital goods wear out to the point where gross investment is required to replace even the small amount of capital required for the low level of output. However, neither the sources of the shocks, nor the mechanisms by which falling prices and wages would restore the economy to equilibrium, have received extensive attention; implicitly, in most of the models, it appears as a hidden real balance effect—as wages and prices fall, the real value of individuals' holdings of money increases, and this induces them to consume more.

The new Keynesian view that emphasizes price flexibility suggests an alternate and more complex perspective: first, that natural economic forces can magnify economic shocks that may seem small, and second, that existing price rigidities may *reduce* the magnitude of the fluctuations, as Keynes argued.<sup>6</sup> Since even with perfectly flexible wages and prices, the economy could experience substantial variations in employment, they believe the single-minded focus on price and wage rigidities is misguided. And since small disturbances can give rise to large effects, there is less concern about identifying the source of the disturbance: in one case, it may be a supply shock (the oil price shocks of 1973 and 1979), in another case it may be a monetary shock (the Volcker recession).

## Basic Ingredients

The purpose of this paper is to describe the second strand of new Keynesian literature and to contrast it both with the alternative strand of new Keynesian literature based on price rigidities as well as with other points of view. The models described here contain three basic ingredients, each playing a different role in explaining aspects of the underlying macroeconomic quandaries, but all based on problems which arise in economies with imperfect information and incomplete contracts. The ingredients are: risk averse firms; a credit allocation mechanism in which credit-rationing, risk-averse banks play a central role; and new labor market theories, including efficiency wages and insider-outsider models. These building blocks should help to explain how price flexibility contributes to macroeconomic fluctuations and to unemployment. In particular, the first two building blocks will explain why small shocks to the economy can give rise to large changes in output, while the new labor market theories will explain why those changes in output (with their associated changes in the demand curve for labor) result in unemployment.

<sup>6</sup>In taking this approach, this second strand of new Keynesian thought addresses one of the major criticisms of real business cycle theory—that real shocks to the economy are simply not large enough to account for the magnitude of the observed fluctuations. Standard neoclassical models have strong forces working to stabilize the economy: price adjustments act like shock absorbers; savings and inventories act as buffers; lags mean that even a major new innovation will take years to be absorbed into the economy; and many shocks have offsetting effects in different sectors, implying limited aggregative impacts.

### Risk Averse Firms

Much of the macroeconomic behavior of firms can be explained by the fact that firms are risk averse. Let us first explore several alternative theories as to why firms are risk averse, and then examine the consequences of that finding.<sup>7</sup>

A first explanation for risk averse firms has to do with imperfections in the equity market. In traditional Keynesian theory, whether finance came from equity or debt was not important. In our view, it is central. With equity, the firm shares risk with those who provide finance, and the firm has no fixed obligation to repay. With debt, the firm has a fixed obligation, and if it fails to meet those obligations, it can be forced into bankruptcy. Thus, firms will tend to be risk averse if they do not have ready access to equity finance, and are therefore pushed to debt finance.

In fact, despite the seeming advantages of equity, firms finance a relatively small fraction of their investment with new equity issues. One obvious explanation is when firms do issue new equities, their market values tend to decline markedly, because the market interprets issuing new shares as a negative signal. Think of it this way: assume the owner of a firm knew the value of the company. Then auctioning off shares in the firm is no different from auctioning off dollar bills. If I know the number of dollar bills in my back pocket, and auction off 1 percent shares, what is the equilibrium price? Zero! And for an obvious reason. If there are \$100,000 in my back pocket, and you offer me less than \$1000 for a 1 percent share, then I will not accept the offer; if you offer me more, I will. The only price at which you will not lose is a price of zero.

So how can markets for issuing new equity exist at all, in the presence of asymmetric information? Owners of firms are risk averse, and do not have perfect information about the value of their firm. Provided it is not too costly, they would like to sell some of their shares and diversify their risk. But the adverse selection effect still works with a vengeance. Those who know that the market overvalues their shares are most anxious to sell additional shares. Accordingly, in a rational expectations equilibrium, the "worst firms" (most overvalued, or least undervalued) are most willing to issue equities; and, given that, issuing equity will be treated as a negative signal and the equity market will be thin.

Investors may also be generally leery of equity because of its effect on incentives. An early version of this argument, using principal-agent theory, pointed out that equity means that management must share the returns of its efforts with others (Ross, 1973; Stiglitz, 1974). A more recent, probably more important effect is what Robert Hall refers to as the "backs to the wall theory" of corporate finance, or what Jensen (1986) refers to as the "free cash flow"

<sup>7</sup>For a more detailed discussion of the arguments presented in this section, and the empirical evidence in its support, as well as a more complete list of references, see Greenwald and Stiglitz (1987, 1988b, 1988c, 1989, 1990a, 1990b, 1991a, 1993), Stiglitz (1992a), and Greenwald, Stiglitz, and Weiss (1984).

hypothesis. In these theories, the fixed obligations entailed by high debt obligations can provide strong managerial incentives.

The literature offers a number of other reasons why firms may be risk averse; the discussion here is not meant as exhaustive.<sup>8</sup> For example, one major strand of literature emphasizes that modern corporations are controlled by managers who act in a risk averse manner. While managerial incentive schemes may attempt to reduce this behavior, they do so only imperfectly.

At this juncture, many a macroeconomist may ask: While all of this is interesting micro-theory, what does it have to do with macroeconomics? To answer this challenge, we have to describe a bit more how risk aversion affects firm behavior.

A risk averse firm will be sensitive to the risk associated with any action (including inaction). Production itself is risky; it takes time and there are no future markets for the sale of goods. Firms are often uncertain about the consequences of their actions (so-called "instrument uncertainty") and their uncertainty grows with the size of the change. In general, firms know more about the status quo than about what things might be like if they changed their actions.

The risk averse nature of firms under these conditions of uncertainty is the basis of the "portfolio theory" of the firm, in which firms simultaneously choose all of their actions—prices, wages, employment, production, and so on—taking into account the risk (covariances as well as variances) and expected returns with each "portfolio" of decisions. In assessing the consequences of various actions, firms look at the effects that those actions will have on the firm's assets, which include cash, a set of machines, a group of employees, a set of customers, and so on. Changes in economic circumstances—either the firm's willingness to bear risks, or its perceptions concerning the riskiness or value of various assets, will lead it to want to change that portfolio; for instance, increased uncertainty about the value of inventories will lead it to want to hold smaller inventories.

