Efficiency Wage Models of Unemployment

By Janet L. Yellen[*]

Keynesian economists hold it to be self-evident that business cycles are characterized by involuntary unemployment. But construction of a model of the cycle with involuntary unemployment faces the obvious difficulty of explaining why the labor market does not clear. Involuntarily unemployed people, by definition, want to work at less than the going wage rate. Why don't firms cut wages, thereby increasing profits?

This paper surveys a recent literature which offers a convincing and coherent explanation why firms may find it unprofitable to cut wages in the presence of involuntary unemployment. The models surveyed are variants of the efficiency wage hypothesis, according to which, labor productivity depends on the real wage paid by the firm. If wage cuts harm productivity, then cutting wages may end up raising labor costs. Section I describes some of the general implications of the efficiency-wage hypothesis in its simplest form. Section II describes four distinct microeconomic approaches which justify the relation between wages and productivity. These approaches identify four benefits of higher wage payments: reduced shirking by employees due to a higher cost of job loss; lower turnover; an improvement in the average quality of job applicants; and improved morale.[1] Section III explains how the efficiency-wage hypothesis, with near rational behavior, can explain cyclical fluctuations in unemployment.

I. The Efficiency Wage Hypothesis

The potential relevance of the efficiency-wage hypothesis in explaining involuntary unemployment and other stylized labor market facts can be seen in a rudimentary model.

[1]For a previous survey of portions of this literature, see Guillermo Calvo (1979).

Consider an economy with identical, perfectly competitive firms, each firm having a production function of the form $Q = F(e(\omega)N)$, where N is the number of employees, e is effort per worker, and ω is the real wage. A profit-maximizing firm which can hire all the labor it wants at the wage it chooses to offer (see Joseph Stiglitz, 1976a; Robert Solow, 1979), will offer a real wage, ω^*, which satisfies the condition that the elasticity of effort with respect to the wage is unity. The wage ω^* is known as the efficiency wage and this wage choice minimizes labor cost per efficiency unit. Each firm should then optimally hire labor up to the point where its marginal product, $e(\omega^*)F'(e(\omega^*)N^*)$, is equal to the real wage, ω^*. As long as the aggregate demand for labor falls short of aggregate labor supply and ω^* exceeds labor's reservation wage, the firm will be unconstrained by labor market conditions in pursuing its optimal policy so that equilibrium will be characterized by involuntary unemployment. Unemployed workers would strictly prefer to work at the real wage ω^* than to be unemployed, but firms will not hire them at that wage or at a lower wage. Why? For the simple reason that any reduction in the wage paid would lower the productivity of all employees already on the job. Thus the efficiency-wage hypothesis explains involuntary unemployment.

Extended in simple ways this hypothesis also explains four other labor market phenomena: real wage rigidity; the dual labor market; the existence of wage distributions for workers of identical characteristics; and discrimination among observationally distinct groups. Concerning real wage rigidity, in the simple model just described, real shocks which shift the marginal product of labor alter employment, but not the real wage. In more elaborate versions of the model discussed below, such shocks will change the real wage, but not sufficiently to leave unemployment unaltered.

Dual labor markets can be explained by the assumption that the wage-productivity nexus is important in some sectors of the economy, but not in others. For the primary sector, where the efficiency-wage hypothesis is relevant, we find job rationing and voluntary payment by firms of wages in excess of market clearing; in the secondary sector, where the wage-productivity relationship is weak or nonexistent, we should observe fully neoclassical behavior. The market for secondary-sector jobs clears, and anyone can obtain a job in this sector, albeit at lower pay. The existence of the secondary sector does not, however, eliminate involuntary unemployment (see Robert Hall, 1975), because the wage differential between primary- and secondary-sector jobs will induce unemployment among job seekers who choose to wait for primary-sector job openings.

Theorists who emphasize the importance of unemployment due to the frictions of the search process have frequently found it difficult to explain the reasons for a distribution of wage offers in the market. The efficiency-wage hypothesis also offers a simple explanation for the existence of wage differentials which might motivate the search process emphasized by Edmund Phelps and others. If the relationship between wages and effort differs among firms, each firm's efficiency wage will differ, and, in equilibrium, there will emerge a distribution of wage offers for workers of identical characteristics.

