

# EFFICIENCY WAGES AND CLASSICAL WAGE THEORY

BY  
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## I. INTRODUCTION

In *The General Theory*, John Maynard Keynes lumped together the marginalist and neoclassical economics of the late nineteenth and twentieth centuries and the more narrowly defined “classical” economics of Adam Smith, David Ricardo, J. R. McCulloch, James and John Stuart Mill and other mainstream economists of the late eighteenth and early nineteenth into what he called the “classical theory of employment,” which he reduced to two “fundamental postulates”:

- (a) *The wage is equal to the marginal product of labour. . .*
- (b) *The utility of the wage when a given volume of labour is employed is equal to the marginal disutility of that amount of employment . . .* (Keynes 1936, p. 5).

In classical, marginal productivity and neoclassical wage theory, wage and price flexibility generate a full-employment equilibrium with no involuntary unemployment.

In the Keynesian labor market, downward price and wage rigidities can generate a macroeconomic equilibrium with involuntary unemployment of labor.<sup>1</sup> The efficiency wage theories that emerged in the New Keynesian economics of the 1960s provide an explanation of downward wage rigidity and involuntary unemployment. In most efficiency wage models, the firms pay a wage premium or an efficiency wage above the market-clearing wage to raise productivity and lower costs, the most famous historical example being Henry Ford’s \$5 per day wage in 1914 (Raff and Summers 1987). Efficiency wages enhance labor productivity by improving workers’ morale and attachment to the firm, and strengthen their incentives to work hard to keep their jobs because they are paid more than the competitive wage.<sup>2</sup> Since efficiency wages

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<sup>1</sup>On the definition of “classical” and “Keynesian,” see Corden (1978) and Gerrard (1995).

<sup>2</sup>Agell and Lundborg (1992, 1995) develop a general equilibrium model with a “fair wage” component, which includes efficiency wages and generates equilibrium involuntary unemployment. The models are then applied to a range of fiscal policy, public finance, and open economy issues.

exceed the market-clearing equilibrium, they call out excess supply of labor and contribute to involuntary unemployment.

This article examines some early recognition of what is now called the efficiency wage in the classical, marginal productivity and neoclassical wage literature and adds an efficiency wage to the classical aggregate, or macroeconomic labor market model. This provides an additional perspective to our understanding of the classical and neoclassical labor market models, as well as our understanding of efficiency wages.

## II. A SIMPLE “CLASSICAL” AGGREGATE LABOR MARKET MODEL

We begin with a very simple aggregate labor market model which is broadly consistent with the classical economics of the late eighteenth and early nineteenth centuries.

### *Demand for Labor*

The demand for labor ( $L_D$ ) in the classical labor market varies directly with the size of the capital stock ( $K$ ), and more specifically the stock of circulating capital ( $K_C$ ) that employs labor. The capital stock, in turn, depends on saving ( $S$ ) which is a function of aggregate output or real GDP. This cornerstone of classical economics is explicit in Smith’s familiar argument that “Parsimony, and not industry, is the immediate cause of the increase of capital . . . Parsimony, by increasing the fund which is destined for the maintenance of productive hands, tends to increase the number of those hands whose labor adds to the value of the subject upon which it is bestowed” (1776, p. 337).

With uncharacteristic clarity, Ricardo argued that “When wages rise, it is generally because the increase of wealth and capital have occasioned a new demand for labor, which will infallibly be attended with an increased production of commodities (1821, p. 60).

John Stuart Mill’s infamous Fourth Fundamental Proposition on Capital asserts with uncharacteristic lack of clarity that “What supports and employs productive labour, is the capital expended in setting it to work, and not the demand of purchasers for the produce of the labour when completed. Demand for commodities is not demand for labour” (Mill 1871, p. 79).

In Mill’s familiar wages fund model, the wages fund in the current period is a portion of the stock of circulating capital ( $K_C$ ). No attempt will be made here to resuscitate the wages fund doctrine, which was after all abandoned by Mill himself.<sup>3</sup>

<sup>3</sup>In his 1869 recantation of the wages fund, Mill wrote: Exists there any fixed amount which, and neither more nor less which, is destined to be expended in wages?

Of course there is an impassible limit which can be so expended; it cannot exceed the aggregate means of the employing classes. It cannot come up to those means; for the employers have also to maintain themselves and their families. But, short of this limit, it is not, in any sense of the word, a fixed amount (1967, p. 664). Mill gave up on the wages fund without any alternative statement of the relationship between  $w$  and  $L$  beyond the fantastic statement that it is indeterminate up to total wage payments that would reduce employers to subsistence. The late N. Arnold Tolles asserted that “By the 1870’s Mill was an old man. He had the courage and candor

However, it did remain in the subsequent editions of *Principles of Political Economy* after Mill's recantation (Mill 1871) and is broadly consistent with the classical economists' conception of capital and their explanation of the demand for labor (Smith 1776, p. 6; Ricardo 1821, p. 53).

The wages fund doctrine suggests that the demand for labor is

$$L_D = L_D(w, K_c\{K[S(Q_{t-1})]\}), \quad (1)$$

where  $L_D$  is the labor demanded in the current period,  $w$  is the real wage per unit of labor,  $K$  is the capital stock and  $S(Q_{t-1})$  is saving from the previous period.<sup>4</sup> From (1), the current wages fund ( $W$ ) is

$$W = \alpha Q_{t-1} \quad (\alpha < 1), \quad (2)$$

where  $\alpha = W / Q_{t-1}$ . The value of  $\alpha$  depends on the average propensity to save, the ratio of capital to saving, and the ratio of circulating capital to total capital in period ( $t - 1$ ).

If aggregate wages exhaust the wages fund,

$$wL = W = \alpha Q_{t-1}, \quad (3)$$

where  $w$  is the real wage rate and  $L$  is aggregate employment, and the demand for labor is

$$L_D = \frac{\alpha Q_{t-1}}{w} = \frac{\alpha}{w} Q_{t-1}. \quad (4)$$

In the current period  $Q_{t-1}$ ,  $\alpha Q_{t-1}$  and  $W$  are given, and

$$\frac{\partial L_D}{\partial w} = -\frac{\alpha Q_{t-1}}{w^2} < 0.$$

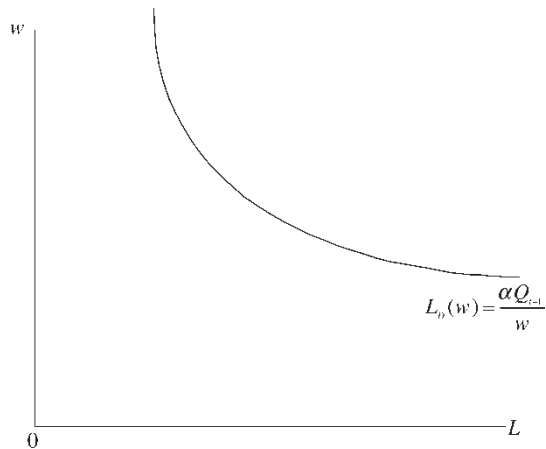
Thus,  $L_D$  varies inversely with  $w$ , *ceteris paribus*, along the unitarily wage-elastic  $L_D$  function in Figure 1 (Hollander 1991, pp. 48-51),<sup>5</sup> which was one of the reasons for Mill's recantation.

