A Note on How and Why Growth and Unemployment Go Hand in Hand in Developing Economies

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Abstract

This paper develops a very simple model to explain the phenomenon of persistent unemployment even in an economy experiencing high output growth. Unemployment will also grow at a rate identical with other factors and sectors. The result is primarily triggered by pre-fixed minimum wage rate for unskilled workers. To corroborate our claim we have checked it for twelve developing countries and found empirical results quite consistent with theoretical apprehension. In deciding on desired rate of growth in different sectors to mitigate or reduce unemployment history becomes crucial.

Keywords: Growth, Unemployment, General Equilibrium

JEL Classification: O40, E24, D5

1. Introduction

Rapid economic growth is often seen as panacea for persistent unemployment problem in less developed countries. However, recent rapid economic growth in less developed/developing countries did not translate into equivalent reduction of unemployment in these countries. Many of these countries are experiencing unemployment rate upward of 10 percent despite rapid economic growth over the last two decades. This phenomenon of persistent unemployment in high growth economies calls for a theoretical structure to explain this character of modern growth experience. In this paper we develop a simple model to shed some light on the missing link between high overall economic growth rate and persistent unemployment. Drawing on earlier works by Jones (1965, 1971), Beladi et al (2011), Marjit and Beladi (1999), Chakrabarti (2004), Findlay and Kierzkowsky (1983), Mandal and Marjit (2012, 2013) etc we frame a theoretical model first and then use a panel dataset of twelve less developed and developing countries from Asia and Latin America to test the theoretical claims of our model.

We develop a model with three factors inputs – skilled labor, unskilled labor and capital, and show that unemployment can persist among unskilled labor despite steady growth in skilled labor and capital. The basic results that we derive here are: if all the factors grow at the same rate, outputs as well as unemployment will also grow at an identical rate; initial unemployment share determines the required growth to reduce unemployment.

The paper is organized as follows: section 2 introduces the theoretical model and the main theoretical propositions, section 3 discusses the data sources and the econometric model used in the study, section 4 reports the regression results, and section 5 concludes the paper.

2. Basic Theoretical Model

We consider a small perfectly competitive open economy producing two traded goods; X and Y. Goods' prices are determined internationally and hence exogenous.

Product markets and factor markets are characterized by standard neo-classical assumptions such as constant returns to scale (CRS), diminishing marginal productivity (DMP) and full employment of factors. Perfect competition assumption guarantees zero profit for producers and also ensures determination of optimum production technology straightway from factor prices only. Both the goods use all three factors of production viz. skilled labor (S), unskilled labor (U) and capital (K). However, factor intensity may vary between goods. Skilled wage (W_S) and rental rate of capita (r) are market determined and hence there is no room for unemployment of skilled labor and capital. The economy is characterized by policy determined minimum wage W which is also unskilled wage in our model. Needless to say that skilled wage $W_S > W$..

The following set of equations describe the model[2]. Competitive price equations are

$$W_S\, a_{SX} + W a_{LX} + r\, a_{KX} = P_X \quad (1)$$

$$W_S\, a_{SY} + W a_{LY} + r\, a_{KY} = P_Y \quad (2)$$

Factor market clearing conditions are

$$a_{SX}.X + a_{SY}.Y = S \quad (3)$$

$$a_{LX}.X + a_{LY}.Y = L - L_U \quad (4)$$

$$a_{KX}.X + a_{KY}.Y = K \quad (5)$$

By virtue of small country assumption factor prices are determined from (1) and (2). Since goods' prices are fixed, W_S and r will also remain fixed throughout and W is given to start with following our assumptions. So there will be no factor substitution, whatsoever.

[2] To define the system of equations we use following symbols: $P_j \Rightarrow$ price of the jth commodity (j= X, Y); $W_S \Rightarrow$ skilled wage; $W \Rightarrow$ unskilled wage; $r \Rightarrow$ rate of return to K; $a_{ij} \Rightarrow$ production requirement of the ith factor in one unit of jth commodity (i = S,L,K and j = X,Y); $S \Rightarrow$ total supply of skilled labor; $L \Rightarrow$ total supply of unskilled labor; $L_U \Rightarrow$ Total unemployment of unskilled labor; $K \Rightarrow$ total supply of capital, K; a *'hat'* over a variable represents proportional change.

Once factor prices are determined we get the values of a_{ij}. So X and Y are simultaneously solved from equations (3) and (5) for any given values of S and K. Substituting the equilibrium values of X and Y in equation (4) we have L_U for constant L.

