

Unemployment and Productivity in the American Economy

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This paper aims at analyzing the unemployment problem as is related to productivity. Higher labor productivity will increase demand for labor, because workers will contribute significantly to firms' revenues relative to their wages. Having estimated the effect of productivity on the rate of unemployment, the paper suggests several economic policies aiming at solving this basic problem that has generated misery and poverty for many people and less tax revenues for the states and the Federal government. Not surprisingly, unemployment can be reduced over the business cycle but cannot be eliminated, because a low rate of unemployment will increase wages of the working people and reduce their labor intensity and productivity over the late expansionary phase of the business cycle.

INTRODUCTION

Capitalist economies always face the basic problem of unemployment. Unemployment is defined as the ratio of unemployed workers to the labor force. For economists, the unemployed is a person who is willing and able to work at the going wage rate but cannot find a job. Unemployment may be a voluntary or involuntary. Voluntary unemployment describes a worker who has decided to be out of the job market for a variety of reasons such as looking for a better job, taking a vacation, and the like. Voluntary unemployment increases the worker's contribution to the economy later on, as the worker is trained more during the duration of the unemployment and becomes more productive. Involuntary unemployment describes a worker who is willing and able to work but cannot find a job due for example to the business cycle.

Various causes have been provided for the involuntary unemployment such as the cyclical unemployment. Pigou (1933), as the basic figure of the classical economic theory, contends that unemployed workers refuse to work at low wage rates. That is, high money (or real) wages cause the unemployment and lower wages should solve it (see also Lucas 1981). Keynes (1936) argues that it was the deficiency in aggregate demand (or spending) that causes the cyclical unemployment. Capitalists produce and hire workers when they expect aggregate expenditures by governments, consumers, and other capitalists to increase. When aggregate expenditures such as investment spending are expected to decline, unemployment will rise and production will be reduced. Hayek (Nishiyama and Leube 1984) thinks that there is mismatch between skills of labor and the need of the markets. For example, if demand for personal computers increases and the demand for typewrites declines, then a new skill for the computer production is need and workers of the typewriters will be unemployed. In fact, this type of unemployment is called structural unemployment.

Other economists concentrate on labor market institutions for generating the problem of unemployment. Regulations, employment protection, and higher tax rates will increase the cost of labor

employment to business enterprises and consequently they will hire less number of workers and will increase the rate of unemployment (see Fujit 2010 for excellent explanation of the effects of unemployment compensation on unemployment). Other economists think that negative macroeconomic shocks increase the rate of unemployment. For example, an increase in real interest rates will reduce investments and demand for labor. A surprise reduction in inflation will increase real wages and reduce demand for labor. In contrast, positive shocks to aggregate supply such as unexpected increases in productivity, unexpected decreases in oil prices, and unexpected development in technological innovations will increase aggregate supply and consequently will increase production and employment (Chang 1997 and Blanchard and Wolfers 2000).

Unemployment generates a loss of Gross Domestic Product (GDP), poverty, criminal activities, budgetary problems, human capital problems, inequality, and mental health. For these reasons policy makers have studied this problem and designed various policies such as macroeconomic policies (fiscal and monetary), labor market policies, education, and training policies for solving this problem.

For the American economy, the unemployment rate was declining since 2002 then increased to about 10 percent after the last quarter of 2007. Currently (March 2011), it is at 8.9 percent. People are concerned about this problem, because the problem of unemployment has been associated with the housing crisis, bankruptcy of several banks and firms, higher oil prices, inflation, and two major wars in Iraq and Afghanistan. Most important, when the rate of unemployment is associated with a high inflation rate, the stagflationary condition of the 1970s comes in mind. That condition was also associated with higher oil prices and the Vietnam War.

The purpose of this paper is to go back to microeconomic theory which links unemployment to productivity of labor, among other factors. Section two states the link between unemployment and productivity. Section three is devoted to the empirical testing of the cause (productivity) and the effect (unemployment). A summary and conclusions are provided in the last section. The important conclusion is that if productivity continues to rise, the rate of unemployment will decline.

UNEMPLOYMENT AND PRODUCTIVITY

John B Clark (1965) argues that employment is grounded in the marginal productivity. If wage rate (W) is determined by a competitive market, which represents an employer's cost of hiring the marginal worker, then this employer will continue employing workers until the benefit (B) of the last worker hired is equal to the wage rate (W). This benefit (B) is actually the contribution of that worker to the firm's output, or the marginal productivity of that worker. In other words, if the benefit of employing a worker (B) is greater than the wage rate (W), the employer will employ workers until $B = W$.

This argument can be restated differently. Let W/L be the average wage per worker and Q/L is the average productivity of that worker, an employer will employ workers as long as the employer obtains more for less. This means that the capitalist obtains more benefits (value of production) from these workers relative to the wages paid to them. That is, if Q/L is greater than W/L , it is of the interest for the employer to employ more workers. This condition will provide the employer with two choices. The first choice is that the employer can cut the price of the product to sell more output. If the elasticity of demand for that product is greater than one, or elastic demand, then a price cut by the producer will increase total revenues and profitability. Hence, the producer will expand the production process and will employ more workers. The second choice is that the producer can increase profitability due to the productive and inexpensive labor without cutting prices. Usually, the producer chooses the first choice: expansion and more profitability.