The efficiency-wage hypothesis also explains discrimination among workers with different observable characteristics. This occurs if employers simply prefer, say, men to women. With job rationing, the employer can indulge his taste for discrimination at zero cost. As another possibility, employers may know that the functions relating effort to wages differ across groups. Then each group has its own efficiency wage and corresponding "efficiency labor cost." If these labor costs differ, it will pay firms to hire first only employees from the lowest cost group. Any unemployment that exists will be confined to labor force groups with higher costs per efficiency unit. With fluctuations in demand, these groups will bear a disproportionate burden of layoffs.

II. Microfoundations of the Efficiency-Wage Model

Why should labor productivity depend on the real wage paid by firms? In the *LDC* context, for which the hypothesis was first advanced, the link between wages, nutrition, and illness was emphasized. Recent theoretical work has advanced a convincing case for the relevance of this hypothesis to developed economies. In this section, four different microeconomic foundations for the efficiency-wage model are described and evaluated.

A. *The Shirking Model*

In most jobs, workers have some discretion concerning their performance. Rarely can employment contracts rigidly specify all aspects of a worker's performance. Piece rates are often impracticable because monitoring is too costly or too inaccurate. Piece rates may also be nonviable because the measurements on which they are based are unverifiable by workers, creating a moral hazard problem. Under these circumstances, the payment of a wage in excess of market clearing may be an effective way for firms to provide workers with the incentive to work rather than shirk. (See Samuel Bowles, 1981, 1983; Guillermo Calvo, 1979; B. Curtis Eaton and William White, 1982; Herbert Gintis and Tsuneo Ishikawa, 1983; Hajime Miyazaki, forthcoming; Carl Shapiro and Stiglitz, 1982; and Steven Stoft, 1982.) The details of the models differ somewhat, depending on what is assumed measurable, at what cost, and the feasible payment schedules.

Bowles, Calvo, Eaton-White, Shapiro-Stiglitz, and Stoft assume that it is possible to monitor individual performance on the job, albeit imperfectly. In the simplest model, due to Shapiro-Stiglitz, workers can decide whether to work or to shirk. Workers who shirk have some chance of getting caught, with the penalty of being fired. This has been termed "cheat-threat" theory by Stoft because, if there is a cost to being fired, the threat of being sacked if caught cheating creates an incentive not to shirk. Equilibrium then entails unemployment. If all firms pay

an identical wage, and if there is full employment, there would be no cost to shirking and it would pay all workers, assumed to get pleasure from loafing on the job, to shirk. In these circumstances, it pays each firm to raise its wage to eliminate shirking. When all firms do this, average wages rise and employment falls. In equilibrium, all firms pay the same wage above market clearing, and unemployment, which makes job loss costly, serves as a worker-discipline device. Unemployed workers cannot bid for jobs by offering to work at lower wages. If the firm were to hire a worker at a lower wage, it would be in the worker's interest to shirk on the job. The firm knows this and the worker has no credible way of promising to work if he is hired.

The shirking model does *not* predict, counterfactually, that the bulk of those unemployed at any time are those who were fired for shirking. If the threat associated with being fired is effective, little or no shirking and sacking will actually occur. Instead, the unemployed are a rotating pool of individuals who have quit jobs for personal reasons, who are new entrants to the labor market, or who have been laid off by firms with declines in demand. Pareto optimality, with costly monitoring, will entail some unemployment, since unemployment plays a socially valuable role in creating work incentives. But the equilibrium unemployment rate will not be Pareto optimal (see Shapiro-Stiglitz).

In contrast to the simple efficiency-wage model, the shirking model adds new arguments to the firm's effort function—the average wage, aggregate unemployment, and the unemployment benefit. The presence of the unemployment rate in the effort function yields a mechanism whereby changes in labor supply affect equilibrium wages and employment. New workers increase unemployment, raising the penalty associated with being fired and inducing higher effort at any given wage. Firms accordingly lower wages and hire more labor as a result. In a provocative recent paper, Thomas Weisskopf, Bowles, and David Gordon (1984) have used the presence of the unemployment benefit in the effort function to explain the secular decline in productivity in the United States; they argue that a major part of the productivity slowdown is attributable to loss of employer control due to a reduction in the cost of job loss. The shirking model also offers an interpretation of hierarchical wage differentials, in excess of productivity differences (Calvo and Stanislaw Wellisz, 1979).