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to reconsider his central theory of wages as supposedly determined by the demand for labor, but he no longer had the energy to substitute anything else" (Tolles 1964, p. 17). Breit (1967) is a very good analytical critique of the wages fund doctrine. Taussig (1896) is still well worth reading on this point.

<sup>4</sup>This draws on Blaug (1996, pp. 177-81), which is an excellent explanation of the dynamic wages fund.

<sup>5</sup>Schumpeter (1950, 664n) attributes this type of demand curve to Fleeming Jenkin's papers "Trade Unions," (1868) and "The Graphic Representation of the Laws of Supply and Demand and their Application to Labour" (1870).



**Figure 1.** The wages fund and the demand for labor

### *Labor Supply in the Classical Labor Market*

The supply of labor in the classical labor market depends explicitly on the size of the labor force ( $LF$ ), which is in turn a function of population ( $N$ ) and the labor-force participation rate. If we expand “classical” to include Jevons, as Keynes did, holding  $N$  and  $LF$  ( $N$ ) constant in the short run, we expect  $L_s(w)$  to vary directly with  $w$  because of the diminishing marginal utility (rising marginal disutility) of labor—that is,

$$L_s = L_s[w, LF(N)]$$

$$\frac{\partial L_s}{\partial w} \geq 0.$$

### *The Natural Wage and Long-run Labor Supply*

For most classical economists the natural (long-run equilibrium) wage is the cost of subsistence. Ricardo, and especially Mill, accepted the Malthusian notion that population stabilizes at subsistence to define the natural wage as the cost subsistence, or the cost of maintaining the labor force (Malthus 1798; Ricardo 1821 chapter V; Mill 1871, pp. 345–46). In the short run, the actual wage ( $w$ ) may be greater than, equal to, or less than the subsistence natural wage ( $w_n$ ), depending on the demand for, and supply of labor. However, in the long run, population, labor force, and labor supply stabilize when  $w = w_n$  on the long-run labor supply curve ( $LRL_s$ ).

### *Labor Market Equilibrium*

The classical labor market clears with no involuntary unemployment of labor. In the short run,

$$L_D(\bar{w}) = L_S(\bar{w}) = \bar{L}.$$

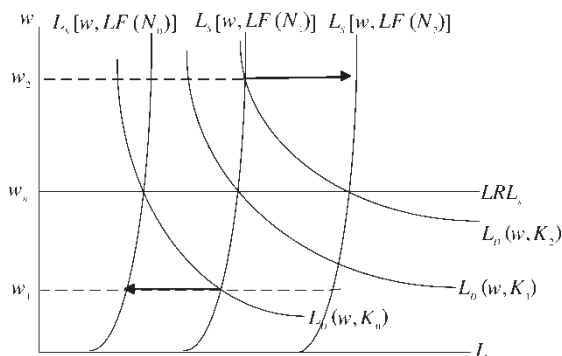


Figure 2. Short-run and long-run equilibrium wage

In the long run,  $\bar{w} = w_n$ , and

$$L_D(w_n) = L_S(w_n).$$

If  $\bar{w} > w_n$  in the short run, population growth increases  $N$ ,  $LF$  and  $L_s$  until the equilibrium wage falls back to  $\bar{w} = w_n$  at a higher level of employment. If  $\bar{w} < w_n$  in the short run, population declines, which reduces  $N$ ,  $LF$  and  $L_s$  until the wage rises to  $\bar{w} = w_n$ .

In the long run, in the classical model, the wage is the outcome of a race between the accumulation of capital and population growth. In Figure 2, for example, suppose that a capital stock of  $K_1$  defines the demand for labor  $L_D(w, K_1)$ , and a population of  $N_1$  defines a labor supply of  $L_s[w, LF(N_1)]$  so that the labor market clears at the natural wage,  $w_n$ . Increasing the capital stock to  $K_2$ , increases the demand for labor to  $L_D(w, K_2)$ , which combines with  $L_s[w, LF(N_1)]$  to generate a new short- equilibrium wage of  $w_2 > w_n$ . In the long run,  $w_2 > w_n$  generates population growth and increases the supply of labor to  $L_s[w, LF(N_2)]$ , which drives the wage back to  $w_n$ .

If the capital stock fell from  $K_1$  to  $K_0$ , the demand for labor would fall to  $L_D(w, K_0)$ , and the short-run equilibrium wage would fall to  $w_1$ . In the long run, declining population and labor force reduce the supply of labor to  $L_s[w, LF(N_0)]$ , which raises the wage until the labor market clears at  $w_n$ . The result is a completely elastic long-run supply of labor at  $w_n$ .<sup>6</sup> The classical long run adjustment to long-run labor market equilibrium is primarily, if not exclusively, via the Malthusian mechanism of population and labor force adjustments to  $w \neq w_n$ .

### III. "EFFICIENCY" AND THE CLASSICAL LABOR MARKET

The output produced by any input of labor depends not only on the properties of labor (health, education, skill, training, etc.) that define the production function, but also on

<sup>6</sup>The demand for labor in this example is consistent with either a marginal productivity explanation, or with a modified version of the wages fund. See Hicks (1963, p. 17n) and Taussig's (1896) analysis of the wages fund issue.

the quality of the effort expended by workers, or the *efficiency of labor*. Efficiency may be “positive” and increase output or lower cost, or “negative” and reduce output or raise cost. As Hicks put it, “Different men cause all sorts of varying amounts of trouble to their employers; some are very ‘reliable’, they are never ill, never want a day off, are always content and on good terms with the management. Others are always causing expensive temporary adjustments for such reasons (Hicks 1963, p. 40).

