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Rational Models of Irrational Behavior

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The General Theory revolutionized macroeconomics with its assertion that classical economics contained a fundamental error. Keynes argued that a capitalist economy could possess equilibria characterized by persistent involuntary unemployment. He also showed that aggregate demand would play a crucial role in determining output and employment. Keynes' analysis accorded with common sense and casual observation fifty years ago. In our opinion, it still does so. Why then is there a crisis in Keynesian economics?

Keynesian analysis violates the commonly regarded sine qua non of good economic theory—a microeconomic foundation based on perfectly rational, maximizing behavior. In our reading, economists have accorded the assumption of rational, self-interested behavior unwarranted ritual purity, while alternative assumptions—that agents follow rules of thumb, that psychological or sociological considerations matter, or that, heaven forbid, they act downright irrationally at times—have been accorded corresponding ritual impurity. This association between “impure” assumptions and ritual pollution has had the ill effect of confusing the esthetic task of economics—which is to provide clear logic for analyzing economic phenomena—with the agenda of economics—which is to explain the economic events of the real world. Keynesian theory, with its partial reliance on psychological, sociological, and rule-of-thumb behavior to derive departures from full employment and Pareto optimality, is the worst casualty of this failure to dissociate esthetic from agenda. If agents really

behave according to impure assumptions, is it not likely that the best models to fulfill the agenda will mirror that behavior?

According to standard Keynesian analysis, the key departure from self-interested, maximizing behavior is the assumed stickiness of money wages. Keynes argued that because of the importance to workers of relative wages, they quite typically resist money wage reductions in circumstances where they are willing to assent to real wage reductions. He recognized that “it is sometimes said that it would be illogical for labour to resist a reduction of money-wages but not to resist a reduction of real wages.” But, he concluded, “whether logical or illogical, experience shows that this is how labour in fact behaves” (1935, p. 9).

Keynes' willingness to build a theory which was a pastiche of optimizing behavior and sociological/psychological rule-of-thumb behavior grounded in the observation of how people appear to behave was probably due to his conviction that the central features of his theory in no way hinged on the seemingly illogical behavior of workers. *The General Theory* makes clear that money wage stickiness is *not* in Keynes' opinion the ultimate cause of involuntary unemployment; indeed, due to the adverse effects of falling prices on demand, involuntary unemployment might possibly be more severe in its absence. But most Keynesians accept the verdict of Patinkin and Pigou that, in the presence of a real balance effect, the aggregate demand curve is *not* vertical and thus a full-employment equilibrium exists. What to Keynes was a minor assumption in a theory rationalizing business cycles is now interpreted as the key assumption.

During the past two decades Keynesian theorists have struggled to formulate a “sensible” microeconomic foundation for Keynesian economics based on individualistic optimizing behavior, by relaxing the assumptions of the perfectly competitive

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Walrasian model and introducing instead a dizzying array of market imperfections: asymmetric information, incomplete contingent claims markets, staggered contracts, transactions costs, imperfect competition, specific human capital, efficiency wages, etc. Have these efforts been successful? Not entirely. While each of these innovations has enriched economics by modeling important aspects of reality, the introduction of these imperfections has still not provided a *total* rationalization of Keynesian economics when judged according to the rule that the proposed theory be *fully* consistent with rational optimizing behavior and the absence of any unexploited gains from trade. In the end, it invariably turns out either that there is an unrealistic assumption or that some clever, complicated neoclassical contract will eliminate involuntary unemployment. For example, most versions of efficiency wage theory which are grounded in optimizing behavior suffer from the “defect” that there exist contracts which, while rarely observed, are feasible in principle (for example, employment bonds, job auctions, tournament contracts) and can eliminate involuntary unemployment if firms can establish reputations for trustworthy labor relations.

