

The Employment Effect of Economic Growth: Identifying Determinants of Employment Elasticity

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<Abstract>

This paper aims to examine the employment effect of economic growth, which is called 'employment elasticity' or 'employment intensity' of growth. While there have been many studies about that issue, no study has identified the structural determinants of employment elasticity. Most studies look only at empirical data of output growth and employment growth and estimate the empirical elasticity. This paper's goal is to employ an equilibrium labor market model in addressing this question and to find the structural determinants of employment elasticity. It will allow us to look at how labor market structure related to the job creation and employment effect of economic growth.

I. Introduction

This paper aims to examine the employment effect of economic growth, which is called ‘employment elasticity’ or ‘employment intensity’ of growth.¹ While there have been many studies about that issue, no study has identified the structural determinants of employment elasticity. Most studies look only at empirical data of output growth and employment growth and estimate the empirical elasticity. This paper’s goal is to employ an equilibrium labor market model in addressing this question and to find the structural determinants of employment elasticity. It will allow us to look at how labor market structure related to the job creation and employment effect of economic growth.

Recently, most countries have persistent job shortage and unemployment problem. And apparently, since the employment does not increase enough while the economy grows, the phenomenon has been called as “Jobless growth”. Due to the chronic high unemployment in most countries, it has become an important and imminent question in Economics how employment growth is affected by economic growth.

Among many previous studies, following ones may be mentioned here. Kapsos(2005) looks at the growth rate of GDP and employment in many countries and estimates employment elasticity. Kapos(2005) finds that the elasticity has indeed decreased in some countries. Seyfried (2006) estimates that employment elasticity is in the range from 0.31 to 0.61 in specific states with an estimate of 0.47 for the US as a whole. Padalino and Vivarelli (1997) is an empirical study on the G-7 economies over the period 1960-1994.² Piacentini and Pini (2000) estimates the employment elasticities - both in aggregate and by economic sectors - for the G-6 + Sweden over the period 1960-97.³

So far, no serious attempt to identify structural determinants of employment elasticity with respect to economic growth has been found in this line of research. The basic underlying idea in the most studies is that employment effect of growth is (mainly) determined only by technological factor (so, labor demand), not giving

¹ It is measured as employment growth with respect to output growth. Here, for a convenience, employment elasticity is used to denote it.

² They derive several interesting results. For example, they find that job creation in North America has been much greater than in Europe. Importantly, they argue that long run evolution has to be distinguished by short run correlation; while North America and Europe structurally differ in their job creation capacity in the long run, both of them keep on showing a strong and statistically significant short run correlation between growth and employment.

³ During ‘90s, negative elasticities were found in Italy, Germany, UK and Sweden. Unlike other countries, Japan did not experience a decrease in the employment elasticities. They also compare elasticities in manufacturing and services.

attention on other ones (for example, labor supply). That is, most studies are based on an implicit premise that labor-saving technology may reduce the employment elasticity as the economy grows. They do not distinguish labor demand and labor supply, and ignore the most basic fact that employment is determined in the labor market as intersection of labor demand and supply.⁴

This paper emphasizes that we need to distinguish labor demand and labor supply effect of growth. It proves that employment elasticity is determined by the structure of technology and preference, thus, the labor demand and supply. Thus, it points out that it could be wrong to take the apparently labor-saving technology as reducing employment, but necessary to look at the other side of labor market, labor supply. And we compare the empirically estimated elasticities and theoretically calculated ones based on the structural parameters of the economy.

This paper is developed as following. In section 2, using a simple model of growth and labor market, we derive employment elasticity as a function of structural parameters. In section 3, we calibrate the structural parameters and calculate the theoretical values of employment elasticity and compare them with empirical values estimated from data of output and employment growth. In section VI, concluding remarks close the paper.