Changes in the economic environment will in general necessitate changes in some actions of the firm. Thus, if the demand curve for the firm's product shifts to the left, it must either change the price it charges, the quantity it sells, or the inventories it holds. If it holds price constant, the quantity sold must adjust, and conversely. Evaluating what it should do entails an evaluation of the risks associated with each of these changes and the costs of adjustment.

The actions of firms are affected by their perceptions of risks, both through instrument uncertainty (the uncertainty concerning the consequences of any actions), and the uncertainty associated with the value of various assets. At least three factors influence the risks firms face and their willingness to bear those risks. One key factor is the overall state of the economy. When the economy

<sup>8</sup>One explanation for why firms do not issue equities upon which we do not put much credence is the costly state verification model, which notes that using equity requires verifying the state (the firm's profits), so the costs of implementing equity contracts thus exceed that of debt contracts. While this argument has some relevance for small businesses, firms that have already issued equity have little or no marginal cost of verifying their state when they seek to issue additional equity.

goes into a recession, and firms talk about their pessimism or uncertainty, these perceptions have real consequences. A second factor is the firm's cash (or liquid asset) position. Changes in a firm's cash position affect how much it must borrow to maintain its production activities. A firm's cash position is affected by profits, and since profits are a residual, small changes in prices may have large effects on profits, and thus on firm liquidity, particularly for highly leveraged firms. Of course, the lower profits also adversely affect the firm's net worth. A third important factor is changes in the price level. Since almost all debt is denominated in nominal terms, such changes have large effects on firm real liquidity and real wealth.<sup>9</sup>

The theory of the risk averse firm can thus provide an explanation of why each firm's supply curve, and hence the aggregate supply curve—the amount that they are willing to produce at each level of prices (given wages)—should shift markedly as the economy goes into a recession. The riskiness of production has increased, and firm's willingness and ability to bear that risk has decreased.

To maintain the same level of economic activity, with the reduced cash flow from lower profits, firms must borrow more. But increased debt creates a higher probability that future returns will not be sufficient to meet these fixed obligations. As the firm expands its production, it must borrow more, increasing its fixed obligations; there is an increased chance of not being able to meet those increased fixed obligations. The expected extra costs associated with bankruptcy are what is meant by the "marginal bankruptcy cost." Normally, the necessity to borrow more resulting from lower cash flow (lower profits) not only increases the probability of bankruptcy (at any fixed level of economic activity) but also the marginal bankruptcy costs. Once bankruptcy costs are taken into account, we need to modify the standard theory of the firm, where, as a firm expands, it compares price (marginal revenue) with marginal cost.

Thus, the aggregate supply curve shifts to the left. The shift in the firm (and aggregate) supply curve means that the amount firms are willing to produce, at each level of prices and wages, is reduced; conversely, it also means that at each level of output the firm's mark-up of price over marginal costs (largely determined by the wage) is increased. Moreover, the same reasoning provides an explanation of why the aggregate demand curve should shift to the left in this situation: the firm's demand for investment may shift down markedly.

The theory also explains why large redistributions, like those stemming from large price changes (like the oil price shocks of the 1970s) should have a negative effect on the economy. While increases in wealth lead to increasing production and investment in the sectors which benefit from the price change, there is diminishing returns; the increases of, say, production from those who benefit are more than offset by the reductions from those who lose.

<sup>9</sup>A major lacuna in this theory is the failure to explain why debt contracts are denominated in nominal terms. However, there are models, such as Cooper (1990), which show that there may be Nash equilibrium with imperfect indexing; that is, given that all other contracts are not indexed, firms would not want to just index debt contracts.

The theory of the risk averse firm explains a number of other aspects of the cyclical behavior of the economy. For instance, imperfections in equity markets and the extent of leveraging on equity differ across sectors. Construction, for instance, is an industry dominated by small firms, most of whom do not have access to the equity market; and construction firms typically borrow heavily to finance their construction activities. Such sectors one would expect to be particularly volatile.

To illustrate how the risk averse theory of the firm can explain why shocks to the economy, whether real or monetary, can have real, large, and persistent effects, let's trace through an example. Say that a decrease in export prices (to lower than expected levels) reduces exporters' net worth, leading them to reduce their supply, and their demand for inputs from other producers. This unexpected change in the demand curve for others' products leads to lower prices than expected in other sectors, with adverse effects on their asset and liquidity position and on what they want to produce, and their demand for inputs (including investment).

Inventory adjustments exacerbate the process: with greater perceived risk and lower wealth, and hence reduced willingness to bear risk, firms cut back on their desired level of inventories; this translates into a further reduction in production. Note that the theory of risk averse firm thus offers an answer to one of the long-standing puzzles of macroeconomics: why inventories do not seem to perform the production smoothing role they should, with concave production functions: if anything, inventories seem to exacerbate economic fluctuations (Blinder and Maccini, 1991).

We thus have a mechanism for the transmission, amplification, and persistence of the effects of shocks, *even with complete flexibility of wages and prices*. Such a model can explain volatility, and also provide answers to the two other questions posed in the beginning of this paper. If one adopts a standard model of money demand, say with constant velocity, then unanticipated changes in the money supply lead to unanticipated changes in the price level, which will set off the process described above. Remember, changes in the price level affect the value of firm debt, since that debt is usually denominated in nominal terms.

Moreover, hiring workers is an investment. As the economy goes into a recession, the optimal portfolio of assets for a firm includes less "human capital." Beyond that, the shadow cost of capital—taking into account, for instance, the increased risks of bankruptcy that follow from the increased borrowing required to finance the hiring and training costs of new employees—is high in a recession, and thus, even if firms eventually wanted to increase their stock of employees, the depths of a recession is not the time to make that investment. Thus, new hires are reduced.<sup>10</sup> This gives rise to unemployment,

<sup>10</sup>The story, as presented thus far, is not quite complete: Why don't workers cut the wages at which they are willing to work, and thus make it worthwhile for the firm to hire them even though costs of capital are high? There are several answers: the required reductions in wages are so large that workers prefer to wait (what they expect to be the short time) until the costs of hiring are lowered; workers are not willing to put up the cost of being hired for a whole variety of reasons, from lack of



which results when the rate of separations exceeds the rate of new hires. As this theory would predict, the rate of new hires shows greater cyclical volatility than the rate of separations.