Modern efficiency wage theory explains the efficiency of labor in terms of diligence vs. “shirking” (Shapiro and Stiglitz 1984), labor turnover (Campbell 1993), loyalty to the firm, perceived fairness of wages (Akerloff and Yellen 1990), and caloric intake of workers (Leibenstein 1957, pp. 94–97; Dasgupta 1993, pp. 481–83, Swamy 1997), among other causes (Gordon 1990, pp. 1157–59; Hicks 1963, pp. 34–41).

Alfred Marshall introduced the term *efficiency wages* in his *Principles of Economics* as follows:

[W]e require the use of a new term. We may find it in *efficiency wages*, or more broadly *efficiency earnings*; that is, earnings measured not as time-earnings are with reference to the time spent in earning them; and not as piece-work earnings are with reference to the amount of output resulting from the work by which they are earned; but with reference to the exertion of ability and *efficiency* required of the worker (Marshall 1920, p. 456).

However, the basic idea of efficiency wages appears in the economic literature long before Marshall. Adam Smith recognized that the monotony of assembly-line jobs was one of the downsides of specialization that could reduce labor efficiency and at least partially offset the increased productivity generated by the division of labor:

The uniformity of his [the worker’s] stationary life naturally corrupts the courage of his mind . . . It corrupts even the activity of his body, and renders him incapable of exerting his strength with vigour and perseverance in any other employment than that to which he has been bred. His dexterity at his own particular trade seems, in this manner, to be acquired at the expense of his intellectual, social, and martial virtues. But in every improved and civilized society this is the state into which the labouring poor, that is, the great body of the people, must necessarily fall, unless government takes some pains to prevent it (Smith 1776, p. 782).

John Stuart Mill’s analysis of the relationship between education, productivity, and wages contains a fairly straightforward human capital investment argument and a suggestion of an efficiency effect of education:

The moral qualities of the labourers are fully as important to the efficiency and worth of their labour as the intellectual. Independently of the effects of intemperance upon their bodily and mental faculties, and of flighty, unsteady habits upon the energy and continuity of their work . . . it is well worthy of meditation, how much of the aggregate effect of their labour depends on their trustworthiness. All the labour now expended in watching that they fulfill their engagement, or in verifying that they have fulfilled it, is so much withdrawn from the real business of production, to be devoted to a subsidiary function rendered needful not by the necessity of things, but by the dishonesty of men. Nor are the greatest outward precautions more than very imperfectly efficacious, where, as is now almost exclusively the case with

hired labourers, the slightest relaxation of vigilance is an opportunity eagerly seized for eluding the performance of their contract (Mill 1871, pp. 109-10).

This is close to the “shirking” variants of modern efficiency-wage theory, in which employers pay a higher wage to raise the efficiency of labor and increase output by raising morale, improving the diligence and trustworthiness of workers, and lowering the costs of supervision and excessive labor turnover.

There are suggestions in the classical literature of the modern efficiency-wage argument that the efficiency of labor ( $e$ ) is a function of the real wage, or

$$e = e(w). \quad (6)$$

We assume that  $e'(w) \geq 0$  and  $e''(w) < 0$ . Unlike the marginal product of labor, which is a determinant of the real wage in marginal productivity and neoclassical wage theory, efficiency is determined in part by the real wage. For example, Smith argued that:

The liberal reward of labour, as it encourages the propagation, so it increases the industry of the common people. The wages of labour are the encouragement of industry, which, like every other human quality, improves in proportion to the encouragement it receives. A plentiful subsistence increases the bodily strength of the labourer, and the comfortable hope of bettering his condition, and of ending his days perhaps in ease and plenty, animates him to exert that strength to the utmost. Where wages are high, accordingly, we shall always find the workmen more active, diligent, and expeditious than where they are low (1776, p. 99).

His explanation of high wages in occupations involving “great trust” also suggests an efficiency component, in addition to the costs (training costs and moral hazard) incurred by those employed in these occupations:

We trust our health to the physician: our fortune and sometimes our life and reputation to the lawyer and attorney. Such confidence could not safely be reposed in people of a very mean or low condition. Their reward must be such, therefore, as may give them that rank in the society which so important a trust requires. The long time and the great expense which must be laid out in their education, when combined with this circumstance, necessarily enhance still further the price of their labour (1776, p. 122).

In his discussion the wage and the cost of labor—unit labor cost or average variable cost if labor is the variable input—Mill argued, “Wages and the cost of labour; what labour brings in to the labourer and what it costs to the capitalist; are ideas quite distinct . . . [T]he cost of labor is frequently at its highest where wages are lowest . . . [T]he labour though cheap, may be inefficient” (Mill 1871, p. 419).

Although Mill did not assert that the wage determines efficiency as clearly as Smith did, he thought that the positive effects of education on habits and efficiency would be more likely to occur if workers’ wages were higher rather than lower. In Bk II, Chapter XIII of *Principles*, “The Remedies for Low Wages Further Considered,” he asserted that “the aim of all intellectual training for the mass of the people should be to cultivate common sense; to qualify them for forming a sound practical judgment of the circumstances by which they are surrounded” (Mill 1871, p. 381). However, he

continued: “Education is not compatible with extreme poverty. It is impossible effectually to teach an indigent population. And it is difficult to make those feel the value of comfort who have never enjoyed it, or those appreciate the wretchedness of a precarious subsistence who have been made reckless by always living from hand to mouth” (1871, p. 381).

Mill thought that the greatest possible effect of the common sense gained through education would be to slow the growth of population and the labor force. However, he also thought, on solid Utilitarian grounds, that educated workers would make better choices and develop better habits. It doesn't seem an unreasonable stretch to infer that one of the benefits of education would be greater efficiency of labor. Moreover, he argued strongly that education and its benefits were more likely to accrue to workers with higher wages and living standards, so it would be reasonable for him to argue that the wage is one of the factors that determines the efficiency of labor.

### *Efficiency (e) and Aggregate Output*

Combining the efficiency wage,  $e(w)$ , and the aggregate production function,  $f(L, K)$ , gives us the aggregate output ( $Q$ ) function

$$Q = Q[L, K, e(w)] = e(w)[f(L, K)] \quad (7a)$$

in the long run with  $L$  and  $K$  both variable and

$$Q = Q[L, \hat{K}, e(w)] = e(w)[f(L, \hat{K})] \quad (7b)$$

in the short run with  $K$  fixed at  $\hat{K}$ . If there are no efficiency wage effects—that is, the wage has no effect on efficiency— $e(w) = 1$  and  $Q = f(L, K)$ .