This paper begins with the premise that theory which fits the real world will be based on assumptions that individuals are not fully rational. It would be simply unscientific to proceed otherwise. For indeed, individuals may actually suffer from money illusion, follow rules of thumb, or give weight to considerations of fairness and equity in economic matters. Section II reviews some evidence which indicates that individuals do behave in such ways, and, furthermore, that the sticky money wages assumed in Keynesian models are consistent with the known irrationalities of human behavior. A second justification for old-style Keynesian models without full rationality, is that the departures from rationality needed to generate Keynesian business cycles are not very great. Section I argues that rejection of Keynesian business cycles on the grounds that fully rational models must be money neutral is based on a faulty implicit assumption—that

significant deviations from rationality are required to rationalize the Keynesian model.

I. How Irrational is Keynesian Economics?

Keynes argued that nominal shocks to aggregate demand (due, say, to changes in the money supply)—whether anticipated or unanticipated—can cause prolonged departures of the economy from full employment. Such departures simply cannot occur in any model that assumes *fully* rational optimizing behavior, including rationally formed expectations, unless nominal prices exhibit inertia. The logic is simple. Rational agents should only care about real magnitudes. If so, any optimizing model with a unique equilibrium will be “money neutral.” A cut in the supply of money should just cause a proportional reduction in prices and wages with no change in employment, output, or real wages. This conclusion in no way depends on the assumption that markets are perfectly competitive, or even that markets clear.

Demand-generated business cycles require nominal price rigidity. Such rigidity could be explained by “menu costs” associated with nominal price changes, or by money illusion. In the case of menu costs, one can hardly imagine that the objective costs of price changes are sufficiently large to explain business cycles. The leading argument against money illusion as a factor generating business cycles is the implausibility that agents persistently pass up opportunities for gain. But how large must transactions costs be? Or how foolish are agents whose behavior exhibits money illusion? Are individuals who change wages and/or prices inertially leaving the proverbial \$500 bills on the sidewalk? Or are they failing to stoop to pick up a few pennies?

Near Rational Behavior. According to previous work by ourselves (1985a,b; 1986) and others (N. Gregory Mankiw, 1985; Olivier Blanchard and Nobuhiro Kiyotaki, 1985), many forms of seemingly irrational behavior may really be “near-rational.” By this, we mean that agents have relatively wide latitude for deviating from full optimization without incurring significant losses. In

mathematical terms, this is a consequence of the envelope theorem which states, in effect, that the impact of an exogenous shock on a fully maximizing agent is identical, up to a first-order of approximation, whether he optimally changes his decision variable in response to a shock, or instead responds inertially. Stated differently, inertial, or rule-of-thumb behavior typically imposes losses on its practitioners, relative to the rewards from optimizing, which are second-order. Thus, slight relaxation of the standards for "good" model building—so as to tolerate behavioral assumptions entailing suitably small losses from nonmaximizing—significantly enlarges the range of behavior to be considered. For example, it turns out that in many contexts, the inertial adjustment of nominal wages and prices is near rational. Staggered nominal contracts in the style of John Taylor (1979), which do not quite optimally make use of newly available information because they keep nominal prices constant for two periods, turn out to be near-rational as also are the stock adjustment responses assumed to characterize money demand, consumption and investment in many Keynesian models. It might be thought that near-rational theories must be close to fully rational theories; but this intuition is in fact incorrect.

An Example. The logic of the difference between near rationality and full rationality can be explained in the context of a simple example. According to this example, if firms are monopolistically competitive, and a fraction of them change prices inertially in response to money supply changes, then significant business cycles result. However, nonmaximizing firms fare only insignificantly worse than optimizing firms. Consider an economy with identical, monopolistically competitive firms selling differentiated products. To make things simple, imagine that output can be produced costlessly. Further, assume that each firm's sales depends on its price relative to its rivals and on aggregate demand which, again for simplicity, is proportional to real balances—the nominal supply of money divided by the average price level. Finally, imagine that each firm

sets its price in Bertrand fashion, choosing the price that maximizes profits, taking rivals' prices as given, and the firms have settled into a Bertrand equilibrium. If all firms are fully rational and the Fed cuts the money supply, the new equilibrium will be exactly like the old in real terms. All that happens is that each firm's nominal price falls in proportion to the money supply cut. Money is neutral.