### **Credit Markets and Risk Averse Banks**

The theory of risk averse firms takes us a considerable distance, but effects that operate through the banking system and credit markets provide yet another process by which shocks to the economy are amplified and their effects propagated, and another set of reasons why monetary policy will work, even in a world with flexible prices and wages.<sup>11</sup>

Recent economic work has emphasized that credit is not allocated in an auction process, with whoever is willing to pay the highest interest rate receiving the loan. Instead, lenders must face the risk that a loan will not be repaid, and institutions, like banks, have arisen for screening loan applicants and monitoring loans. Banks are highly leveraged; with fixed obligations (the deposits they hold) and risky assets, banks must worry about the risk of bankruptcy. It is now well-known that increasing interest rates may have adverse effects both on the mix of loan applicants and on the incentives of borrowers to undertake risky activities, and that these adverse incentive and selection effects can be so strong that lenders' expected returns may actually decrease as the interest rate charged increases. This can lead to credit rationing, with the interest rate charged being that which maximizes the expected return to lenders, and at that interest rate, there is an excess demand for credit.

In recent work, Greenwald and Stiglitz (1990a) have extended that analysis to embrace risk averse lenders. Like the equity-constrained firms described earlier, banks, who must worry about the risk of bankruptcy, act in a risk averse manner. There will still be credit rationing, with interest rates chosen to maximize the "expected utility" of the lender, or the expected returns minus the costs of bankruptcy. But with risk averse banks, the same kinds of factors which affect firm behavior—changes in risk perceptions and changes in net worth, affecting the willingness to bear risk—affect bank behavior, too.

This risk averse behavior of banks will magnify an initial negative economic shock, and make recessions deeper and longer. The banks' portfolio of activities can usefully be divided into recruiting and processing new customers; making (and monitoring) loans to existing customers; and buying a safe asset, like Treasury bills. When economic conditions worsen, banks' perceptions of the relative risk of loans increases; and since bad economic conditions are often accompanied by high default rates, banks' net worth decreases, along with their willingness to bear risks. On both accounts, banks respond to bad conditions by

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capital, worker risk aversion, and firm moral hazard; workers cannot reduce the firm's risk of hiring by making wages contingent upon the performance of the firm, for that would entail, in effect, workers taking an equity share in the firm, and all the arguments for why equity markets fail apply with equal force here; and workers cannot even commit themselves to charging only a low wage, once they are trained, as insider-outsider theories have emphasized.

<sup>11</sup>For a more extensive development of these ideas, see Stiglitz (1988, 1992a) and Stiglitz and Weiss (1992a, 1992b).

shifting their portfolio towards the safer activity: investing in Treasury bills. Equilibrium in the loan markets would only be attained at a higher real interest rate, which would also discourage investment activity. And banks will often be unwilling to raise interest rates, because of a fear that higher rates will have the adverse selection effect of chasing away credit-worthy borrowers and adverse incentive effects, inducing them to undertake greater risks (Stiglitz and Weiss, 1981).

Monetary policy still works (at times) in this situation, but not in the accustomed way. The conventional monetary policy story has the Federal Reserve driving down interest rates, which stimulates investment. In this situation, though, while monetary policy may succeed in lowering the rate of interest on Treasury bills, the change in interest rates charged by banks may well be minimal. It may also result in little change, if any, in the supply of loans: while there is a substitution effect associated with loans being relatively more attractive, there is an income effect which goes the other way (if banks have decreasing absolute risk aversion). And in the credit rationing regime, it is the supply of loans which is critical; firms are limited in their investment activities, and possibly even in their production activities (if they rely on bank credit for working capital) by the lack of credit.<sup>12</sup>

However, monetary policy also works through another set of mechanisms. Reserve requirements (when reserves are kept in accounts that bear little or no interest) act as a tax on deposits. Higher reserve requirements raise that tax, and reduce the wealth of banks; lower reserve requirements have the reverse effect. Lowering the discount rate has the effect of reducing one cost facing the bank—the cost of obtaining funds from the central bank. This change increases the real wealth of banks, making them more willing to bear risks and make loans. Since the ratio of loans to net worth for banks is typically very large, relatively small changes in bank net worth can give rise to large changes in credit availability.<sup>13</sup>

<sup>12</sup>Of course, this story raises the question of why firms facing credit constraints from their banks do not turn to other sources of funds. We have explained why equity is not a viable alternative. Other sources of funds are even less informed about creditworthiness; they are likely to make credit available only under much less favorable terms, or not at all. Adverse selection works to exacerbate other sources of credit, too; the firms that avail themselves of these alternative supplies are those in dire straits.

<sup>13</sup>Open market operations will have a similar net wealth effect on banks. However, this will occur only to the extent that rates of interest paid on demand deposits are held below their competitive levels, by either direct legal fiat or limitations on interbank competition. With zero interest on demand deposits, increases in deposits (if believed to be permanent) represent equal increases in effective bank equity; thus money supply expansions represent a particularly powerful wealth transfer from households to banking firms. (Letting  $W$  = bank wealth derived from deposits,  $r$  = interest rate,  $D$  = deposits,  $W = r(D/r) = D$ ). If the monetary policy is believed to be temporary, then there may be no significant wealth effect ( $\Delta W = \Delta M \cdot r + \Delta r \cdot M$ ; when  $r$  is near zero, this is near zero). However, if rates paid on demand deposits are competitive either because, as recently, they are deregulated or because, as in the Depression, a zero nominal rate is close to the competitive rate of interest, increases in demand deposits through open market operations will have no significant effect on bank wealth.

Although monetary policy can have potent effects through these channels, it will also be relatively impotent at times. If the economy is very weak, so that expected returns on bank loans are very low, relative to the risks associated with them, then raising the wealth of banks may still not make lending money look profitable.<sup>14</sup>

### Labor Markets

One peculiar aspect of old Keynesian analysis was that while its main concern was unemployment, it offered little discussion of the labor market. However, a consensus is growing that an understanding of the labor market must be at the center of any macroeconomic theory (Lindbeck, 1992).