If an efficiency wage strengthens workers' commitment and loyalty to the firm, makes them feel fairly treated or simply that they will do worse by quitting or being dismissed and earning the lower market wage, they are likely to work harder and require little supervision. In this case  $e(w) > 1$ ,  $Q > f(L, K)$ , and efficiency is “positive.” On the other hand, if the wage makes workers feel unfairly treated they will have more tenuous attachments to the firm and be more likely to shirk on the job, produce low quality output and require tighter supervision. In this case,  $0 < e(w) < 1$ ,  $Q < f(L, K)$ , and efficiency is “negative.”

Adding  $e(w)$  to the output function makes aggregate output ( $Q$ ) a function not only of  $L, K$  and  $e$ , but also of the real wage ( $w$ ). If  $e'(w) \geq 0$  and  $e''(w) < 0$ , then the first and second partial derivatives of  $Q$  with respect to  $w$  are

$$\begin{aligned} Q_w &= e'(w)f(L, K) \geq 0, \\ Q_{ww} &= e''(w)f(L, K) < 0. \end{aligned}$$

Holding everything else constant and assuming  $e''(w) < 0$  limits the ability to increase  $Q$  by raising  $w$ . This precludes an untenable “economy of high wages”



argument that raising the real wage has unlimited potential for raising aggregate employment and output (Dobb 1933, pp. 101–102).

### *Efficiency and Demand for Labor: Wages Fund*

If the wages fund and demand for labor were determined by aggregate output in the previous period, as most versions of the wages fund doctrine asserted, then it also depends in part on the real wage in the previous period. If we modify (2) to include  $e(w)$  and assume that  $w = w_{t-1}$ , the current wages fund ( $W$ ) becomes

$$W = \alpha[e(w)]f(L_{t-1}, K_{t-1}) \quad (\alpha < 1). \quad (8)$$

From (8), the demand for labor is

$$L_D = \frac{\alpha[e(w)]f(L_{t-1}, K_{t-1})}{w} = \frac{\alpha}{w}[e(w)]f(L_{t-1}, K_{t-1}). \quad (9)$$

The slope of  $L_D$  is the partial derivative

$$\frac{\partial L_D}{\partial w} = \frac{\alpha f(L, K)}{w} \left\{ e'(w) - \frac{e(w)}{w} \right\}. \quad (10)$$

The sign of (10) is ambiguous because it depends on the strengths of the *efficiency effect* of wage changes,  $e'(w) > 0$ , and the *wages fund effect*,  $[-e(w)/w] < 0$ . It is theoretically possible that the efficiency effect could dominate and  $\partial L_D/\partial w > 0$ , or that the two effects could offset each other resulting in  $\partial L_D/\partial w = 0$  and completely wage inelastic demand for labor—as in Mill's recantation of the wages fund. However, we would realistically expect the wages fund effect to dominate the efficiency effect and the quantity of labor demanded to vary inversely with the wage ( $\partial L_D/\partial w < 0$ ).

In Figure 3, the initial wage is  $w_1$  and the quantity of labor demanded is  $L_1$  on  $L[w, e(w_1)]$ . A real wage of  $w_2$  raises efficiency to  $e(w_2)$  if  $e'(w) > 0$ . The wages-fund effect of  $w_2 > w_1$  reduces employment to  $L_1'$  on  $L[w, e(w)]$ , while the efficiency effect moves employment from  $L_1'$  to  $L_2$  on  $L[w, e(w_2)]$ . Likewise, reducing the real wage from  $w_1$  to  $w_0$  lowers efficiency to  $e(w_0)$ . The wages-fund effect of  $w_0 > w_1$  increases employment to  $L_1''$  on  $L[w, e(w_1)]$ , while the efficiency effect reduces employment from  $L_1''$  to  $L_3$  on  $L[w, e(w_0)]$ . The demand for labor with the efficiency wage effect is  $L_D[w, e(w)]$  in Figure 3.

One of the issues in the wages fund controversies in the nineteenth century was the wage elasticity of demand for labor. If the wages fund is fixed by past output, saving, and investment, then total wage payments would be constant at all points on the demand curve for labor in Figure 1, and along any of the unitarily wage elastic  $L[w, e(w_i)]$  curves in Figure 3. (Hollander 1968, pp. 51–52) One reason that Mill recanted the wages fund doctrine was the anti trade-union argument that whatever unions might gain in a higher wage would be offset by the decline in employment so that total wages would remain constant.

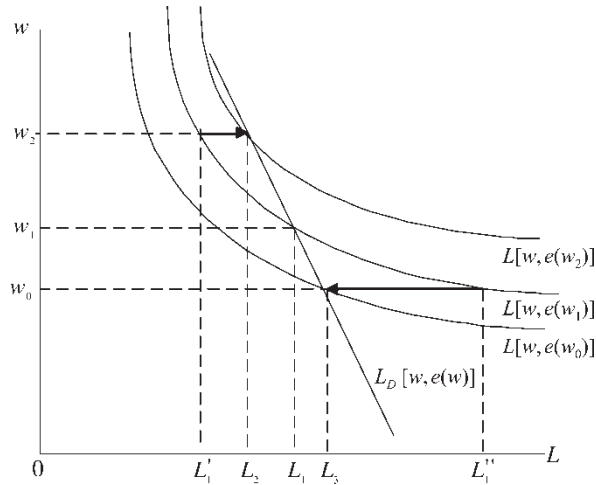


Figure 3. Efficiency and the demand for labor

If the wages fund is not pre-determined and fixed, then changes in the wage can change total wage payments or the wages fund and the demand for labor is not necessarily unitarily elastic. In his recantation in 1869, Mill even asserted that the demand for labor might be completely wage inelastic<sup>7</sup>:

Does the employer require more labour, or do fresh employers of labour make their appearance, merely because it can be bought cheaper? Assuredly, no. Consumers desire more of an article, or fresh consumers are called forth, when the price has fallen: but the employer does not buy labour for the pleasure of consuming it; he buys it that he may profit from its productive powers, and he buys as much labour and no more as suffices to produce the quantity of his goods which he can sell to advantage. A fall of wages does not necessarily make him expect a larger sale for his commodity, nor, therefore does it necessarily increase his demand for labour (1869, p. 644).