Marx (1967), before Clark, uses a similar analysis. If the value of a product is (P) which is the sum of wages (W), the variable capital, surplus value (S), and the fixed capital C , or the depreciation of machines and equipment used in the production process, then

$$P = W + C + S \dots 1$$

But R, the rate of profit, is equal to

$$R = S/(W + C) \dots 2$$

where S is the surplus value. Thus,

$$P = W + C + R(W + C) \dots 3$$

Or

$$P = (1 + R) (W + C) \dots 4$$

If this equation is taken to represent a per unit output, the price of the product is equal to the average total cost (W + C) multiplied by one plus the average rate of profit R or the mark-up. For example, if (W + C) per unit is equal to \$100.00 and the profit rate is 50 percent, then the price of the product is equal to (1 + 0.5)(100), or \$150.00.

This analysis indicates that the capitalist will employ more workers if the surplus value (S) is greater than (W). If (S/W) is high, the rate of surplus value, or the rate of exploitation, is high. Productive workers create very high (S) to the capitalist. This incentive stimulates capitalists to invest in foreign countries and to relocate their production operations to these nations, because the rate of surplus value is very high due to higher labor productivity and lower wages. That is, the higher the rate of the surplus value, the higher the rate of profit will be. One can substantiate this conclusion by dividing the right-hand side of equation 2 by W to obtain

$$R = S/W / (W/W + C/W) \dots 5$$

Or,

$$R = S/W / (1 + C/W) \dots 6$$

If C and W are constant, the rate of profit R will increase when the rate of surplus value (S/W) increases. And if W increases at a faster rate than the increase in S, the rate of profit will decline. In fact, if labor productivity increases due to a high rate of capital accumulation (or investment), the relative surplus value and S will be increasing, and the capitalists will earn more profits. This is the same conclusion as stating that the difference between labor productivity (or the average product of labor) and the average wage relative to value of capital goods per worker is increasing. Hence, the capitalist will employ more workers, and the unemployment rate will decline.

The standard microeconomic theory produces a similar result with different terminology. In this theory the marginal revenue product is MRP which is the multiplication of marginal revenue (MR) by the marginal product of labor (MP_L), or productivity. Mathematically, it is $MRP_L = (MR) (MP_L)$. And the profit-maximizing firm will hire workers until $MRP_L = W$, where W is the given wage rate. It is assumed here that the production function is of the form where output (Q) depends on two resources Labor (L) and all other resources combined as O, and is subject to constant return to scale, where the sum of the exponents are equal to one. It is also assumed that the production function is affected by the technological level A such that,

$$Q = AL^a O^b \dots 7$$

Differentiate the production function partially with respect to labor yields

$$\partial Q / \partial L = aAL^{a-1} O^b \dots 8$$

Use the marginal product of labor in the MRP_L equation to obtain

$$MRP_L = MR \times MP = MR \times (aAL^{a-1}O^b) \dots 9$$

because,

$$MP_L = (aAL^{a-1}O^b)$$

The MRP_L should equal to the real wage rate W/P , where P is the price of the product. The MRP_L is equal to the value of the marginal product of labor if $MR = P$ under perfect competition. Under imperfect competition, the MRP_L is smaller than the value of the marginal product, indicating the existence of exploitation. In any event, solving for L , we obtain the employment level

$$L = aPQ/W \dots 10$$

where PQ represents the gross domestic product, or GDP. If the numerator and the denominator of the above equation are divided by L , one can obtain

$$L = aPQ/L/W/L = a (\text{average product of labor})/(\text{average wage})$$

This equation states that if labor productivity (or the average product of labor) increases, assuming W is constant, the demand for labor, L , will rise, and the unemployment rate will decline. And this shift (or increase) in the demand for labor can occur, for example, if investment or capital formation increases. This is because if labor productivity increases relative to wages, the employer or the producer will increase the firm's rate of profit by hiring more workers (L).

The previous analysis was adopted by Arthur Lewis. He (1954) developed what was called the Lewis model in which he assumed that if there was a surplus of labor and a given demand for labor, then the wage rate is fixed. Lewis pointed out that under this condition capitalists do make a certain level of profit. The capitalists will reinvest part of the profits in new capitals. This investment will raise labor productivity. Hence, the demand for labor will increase, and these new employed workers can come from low productivity sectors or the rural areas. This increase in employment will provide more profits for the capitalists, and more profits will increase investment, employment, and income. In short, demand for labor will shift to the right when labor productivity rises, indicating an increase in employment and income.

Clearly, the introduction of new innovative marketing techniques will increase the demand for the product and consequently will increase demand for labor. Moreover, if productivity increases due to a greater utilization of capital goods, new technological advances, and better quality of labor (due to education, training, and health), then the demand for labor (or employment) will increase. In other words, successful innovations will increase productivity and employment (Schumpeter 1934). In addition, if the prices of capital goods decline, the quantity demanded for these goods will rise. Consequently, output will increase, so will the employment of labor. If resources are complement, the employment of more capital in the production process will increase the demand for labor or employment.