The basic empirical puzzle in the labor market is that employment levels change markedly, with little change in real wages. One explanation is that the supply curve for labor is horizontal, but that would run counter to all the microeconomic evidence, as well as introspection. Another explanation is that, by some miracle of coincidence, shifts in the demand and supply curves have been perfectly offsetting. A recession, for example, is marked by a leftward shift in the labor supply schedule, just as the demand schedule moved left. But why should labor supply fall so fortuitously? Changes in real interest rates and expectations concerning future wages could, of course, through intertemporal substitution, induce shifts in the labor supply schedule; but micro-evidence suggests that these intertemporal substitution effects are far too small to obtain the desired effects. A further problem is presented by the contradictory movements in real interest rates: in the Great Depression they rose markedly; during the recessions of the '50s, '60s and early '70s, they changed hardly at all.

New Keynesians offer an alternate interpretation. They have explored reasons why real wages are not likely to move. As a result, shifts in demand for labor can create a situation where people are willing to work at the going wage, but cannot find jobs; in other words, there is involuntary unemployment. Some of the possible reasons for sticky real wages include efficiency wages, insider-

<sup>14</sup>At one level of analysis, the insights of this model can be viewed as a mild modification of standard IS-LM theory. The LM curve is now derived not as the equilibrium in the money market—the locus of interest rates and income levels at which the demand for money equals the supply of money; but rather as the equilibrium in the capital market—the locus of interest rates and income levels at which the capital market is in equilibrium; for the capital market to be in equilibrium the demand for reserves must be equal to the supply (otherwise banks would change their behavior) and the demand for Treasury bills held by the public must be equal to the supply.

Operationally, the standard IS-LM curves differ in two fundamental ways from the ones implicit in our analysis. First, we have identified a set of variables—balance sheet variables of firms and banks, and the dispersion in those variables—which affect both the IS and LM curves, and can cause them to shift markedly. Secondly, monetary policy may shift the IS curve: firm investment depends on the interest rates charged by banks and the credit they make available. The interest rate charged by banks is not just the government interest rate. There may be marked changes in the spread (for instance, they increased in 1991, so that bank loan rates fell much less than did government interest rates). Monetary policy may affect not only the Treasury bill rate, but also the spread, so that monetary policy, in effect, shifts the IS curve as well.

outsider theory, imperfect competition, and implicit contracts. Let us say a few words about each; the reader interested in a thorough evaluation of these theories might begin with Stiglitz (1992a) or Newbery and Stiglitz (1987).

Efficiency wage theories argue that productivity often increases with real wages; as a result, it does not pay firms to cut wages. High wages may raise productivity either because they attract higher quality labor; or because they result in increased effort; or because they reduce labor turnover and save on hiring and training costs.<sup>15</sup> Efficiency wage theories can be used to explain why firms do not lower wages even in the presence of an excess supply of workers, and also why they avoid two-tier wage systems, under which new workers are hired at lower wages than existing workers.

Insider-outsider theories and bargaining theories begin with the presence of turnover costs, and then argue that trained "inside" workers are not a perfect substitute for untrained "outside" workers. This situation gives rise to a bargaining problem. Since "inside workers" control the training process, they would react negatively to hiring workers at lower wages who could potentially replace them. Moreover, the fact that new workers cannot commit themselves not to demand higher wages once trained provides a further reason that firms do not hire "cheap" new workers.

When imperfect competition exists in labor and product markets, firms set wages, prices, and employment. Given the risk averse nature of the firm, as described earlier, and efficiency wage and insider-outsider effects just mentioned, a firm that is considering lower wages must face considerable uncertainty about the possible effects on the effort, quality, and turnover of its labor force.

To this point, the discussion has focused on the "supply side" of the labor market. But the demand side offers a puzzle as well. The demand for labor at any real product wage can be derived in a straightforward way from the production function. The fact that employment varies considerably with small variations in real product wages presents a puzzle.

With given technology and capital stock, if firms operate along their supply function (with concave production functions), then a reduction in output should be associated with an increase in real product wages, contrary to what is observed. There are several possible explanations. One is that, somehow, there has been a large negative change in technology. The implausibility of this hypothesis, and the empirical evidence against it, are matters taken up elsewhere. Secondly, there could be a change in the degree of competition, and hence in the mark-up over marginal costs. Thirdly, firms could simply be off their supply curve. (For a critique of these alternative explanations, see Stiglitz, 1992b.)

<sup>15</sup>Workers' efforts may be reduced if they receive less than what they perceive to be a fair wage; while they may respond to higher wages with higher effort as part of a "gift exchange" (Akerlof, 1982).

We prefer a fourth theory, provided by the theory of the risk averse firm. Earlier, we explained why the firm and aggregate supply curve of output shifts as the economy goes into a recession. One can easily translate this into a shift in the firm and aggregate demand curves for labor.

The new Keynesian research program in labor economics followed traditional macroeconomics in seeking to explain the observed patterns of real wages and employment. But it has also tested those explanations against a number of other key aspects of the labor market, like why reductions in the demand for labor take the form of layoffs rather than reduced hours for everyone and why unemployment seems to be so concentrated in certain groups in the population. Focusing on these characteristics of unemployment is important, because if the reduction in the demand for labor took the form of an equi-proportionate reduction in the hours worked by each individual, the social and economic consequences of unemployment would be much less than they in fact are. The labor market theories described above are able to explain these phenomena.<sup>16</sup>

## **Perspectives on Alternate Theories**

Our main objective in this paper is to describe this emerging strand of new Keynesian literature in broad terms. To this point, we have described how theories based on informational imperfections can explain the main puzzles mentioned at the start of the paper: the presence and persistence of unemployment, the variability of output, and why money matters. In fact, the theories described here go farther, and offer an explanation of why certain sectors of the economy exhibit greater volatility than others; why the variability in hours worked takes the form of lay-offs; and the logic behind the cyclical patterns of inventories, hours worked and employment.

In this section, we describe the kinds of arguments that persuade us that alternative theories are at best incomplete, at worse wrong. None of the theories discussed in this paper, including our own, have been fully embodied in a large macro-econometric model. We believe that constructing such models, together with conducting the kind of simulation exercises that have provided much of the support for real business cycles, should be on the agenda for future research. But before subjecting a model to that sort of extensive testing, we believe it must be shown that it can at least display the critical basic observed

<sup>16</sup>The precise mechanism differs among the different theories. For instance, in the Shapiro and Stiglitz (1984) efficiency wage theory, it is the risk of being fired, and with it loss of total rents which provides workers incentives not to shirk. But part-time workers, with the same surplus per hour, have a lower total level of surplus. Certain changes in the economic environment which necessitate an increase in the wages to induce workers not to shirk will necessitate a larger increase in the wages of part-time workers, and thus, these workers become less attractive—their costs, adjusted for quality, increase.

facts about the economy. Thus, our discussion will seek to identify key observations which, in our judgment, cast serious doubt on the major competing theories.<sup>17</sup>

### **New Keynesian Price Rigidities**

As mentioned earlier, one strand of new Keynesian economics has emphasized nominal price rigidity, and used explanations that go under the name of "menu costs" to explain that rigidity.