He explained the inelasticity of demand for labor in terms of the employer's allocation of resources among advances to workers (wages), advances to support himself and his family, and maintenance of fixed capital:

If we choose to call the whole of what he possesses applicable to the payment of wages, the wages-fund, that fund is co-extensive with the whole proceeds of his business, after keeping up his machinery, buildings and materials, and feeding his family; and it is expended jointly upon himself and his labourers. The less he spends on one, the more may be expended on the other, and *vice versa*. The price of labour, instead of being determined by the division of proceeds between the employer and the labourers, determines it. If he gets labour cheaper, he can afford to spend more upon himself. If he has to pay more for labour, the additional

<sup>7</sup>This point is analyzed in Hollander (1968, pp. 58–61).

payment comes out of his own income; perhaps from the part which he would have saved and added to capital. . . , perhaps from what he would have expended on his private wants or pleasures . . . The real limit to the rise is the practical consideration, how much would ruin him, or drive him to abandon the business; not the inexorable limits of the wages-fund (1871, p. 645).

If the classical labor supply were the labor force and completely wage inelastic, a completely wage inelastic demand for labor precludes a unique competitive equilibrium wage, and a positively sloped  $L_D$  would generate an unstable equilibrium. A completely wage inelastic, or even positively sloped,  $L_D$  is possible, but this would require very strong efficiency effects of wage changes.<sup>8</sup> The most likely case would be a wage inelastic, but probably not completely wage inelastic,  $L_D$ . In Figure 3,  $L_D$  is less wage elastic than the unitarily elastic  $L[w, e(w)]$  curves.  $L_D$  is more wage elastic in the long run, with  $K$  variable than in the short run, and might be wage elastic. The addition of  $e(w)$  doesn't rescue the wages fund, but it does address one of the issues that led Mill to abandon it. If the demand for labor is wage inelastic, raising the wage would reduce employment, but total wage payments to workers would rise.

### *Efficiency and Labor Market Equilibrium*

Efficiency wages that generate worker loyalty to the firm, low turnover, diligence, honesty, and other "moral qualities" of labor are consistent with market-clearing equilibrium in the classical labor market—at least in the short run, before population has time to adjust to  $w \neq w_n$ . There may be some specific occupational and industrial segments of the labor market where there is involuntary unemployment if firms pay an efficiency premium above the market clearing wage. However, the aggregate labor market clears at an equilibrium average real wage. Presumably, the workers who are shut out of above-market, efficiency wage occupations increase the supply of labor in lower-paid jobs to clear the aggregate labor market of involuntary unemployment (Doeringer and Piore 1970, Doeringer 1986).

### *The Natural Wage as a Non Market-Clearing Efficiency Wage*

Smith suggests in a well-known passage in *The Wealth of Nations* that the natural, subsistence wage may be an absolute floor on wages:

[T]here is however a certain rate below which it seems impossible to reduce, for any considerable time, the ordinary wages even of the lowest species of labour. A man must always live by his work, and his wages must at least be sufficient to maintain him. They must even upon most occasions be somewhat more; otherwise it would be impossible for him to bring up a family, and the race of such workmen could not last beyond the first generation (Smith 1776, p. 85).

<sup>8</sup>Hollander (1985, pp. 407–409) shows that a downward-sloping demand for labor is possible only in the long run in the wages-fund with fixed factor proportions because it requires changing the input of "technological capital," which is assumed constant in the short run. However, if the demand for labor includes a positive efficiency effect of wage changes,  $e'(w) > 0$ , the wages fund can generate a downward sloping  $L_D$  in the short run with  $K$  fixed, even with fixed factor proportions—as is the case in Figure 3.

He argued that if the capital stock and demand for labor are “sensibly decaying” there may be excess supply of labor that drives:

the wages of labour to the most miserable and scanty subsistence of the labourer. Many would not be able to find employment even upon these hard terms, but would either starve, or be driven to seek a subsistence either by begging, or by the perpetration perhaps of the greatest enormities. Want, famine and mortality would immediately prevail in that class (Smith 1776, pp. 90–91).

This is broadly consistent with a “survival”  $w_n$ .

Even if demographics and labor demand generated an equilibrium market wage,  $w_m < w_n$ , Smith thought that firms might pay  $w_n$  to maintain worker health, strength, morale, and productivity in the short run, and to provide sufficient population and labor force in the long run.<sup>9</sup> This suggests the possibility that the classical natural wage could in fact be the equivalent of an efficiency wage above the market-clearing market wage. The Malthusian specters of “want, famine and mortality” would reduce population, labor force, and labor supply in the long run, but the adjustment would be very slow and painful. In the meantime,  $w_n$  would be an above-market-clearing efficiency wage that generates involuntary unemployment.

If the subsistence wage were a physiologically determined cost of biological survival, it couldn't be sustained as a “natural” wage. The workers' physical condition, skill, and morale might depress efficiency sufficiently that even though the wage is extremely low, the unit labor cost may be higher than if the workers were paid the higher natural wage and their efficiency were higher. This is the main point of Mill's distinction between wages and labor cost, discussed earlier (Mill 1871, pp. 419–21). However, most classical economists thought that “subsistence” and the natural wage are socially rather than biologically defined survival. Ricardo argued that:

When the market price of labour is below its natural price, the condition of the labourers is most wretched: then poverty deprives them of those comforts which custom renders absolute necessities. It is only after their deprivations have reduced their number, or the demand for labour has increased, that the market price of labour will rise to its natural price, and that the labourer will have the moderate comforts which the natural rate of wages will afford (1821, p. 53).

Custom, along with biology, dictates what the “most wretched” condition of the workers and “absolute necessities” are. The economic role of “custom” is a major theme in Mill's *Principles*, including raising the accustomed or expected standard of living of the poor in his strategy for “remedying low wages.” In Bk. II, chapter 11, “On Wages,” Mill argued that:

Things which only affect (workers) a very little make no permanent impression upon their habits and requirements, and they soon slide back to their former state. To produce permanent advantage, the temporary cause operating upon them must be sufficient to make a great change in their condition—a change such as will be felt for

<sup>9</sup>Cannan (1929, pp. 340–42) criticized Smith's “crude subsistence theory” and his argument that employers would not pay less than the subsistence wage necessary to generate the next generation of workers because the employer “does not rely on his own workers' children, but can draw on supplies from elsewhere” (p. 340).

many years . . . When, indeed the improvement is of this signal character, and a generation grows up which has always been used to an improved scale of comfort, *the habits of this new generation in respect to population become formed upon a higher minimum*, and the improvement in their condition becomes permanent (1871, pp. 348–49, italics added).