All these models suffer from a similar theoretical difficulty—that employment contracts more ingenious than the simple wage schemes considered, can reduce or eliminate involuntary unemployment. In the cheat-threat model, the introduction of employment fees allows the market to clear efficiently as long as workers have sufficient capital to pay them (see Eaton-White and Stoft). Unemployed workers would be willing to pay a fee to gain employment. Fees lower labor costs, giving firms an incentive to hire more workers. If all firms charge fees, any worker who shirks and is caught knows that he will have to pay another fee to regain employment. This possibility substitutes for the threat of unemployment in creating work incentives. Devices which function similarly are bonds posted by workers when initially hired and forfeited if found cheating, and fines levied on workers caught shirking. The threat of forfeiting the bond or paying the fine substitutes for the threat of being fired. Edward Lazear (1981) has demonstrated the use of seniority wages to solve the incentive problem. Workers can be paid a wage less than their marginal productivity when they are first hired with a promise that their earnings will later exceed their marginal productivity. The upward tilt in the age-earnings profile provides a penalty for shirking; the present value of the wage paid can fall to the market-clearing level, eliminating involuntary unemployment.

As a theoretical objection to these schemes, employers would be subject to moral hazard in evaluating workers' effort. Firms would have an obvious incentive to declare workers shirking and appropriate their bonds, collect fines, or replace them with new fee-paying workers. In Lazear's model, in which the firm pays a wage in excess of marginal product to senior workers, there is an incentive for the firm to fire such workers, replacing them with young workers, paid less than their pro-

ductivity. The seriousness of this moral hazard problem depends on the ability of workers to enforce honesty on the firm's part. If effort is observable both by the firm and by the worker, and if it can be verified by outside auditors, the firm will be unable to cheat workers. Even without outside verification, Lazear has shown how the firm's concern for its reputation can overcome the moral hazard problem. Sudipto Bhattacharya (1983) has suggested tournament contracts that also overcome the moral hazard problem. The firm can commit itself to a fixed wage plan in which a high wage is paid to a fraction of workers and a low wage to the remaining fraction according to an *ex post*, possibly random, ranking of their effort levels. By precommitting itself to such a plan with a fixed wage bill, any moral hazard problem on the firm's part disappears.

B. *The Labor Turnover Model*

Firms may also offer wages in excess of market clearing to reduce costly labor turnover. (See Steven Salop, 1979; Ekkehart Schlicht, 1978; and Stiglitz, 1974.) The formal structure of the labor turnover model is identical to that of the shirking model. Workers will be more reluctant to quit the higher the relative wage paid by the current firm, and the higher the aggregate unemployment rate. If all firms are identical, one possible equilibrium has all firms paying a common wage above market clearing with involuntary unemployment serving to diminish turnover.

The theoretical objection to the prediction of involuntary unemployment in this model again concerns the potential for more sophisticated employment contracts to provide Pareto-superior solutions. As Salop explains, the market for new hires fails to clear because an identical wage is paid to both trained and untrained workers. Instead, new workers could be paid a wage equal to the difference between their marginal product and their training cost. A seniority wage scheme might accomplish this, although, if training costs are large and occur quickly it might prove necessary to charge a fee to new workers. In contrast to the shirking model, an employ-ment or training fee scheme could be employed without the problem of moral hazard. It is no longer in any firm's interest to dismiss trained workers; explicit contracts could probably be written to insure that training is actually provided to fee paying workers. Although moral hazard thus appears to be a less formidable barrier to achieving neoclassical outcomes via fees or bonds than in the shirking model, capital market imperfections or institutional or sociological constraints may in fact make them impractical.