A number of facts imply that price rigidities are, at a minimum, not the only source of economic problems like volatility and unemployment. For example, Keynesian-like unemployment problems seem to arise even in economies which are experiencing inflationary pressures, and thus where the *nominal* wages do not need to fall, but only to rise more slowly. Moreover, nominal wages and prices did fall in the Great Depression, as well as in other economic downturns. We agree with Keynes that had prices fallen even faster, the economy would have degenerated farther, rather than improving more quickly.

Indeed, in most new Keynesian models the mechanism by which wage and price flexibility would *eventually* restore the economy to full employment is the old real balance effect. The 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, as intertemporal substitution effects may (depending on expectations) more than offset the wealth effects (Neary and Stiglitz, 1982; Grandmont, 1983).

But while price rigidities may not be at the center of phenomena like fluctuations and unemployment, and one does not have to assume price rigidities to establish that monetary policy has real effects, the relative rigidity of wages and prices remains a phenomena which needs to be explained.

The menu cost literature has attempted to argue that the costs of adjustment, like the costs of printing new menus, results in firms only adjusting prices periodically, which is another way of saying that price stickiness exists. From a tactical point, the advocates of menu costs beat their critics to the punch

<sup>17</sup>One group of theories not discussed here, which should be mentioned briefly, are those focusing on imperfect competition. For many of the central issues with which macroeconomics is concerned, we do not believe that imperfect competition is central. For example, imperfect competition can hardly explain the cyclical movements in output and employment. While prices might be different from what they would be in perfect competition, imperfect competition in the product market cannot explain why the labor market does not clear. While the classical dichotomy has traditionally been couched in terms of models with perfect competition, one can prove analogous results from general equilibrium models with imperfect competition. However, we do view imperfect competition as important to the extent that it allows firms to set prices and wages. As explained earlier, the price and wage setting behavior of risk averse firms has important macroeconomic consequences.

by choosing a name—"menu costs"—which would seem to belittle the importance of the subject. Indeed, these costs are small, and have become smaller as computer programs allow the printing of menus on a daily basis at a marginal cost of pennies.

Two arguments were necessary to give these seemingly small effects any plausible relevance (Akerlof and Yellen, 1985). First, if firms are already choosing their prices optimally, then the cost of not adjusting was of second order. Thus, while the costs of adjusting may be small, so were the benefits of adjusting. Second, in spite of the small (second order) losses to the firm, the losses to society could be first order.<sup>18</sup> While both of these propositions are correct, they are not sufficient to justify paying much attention to the menu cost literature. Both propositions apply to *any* decision of the firm: they offer no reason to single out pricing decisions.

By contrast, we have emphasized that firms must view all their decisions together; that the costs of adjusting prices must be put in juxtaposition with the costs of adjusting (or not adjusting) quantities. Since there is a strong presumption that costs of adjusting outputs and inputs will be much greater than those associated with simply adjusting prices, this would seem to argue for quantity rigidities, and against price stickiness. But when focusing on risk, as we have done, the conclusion changes. When a firm considers the various ways it might react, it will perceive greater uncertainty about the consequences of price and wage adjustments—because those consequences depend on the uncertain responses of rival firms, customers, and workers—than about the consequences of output adjustments. In fact, for those goods which can be put into inventory, the only risk associated with producing too little is the risk associated with higher production costs next period, when any inventory deficiency must be made up. (Of course, boom times may create a risk of running out of stock, but that risk is not important in recessionary periods.) This portfolio theory of firm adjustment does provide an explanation of price and wage rigidity, at least in the short run; though in the long run, the theory suggests that prices and wages eventually do adjust.<sup>19</sup>

To be sure, *if* agents in the economy perfectly anticipated changes in the money supply and *if* it was common knowledge that all agents in the economy responded to changes in the money supply by changing all prices

<sup>18</sup>This result can also be seen as a direct corollary of the Greenwald and Stiglitz (1986) analysis of the welfare economics of economies with imperfect information and incomplete markets. We show there that under those conditions the economy is not (constrained) Pareto efficient, and that whenever this is true, pecuniary externalities matter.

<sup>19</sup>In some important cases, however, the economy exhibits nominal rigidities even in the long run. In effect, these are cases of multiple equilibria. If each firm believes other firms are going to keep their nominal wages rigid, it pays each firm to keep its own nominal wages unchanged. There are thus equilibrium exhibiting nominal wage rigidities (Stiglitz, 1985). Similarly, if each firm believes other firms are going to keep their nominal prices unchanged, it pays each firm to keep his nominal prices unchanged. There are thus Nash equilibrium nominal price rigidities (Stiglitz, 1987).

proportionately, then money might be neutral. But since the money supply is not perfectly observed by all agents, not all agents change prices proportionately, and so there is no reason that they should all believe that price changes will perfectly offset changes in the money supply. Given the uncertainty about whether other agents will increase prices proportionately to observed changes, it will not generally be optimal for any firm to increase its price proportionately; thus, the beliefs about non-proportional responses to price changes are consistent.

Thus, there is a presumption that as long as risk markets are incomplete and firms and individuals are risk averse, and debt is imperfectly indexed, then an expansion of the money (credit) supply will have real effects. Also, there are distributional consequences of the manner in which the money (credit) supply is increased. A credit expansion affects some individuals, firms, and industries more than others. In short, money (credit) matters, but not just because of nominal rigidities.

