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Wage Shock, Economical Growth and Unemployment Rate

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ABSTRACT

In this article, first we show that how applying the real wage shock policy by labor unions, under certain assumptions, can cause the potential real output growth rate to decrease and then to increase the unemployment rate beyond the natural level.

On the other hand we will show that finally labor union's pressure causes that the firms decrease the amount of labor input in production process.

Second , by using the data related to the economy of Iran in relation to the amounts of real wage and accelerator coefficient index during the period of 1993 – 2008 , we will attempt to derive the potential real output equation .the result of the research indicates the fact that during the mentioned period along with a decrease in real wage index , the amount of accelerator coefficient index from the aspect of statistics has had an outstanding decrease which proves the theory in the economy of Iran .

It should be noted that in this process we only used the generalized form of production function with fixed coefficient. And it indicates that the firm, in exchange of different ratios of input prices, selects different ratios of minimum inputs so that the firm's profit usually lies on the maximum level, through creating changes in its parameters in order to decrease the amount of labor input.

So there is no need of using other functions in CES set of functions or other forms of production function.

KEYWORDS: Generalized form of Production function with fixed coefficient, Wage shock, natural unemployment rate, the potential real output.

1. INTRODUCTION

The article considers and examines the effect of continuous increase in real wage on the potential real output growth rate and unemployment rate under the certain assumptions in a theoretical approach. In this article, through parametrical estimates we will exactly show that how applying the mentioned policy by labor unions can decrease the amount of the potential real output growth rate and increase the unemployment rate.

The noticeable point in this article is That, contrary to the other studies in which deriving the equation of the potential real output growth rate depends on the specific forms of production function such as cobb - Doglas production function or a set of functions with constant elasticity substitution, in this article the generalized form of production function with fixed coefficient is used as it was mentioned in the abstract.

Fulfilled studies and researches show that previous researches which were done by other researchers don't relate to our main topic and research, other researches will have been presented in similar issues can be summaries as below:

There are quite a few papers that integrate structural unemployment into standard growth models. Palokangas (1995) integrates union wage bargaining into a Romer (1990) type of model and finds that the effect of union wage bargaining is ambiguous and depends on the elasticity of substitution between low-skilled and high- skilled labor. Lingens (2003) applies an Aghion/Howitt (1992) type of model and derives quite similar results. The basic mechanism in these types of models is that the allocation of the stock of high- skilled labor to the two sectors of the economy will be affected by the union wage bargain. Hence, union wage bargaining will cause "migration "of high- skilled labor from the production to the R&D sector or vice versa. The rationing effect of the union does not affect the growth driving sector of the economy.

In addition to these types of models, there are also ones that exclusively focus on the rationing effect of unions, as De Groot (2001). In his model the amount of resources employed in the research sector of the economy is a fixed and exogenously given part of the amount of resources employed in the production sector. With unionization, the amount of production declines and hence, the amount of resources employed in the research sector must decline, too, which dampens the rate of growth.

The main drawback of these types of models is twofold. Firstly, when concentrating on the allocation effect of the wage bargain, it is assumed that the stock of high – skilled labor is exogenously given. This assumption seems to be a crackpot idea, at least in a long run context. Secondly, the assumption of the De Groot (2001) model that there exists an exogenously given relation between the research and the production sector seems problematic, too.

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2.RESEARCH METHODS

First, in order to facilitate the work we present the model assumptions.

Model Assumptions

1) Production function governing on economy is the generalized form with the fixed coefficient. So according to the first assumption we have:

$i)$ $\quad y = f(K, L)$

$ii)$ $\quad f(\alpha, \beta) = f\left(\lambda/\beta\ ,\ \beta\right) = 1 \quad : \lambda > o \ \ \& \ \ \alpha = \lambda/\beta$

$iii)$ $\quad f(\eta K\ ,\ \eta L) = \eta\ y$

So that:

$\alpha > 0$, represents the minimum capital input amount for producing a unit real output.