This strongly suggests a socially determined subsistence living standard. For Mill, a biologically or physically determined subsistence standard would be relevant only to a period in which “mankind remained in a semi-barbarous state, with the indolence and the few wants of a savage” (Mill 1871, p. 358).<sup>10</sup>

If  $w_n$  is an efficiency wage above the market-clearing wage, the classical labor market could generate involuntary unemployment in the short run. Because the classical Malthusian population and labor force adjustments are very slow in calendar time, the current generation of unemployed workers would probably agree with Keynes that “*In the long run we are all dead*” (Keynes 1924, p. 80).

#### IV. EFFICIENCY, MARGINAL PRODUCTIVITY AND NEOCLASSICAL WAGE THEORY

With the marginal revolution in late nineteenth and twentieth century economics, the explanation of the values of goods and factors of production turned from the classical cost-of-production, or labor, theory of value to the value of the marginal unit. In wage theory, the classical wages fund gave way to marginal productivity theory.

##### *From Wages Fund to Marginal Productivity*

A detailed analysis of the displacement of the wages fund doctrine by marginal productivity and neoclassical wage theories is beyond the scope of this paper, and there is a substantial body of literature on the subject. I will focus on several points that are relevant to the question of efficiency wages.

In marginal productivity and neoclassical wage theory, wages are paid out of current output, not from a predetermined fund accumulated in the past and dedicated to pay current wages.<sup>11</sup> In 1876, for example, Francis Amasa Walker argued in *The Wages Question* that “An employer pays wages to purchase labor, not to expend a fund of which he may be in possession. He purchases labor not because he desires to keep it employed, but as a means to the production of wealth. He produces

<sup>10</sup>His example was the effect of the rise in living standards of the poor in France following the Revolution. He asserted that the immediate effect of the rapid improvement in living standards was:

that population, notwithstanding the destructive wars of the period, started forward with unexampled rapidity . . . The succeeding generation, however, grew up with habits considerably altered; and though the country was never before in so prosperous a state, the annual number of births is now nearly stationary, and the increase of population extremely slow (p. 349).

<sup>11</sup>This point was also taken up by Taussig (1896). Taussig argued that while many goods that are consumed currently were produced in a past period, there is not really a separate fund that is set aside for the payment of wages. He held what Hicks (1963) called a “modernized wages fund.”

wealth not for the sake of producing it, but with a view to a profit to himself, individually, in that production” (Walker 1876, I.VIII.2).

Marshall advanced a similar argument in Appendix J of *Principles of Economics*: “[I]n fact, this last cause [aggregate production] is the most powerful of all those which influence wages” (Marshall 1920, p. 679). In John Bates Clark’s version of marginal productivity theory, the marginal product of the “final” unit of labor defines the contribution of all intramarginal units and the wage per unit of labor. For example, in *The Distribution of Wealth* (Clark 1899), he argued that “Each unit of labor . . . is worth to its employer what the last unit produces” (p. 177) and that “*Final productivity governs wages*” (p. 180).

Early marginal productivity theorists tended to assume a given and completely wage inelastic supply of labor, so that in the short run, with a fixed capital input of  $\hat{K}$ ,  $w(L) = MP(L)$  is the demand price that clears the labor market. As Knut Wicksell explained it, “One may therefore say, in theory, that *the additional product of the last labourer engaged* will, in general regulate wages; which can neither rise above it nor fall below it . . . And, theoretically, at these wages *all* the labour in the market *will just find* employment” (1934, p. 111).

If wages are paid out of current production, and there are no efficiency wage effects ( $e(w) = 1$ ),

$$Q = f(L, K). \quad (11)$$

Assuming diminishing returns,  $f'(L) < 0$  and  $w'(L) = MP'(L) < 0$ . The market-clearing wage, or demand-price of labor— $w(L)$ —varies inversely with  $L$ . This is not a complete theory of wages because it deals only with the demand side of the labor market and the demand price of a given supply of labor.

Marshall completed the neoclassical labor market model by adding the supply of labor to the marginal productivity explanation of the demand for labor. Drawing on William Stanley Jevons (1871, chapter V), he argued that the marginal disutility of labor varies directly with the quantity of labor supplied (Marshall 1920, pp. 117–18). However, unlike Jevons, he didn’t clearly identify the marginal disutility of labor as the supply price. Marshall’s “supply price” of labor in *Principles* is the long-run cost of “rearing, training and sustaining the energy of efficient labour” (1920, p. 442).

[D]emand and supply exert co-ordinated influences on wages; neither has a claim to predominance; any more than has either blade of a pair of scissors, or either pier of an arch. Wages tend to equal the net [marginal] product of labour; its marginal productivity rules the demand price for it; and on the other side, wages tend to retain a close though indirect and intricate relation with the cost of rearing, training and sustaining the energy of efficient labour . . . and incidentally this secures that supply-price and demand price tend to equality: wages are not governed by demand-price nor by supply-price, but by the whole set of causes that govern demand and supply (Marshall 1920, p. 442).

Adding Jevons’ argument that workers “will cease to labour just at the point when the pain becomes equal to the corresponding pleasure gained” (Jevons 1879, p. 176)—that is, where the marginal disutility of additional work equals

the marginal utility of the real wage—the supply price of labor is determined by its marginal disutility. In the neoclassical model, then, the wage is determined by marginal product on the demand side and marginal disutility of labor on the supply side.

Putting all of this together, we end up with Keynes's two "fundamental postulates" of what he called the "classical theory of employment"—more accurately, "neoclassical" wage theory. The neoclassical labor market clears when

$$\begin{aligned}w(L_D) &= w(L_S) = \bar{w} \\L_D(\bar{w}) &= L_S(\bar{w}) = \bar{L} \\MP(\bar{L}) &= MDU(\bar{L}) = \bar{w},\end{aligned}$$

where  $L_D$  is the quantity of labor demanded,  $L_S$  is the quantity of labor supplied,  $\bar{w}$  is the equilibrium wage,  $\bar{L}$  is equilibrium employment and  $MDU(\bar{L})$  is marginal disutility of labor. Now we can examine the implications of efficiency and efficiency wages for the neoclassical labor market model.

### *Efficiency and Marginal Productivity*

There are numerous references to "efficiency" in the early marginal productivity and neoclassical literature, most notably Marshall's introduction of the terms "efficiency wages" and "efficiency earnings," cited above. Fritz Machlup argued that not only the marginal product, but the very definition of a factor of production assumes efficiency:

"Marginal" productivity of factors has sense only if the units of factors are homogeneous in respect of "efficiency." This must be taken into account in a puristic definition of a "factor" by including only productive services of perfect substitutability (interchangeability), while services which are not perfectly substitutable for one another are considered as different factors (1937, p. 193).