II. A Model for Growth and Employment

2.1 Growth and Labor demand.

It is assumed that production structure is following, which satisfies constant returns to scale : $\alpha + \beta = 1$.

$$Y = AF(K, N) = AK^\alpha N^\beta \quad (1)$$

Here, Y, K, N, A are output, capital stock, employment and technology shock respectively. The labor demand ($=N^D$) condition is following, equalizing marginal productivity to real wage.

⁴ To my knowledge, Kennan(1988) is a good example of dealing with the identification problem in understanding labor supply and demand.

$$AF_N(K, N^D) = (1 - \alpha)A\left(\frac{K}{N^D}\right)^\alpha = W \quad (2)$$

To focus on the effect of economic growth on labor demand, we use the concept of labor per capital, $\frac{L}{K} = n$, which simplifies the labor demand function as following.

$$(1 - \alpha)An^{-\alpha} = W \quad (3)$$

Capital accumulation through economic growth affects labor demand as following.

$$\frac{\partial n}{\partial \alpha} = \frac{1 + (\alpha - 1)\ln \alpha}{\alpha(\alpha - 1)n^{-1}} < 0 \quad (4)$$

It means that labor demand per capital decreases as the value of α is larger. As mentioned above, this parameter is the elasticity of output with respect to capital and affects the convergence speed in transitional dynamics of neoclassical growth model. In other words, the parameter affects both the growth rate and job creation in the growing economy.

2.2 Determinants of Employment elasticity

Note that the above discussion is concerned only with labor demand, but not employment. Since the employment is determined in the labor market equilibrium of labor demand and supply, we need to specify labor supply and demand functions as following.

$$N^S = N^S(W, \Psi) \quad (10)$$

$$AF_N(K, N^D) = W \quad (11)$$

In (10), N^S, Ψ are labor supply and other structural determinants of labor supply respectively. First, the equilibrium employment is determined by substituting (11) into (10).

$$N = N^S(AF_N(K, N), \Psi) \quad (12)$$

Using this employment equation, one can derive elasticity of employment with respect to capital.

$$\eta_{NK} = \frac{\varepsilon^S_{NW} \zeta_{NK}}{(1 - \varepsilon^S_{NW} \zeta_{NN})} \quad (14)$$

Here, ε^S_{NW} = labor supply elasticity with respect to real wages, ζ_{NK} and ζ_{NN} are elasticity of marginal product of labor with respect to capital and labor respectively. Employment elasticity with respect to growth of output may be defined as following.

$$\eta_{NY} = \frac{\varepsilon^S_{NW} \xi_{NK} \varepsilon_{KY}}{(1 - \varepsilon^S_{NW} \zeta_{NN})} \quad (15)$$

One can see that the employment elasticity is affected by preference and technology structure. There are four factors determining the elasticity: the elasticity of labor supply with respect to real wages, elasticity of marginal product with respect to labor, elasticity of marginal product with respect to capital, elasticity of output with respect to capital. The first one is from preference structure and the other three from technology structure. Important point is that employment elasticity with respect to output growth is determined both by preference and technology structure.

Next, one can also derive wage elasticity of output growth as following.

$$\eta_{WY} = \frac{\xi_{NK} \varepsilon_{KY}}{(1 - \varepsilon^S_{NW} \zeta_{NN})} \quad (16)$$

The same four factors determining employment elasticity determines wage elasticity. Other factors except ε^S_{NW} are affecting both elasticities in the same direction. As the value of ε^S_{NW} gets bigger, however, employment elasticity increases while wage elasticity decreases. The larger the value of ξ_{NK} , ξ_{NN} and

ε_{KY} is, the bigger the employment elasticity is, which is a quite intuitive result.