$\beta > 0$, represents the minimum labor input amount for producing a unit real output

y, represents the total real output in economy,

$\alpha = \lambda/\beta$, represents the substitution among input minimum amounts for producing a Unit real output.

3) At the beginning of analyzing Unemployment rate is equal to the natural unemployment rate (i .e full employment)

4) Inflation rate equals zero

5) Depreciation rate is equal to δ , so that: $0 < \delta < 1$

6) There is no technical progress

7) The way of income distribution doesn't make any changes in amounts of marginal Propensity to consume and marginal propensity to save.

8) At the beginning of analyzing, real wage is equal to ω_1 so that in ω_1 labor market is in equilibrium

9) Marginal cost of capital is always fixed

10) Existent firms in all industries are in perfect competition; meanwhile they are similar to each other.

Demand and Supply Functions for Labor Input

According to the mentioned assumptions, the graph of supply and demand for labor input can be considered as follows in economy.

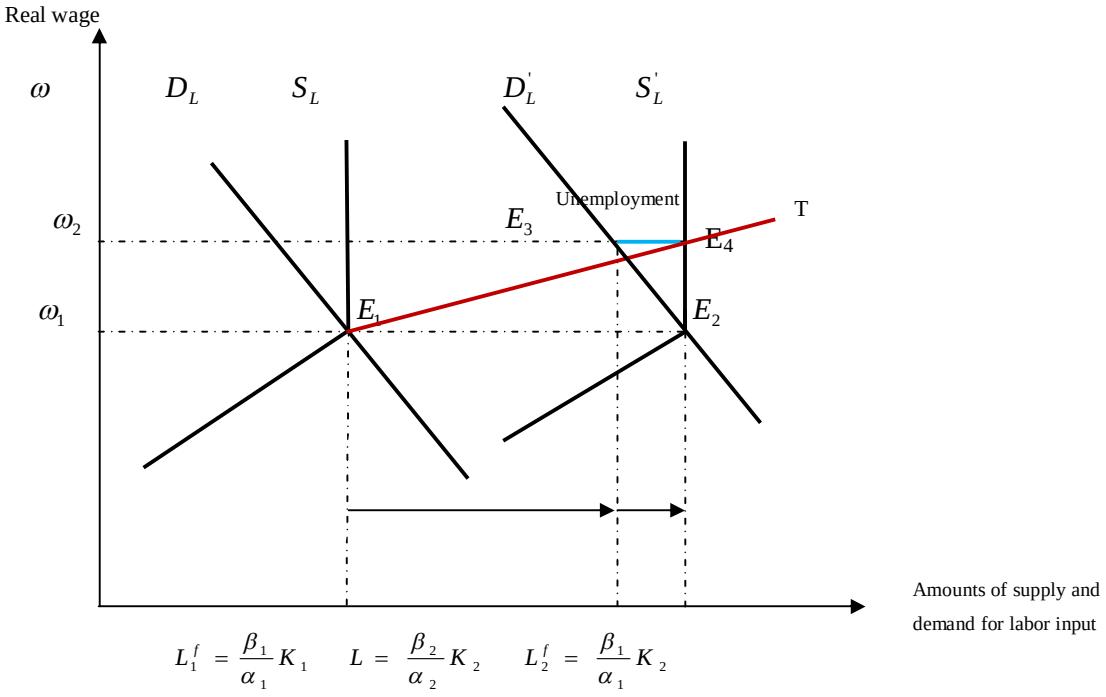

Fig. (1): it shows the labor market situation before and after the increasing of real wages

According to the figure (1) It is assumed that if labor unions don't desire to raise real wage level during the period of time, so the economic through more accumulation in capital will be able to expand the demand for labor input in away in which the economy will be always in full employment.

This assumption has been shown by E_1E_2 Line. On the other hand, if labor unions desire to increase the real wage on E_1T line during the period time, so the firms will try to opt those productive methods which bring the firms the maximum profit during the period of time.

This policy will result in using more capital instead of labor input during the period of time.