In fact, our theory can be seen as a particular kind of menu cost theory—a theory which emphasizes the riskiness of adjusting prices, rather than the actual adjustment costs. But while our theory does provide a theory of price stickiness, it argues that price stickiness is only one element, and not the most important one, in understanding macroeconomic phenomena. And nothing that we have said would be substantially altered if, in addition to the risk costs which we have emphasized, fixed costs of price adjustment were significant.<sup>20</sup>

Another major distinction between the two strands of new Keynesian literature is whether nominal or real price rigidities are emphasized. One strand uses nominal rigidities as an important step in explaining why money matters. But in the alternative theory, based on the risk averse theory of the firm with incomplete contracting and indexing, money matters more as prices become more flexible. By contrast, to explain unemployment, it focuses on real rigidities in the labor market (such as associated with the efficiency wage theory). It argues that whatever happens to the product market, unless one has a theory of real wage rigidity, one cannot explain unemployment. For even if there were large shifts in the demand curve for labor, if the real wage were flexible, demand and supply for labor would equilibrate.<sup>21</sup>

There is, however, an important difference between the two approaches for policy purposes. A menu cost theorist would focus efforts at structural

<sup>20</sup>One empirical objection to standard menu cost theory (which is addressed by our theory) is that while the theory would seem to explain rigidities in the adjustments in the level of prices; it has a hard time explaining inflation inertia—that is, rigidities in adjustments of the rate of change of prices.

<sup>21</sup>Of course, nominal rigidities in wages *and* prices give rise to real wage rigidities. See Solow and Stiglitz (1968) for a model incorporating explicitly stickiness in both. Of course, if the costs of adjusting wages and prices differ, one would not expect the same degree of stickiness in both markets, and thus, one would expect systematic changes in real wages in response to particular economic disturbances.



macroeconomic reform on reducing the costs and speeding the implementation of price changes. Anti-inflation measures like those considered in the 1970s, which penalized price changers, would have potentially destructive consequences for overall economic welfare. A menu cost theorist would to the contrary advocate measures which would provide incentives for rapid nominal price adjustments. In contrast, in our model rapid price adjustment is a two-edged sword. On the one hand, it reduces the reliance of firms on quantity adjustment and hence might stabilize aggregate levels of employment and output. On the other hand, greater overall price changes would mean greater wealth transfers to and from firms, exacerbating the financing imbalances which act to amplify the original macroeconomic disturbances. On balance, therefore, we would regard price and wage rigidity more as a symptom of underlying financial and labor market failures and not as a fundamental cause of business cycles. We, therefore, would focus structural reform on those fundamental areas rather than directly on price and wage setting by firms.

### **Other Keynesian Theories**

Of course, there are other strands of Keynesian and new Keynesian thought besides those focused on price rigidities. One strand which enjoyed considerable popularity in the '70s and '80s was that of Tobin, which, like our theory, emphasized the importance of risk. It used a portfolio theory to explain the demand and supply of assets; and related firm investment to the price of (existing) capital goods, as reflected in the price of equity, which emerged in the market equilibrium. Monetary policy affected this price, and hence the level of investment.

The theory has had limited empirical success. One possible reason is that firms raise little of their funds for investment through equity. What success it has had may be due to a spurious correlation: when a firm's future prospects are good, firm managers invest more, and the firm's stock is high. There is not (necessarily) the causal connection suggested by that theory.

That theory, as well as most other Keynesian theories, explain the effect of monetary policy by looking at the demand for money by households. Our theory focuses more on the effects on the banking system, and on the implications through the credit mechanism, both as a result of credit rationing and the behavior of the risk averse firm.<sup>22</sup>

### **Real Business Cycle Theories**

Real business cycle theory addresses two of the three puzzles with which we began this paper by denying their existence: proponents of this school deny either that (involuntary) unemployment exists or that money matters. (The fact

<sup>22</sup>For a more extended critique of the standard theory of the household's demand for money, see Greenwald and Stiglitz (1991b).

that monetary policy is ineffective is of little moment, since in any case the economy is, in this view, efficient, with resources being fully used.) This school of thought focuses on the second problem, that of economic volatility, and proposes exogenous technology shocks as the source of that volatility. The most telling criticisms of this view is the difficulty it has explaining the large negative shocks that mark recession: was there a loss in technological competence?<sup>23</sup>

Of course, if one includes economic organization in "technology," and in the information embodied in the various firms within the economy in "capital," then the financial disorganization and risk associated with recessions discussed in this paper represents both a negative technology and capital shock. With this expanded vocabulary, the basic model of risk averse firms and banks, together with flexible wages and prices, and market clearing in the labor market, can be viewed as a version of real business cycle theory—but one with fundamentally different predictions and policy presumptions than the standard version of the theory.

### **New Classical Theories**

The branch of new Keynesian theory emphasized here shares a methodological premise with at least some versions of new classical theories: the importance of imperfect information in explaining observed deviations from the predictions of neoclassical theory. But new classical theories have tended to focus on the consequences of imperfect information for the inferences firms make—say, about the desirability of changing price or quantity. We think the difficulties firms have in inferring whether a shift in the demand curves which they face is due to a real or nominal shock may play a role in explaining "why money matters," but surely it is not the only reason, nor even perhaps the most important one. While accepting the importance of looking at these issues, we also emphasize the implications of imperfect information for how markets function—the causes and consequences, for instance, of credit rationing, limited equity markets, and efficiency wages.

Another ingredient in new classical models attempts to explain why unanticipated increases in prices (presumably following from an unanticipated increase in the money supply) might elicit a larger than normal output. Our

<sup>23</sup>For an introduction to the claims and difficulties of real business cycle theory, see the exchange between Plosser and Mankiw in the Summer 1989 issue of this journal. Other criticisms, besides those mentioned in the text, include the lack of correlation across countries of the implied shocks to different industries (which one would expect if the shocks were really technology shocks), compared to the correlation of industries within a country. Also, this school has failed to identify large positive shocks of the required magnitude. (Remember that once one takes into account the shock absorbers, buffers, and lags, and that much of technology is "embodied," then the implied shocks to technology must indeed be large.) Furthermore, negative technology shocks move the factor price frontier inward; that would imply that if real product wages remain unchanged, real interest rates would have to fall markedly. But in fact, while real interest rates vary little in many recessions, in other recessions, like the Great Depression and the 1982 recession, real interest rates rose.

theory provides an alternative explanation: larger-than-anticipated increases in prices increase firms' net worth, and this increases the amount they are willing to supply. Our theory is not based on misperceptions: at the time the loan contract was made, it was anticipated that, with some probability, prices would be high.

New classical economists have also emphasized the importance of expectations (as does King in his article in this symposium), and particularly rational expectations. Thinking about expectations is hardly new. Keynes invoked a variety of assumptions concerning expectations, and in this, he was only reflecting the common practice of the time.<sup>24</sup> Today, most Keynesians believe that whether expectations are "rational" is an empirical question—one which, in important instances, will surely be answered in the negative. For example, the stock market crashes of 1929 or 1987 seem very difficult to reconcile with "rational" expectations.