Recently, the Real Business cycle theory (Chatterjee 1995 and 1999) uses the idea that if a positive technological shock occurs, then the production function and labor productivity will rise, so will demand for labor and employment. It becomes evident in this theory that the works of Schumpeter (1934) and Veblen (1904) are very important, because technological changes and innovations, the basic ingredients of their works, are the basic causes for the consequent economic changes.

In fact, technological change or growth will be equal to the growth rate of output minus the growth rate of labor productivity. If productivity increases significantly, it will increase the growth rate of the gross domestic product (GDP) with larger increases than productivity, which forces employers at that point to hire more workers to accommodate expected demand. (It should be noted that if productivity

increases at the same rate of output, then employment will not increase. By the same token, if productivity increases at a rate higher than the output, then employment will decrease.) Wages will rise but if labor productivity increases at a rate faster than the increase in wages, then the rates of inflation and unemployment will decline.

EMPIRICAL RESULTS

The theoretical conclusion of the previous section can relate the unemployment rate to productivity. This conclusion can be stated in a simple linear equation where the rate of unemployment (Un) is the dependent variable and the productivity level PrL is the independent variable. Statistically, the mathematical formulation can be stated as a simple regression equation, where Un is regressed against the productivity level (PrL). This statistical equation has been estimated for several periods the U.S. economy has passed through, which have been explained below.

For the period 1960-1969, the regression equation for the non-farm business sector is

$$Un = 15.74 - 0.1817PrL \quad R^2 = 0.92 \\ (9.26) \quad (-6.46)$$

For the estimated equation the sign is correct and it is statistically significant. The R^2 is reasonably good, indicating that 92 percent of the variations in the rate of unemployment are explained by the regression equation. Thus, for this period of high productivity, when productivity increased by one percent, the unemployment rate declined by 18 percent of one percentage point.

For the stagflation period 1970-1981, the regression equation for the non-farm business is

$$Un = -4.66 + 0.144 PrL \quad R^2 = 0.34 \\ (-0.86) \quad (2.10)$$

For the estimated equation the coefficient has the wrong sign but it is statistically significant. R^2 is good indicating that 57 percent of the variations in Un are explained by the variations in the productivity level. Because productivity was declining during this period of an uncertain condition of economic stagflation, capitalists kept fewer workers, because it was not economically possible to hire or to keep workers at higher wages. Thus, the increased productivity was used as a basic tool for increasing the rate of unemployment. Usually, this is the case in a recessionary condition, where unemployment is associated with high productivity and lower GDP.

For the period 1982-2006, the regression equation for the non-far business sector data is

$$Un = 12.54 - 0.062 PrL \quad R^2 = 0.47 \\ (8.55) \quad (-4.51)]$$

The estimated equation has the correct sign and the coefficient is statistically significant, because the calculated t-ratio is higher than the tabulated t-ratio at $\alpha = 5$ percent. The R^2 is also reasonable, indicating that 69 percent of the variations in the rate of unemployment are explained by the variations in the productivity level. In addition, the estimated equation clearly suggests that during the 1990s investments in the information technology, or capital deepening such as investment in computer hardware, software, and communications per worker, increased the productivity level. It is also true that the increased productivity was diffused to many industries in the American economy.

For the entire period of 1960-2006, the regression equation for the non-farm business sector data is

$$Un = 6.37 - 0.0059 PrL \quad R^2 = 0.008 \\ (7.41) \quad (-0.62)$$

For the estimated regression equation the sign is correct but the coefficient is statistically insignificant. The R^2 is also very low, indicating that the variation in the unemployment rate is mostly explained by the variations of variables other than the variations in the productivity level.

SUMMARY AND CONCLUSIONS

This paper explains the link between unemployment and productivity. The most important variable affecting the unemployment rate has been the productivity level. When the latter increased in the American economy, the unemployment rate declined during a regular economic condition, and the capitalists generated more profits.

Based on the fact that higher productivity generates a lower rate of unemployment, the government and the private sector must be directed toward finding ways for generating permanent increases in productivity. Stimulating research and development, innovations, and investment in the country are very important directions to increase productivity. Education, training, and health are effective means for increasing skills and productivity. Education that provides students with backgrounds in mathematics and sciences are required foundations for competitive education. Building the infrastructure such as roads, bridges, communications, and transportation system are extremely important foundations for rising productivity. Motivation of the working people and scientists and cooperative labor relations are also important for increasing productivity. Incentives do increase labor intensity and productivity. Technological advances and more capital goods per worker will create significant increases in productivity and decreases in the price of energy. Normally, these indicators can destroy some jobs but create other important jobs for the working people as well, and in the final analysis they will increase aggregate supply, which creates a higher employment level for the nation.

Finally, it must be clearly stated that higher productivity does not lead to a higher employment level and higher wages only. As has been shown in this paper, a higher productivity level is able to increase profitability and investments, and producers will be able to cut business cost of production. Therefore, profit margins do increase and prices of products can be cut, which, along with the previous factors, reduce the inflation rate. Global competitiveness will be enhanced as well, which will increase productivity and profitability of the business people.

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