According to the figure(1) if demand and supply functions for labor input lie on D'_L& S'_L situations after a period of time , and the wage increases to ω_2 Level , so the amount of demand for labor input will be equal to OL rather than L_2^f . Under these conditions the unemployment level in economy will be equal to E_3E_4

Derivation of the Growth Rate of the Potential Real Output Expansion Path

According to the mentioned assumptions and explanations it can be written:

$$i \equiv \delta K + \frac{dK}{dt} = sY \qquad (1)$$

So that:

$\frac{dK}{dt}$: represents changing in capital stock per changing in each unit of time.

According to the production function we have:

$$K = \alpha Y$$

There fore:

$$\frac{dK}{dt} = Y\frac{d\alpha}{dt} + \alpha\frac{dY}{dt} = Y\alpha' + \alpha Y' : \alpha' > 0 \qquad (2)$$

By substituting relationship (2) in relationship (1)

We have:

$$\delta K + Y\alpha' + \alpha Y' = sY \qquad (3)$$

So that:

$Y\alpha'$: Represents that level of investment in economy which is substituted for labor input.

By substituting production function in equation (3)

We have:

$$sY - \alpha' Y - \alpha\delta Y = \alpha Y'$$

$$(s - \alpha' - \alpha\delta)Y = \alpha Y'$$

$$\left(\frac{s - \alpha' - \alpha\delta}{\alpha}\right)Y = Y'$$

$$\frac{s - \alpha' - \alpha\delta}{\alpha} = \frac{Y'}{Y}$$

$$\frac{s}{\alpha} - \frac{\alpha'}{a} - \delta = \frac{Y'}{Y}$$

$$\frac{s}{\alpha} - \left(\frac{\alpha'}{\alpha} + \delta\right) = \frac{Y'}{Y}$$

So that:

$$Y'/Y = (\ln Y)' = \dot{Y} \qquad ;\dot{Y} = the\ growht\ \ rate\ of\ Y$$

$$\alpha'/\alpha = (\ln \alpha)' = \dot{x} \qquad ;\dot{\alpha} = \ the\ growht\ \ rate\ of\ \alpha$$

There for the equation (3) can be written as follows:

$$s/\alpha - (\dot{\alpha} + \delta) = \dot{Y} \qquad (4)$$

Now in continuation we assume that the growth rate of α will be a fixed and positive number during the period of time so we have:

$\dot{\alpha} = \theta > 0$

According to the recent assumption the amount of α can be computed as follows:

$\alpha = \alpha_1 e^{\theta t}$

So that: (5)

α_1: represents the primary amount of α (i.e the point of E_1 in figure (1))

So equation (4) can be written as follows:

$$\frac{s}{\alpha} - (\theta + \delta) = \dot{Y}$$

$$\frac{s}{\alpha_1 e^{\theta t}} - (\theta + \delta) = \dot{Y}$$

$$\frac{s}{\alpha_1} e^{-\theta t} - (\theta + \delta) = \dot{Y} \qquad (6)$$

It can be simply seen that:

$\lim_{t \to +\infty} e^{-\theta t} = 0$

Now by using equation (6) the graph of the growth rate of the potential real output expansion path in two different situations i.e in a fixed real wage situation and in a rising real wage situation can be drawn as follows:

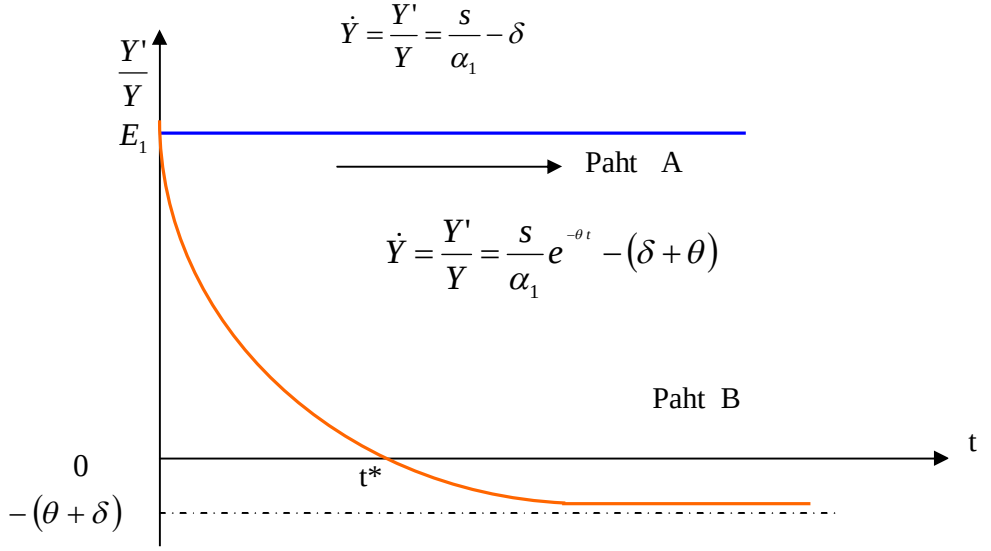

Fig .(2):it shows the growth rate of potentionl real output befor and after the increasing real wages

According to the figure (2) It can be considered that in the rising real wage situation, economic growth rate will be falling during the time (path B) while in fixed real wage situation, economic growth rate will be fixed during the time (path A).

On the other hand t* represents that situation in economy in which the economic growth rate equal zero. So there will not exist any demand for labor input.

Therefore, for t >t* the economic growth rate will be negative. So in this situation the demand for labor input will be constantly falling

Derivation of the Potential Real Output Expansion Path

Real Fixed Wage Situation

In this situation the amount of θ equals zero so equation (6) will be changed as follows:

$$\frac{Y'}{Y} = \frac{s}{\alpha_1} - \delta \qquad (7)$$

Equation (7) represents the equation of the growth rate of the potential real output path when the real wage is fixed.

Now by using equation (7), the equation of the potential real output path can be found as follows:

$$\frac{dY}{Y} = \left(\frac{s}{\alpha_1} - \delta\right)dt$$

$$\ln Y = \left(s/\alpha_1 - \delta\right)t + \ln B_1$$

$$\ln Y/B_1 = \left(s/\alpha_1 - \delta\right)t$$

$$Y(t) = B_1 e^{\left(s/\alpha_1 - \delta\right)t} \qquad (8)$$

So that according to the assumption we have:

$$s/\alpha_1 - \delta > 0$$

Equation (8) represents the potential real output path.

Real Rising Wage Situation

In this situation the amount of θ is opposite zero (θ >0).

Now by using equation (6), the equation of the potential real output path can be found as follows:

$$\ln Y = s/\alpha_1 \int e^{-\theta t}dt - (\delta + \theta)t + \ln B_2$$

$$\ln Y/B_2 = s/\alpha_1 \left(-\frac{1}{\theta}\right)e^{-\theta t} - (\delta + \theta)t$$

$$\ln Y/B_2 = \frac{s}{\alpha_1\theta}e^{-\theta t} - (\delta + \theta)t$$

$$\ln Y/B_2 = -\left[\frac{s}{\alpha_1\theta}e^{-\theta t} + (\delta + \theta)t\right]$$

$$Y(t,\theta) = B_2 \; e^{-\left[\frac{s}{\alpha_1\theta}e^{-\theta t} + (\delta+\theta)t\right]} \qquad (9)$$

On the other hand we know that:

$$Y(o,\theta) = B_2 e^{-\frac{s}{\alpha_1\theta}} \quad , \quad Y(o) = B_1$$

So we have:

$$B_2 = \frac{B_1}{e^{-\frac{s}{\alpha_1\theta}}} = B_1 e^{\frac{s}{\alpha_1\theta}} \qquad (10)$$

By substituting (10) relationship in equation (9) we have:

$$Y(t,\theta) = B_1 e^{-\left[\frac{s}{\alpha_1\theta}\left(e^{-\theta t}-1\right)+(\delta+\theta)t\right]} \qquad (11)$$

Equation (11) represents the potential real output set of functions expansion path, the Term set of functions implies that in exchange of each θ >0, we will have one path for potential real output.
In the following we will show that the limit of the presented set of functions in equation (11), will tend to equation (8) when θ tend to zero.

