SESSION ON TECHNOLOGICAL CHANGE AS A FACTOR IN UNEMPLOYMENT

THE THEORY OF TECHNOLOGICAL PROGRESS AND THE DISLOCATION OF EMPLOYMENT

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The orthodox view that technological innovations release purchasing power which is directed against new goods, and that in this manner the displaced labor is reabsorbed, confuses, as John Stuart Mill pointed out long ago,[1] the demand for labor with the demand for commodities. Mill saw and stated very clearly the fallacy involved in this reasoning, but his criticism appears to have been forgotten in the current discussions. The traditional explanation has it that the total purchasing power is increased by the introduction of labor saving improvements. This new purchasing power, it is argued, is directed toward the purchase of new or additional goods and these require for their production the reabsorption of the displaced labor. In point of fact, however, the displacement of labor of itself means only that the same quantity of goods can now be made at lower cost. It is not until the displaced labor, or at least a portion of it, has again been put to work, that the purchasing power has in reality been increased. Labor saving improvements, it is true, make possible an increase in purchasing power once the displaced labor again becomes active in industry. But the increase in purchasing power is the result of labor reabsorption and not the cause. Labor saving techniques redistribute purchasing power but do not of themselves create additional purchasing power. The increased purchasing power of other groups is exactly offset by the decreased purchasing power of the displaced workers. What these technological developments set free is not purchasing power but productive power.

The productive power set free through the displacement of labor may eventually become reabsorbed into industry in several ways. It may be that credit released from the lower cost industry may find an outlet in other fields. In consequence prices rise, profits improve, business expands, and labor is employed in larger volume. Or, should this development not occur, it may be that the reabsorption takes place through a lowering of money wages. It is also possible that the improved techniques and lower costs may raise profits, increase capital investment and thus raise the demand for labor. This latter development may also, under certain circumstances, necessitate a readjustment in money wage-rates.

[1] J. S. Mill, *Principles of Political Economy*, pp. 96-7 (Ashley edition). See also my "Institutional Frictions and Technological Unemployment," Q.J.E., August, 1931.

Thus in one way or another the likelihood is that the displaced labor will eventually be reabsorbed.

Put briefly, the current, traditional view is subject to criticism on two counts: first, the mechanism usually employed to explain the labor reabsorption confuses cause and effect; second, there is no assurance that the displaced labor will, in all cases, be reabsorbed unless we assume a flexible economic structure; that is to say, a flexible system of prices and wage-rates.

The orthodox view has been roundly criticized from the standpoint of price rigidity by numerous adherents of the institutional school. The position taken is that the displaced labor will not be reabsorbed, as the orthodox view has it, unless the prices of the commodities affected by technological changes are lowered to the new cost basis.

If prices are maintained by cartels, trusts, or any other form of monopoly power, the labor reabsorption, it is argued, will not occur. This traditional institutional viewpoint, while it points in the right direction, needs, it seems to me, some qualification. So long as the price of labor is established in a free market, the displaced labor can eventually be absorbed even though individual prices are rigidly maintained by monopoly power over a wide field of industry. No factor of production can permanently remain unemployed so long as its own price is subject to free market forces. Though the output and prices of certain commodities are subjected to monopoly control, capital can always find an outlet for employment if interest rates fall sufficiently. So also with labor. Should, however, the whole field of industry be completely monopolized, so that every avenue of employment for all the factors of production is closed, then indeed a flexible price system in the labor and capital markets would be of no avail. The institutionalists' criticism of the orthodox position does not, however, presuppose a completely monopolized society.

But while organized resistance to lower prices, conforming to lower costs, does not preclude the ultimate absorption of labor when wage rates are flexible, it is nevertheless true that such action places an undue strain upon the flexibility of wage-rates. Since wage-rates, in point of fact, even in the most fluid society, cannot be perfectly flexible, it cannot be doubted that monopoly and quasi-monopoly control does delay the process of labor reabsorption. Indeed, under certain circumstances, a proper price policy would alone be sufficient to guarantee the re-employment of the displaced labor. Under these circumstances it is quite correct to place the whole blame for continued unemployment upon the uneconomic price policies of organized business groups.

There is, however, still a third theory of technological unemployment It is the view that technological displacement may become permanent if

wages rise or remain constant while the price of machinery falls. Technological unemployment has increased of late, it is said, because wage-rates have remained during the last decade on substantially the same level, while the prices of capital goods in general have fallen sharply.

This viewpoint represented, in particular, by Professor Sumner Slichter in our meetings of three years ago, while on the right track, does not, in my judgment, go quite far enough in the analysis. To illustrate: During the last century the prices of capital goods in relation to wage-rates have fallen very materially and almost continuously. Yet, up to the time of the World War, there is not the slightest evidence of an upward trend in per capita unemployment.