Marginal productivity and neoclassical economists dealt with efficiency by assuming homogeneous labor and constant efficiency. J. B. Clark essentially did this by assuming a composite "social unit of labor," "consisting of some labor from every industrial group that the community contains" (1899, p. 170). In his "marginal shepherd" example, Marshall argued: "It is best to assume throughout that the man is of normal efficiency . . . He should be representative: that is, of normal efficiency . . . If he is representative, and his employer is representative, his [additional] twenty sheep will represent the net product and therefore the earning power of a shepherd (1920, pp. 428–29).

We can see the relationship between efficiency of labor and its marginal product in the aggregate output function,

$$Q = ef(L, K), \quad (11)$$

where  $Q$  is aggregate output,  $f(L, K)$  is the aggregate production function, and  $e$  is the efficiency of labor (for now, assumed to be a constant). The marginal product of



labor in (11) is

$$MP(L) = Q_L = ef_L. \quad (12)$$

Thus,  $MP(L)$  is defined for a given value of  $e$ .

It isn't always easy to disentangle the variables that determine the "efficiency" of labor, in the modern efficiency wage theory sense, from those that would normally be assumed in the aggregate production function. A. C. Pigou (1932, p. 607) for example, included "the physique, mentality and morale. . . of the workpeople" as determinants of efficiency. Clearly, "physique" would be one of the independent variables in the aggregate production function that affects  $Q$ ,  $MP(L)$  and productivity of labor. The "morale," and possibly the "mentality" of workers would be more consistent with efficiency wage theory. Marshall (1920, p. 161) asserted that "health and strength, physical, mental and moral . . . are the basis of industrial efficiency, on which the production of material wealth depends," and that even in occupations that require "little more than physical vigour . . . the power of sustaining great muscular exertion seems to rest on constitutional strength and other physical conditions, yet even it depends also on force of will, and strength of character."

"Efficiency" of labor in the marginal productivity and neoclassical wage literature thus includes variables that affect  $f(L, K)$  and  $e$  in (11). It seems clear that there is some recognition of efficiency in the modern efficiency wage theory sense of that term.

### *Efficiency Wages and Marginal Productivity Theory*

Efficiency ( $e$ ) poses no real problem for the marginal productivity explanation of the demand price for labor, unless  $e = e(w)$ . From (12), with a given  $L$ , the labor market clears when  $w = MP(L) = ef_L$ . Changing  $e$  simply changes the demand for labor and the demand price of labor,

$$w(L) = MP(L) = ef_L. \quad (13)$$

However, there are numerous suggestions in the marginal productivity and neoclassical literature that efficiency is a determinant of the wage—that is, that  $e = e(w)$ . Pigou, for example, cited Jevons's argument in *Methods of Social Reform* that there are ways in which workers can "either benefit or injure the establishment" (Jevons 1883, p. 52), from which Pigou argued that:

Among these additional elements perhaps the most important are the suggestions which a workman may be able to offer for more effective or more economical methods of work, and the contribution which he may make by his influence towards a spirit of harmony and good-fellowship in the shop. These elements can, indeed, be taken account of in a rough general way, and money rewards designed to induce workpeople to provide them can be offered; but anything in the nature of approximate measurement of their value is obviously impossible (Pigou 1932, p. 476).

Marshall also recognized that efficiency is affected by the wage in *Principles of Economics*, and argued that the effect of wages on efficiency in the current generation would affect the efficiency of future generations of labor. He thought that low wages would:



have the indirect effect of lowering the character of the workers or of hindering it from becoming stronger. For these . . . cause further weakness and suffering, and so on cumulatively. On the other hand high earnings, and a strong character, lead to greater strength and higher earnings, which again lead to still greater strength, and still higher earnings, and so on cumulatively (1920, p. 466).

This is close to the “economy of high wages” arguments that higher wages would generate higher productivity of labor and higher levels of employment and output indefinitely,<sup>12</sup> although it is inconsistent with the thrust of Marshall’s labor market analysis. Marshall thought that the effect of wages on efficiency was strongest for workers in the lowest-paid occupations: “the slender means and education of the parents, and the comparative weakness of their power of distinctly realizing the future, prevent them from investing capital in the education and training of their children” (1920, p. 468). Pigou advanced a similar argument in *Economics of Welfare*: “High earnings will lead to greater capacity; greater capacity will lead to the power of obtaining higher earnings, both because the workers’ services are worth more and because, being better off, they are in a stronger position for bargaining” (1932, pp. 609–10).

Adding efficiency as a function of the wage poses some problems for marginal productivity and neoclassical wage theory. Although there is ample evidence that neoclassical economists recognized that the wage affects efficiency, they generally argued that  $w = MP(L)$ . Pigou, for example, argued:

It is found that people who earn good money are very much more capable than those who earn bad money, and it is inferred that, if the latter were paid as much as the former they would thereby be raised to their standard. This reasoning is inadequate. The fact that workpeople in high-wage districts are, in general, more capable than workpeople in low-wage districts does not prove that high wages cause high capacity; for there is available the alternative explanation that high capacity causes high wages (1932, p. 608).

The problem of recognizing that efficiency varies directly with the wage and arguing that  $MP(L)$  determines the wage is obvious if we modify (11) and (12), above, so that  $e = e(w)$ , giving us

$$Q = e(w)f(L, K), \quad (14)$$

$$MP(L) = Q_L = e(w)f_L. \quad (15)$$

This makes the marginal product of labor  $MP(L)[L, e(w)]$ , and arguing that

$$w = MP(L) = e(w)f_L$$

is questionable at best because the above equation has no unique solution that would define a demand function for labor from a single  $f_L$  function.<sup>13</sup> The argument that the wage equals the marginal product of labor, which in turn depends on the wage, is circular. H. L. Moore (1907a) was particularly sharp in criticizing the theory on this point:

<sup>12</sup> Marshall extended this into an intergenerational human capital argument: “[T]he investment of capital in the rearing and early training of the workers of England is limited by the resources of the parents in the various grades of society, by their power of forecasting the future, and by their willingness to sacrifice themselves for the sake of their children” (1920, p. 467).

<sup>13</sup> Rees (1973, pp. 80–83) develops a demand for labor from multiple  $MP(L)$  curves similar to Figure 3, above, which develops the demand for labor from the wages fund and efficiency of labor.