On the other hand we want to show that:

$$\lim_{\theta \to 0} Y(t,\theta) = Y(t) = B_1 e^{\left(\frac{s}{\alpha_1}-\delta\right)t}$$

Proof:

If $\theta \to 0$, then $\quad \frac{s}{\alpha_1\theta}\left(e^{-\theta t}-1\right) \to \infty \times 0$

But, $\infty \times 0$ is one of the indefinite forms now for solving the problem we get help from L' Hospital's rule.
So we have:

$$\lim_{\theta \to 0} \frac{e^{-\theta t}-1}{\alpha}.\frac{s}{\alpha_1} = -t\frac{s}{\alpha_1}$$

Finally we have:

$$\lim_{\theta \to 0} Y(t,\theta) = Y(t) = B_1 e^{\left(\frac{s}{\alpha_1}-\delta\right)t}$$

In the following, we are enthusiastic about finding the amount of t* in figure (2) in which the potential real output growth rate will be equal to zero.
We Have:

$$0 = \frac{s}{\alpha_1}e^{-\theta t} - (\delta+\theta)$$

$$\frac{s}{\alpha_1}e^{-\theta t} = (\delta+\theta)$$

$$\frac{\alpha_1}{s}(\delta+\theta) = e^{-\theta t}$$

$$-\theta t = \ln\frac{\alpha_1}{s}(\delta+\theta)$$

$$t^* = -\frac{1}{\theta}\ln\frac{\alpha_1}{s}(\delta+\theta)$$

3.EMPIRICAL RESULTS

In order to test the model empirically , it can be easily shown that the amount of accelerator coefficient is the ratio of net investment to the changes in the gross domestic product .
So it can be written as follows :

$$\alpha = \frac{I(t)}{\Delta y\,(t)}$$

so that I (t) and Δy (t) indicate the net investment and changes in the gross domestic product respectively in economy.
On the other hand according to the central bank data , the amounts of real wage and accelerator coefficient index in the mentioned period will be based on the following table:

Time	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Real wage index (ω)	1	0.98	0.98	0.95	0.92	0.87	0.9	0.86	0.84	0.8	0.81	0.79	0.75	0.7	0.69	0.69
Accelerator coefficient Index (α)	1	0.99	0.97	0.96	0.96	0.91	0.91	0.89	0.88	0.87	1.01	0.95	0.8	0.82	0.79	0.76

table (1) : it shows the amounts of real wage and accelerator coefficient index in the economy of Iran according to the data of Iran,s central bank.

According to the table (1) , 1995 has been selected as the base year .
The scatter plot related to the table (1) will be as follows :

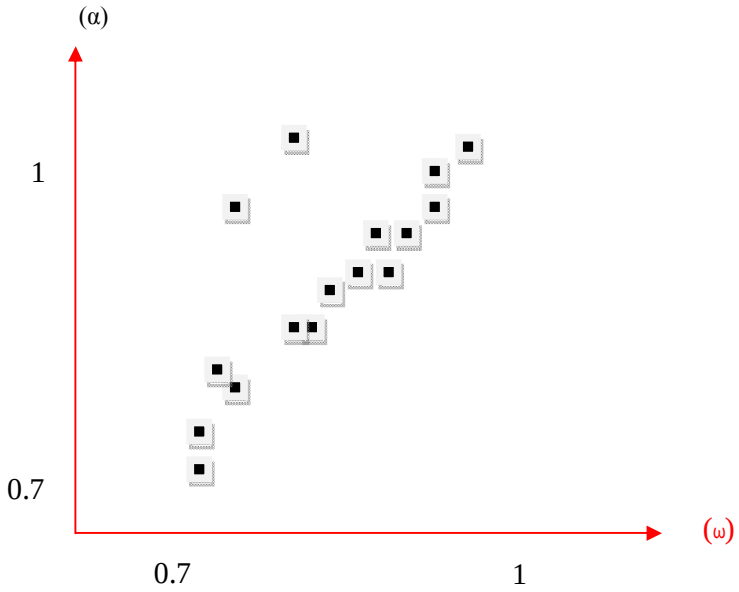

Fig . (3): it shows the amounts of real wage and accelerator coefficient index during the period of 1993-2008