Now consider what would happen if some proportion of firms are nonmaximizers who follow an inertial rule in altering prices. To take an extreme case, suppose the nonmaximizers leave their price unchanged following the cut in the money supply. How much do they lose? The answer is that their losses are second-order. If the money supply fell by a percentage ϵ , the inertial firms will make a pricing error which is proportional to ϵ , but incur losses which are proportional to ϵ^2 —second-order in terms of the shock to the system. However, the decline in real balances (and hence output) resulting from the cut in M is first-order—proportional to ϵ . How can this be? Recall that under normal circumstances, any optimal decision is made by just balancing the marginal gains and losses from a change in the decision variable. The price-setting competitors optimally set prices by balancing the marginal gain of greater sales from a reduction in the price against the loss due to lower profit on each unit sold. An optimum has not been reached until the firm is indifferent, to a first-order of approximation, about its price. The firm's profit, as a function of its own price, is almost flat in the neighborhood of an optimum. Accordingly, the firm has latitude for making a relatively large error, without suffering large losses. An error of size δ causes a loss proportional to δ^2 . In this context, inertial price setting is almost costless even though its macroeconomic impact is significant.

The logic of the preceding example concerning prices suggests a similar defense of the standard Keynesian assumption of nominal wage rigidity. Nominal wage rigidity is near-rational if the firms' profits are a continuously differentiable function of the wage

they pay. In the efficiency wage paradigm, for example, the “productivity” of workers, broadly defined, is an increasing function of the real wage they receive. Firms optimally set wages by equating the marginal gains from lower wage cost per worker with the losses from lower productivity per worker; accordingly, inertial wage setting is near-rational. A firm that (nonoptimally) fails to cut wages in a recession gets some reward from its behavior—higher morale, lower turnover, etc. And while the behavior may not be strictly optimal, it is almost optimal since, for a firm which was initially optimizing, the rewards and costs of wage cuts were exactly balanced to start with.

II. How Rational Are Economic Agents?

We argued above that nonrational elements should be brought into macro models, and that, in many models, not much irrationality is needed to produce business cycles. In this section we shall argue that psychology and sociology provide natural explanations for sticky money wages. The New Classical Economics’ conclusion, that nominal variables are proportional to the expected money supply, is a singularity, in no way predicted by the judgmental errors and concern with equity which is well documented in psychology and sociology.

Cognitive Biases. Twenty years ago it was widely believed that in most cognitive judgments people acted as intuitive scientists. However, two decades of work by cognitive and social psychologists have unearthed a large variety of ways in which individuals’ judgments exhibit systematic errors relative to the scientific, objectively rational model.

People use at least three heuristics which generate biases in their decisions. According to the *availability heuristic*, they depend more than they should on “salient” information which is easily retrievable from memory. According to the *representativeness heuristic*, they act as if stereotypes are more common than they actually are, and in *anchoring*, they let their judgments be overly reliant on some initial “anchoring” values. Max Bazerman (1986) has enumerated thirteen distinct

judgmental mistakes that are due to the use of the three heuristics. These judgment errors are too numerous and too frequently documented in the laboratory with salient examples in the field to be easily dismissed as unimportant.

The question arises whether there are cognitive biases that suggest potential reasons for money wage stickiness. The most natural explanation of sticky money wages stems from anchoring. In a typical anchoring experiment, one finds that “irrelevant” initial conditions affect outcomes. For example, in a classic anchoring experiment, Daniel Kahneman and Amos Tversky (see Bazerman) spun a roulette wheel, and then asked subjects to estimate the number of African states with representatives in the United Nations—using the number obtained by spinning the roulette wheel as the initial estimate. For those whose initial estimate from the roulette wheel was 10, the median estimate was 25; for those whose initial estimate from the roulette wheel was 65, the median estimate was 45!

Could anchoring explain sluggish adjustment of money wages? It certainly could if last-period’s money wage acts as an anchor which influences this period’s wage settlement. As we shall see presently, in the discussion of *fairness*, people’s views of fair money wages apparently are anchored in the current *money wage*.