It is not wage-rates and the prices of capital goods, as such, that matters. Rather it is labor costs in relation to capital costs. If the productivity of labor doubled, capital would not be substituted for labor even though the prices of capital goods had fallen 50 per cent.

The problem of technological unemployment is fundamentally, as I see it, a part of the broader problem of the proportionality of the factors of production. Technological innovations disturb the correct pricing of the factors of production, because they alter the relative productiveness of the factors. Until the prices paid the different factors are again brought into line with the changed productivity the overpriced factor will be displaced.

As a rule, labor is the factor which becomes overpriced in consequence of technical innovations. Technological unemployment is thus seen to be the result of the time lag required to adjust the earnings of the factors to changes in productivity. Were it not for institutional frictions which prevent the pricing of the factors from shifting instantly with every change in productivity, there would be no technological unemployment. Technological unemployment is a function of the failure of the pricing system to adjust itself to changes in the relative productivity of the different factors of production.

If labor is overpriced in relation to capital, a part of it will be unemployed. The correct pricing, of course, implies that the efficiency earnings of labor and capital shall be equal; that is, the money rewards of labor in relation to marginal product, must equal the money rewards of capital in relation to its marginal product. Labor costs and capital costs must be equal at the margin. Under these circumstances the entrepreneur could make no gains from substituting one factor for another. The pricing of the factors may be upset either by a change in the price paid for a factor without any change in its productivity, or by a change in the productivity of a factor, without a corresponding change in its price.

It is the lag in the adjustment of earnings to productivity or of pro-

ductivity to earnings which is responsible for the overpricing of one factor in relation to another, and therefore for the substitution of the low-priced factor for the high-priced factor.

Labor may be displaced by capital in consequence of any one of the following changes: In the first place a forced increase in wage-rates, for example by trade union action, to a point at which capital can be employed more economically than labor. Labor thus displaced would remain permanently unemployed until wages were reduced or else labor's productivity were raised to a point at which its efficiency earnings were again in line with the efficiency earnings of capital.

In the second place, a lowering of the rate of interest might reduce capital costs below the level of labor costs. Under these conditions capital would be substituted for labor. Such substitution, however, would soon cease since every added investment of capital would lower its marginal productivity and raise the marginal productivity of labor and thus again bring the efficiency earnings of capital into line with the efficiency earnings of labor. Eventually the investment in additional increments of capital would reach a point at which any further extension of the roundaboutness of production would become unprofitable; the marginal productivity of capital in relation to its earnings would eventually become lower than the marginal productivity of labor in relation to wages. At this point labor displacement would cease, and beyond this point any further expansion of industry would favor the employment of labor in preference to capital.

Briefly stated, increased saving tends to displace labor since it has the effect, through the consequent reduction in the interest rate, of lowering capital costs in relation to labor costs. On the other hand, each additional increment of capital outlay brings you nearer the point at which further labor displacement becomes unprofitable since the continued process of investment lowers the marginal productivity of capital and therefore raises capital costs in relation to labor costs.

In the third place, technical innovations tend to displace labor since they usually have the effect of raising the marginal productivity of capital. This normally leads, however, to a more roundabout process of production, and this, as we have already noted, tends eventually to reestablish the equilibrium of capital and labor costs, since every additional capital increment raises the productivity of labor and lowers the productivity of capital.

According to the wage-fund theory, particularly as developed and clarified by Cairnes,[2] displaced labor could not be reabsorbed except through the increased investment of capital. Cairnes believed that the combination of labor and capital was rigidly fixed by the state of the

[2] J. E. Cairnes, *Some Leading Principles of Political Economy*, pp. 167-174.

arts for each industry, and therefore more labor could not be employed unless more capital were available with which the labor could be combined. Moreover, the source of this capital supply would have to come out of an increase in profits made possible by a reduction in wages. His analysis therefore called for a very substantial reduction in wages in order to furnish a sufficient volume of new capital. The error in Cairnes' analysis lies fundamentally in his belief that the state of the arts rigidly determines the combination of the factors of production.

In point of fact, the large measure of flexibility possible in the combination of factors brings it about that a relatively slight fall in money wages and a relatively slight investment of new capital may alter the ratio of the efficiency earnings of labor to the efficiency earnings of capital very considerably. Thus a new equilibrium can be reached much more readily and quickly than was believed possible by Cairnes. Moreover, Cairnes, with his wage-fund doctrine, was unable to see that the demand for labor comes from prospective income and not from capital, and that this prospective income may become an actuality through the employment of bank credit which enables one to put the productive forces in motion in anticipation of the sale of the product from which the factors of production will eventually have to be paid.