Figure (3) indicates a positive correlation between the amounts of real wage and accelerator coefficient index.
Then by the use of regression model we try to estimate the parameters of relationship (5) .
In order to reach the mentioned aim again we consider the relationship (5) as follows :

$$\alpha = \alpha_1 e^{\theta t}$$

By applying the logarithm we have:

$$\text{Ln}\,\alpha = \text{Ln}\,\alpha_1 + \theta t \quad : \theta < 0 \quad \& \quad \text{Ln}\,\alpha_1 > 0 \qquad (12)$$

The results obtained from the estimates of relationship parameters (12), by using *spss* Software have been summarized in tables (2) as follows:

model		Unstandardized coefficients		Standardized coefficients	t	Sig .
		B	Std.Error	**Beta**		
1	time	-0.016	0.002	-0.901	-8.039	0.000
R		R Squere	adjusted R square	std.error of the estimate	Durbin Watson	F
0.9		0.81	0.8	0.07	1.37	64.62

Table (2) : it shows the estimates of relationship parameters (2)

Now , according to the obtained results from table(2)and Iran,s centeral bank data in relation to the amounts of depreciation rate , marginal propensity to save and the amount of accelerator coefficient in the starting point of analysis in the economy of Iran which are 0.048 ,0.31and 3 respectively , we can have the equation and graph related to the potential real output expansion path in the mentioned period as follows:

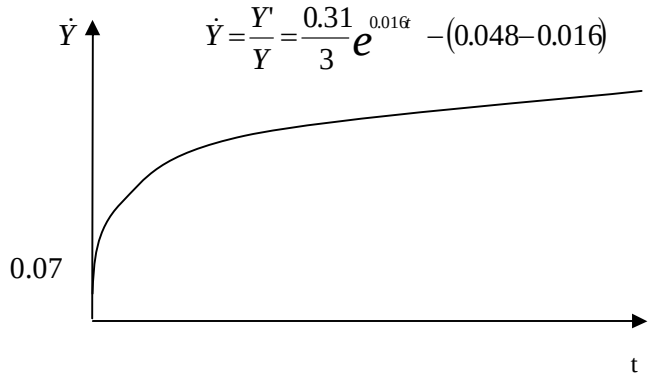

fig .(4) : it shows the equation and graph related to the potential real output expansion path.

4.Conclusion

In this article and in a theoretical approach we showed that how labor union's Tendency in increasing the real wage can lessen the economic growth rate. Because the firms are obliged to spend some parts of the society's capital resources on substituting in labor input.

On the other hand they decrease the amount of use in the labor input in production process.

And we showed that this affects the unemployment rate in the society, which results in raising the unemployment rate beyond the natural rate.

Besides, by using the data related to the economy of iran in relation to the amounts of real wage and accelerator coefficient index and by the use of regression model , we tried to derive the potential real output equation in the economy of iran , so that the result of the research indicates that there is a positive relationship between the amounts of the mentioned indexes.

Based on the obtained results and the fact that unemployment rate has reached a very high level , it is suggested that economy policy maker can decrease the unemployment rate through decreasing as much real wage rate as they can in the economy of iran.

A noticeable point in this article is that, the generalized production function with fixed coefficient was used in order to derive the growth rate of the potential real output expansion path in two different situations. i ,e real fixed wage situation and real rising wage situation .

It should be noted that the generalized production function with fixed coefficient indicates that the firm, in exchange of different ratios of input price, selects different ratios of minimum inputs so that the firm's profit usually lies on the maximum level.

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