To be more specific, if we assume that production function is Cobb-Douglass, employment and wage elasticity is simplified as following.

$$\eta_{NY} = \frac{\varepsilon^S_{NW}}{(1 + \alpha\varepsilon^S_{NW})} \quad (17)$$

$$\eta_{WY} = \frac{1}{(1 + \alpha\varepsilon^S_{NW})} \quad (18)$$

These derivations are more readable than (15) and (16). Output elasticity has a negative relationship with capital coefficient and a positive relationship with wage elasticity of labor supply. Wage elasticity has a negative relationship with capital coefficient and the elasticity of labor supply with respect to wage. This result is intuitively right. As the elasticity of labor supply with respect to wage becomes more elastic, the resulting increase of labor demand from economic growth may be transformed into more employment rather than higher wage.

III. Empirical Result and Interpretations

3.1 Data and Specification

Here, we look at data of Korean economy : time series of GDP, employment and wages. Sample period is from 1971 to 2005 and data are yearly data.

<Table 1 Empirical result: Employment and wage elasticity>

	Workers Employed		Real GDP (Billion Won)		Real Wages		Employment Elasticity of Output	Wage Elasticity of Output
		Growth rate of Employment		Growth rate of GDP		Growth rate of Wage		
1971~1980	12,030	3.62	107,617.2	7.3	368,567	6.86	0.49	0.93

1981~1990	15,668	2.84	223,583.4	8.7	614,789	6.18	0.34	0.71
1991~1996	19,668	2.40	418,577.6	7.7	1,045,960	6.72	0.31	0.93
1997~1999	20,481	-0.84	514,432.5	2.4	1,225,344	0.73	-0.35	0.30
2000-2005	22,075	2.01	578,664.5	5.2	1,450,969	4.41	0.38	0.85

< Note: The period 1997-1999 is separated because of economic crisis in Korea >

First of all, one can see that the employment elasticity has decreased since 1970s until the end of 1990s. However, it is rising again since 2000. Thus, the so called “jobless growth” is not found during 2000s. While the employment elasticity was 0.31 from 1991 to 1996, it has rebounded to 0.38 since 2000. Wage elasticity has been larger than employment elasticity, but has decreased since 2000.

The theoretical derivation of (17) and (18) allows us to calculate both elasticities based on other structural parameters. First, it is assumed that capital coefficient α is 0.4. Concerning the elasticity of labor supply with respect to wage in the aggregate labor market, there are only a few studies in Korea, one of which is Choi(1995). For example, when the number of workers employed is used, Choi(1995) estimates the labor supply elasticity w.r.t wage to be from 0.06 to 0.12. Using these values about economic structure, the calculated employment elasticity is in the range of [0.05, 0.11]. Choi(1995)’s estimate becomes 0.18 when hours worked are used for labor supply. With this value, the employment elasticity is calculated to be 0.17. Other study of Choi(2006) estimating labor supply and demand jointly suggests that wage elasticity of labor supply is 0.48. This value implies that employment elasticity is 0.40, and is very close to the above empirically estimated value which is in the range of [0.3, 0.5]. The former elasticity looks consistent with the latter one.

Conversely, one can use the formula of employment elasticity in conjecturing the elasticity of labor supply with respect to wage. That is, we can infer it by equalizing the calculated and the empirically estimated employment elasticity. As the value of the latter is in the range of [0.3, 0.5], the labor supply elasticity of wage is inferred to be in the range of [0.5, 0.8] with the calibrated value of $\alpha = 0.4$. These values are too larger than the empirically estimated values, making the comparison inconsistent. Next, wage elasticity of output is calculated by (16), which

is from 0.97 to 0.95 depending on the labor supply elasticity of wage from 0.06 to 0.12. The value of 0.48 in Choi(2006) implies it to be 0.84. These values are very close to the empirically estimated wage elasticity in Table.

IV. Conclusion

This paper shows that one can identify the structural determinants of employment elasticity with respect to output growth. It is shown that the elasticity is determined by preference and technology parameters. So, this paper point out that the apparently labor-saving technology alone may not be responsible for the slow increase in employment. We also should look at the other side of labor market, labor supply. We found that the elasticity of labor supply with respect to wage is an important determinant of employment effect of economic growth.

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