C. *Adverse Selection*

Adverse selection yields further reason for a relation between productivity and wages. Suppose that performance on the job depends on "ability" and that workers are heterogeneous in ability. If ability and workers' reservation wages are positively correlated, firms with higher wages will attract more able job candidates. (See James Malcolmson, 1981; Stiglitz, 1976b; Andrew Weiss, 1980.) In such a model, each firm pays an efficiency wage and optimally turns away applicants offering to work for less than that wage. The willingness of an individual to work for less than the going wage places an upper bound on his ability, raising the firm's estimate that he is a lemon. The model provides an explanation of wage differentials and different layoff probabilities for observationally distinct groups due to statistical discrimination if it is known that different groups have even slight differences in the joint distributions of ability and acceptance wages. However, for the adverse-selection model to provide a convincing account of involuntary unemployment, firms must be unable to measure effort and pay piece rates after workers are hired, or to fire workers whose output is too low. Clever firms may also be able to mitigate adverse selection in hiring by designing self-selection or screening devices which induce workers to reveal their true characteristics.

D. *Sociological Models*

The theories reviewed above are neoclassical in their assumption of individualistic maximization by all agents. Solow (1980) has

argued, however, that wage rigidity may more plausibly be due to social conventions and principles of appropriate behavior that are not entirely individualistic in origin. George Akerlof (1982) has provided the first explicitly sociological model leading to the efficiency-wage hypothesis. He uses a variety of interesting evidence from sociological studies to argue that each worker's effort depends on the work norms of his group. In Akerlof's partial gift exchange model, the firm can succeed in raising group work norms and average effort by paying workers a gift of wages in excess of the minimum required, in return for their gift of effort above the minimum required. The sociological model can explain phenomena which seem inexplicable in neoclassical terms—why firms don't fire workers who turn out to be less productive, why piece rates are avoided even when feasible, and why firms set work standards exceeded by most workers. Akerlof's paper in this issue explores alternative sociological foundations for the efficiency wage hypothesis. Sociological considerations governing the effort decisions of workers are also emphasized in Marxian discussions of the extraction of labor from labor power (see, for example, Bowles, 1983).

III. Explaining the Business Cycle

Any model of the business cycle must explain why changes in aggregate demand cause changes in aggregate employment and output. A potential problem of the efficiency-wage hypothesis in this regard is the absence of a link between aggregate demand and economic activity. In an economy with efficiency-wage setting, there is a positive natural rate of unemployment and real wage rigidity. But the economy's aggregate output is independent of price at this natural rate. These models have no wage or price stickiness to cause real consequences from aggregate demand shocks. However, for a natural but subtle reason, the efficiency-wage model is consistent with nominal wage rigidity and cyclical unemployment. This reason (suggested by Stoft), is explored in depth by Akerlof and myself (1983), where we argue that sticky wage and price behavior, that will cause significant business cycle fluctuations, is consistent with near rationality in an economy with efficiency wage setting. Any firm that normally chooses its wage as part of an optimizing decision will incur losses that are only second-order if it follows a rule of thumb in adjusting nominal wages which leads to a real wage error. At the point of maximum profits, the profit function relating wages to profits is flat. Thus, in the neighborhood of the optimum wage, the loss from wage errors is second-order small. This implies that firms with sticky wages have profits that are insignificantly different from firms with maximizing behavior. Furthermore, if firms have price-setting power because of downward-sloping demand curves, for similar reasons, price-setting errors also lead to insignificant losses.

In the Akerlof-Yellen model, firms are efficiency-wage setters and monopolistic competitors. In the long run, wages and prices are set by all firms in an optimal way. In the short run, in response to aggregate demand shocks, some firms keep nominal wages and prices constant, while other firms choose these variables optimally. In this model, a cut in the money supply causes a first-order change in employment, output, and profits. But the behavior of nonmaximizers is near rational in the sense that the potential gain any individual firm could experience by abandoning rule of thumb behavior is second-order small. And thus the efficiency-wage hypothesis can be extended into a full-fledged Keynesian model of the business cycle generated by sticky prices and wages.

IV. Concluding Remarks

It has been widely observed that the existence of excess labor supply does not lead to aggressive wage cutting by workers and firms. Firms appear content to pay workers more than the wages required by their potential replacements. The models surveyed here offer several different and plausible explanations of this seemingly paradoxical fact. In addition to accounting for the persistence of involuntary unemployment in competitive markets, these efficiency wage models can explain why unemployment varies in re-

sponse to aggregate demand shocks. In sum, these models provide a new, consistent, and plausible microfoundation for a Keynesian model of the cycle.