[W]e have not thus far come nearer to a solution of this problem [efficiency] than to offer an artless paralogism having its origin in the ambiguity of the term efficiency. At one time the term is used to signify the physical, mental and moral qualities of the labourer, his “general sagacity and energy,” and at another time it is taken to signify the measure of the labourer’s product. The theory is then propounded that efficiency—implicitly in the first sense—determines the amount of the reward, and this is thought to be proved by slipping into the second sense in which the actual product is taken as the measure of efficiency. The net result of laborious reasoning is that the labourer gets what he gets (1907a, p. 572)

Some early marginal productivity and neoclassical theorists avoided circularity by assuming that the factors that define efficiency are constant, while others—Wicksell, for example—simply eliminated it by assumption: “We . . . ignore here the practically very important circumstance that the mental and physical health and strength of the worker, and consequently the efficiency of labour, are largely dependent on the wages received and, within certain limits, rise and fall with the wage” (Wicksell 1932, pp. 104–105).

### *Marginal Productivity, Efficiency Wages, and Unemployment*

By the late nineteenth century, economic growth and rising living standards had moved subsistence wages from the forefront of economic thought, although Marshall in particular had a lasting interest in the alleviation of poverty. The founders of marginal productivity theory did not generally argue that the real wage would be driven by Malthusian population and labor force adjustments to a subsistence natural wage, whether biologically or socially determined. For J. B. Clark, natural rates of wages “are identical with those that would be realized, if a society were perfectly organized but were free from the disturbances that that progress causes. Far more than classical economists were aware of is involved in a thorough-going study of what they called natural values (1899, p. 20).

Marshall rejected simplistic notions of a long-run supply of price labor generated by Malthusian population and labor force adjustments that, although he was concerned that the bulk of the working class might be living close to the minimally acceptable standard of living<sup>14</sup>:

Wages tend to equal the net product of labour; its marginal productivity rules the demand price for it; and, on the other side, wages tend to retain a close though indirect and intricate relationship with the cost of rearing, training and sustaining the energy of efficient labour. The various elements of the problem determine . . . one another; . . . wages are not determined by demand-price nor by supply-price, but by the whole set of causes which govern demand and supply (1920, p. 442).

If we reject the classical natural wage that covers the socially determined cost of production of labor—that is, subsistence—then the only meaningful floor on wages is the cost of biological survival. For example, Walker defined the “necessary wage” as the ultimate wage floor: “There is a point below which if, in any community, wages go,

<sup>14</sup>For a more extensive discussion of Marshall’s analysis of population, see Bowman (2006).

the supply of labor will not be kept up; and hence if employers will have labor, they must pay for it up to this point” (Walker 1876, I.VII.13).

However, this would be far below the classical natural wage and might not even allow survival for all workers and their families. It would generate very low, almost certainly negative, efficiency. It would also be far below any reasonable notion of an efficiency wage above the market-clearing wage. Moreover, there is no mechanism in marginal productivity theory that would necessarily drive the wage to this level in the long run.

Marginal productivity and neoclassical wage theory paid more attention to the microeconomic determination of wages in specific industries, markets and firms than an aggregate wage. Market imperfections might generate wages above the market-clearing wage in neoclassical labor markets, but these were generally not efficiency wages in the modern sense. In any event, competition and resource mobility would clear labor markets in the long run.

## V. SOME CONCLUDING REMARKS

The basic concepts of labor efficiency and efficiency wages have origins deep in the history of economic thought. Mainstream economists from Adam Smith in the eighteenth century to John Maynard Keynes’s orthodox contemporaries (Pigou, Wicksell, *et al.*) in the early twentieth century clearly recognized that labor productivity is affected by variables in addition to the inherent qualities of labor that define the production function. Moreover, they generally understood that the efficiency of labor is affected *by* the wage, as in modern efficiency wage theory.

It would be a gross exaggeration to say that Smith, Ricardo, Mill, Marshall (although he coined the term “efficiency wage”), or any of the classical and early neoclassical economists really discovered efficiency wages, in the contemporary meaning of the term, or that efficiency wages played a critical role in their analysis of labor markets. Recognition of the variables that define efficiency wages did not translate into an explicit efficiency component in classical and neoclassical theories of wages and employment. However, incorporating efficiency wages into stylized classical, marginal productivity and neoclassical wage theories yields some interesting insights on the “classical” theory of employment and contemporary efficiency wage theories.

It is somewhat surprising that the classical economists did not incorporate the equivalent of efficiency wages into their explanation of the demand for labor as a function of the capital stock or the wages fund. There are no serious difficulties in including efficiency as a determinant of productivity, aggregate output, and the capital stock. In the intertemporal wages fund, higher wages, efficiency, and productivity of labor in  $(t - 1)$  enhance the current stock of circulating capital and the demand for labor—all of which would affect the current wage and employment.

Efficiency wages are also broadly consistent with the classical market-clearing wage. In classical economics the entire “stock” is employed. With a positive efficiency wage effect that raises productivity, output, and stock of capital—and Mill’s wages fund—the labor market will clear at a higher equilibrium wage than it would without the efficiency wage effect.

Perhaps the most interesting result of adding an efficiency wage to the classical model is the possibility that the labor market may reach equilibrium with involuntary

unemployment. If the market wage is below the natural wage and the natural wage generates only minimal efficiency and labor productivity, firms may find it more profitable to pay the natural wage than the lower market wage that clears the labor market. The excess supply of labor, or involuntary unemployment, at the natural wage suggests an above-equilibrium efficiency wage.

Even though early marginal productivity and neoclassical economists recognized that efficiency and marginal product vary directly with the wage, it isn't easily incorporated into marginal productivity and neoclassical wage theory. Marginal productivity and neoclassical economists recognized the basic concept of efficiency wages, but their central analytical argument was that the marginal product determines the wage. If we add efficiency as a determinant of marginal product and the wage as a determinant of the marginal product, we get the circular argument that the wage is a function of marginal product, which is in turn a function of the wage. Marginal productivity and neoclassical wage theorists avoided circularity through some combination of simply ignoring efficiency wage effects, recognizing them and assuming constant efficiency, or recognizing them and assuming them away. However they did it, suggestions of efficiency wages are less common in the marginal productivity and neoclassical wage literature than in the classical literature.

The efficiency wage as an above-market wage floor that generates involuntary unemployment is inconsistent with the marginal productivity and neoclassical market-clearing equilibrium wage. Marginal productivity theorists argued that the marginal product of labor defines the wage that clears the market with a given supply of labor. In neoclassical wage theory, the wage will adjust until the quantity of labor supplied equals the quantity demanded, or where the wage equals the marginal product of labor on the demand side and the marginal disutility of labor on the supply side. Unlike the classical model, there is no natural wage that might be a wage floor that leaves involuntary unemployment.

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