At the same time, many new Keynesians are not adverse to using the rational expectation assumption when it is convenient to do so (for example, Greenwald and Stiglitz, 1986). One especially interesting result is that the basic results of the models which lead to the conclusion that government policy is ineffective do not depend on the assumptions of rational expectations, but rather on even less realistic assumptions concerning instantaneous market clearing. For instance, Neary and Stiglitz (1983) supply a model with price and wage rigidities where rational expectations actually increased the multipliers from government action. The multipliers were *larger* for an obvious reason: consumers with rational expectations recognized that the "leakage" of increased income into savings would be translated into higher consumption in future periods; and the expectation of this higher future income "spilled over" into higher current consumption.

To be sure, rational expectations of policy changes may sometimes lead individuals to act in a manner which undoes those policy changes, but this is surely not the case when the government imposes taxes or subsidies which change intertemporal prices, nor when the government engages in redistributions which have aggregate effects. Obviously, in models with a representative agent, redistributions make no sense, and cannot have any effects. But this just illustrates how such models may be of little use in addressing fundamental issues of macroeconomics.

<sup>24</sup>At times, Keynes seems inconsistent in his discussion of expectations. For example, in discussions of the liquidity trap, it was argued that the value of long-term bonds—consols—was inversely proportional to the short term interest rate, a result which can be justified on the basis of *static* expectations concerning interest rates (that is, the expectation that future interest rates will, on average, be equal to current interest rates) and risk neutrality. It was then argued that, when interest rates were very low, investors were worried that the interest rate would rise, giving rise to a fall in the price of consols. But if investors expect interest rates to fall, then the price of consols will not be inversely proportional to the short-term interest rate, and changes in the short-term interest rate will have negligible effects on the price of consols.

## Summary

The economy is a complex organization, requiring coordination of decisions of the millions of households and firms. Unemployment and other macroeconomic problems can be viewed as a failure of society to solve the necessary coordination problem efficiently. The focus of our research program has been to understand why markets and other social institutions sometimes do not work as well as we would like. Given the complexity of the economy, no one should expect to find a single explanation of any of the macroeconomic phenomena under study. There is no Holy Grail. But new Keynesian economists, whether of the first or the second type as described in this paper, agree on two broad propositions.

First, they agree that the Walrasian auctioneer does not really exist, and that "as if" stories about the auctioneer are a fiction that has too long misled the profession. Instead, firms set prices and wages in an uncoordinated fashion, facing considerable uncertainties about the consequences of their actions. As a result, it will often be true that wages, prices, and interest rates are not at market clearing levels (and will not adjust rapidly to those levels), so that large parts of the economy will not be in equilibrium.

Secondly, they agree that problems of coordinating prices and wages simply cannot be studied in the context of a macroeconomy consisting only of an aggregated representative agent, like Robinson Crusoe. It is not even clear that an island with Robinson Crusoe and Friday provides a fertile basis for studying macroeconomic problems, though at least this opens the possibility of problems such as those associated with asymmetric information. Indeed, at the core of the models discussed here is the notion that redistributions of wealth across firms and between households and firms matter, and they matter because there is a corporate veil created by imperfect information. Aggregate approaches using representative agent models are not of much use in studying these macroeconomic phenomena.

The strand of new Keynesian literature discussed and advocated here attempts to shift the focus of the research program in two ways. It argues for shifting the analysis of these issues from the product market to the capital and labor markets. In addition, it argues for shifting away from a single-minded pursuit of the consequences and causes of price rigidities; in fact, the analysis here suggest that greater price flexibility might exacerbate the problem of economic fluctuations.<sup>25,26</sup> Instead, we believe that the focus should be on how

<sup>25</sup>Thus, the work described in this paper can be thought of as providing the theoretical underpinnings of one of the standard interpretations of the Great Depression and other major economic downturns, the debt-deflation theories. See for example, Calomiris (1993) and the papers cited there. (Of course, the effects we describe do not require actual deflation, only a slowdown in the rate of inflation relative to that anticipated.)

<sup>26</sup>Keynes seemed to be of that view when he concluded, "In the light of these considerations, I am now of the opinion that the maintenance of a stable general level of money wages is, on balance of considerations, the most advisable policy for a closed system." Clearly, Keynes did not consider the central problem one of lack of wage (and price) flexibility.

imperfections in information limit, and sometimes even eliminate, the markets which distribute risk in modern economies; how these market imperfections serve to amplify the shocks facing the economy and make their effects persist; and how, when translated to the labor market and combined with information and other problems there, they can give rise to high levels of unemployment.