But the general direction of Cairnes' analysis was nevertheless sound. A flexible system of wage-rates and an increase in new investment are the chief instrumentalities through which labor, displaced by technological innovations, is eventually reabsorbed.

It is true that an adequate increase in new investment might absorb any given volume of displaced labor even without a fall in money wage rates, provided, first, that sufficient profits to finance the new investment were forthcoming from the gains of technological improvements, and, second, that the monetary system were able to furnish a sufficient quantity of circulating media to finance the new method of production without producing disequilibrium in the internal price structure. But this is by no means always or necessarily the case. It follows, therefore, that the complete absorption of the displaced labor presupposes, as a necessary condition, flexible capital and labor markets.

This brings us to a consideration of the relation of technological unemployment to a downward trend in prices. If the money supply does not keep pace with the requirements of the highly productive new techniques, the commodity price level must fall. Under such conditions, the displaced labor would be absorbed more slowly. In the event that the fall in prices were not wholly caused by technological improvements but were caused in part by monetary factors, a deflation of the earnings of the factors would obviously become necessary before all could be employed. But even in the event that the fall in prices were caused by technical inno-

vations the displaced labor would be absorbed less rapidly in a period of falling prices. Maladjustments also in these circumstances would develop in the internal price structure for the following three reasons:

In the first place, maladjustments would develop owing to the unequal rates of progress in different industries. If the progressive industries confronted an elastic demand situation they would absorb a larger share of the total purchasing power of the commodity and so force a retrenchment in the inefficient industries which proved unable to reduce costs. Until a new equilibrium were reached unemployment would be intensified. In the next place, falling prices caused by technological improvements cause serious maladjustment owing to the unequal rates of progress of different firms in the industry affected. Only a small fraction of the producers can as a rule take advantage of the new techniques. The less progressive firms are gradually squeezed out and while this process is going on much unemployment will prevail. Finally, even though the general decline in prices is caused by technological progress, the prices are, as a rule, not lowered simultaneously with costs. The firms which have introduced the new methods strive, as a rule, to retain the advantages of the improved techniques, and refuse to pass on the gains to the public in the form of lower prices until they are forced to do so under the pressure of economic necessity. As a rule, business enterprises will not lower prices in line with reduced costs until they have passed through the disillusionment and bitter experiences of depression.

We must conclude, therefore, that a fall in prices caused by technological progress tends to aggravate and prolong the displacement of labor. And if the fall in prices is further accentuated by monetary causes, the displaced labor will be absorbed with still more difficulty. Particularly is this the case when wage-rates are inflexible and fail to become adjusted to such changes in the price level as are caused by monetary factors. In the last decade, the whole world has experienced a downward price trend, and consequently more than the usual difficulty was encountered in absorbing technologically displaced labor.

Finally let us consider the relation of technological unemployment to the stabilization of the business cycle. Let us suppose for the sake of the argument that the business cycle could really be flattened out, whether by monetary policies, by a program of public works, or by the controlled adjustment of investment to saving. With cyclical unemployment disposed of, there is every reason to believe that technological unemployment would thereby be intensified. When is it that the labor displaced by technological innovations or other structural changes is most readily and easily reabsorbed into industry? Is it not in the prosperity phase of the cycle? It is the absorptive power of the boom period that opens up new jobs for the displaced workers. If the boom were eliminated would

not the labor made redundant by machinery become reabsorbed far more slowly, thus increasing the volume of technological unemployment?

Cyclical fluctuations have the effect of giving the whole economic structure a good shake-up and keeping the system reasonably flexible and mobile. With the business cycle eliminated there would not be the periodic rubbing down, so to speak, which gives industry a fresh lease on life. Depression, like a cruel and heartless tyrant, clubs down the impossible demands made by the employed agents of production, until the earnings of the factors have again reached a point at which full employment becomes profitable. With the business cycle ironed out, it can scarcely be doubted that the price and wage structures would become more rigid. The capacity to absorb labor displaced by technological innovations would therefore be reduced.

The conclusion is that we cannot afford to assume a too easy optimism with respect to technological unemployment. The increasing rigidity of modern economic life consequent upon price and wage controls—*Die gebundene Wirtschaft*, as the Germans so aptly put it—points in the direction of a slackening in the rate at which displaced labor can be reabsorbed into employment. Moreover, should we prove unable to prevent a downward price trend in the next decade or two this growing tendency toward rigidity would become a still more serious matter and the problem of technological unemployment would be intensified.