Since $\widehat{W_S} = \widehat{W} = \hat{r} = 0.$, the full employment conditions of S and K yield $\hat{X}\,\lambda_{SX} + \hat{Y}\lambda_{SY} = \hat{S}$; $\hat{X}\,\lambda_{KX} + \hat{Y}\lambda_{KY} = \widehat{K}$. Interpretation of λs are well used in trade models and can be best understood from Jones (1965). Essentially λ_{ij} indicates employment share of ith factor in jth commodity. Now let us consider that the economy is experiencing an identical growth in all the factors. As of now we are not bothered about the reasons for such a growth. $\hat{X}$ and $\hat{Y}$ are solved as follows:

$$\hat{X} = \hat{S}\,\frac{\lambda_{KY}-\lambda_{SY}}{\lambda_{KY}\lambda_{SX}-\lambda_{SY}\lambda_{KX}} = \frac{\lambda_{KY}-\lambda_{SY}}{\lambda_{KY}-\lambda_{SY}}\hat{S} = \hat{S} > 0 \qquad (6)$$

$$\hat{Y} = \hat{S}\,\frac{\lambda_{SX}-\lambda_{KX}}{\lambda_{KY}\lambda_{SX}-\lambda_{SY}\lambda_{KX}} = \frac{\lambda_{SX}-\lambda_{KX}}{\lambda_{SX}-\lambda_{KX}}\hat{S} = \hat{S} > 0 \qquad (7)$$

Note that $\lambda_{SX} + \lambda_{SY} = 1$ and $\lambda_{KX} + \lambda_{KY} = 1$. Therefore we propose that

> *Proposition I: Irrespective of factor intensity comparison both the sectors will expand if factors grow.*
>
> *Proof: See discussion above.*

Now we move to the unskilled labor (un)employment condition. Substituting the values of $\hat{X}$ and $\hat{Y}$ and manipulating a bit we arrive at

$\hat{L}_U\lambda_{LU} = \hat{L}(1-\lambda_{LX}-\lambda_{LY}) \quad \Rightarrow \hat{L}_U\lambda_{LU} = \hat{L}(1-1+\lambda_{LU}) \Rightarrow \hat{L}_U = \hat{L}\,\frac{\lambda_{LU}}{\lambda_{LU}}$ (as $\lambda_{LX} + \lambda_{LY} + \lambda_{LU} = 1$). So

$$\hat{L}_U = \hat{L} = \hat{S} = \hat{X} = \hat{Y} \qquad (8)$$

> *Proposition II: Unemployment will also grow at a rate identical with factors and other sectors.*

The underlying intuitive explanation may run as follows. Both S and K are easily absorbed in the economy. Competitive prices for these factors promise this. In case

of L, however, downward wage rigidity made full absorption impossible. When all the factors grow at an identical rate, again, the economy fails to employ all L due to the same reason and hence L_U also grows. So the economy does not get rid of the unemployment problem even if it experiences an all-round growth.

Nevertheless, if S and K increase at a rate faster than L, unemployment rate would rise at a rate lower than $\hat{L}$ since extra S and K make room for some unemployed L. Say $\hat{S} = \hat{K} \neq \hat{L}$. So

$$\hat{S}\,\lambda_{LX} + \hat{S}\lambda_{LY} = \hat{L} - \hat{L}_U\lambda_{LU} \Rightarrow \hat{L}_U\lambda_{LU} = \hat{L} - \hat{S}(1 - \lambda_{LU}) \qquad (9)$$

And unemployment would be reduced if S and K rise by sufficiently higher rate than L. The precise condition for $\hat{L}_U < 0$ is $\hat{S} > \hat{L}\,\frac{1}{(1-\lambda_{LU})}$. Therefore we have the following corollaries of Proposition II.

Corollaries:

(i) $\hat{L}_U > 0 \;\; if\, \hat{S} < \hat{L}\,\frac{1}{(1-\lambda_{LU})}$

(ii) $\hat{L}_U = 0 \;\; if\, \hat{S} = \hat{L}\,\frac{1}{(1-\lambda_{LU})}$

(iii) $\hat{L}_U < 0 \;\; if\, \hat{S} > \hat{L}\,\frac{1}{(1-\lambda_{LU})}$

When both S and K grow, X and Y simultaneously draw increased S and K by the amount dictated by technology. But technology remains unaltered throughout in the structure developed here. On the other hand L is also increasing to complement with the increased S and K. In spite of full employment of S and K, some L are not lucky enough to get a job at the given wage rate W. Here we started with some amount of unemployment indicating the capacity constraint in Y. This indicates that unless S and K grow at a faster rate than L, unemployment will never cease to exist or reduce. One can easily understand this from Corollaries (ii) and (iii) as $0 < \lambda_{LU} < 1$. Alongside, if initial unemployment share in the economy is relatively small (or unskilled labor employment share is large), the required growth in S and/or K and output would be much less for all the possibilities mentioned above. Therefore *history matters* in reducing unemployment.