## References

- Akerlof, G. A.**, "Labor Contracts as Partial Gift Exchange," *Quarterly Journal of Economics*, 97:4, November 1982, 543-69.
- Akerlof, G. A., and J. Yellen**, "A Near-Rational Model of the Business Cycle with Wage and Price Inertia," *Quarterly Journal of Economics*, 1985, 100, 823-38.
- Barro, R. J., and H. I. Grossman**, "A General Disequilibrium Model of Income and Employment," *American Economic Review*, 1971, 61, 82-93.
- Benassy, Jean-Pascal**, *The Economics of Market Disequilibrium*. New York: Academic Press, 1982.
- Blinder, A. S., and L. J. Maccini**, "Taking Stock: A Critical Assessment of Recent Research on Inventories," *Journal of Economic Perspectives*, Winter 1991, 5:1, 73-96.
- Calomiris, Charles W.**, "Financial Factors in the Great Depression," *Journal of Economic Perspectives*, forthcoming Spring 1993, 7:2.
- Cooper, Russell**, "Predetermined Wages and Prices and the Impact of Expansionary Government Policy," *Review of Economic Studies*, April 1990, 57, 205-14.
- Grandmont, Jean-Michel**, "Money and Value: A Reconsideration of Classical and Neoclassical Monetary Theories. Cambridge: Cambridge University Press, 1983.
- Greenwald, B., and J. E. Stiglitz**, "Externalities in Economies with Imperfect Information and Incomplete Markets," *Quarterly Journal of Economics*, 101:2, May 1986, 229-64.
- Greenwald, B., and J. E. Stiglitz**, "Imperfect Information, Credit Markets and Unemployment," *European Economic Review*, February/March 1987, 31:2, 444-56.
- Greenwald, B., and J. E. Stiglitz**, "Pareto Inefficiency of Market Economies: Search and Efficiency Wage Models," *American Economic Review*, 78:2, May 1988a, 351-55.
- Greenwald, B., and J. E. Stiglitz**, "Examining Alternative Macroeconomic Theories," *Brookings Papers on Economic Activity*, 1988b, No. 1, 207-70.
- Greenwald, B., and J. E. Stiglitz**, "Imperfect Information, Finance Constraints and Business Fluctuations." In Kohn, Meir, and S. C. Tsiang eds., *Finance Constraints, Expectations and Macroeconomics*. Oxford: Oxford University Press, 1988c, 103-40.
- Greenwald, B., and J. E. Stiglitz**, "Toward a Theory of Rigidities," *American Economic Review*, May 1989, 79:2, 364-69.
- Greenwald, B., and J. E. Stiglitz**, "Macroeconomic Models with Equity and Credit Rationing." In Hubbard, R. Glenn, ed., *Information, Capital Markets and Investments*. Chicago: University of Chicago Press, 1990a, 15-42.
- Greenwald, B., and J. E. Stiglitz**, "Asymmetric Information and the New Theory of the Firm: Financial Constraints and Risk Behavior," *American Economic Review*, May 1990b, 80:2, 160-65.
- Greenwald, B., and J. E. Stiglitz**, "Capital Market Imperfections and Labor Market Adjustments," paper presented at NBER/CEPR Conference on Labor Market Dynamics, Cambridge, Massachusetts, October 1991a, forthcoming in *Conference Proceedings*.
- Greenwald, B., and J. E. Stiglitz**, "Towards a Reformulation of Monetary Economics." Caffee Lectures presented to the University of Rome and the Bank of Italy, April 1991b, to be published by Cambridge University Press, 1992.
- Greenwald, B., and J. E. Stiglitz**, "Financial Market Imperfections and Business Cycles," *Quarterly Journal of Economics*, forthcoming 1993.
- Greenwald, B., J. E. Stiglitz, and A. Weiss**, "Informational Imperfections in the Capital

Markets and Macroeconomic Fluctuations," *American Economic Review*, May 1984, 74:1, 194-99.

**Hansen, Bent**, *A Study on the Theory of Inflation*. London: Allen Press, 1951.

**Jensen, Michael C.**, "Agency Costs of Free Cash Flow, Corporate Finance and Takeovers," *American Economic Review*, May 1986, 76, 323-29.

**Kirman, A.**, "Whom or What does the Representative Consumer Represent?" *Journal of Economic Perspectives*, Spring 1992, 6:2, 117-36.

**Lindbeck, Assar**, "Macroeconomic Theory and Labor Markets," *European Economic Review*, 1992, 36:2/3, 209-36.

**Mankiw, N. Gregory**, "Real Business Cycles: A New Keynesian Perspective," *Journal of Economic Perspectives*, Summer 1989, 3:3, 79-90.

**Neary, P., and J. E. Stiglitz**, "Expectations, Asset Accumulation and the Real Balance Effect." Presented at the Dublin Meetings of the Econometric Society, September 1982.

**Neary, P., and J. E. Stiglitz**, "Toward a Reconstruction of Keynesian Economics: Expectations and Constrained Equilibria," *Quarterly Journal of Economics*, Supplement 1983, 98:3, 199-228.

**Newbery, D., and J. E. Stiglitz**, "Wage Rigidity, Implicit Contracts, Unemployment and Economic Efficiency," *Economic Journal*, June 1987, 97:386, 416-30.

**Plosser, C. I.**, "Understanding Real Business Cycles," *Journal of Economic Perspectives*, Summer 1989, 3:3, 51-77.

**Ross, S. A.**, "The Economic Theory of Agency: The Principal's Problem," *American Economic Review*, May 1973, 63:2, 134-39.

**Shapiro, C., and J. E. Stiglitz**, "Equilibrium Unemployment as a Worker Discipline Device," *American Economic Review*, June 1984, 74:3, 433-44. Reprinted in Mankiw, N. G., and D. Romer, eds., *New Keynesian Economics*, 2. Cambridge: MIT Press, 1991, 123-42.

**Solow, R., and J. E. Stiglitz**, "Output, Em-

ployment and Wages in the Short Run," *Quarterly Journal of Economics*, Vol. XLXXXII, November 1968, 537-60.

**Stiglitz, J. E.**, "Incentives and Risk Sharing in Sharecropping," *Review of Economic Studies*, April 1974, 41:2, 219-55.

**Stiglitz, J. E.**, "Equilibrium Wage Distribution," *Economic Journal*, September 1985, 95:379, 595-618.

**Stiglitz, J. E.**, "Competition and the Number of Firms in a Market: Are Duopolies More Competitive than Atomistic Markets?" *Journal of Political Economy*, October 1987, 95:5, 1041-61.

**Stiglitz, J. E.**, "Money, Credit and Business Fluctuations," *Economic Record*, December 1988, 307-22.

**Stiglitz, J. E.**, "Alternative Approaches to Macroeconomics: Methodological Issues and the New Keynesian Economics." In Vercelli, A., and N. Dimitri, eds., *Alternative Approaches to Macroeconomics*. Oxford: Oxford University Press, forthcoming 1992a.

**Stiglitz, J. E.**, "Capital Markets and Economic Fluctuations in Capitalist Economies," *European Economic Review*, North-Holland, 36, 1992b, 269-306. (Marshall Lecture prepared for the European Economic Association Annual Meeting, Cambridge, U.K., August 1991.)

**Stiglitz, J. E. and A. Weiss**, "Credit Rationing in Markets with Imperfect Information," *American Economic Review*, June 1981, 71:3, 393-410.

**Stiglitz, J. E. and A. Weiss**, "Banks as Social Accountants and Screening Devices and the General Theory of Credit Rationing." In *Essays in Monetary Economics in Honor of Sir John Hicks*. Oxford: Oxford University Press, forthcoming 1992b.

**Stiglitz, J. E. and A. Weiss**, "Asymmetric Information in Credit Markets and Its Implications for Macroeconomics," *Oxford Economic Papers*, October 1992 (Special Issue), 44:4. Reprinted in Courakis, A. S. ed., *Financial Markets, Institutions, and Policy*. Oxford: Oxford University Press, forthcoming 1993.