Fairness. It is hard to believe that payments are not jointly determined by market forces and fairness. Steven Allen, Robert Clark, and Daniel Sumner (1984) have pointed out that some firms have voluntarily added some indexation to benefits paid to already retired employees. While these payments undoubtedly had some beneficial effect in enhancing the firms’ reputations with current and prospective employees, a more natural explanation for these payments is not pure profit maximization by the firms, but a commitment to fair behavior.

In order for fairness to play a role in determining contract outcomes there must be a discrepancy between fair and market clearing outcomes. Kahneman, Jack Knetsch, and Richard Thaler (1986) have provided indisputable evidence of such a divergence in

a recent interview study. In this study they described a variety of situations to randomly sampled telephone interviewees, and then asked whether the market-clearing solution was fair. For example, they asked whether it would be fair for a hardware store to charge more for snow shovels following a snowstorm: 82 percent think it unfair and 18 percent think it fair. As a second example, they told interviewees that a small photocopying shop has one employee earning \$9 per hour. Business continues to be satisfactory but a factory in the area has closed and unemployment has increased. Would it be fair to reduce the wage paid to \$7 an hour now paid elsewhere to newly hired workers with similar talents? Eighty-three percent think it unfair.

Anchoring played a crucial role in most of the interview results in this study. Most questions involved the fair response to a change from some initial situation. It was, in general, considered unfair for one party to benefit relative to the initial anchoring situation while the second party lost. Thus in the hardware store example, it was unfair for the store to profit while customers paid more for snow shovels; similarly, it was unfair for the firm to cut the wages of its existing employees.

Importantly for Keynesian economics the Kahneman-Knetsch-Thaler experiments indicated the presence of anchoring based on current *money* wages. Respondents felt it fair for a company whose business was bad to raise wages by only 7 percent when there was 12 percent inflation, but unfair to cut wages by 5 percent if there was no inflation.

These findings are consistent with the standard sociological theory of fairness known as equity theory. (For an excellent survey see Roger Brown, 1986.) Equity theory (due to J. Stacy Adams and George Homans) predicts that in exchanges, "outcomes" (rewards) relative to the "investments" must be equal between the parties to the transaction. While this theory is specifically derivative from economics, there is an important difference between its predictions and those of standard economic theory. In equity theory, the investments and outcomes are *subjectively* measured. The provider of

labor services may *subjectively* value his or her services by more than the buyer of those services. Then, if we take the gap between the ratio of "reward" relative to investment on the part of the buyer and the seller, we have a prediction of the extent of resentment that parties in an exchange will experience. Because market-clearing contracts may be viewed as inequitable, the attempt to impose market-clearing terms on a transaction can easily generate resentment.

The existence of resentment does not, of course, imply that economic outcomes cannot occur which are resented. But in labor contracts there are good reasons why employers will wish to temper the resentments of their employees and accordingly may offer contracts that are not market clearing. Quite simply, resentment caused by a sense of unfair treatment is likely to translate into poor performance by workers who can exercise discretion in the performance of their work. Even if supervision and monitoring are feasible at low cost, it may not pay firms to monitor their employees too closely. A recent study by Edward Deci, James Connell, and Richard Ryan (1985) has shown that workers who are given more detailed rules and are more closely monitored experience less job satisfaction, are less motivated, and place more importance on such external rewards as compensation; in contrast, those who are less controlled achieve greater satisfaction in mastering their jobs. If firms are to take advantage of the self-motivation that comes with on-the-job autonomy, then they must ensure that workers perceive themselves to be fairly treated. The cost can easily involve paying wages in excess of market clearing. Accordingly, we would expect *perceptions* of fairness to play a role in determining wage contracts and anchoring to cause money wages to be sticky.

III. Conclusion

The bad press that Keynesian theory has recently received from maximizing, super-rational theory is simply undeserved. The assumptions required to motivate Keynesian economics are quite consistent with the behavioral regularities documented by psy-

chologists and sociologists. This motivation is in no way tortured out of complicated assumptions and models. It is highly natural. Keynesianism, both as theory and explanation of the facts, is alive and well on its fiftieth birthday. Happy Birthday, *General Theory*!

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