3. Econometric Model and Empirical Results

3.1 Data

The data has been considered from various sources. The dependent variable, unemployment rate across years, is taken from the World Bank. The data on Gross Domestic Product and Gross Domestic Fixed Capital Formation, both in 2005 US$, is also obtained from the World Bank. The share of skilled workers in total labor force is estimated from the Groningen Growth and Development Centre 10-sector database. Due to lack of information on unskilled workers, we assumed that unskilled workers are primarily based in agriculture, forestry and fishing, mining and quarrying, construction, and wholesale and retail trade, hotels and restaurants. The countries under study are Argentina, Brazil, Chile, Colombia, Costa Rica, Indonesia, Malaysia, Mexico, Peru, Philippines, Thailand and Venezuela. The choice of countries are primarily limited by the availability of data. However, we think that we have a good sample of developing countries from both Asia and Latin America.

3.2 Empirical Methodology and Benchmark Results

Panel specification is considered over the period 1995 to 2005. The choice of time period is primarily limited by the availability of data. The Groningen Growth and Development Centre 10-sector database is only available for 1995 to 2005.

Our panel regression specification is as follow

$$Unemployment\ Rate_{i,t} = \alpha_0 + \alpha_1 Capital\ Formation_{i,t} + \alpha_2 Skilled\ Labor_{i,t} + \alpha_3 X_{i,t} + \alpha_4 T_t + \epsilon_{i,t}$$

The panel specification adopted to address the problems induced by unobserved country-specific effects. Our independent variables of interest are capital formation and skilled labor. Capital formation is measured as gross fixed capital formation as percent of GDP and skilled labor is the share of skilled labor in total labor force. $X_{i,t}$ is the matrix of control variables and T_t is the vector for time dummies. Table 1 presents the results with fixed effect specifications. We consider country fixed effects.

Our theoretical model predicts that both capital formation and skilled labor will have negative impact on unemployment rate. Therefore in the panel specification above, we expect coefficients for capital formation and skilled labor will be negative.

The controls in column 1 are GDP per capita in 2005 US$. We have used two different definitions of capital formation – Gross Capital Formation as % of GDP and Gross Capital Formation per capita in 2005 US$. In all specifications, both measures of capital formation are negative and significant. The coefficient of Skilled Labor is negative but not significant. The coefficient for GDP is negative, but significant only in case of Gross Fixed Capital Formation as % of GDP. The signs of all the explanatory variables are as predicted by our model.

Table 1: Fixed-Effect Specifications: The Impact of Skilled Labor and Capital Formation on Unemployment Rate Dependent Variable

VARIABLES	(1)	(2)	(3)	(4)
Gross Fixed Capital Formation (% of GDP)	-0.1505908***		-0.1435006***	
	(0.0334998)		(0.0330508)	
Gross Fixed Capital Formation Per Capita (2005 US$)		-0.0000385***		-0.0000361***
		(0.00000798)		(0.00000897)
Skilled Labor (% of Labor Force)	-0.1297602	-0.1366212	-0.0737032	-0.1193347
	(0.126839)	(0.1255208)	(0.1269544)	(0.1293705)
GDP Per Capita (2005 US$)			-0.000012**	-0.00000342
			(0.0.00000523)	(0.0000059)
Constant	0 .1761817**	0.1789954**	0.195722**	0.182326**
	(0.0603443)	(0.059702)	(0.0598816)	(0.0601468)
Observations	132	132	132	132

R Squared (Within)	0.1508	0.1690	0.1875	0.1714
R Squared (Between)	0.0392	0.0012	0.0040	0.0000
R Squared (Overall)	0.0068	0.0001	0.0099	0.0016
Number of Countries	12	12	12	12

Standard errors in parentheses

*** p<0.01, ** p<0.05

4. Conclusion

This paper tries to examine the theoretical underpinning of persistent unemployment in an otherwise growing economy. It has been shown that despite of experiencing an all- round growth across sectors the economy may not come out of unemployment problem. In fact the unemployment rate that the economy starts with is also very fundamental in fixing the target growth rate for different sectors. So in a crude sense history also matters in designing proper economic policy. We have also validated our theoretical claim for few developing economies characterized by unemployment and growth.

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