REFERENCES

Akerlof, George, "Labor Contracts as Partial Gift Exchange," *Quarterly Journal of Economics*, November 1982, *97*, 543–69.

_____, "Gift Exchange and Efficiency Wage Theory: Four Views," *American Economic Review Proceedings*, May 1984, *74*, 79–83.

_____ and Yellen, Janet, "The Macroeconomic Consequences of Near Rational, Rule of Thumb Behavior," mimeo., University of California-Berkeley, September 1983.

Bhattacharya, Sudipto, "Tournaments and Incentives: Heterogeneity and Essentiality," mimeo., Stanford University, March 1983.

Bowles, Samuel, "Competitive Wage Determination and Involuntary Unemployment: A Conflict Model," mimeo., University of Massachusetts, May 1981.

_____, "The Production Process in a Competitive Economy: Walrasian, Neo-Hobbesian and Marxian Models," mimeo., University of Massachusetts, May 1983.

Calvo, Guillermo, "Quasi-Walrasian Theories of Unemployment," *American Economic Review Proceedings*, May 1979, *69*, 102–07.

_____ and Wellisz, Stanislaw, "Hierarchy, Ability and Income Distribution," *Journal of Political Economy*, October 1979, *87*, 991–1010.

Eaton, B. Curtis and White, William, "Agent Compensation and the Limits of Bonding," *Economic Inquiry*, July 1982, *20*, 330–43.

Gintis, Herbert and Ishikawa, Tsuneo, "Wages, Work Discipline and Macroeconomic Equilibrium," mimeo., 1983.

Hall, Robert, "The Rigidity of Wages and the Persistence of Unemployment," *Brookings Papers on Economic Activity*, 2:1975, 301–35.

Lazear, Edward, "Agency, Earnings Profiles, Productivity, and Hours Restrictions,"

American Economic Review, September 1981, *71*, 606–20.

Malcolmson, James, "Unemployment and the Efficiency Wage Hypothesis," *Economic Journal*, December 1981, *91*, 848–66.

Miyazaki, Hajime, "Work Norms and Involuntary Unemployment," *Quarterly Journal of Economics*, forthcoming.

Salop, Steven, "A Model of the Natural Rate of Unemployment," *American Economic Review*, March 1979, *69*, 117–25.

Schlicht, Ekkehart, "Labour Turnover, Wage Structure and Natural Unemployment," *Zeitschrift für die Gesamte Staatswissenschaft*, June 1978, *134*, 337–46.

Shapiro, Carl and Stiglitz, Joseph, "Equilibrium Unemployment as a Worker Discipline Device," mimeo., Princeton University, April 1982.

Solow, Robert, "Another Possible Source of Wage Stickiness," *Journal of Macroeconomics*, Winter 1979, *1*, 79–82.

_____, "On Theories of Unemployment," *American Economic Review*, March 1980, *70*, 1–11.

Stiglitz, Joseph, "Wage Determination and Unemployment in L.D.C.'s: The Labor Turnover Model," *Quarterly Journal of Economics*, May 1974, *88*, 194–227.

_____, (1976a) "The Efficiency Wage Hypothesis, Surplus Labour, and the Distribution of Income in L.D.C.s," *Oxford Economic Papers*, July 1976, *28*, 185–207.

_____, (1976b) "Prices and Queues as Screening Devices in Competitive Markets," IMSSS Technical Report No. 212, Stanford University, August 1976.

Stoft, Steven, "Cheat-Threat Theory: An Explanation of Involuntary Unemployment," mimeo., Boston University, May 1982.

Weiss, Andrew, "Job Queues and Layoffs in Labor Markets with Flexible Wages," *Journal of Political Economy*, June 1980, *88*, 526–38.

Weisskopf, Thomas, Bowles, Samuel and Gordon, David, "Hearts and Minds: A Social Model of Aggregate Productivity Growth in the U.S., 1948–1979," *Brookings Papers on Economic Activity*, 1984, forthcoming.