4 THE RELATIONSHIP BETWEEN UNEMPLOYMENT AND OUTPUT CYCLES IN KOREA

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Abstract

This paper[**] addresses the problem of Okun's coefficient for the Korean economy. By running regressions between the unemployment and employment variables cycles and the economic activity cycles, I find that Okun's Law has held in Korea in the last decades. At the same time, the results indicate a rather low response of the labor market to the changing conditions in the economy, suggesting a higher than average degree of labor market rigidity.

Keywords: Okun's Coefficient, Unemployment, Business Cycles, Korea.

JEL Classification: E24, E32.

1. Introduction

The importance of employment variables comes from two basic facts. One is that the labor market is one of the three key markets, along with the goods and the financial markets, and the second is that employment directly affects the life of the people. Ensuring that the market generates enough jobs for the individuals entering the labor market is of major interest for any policy maker. It is obvious that unemployment is a key variable that the policy makers, firms, and also individuals watch closely as an essential indicator of the current and near-future position of the economy. In particular, unemployment behavior during the business cycles is essential with regard to policy making, as it reveals how strong the connection between the labor market and the goods market is. The chief purpose of this study is to confirm whether the Okun's Law has held for the Korean economy. In this regard, I ask the following questions: Which is the Okun coefficient for the Korean economy? Is it statistically significant? What are the factors that have determined the value of the Okun coefficient in Korea?

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[**] *This is a simplified version of the author's MA thesis submitted to the Graduate School of Pan-Pacific International Studies, Kyung Hee University, Seoul, Korea, as a requirement for the Degree of Master of Arts in International Trade and Economic Cooperation, year 2005.*

The Okun's Law is of an undeniable importance at both theoretical and practical levels. In theory, Okun's coefficient is usually used to derive the aggregate supply curve in macroeconomic models, by combining the expectations' augmented Phillips Curve with Okun's coefficient, so as to derive the relationship between prices and output. In practice, computing Okun's coefficient gives us the sensitivity of unemployment during the business cycles. It also provides us with a quantitative measure of the rigidity of the labor market. Moreover, Okun's relationship can be used to assess the impact of the macroeconomic policies upon the labor market.

This paper will use regression analysis in order to derive Okun's coefficient for the 1970-2004 period and check for its statistical significance. I also analyze the institutional factors that underlie Okun's coefficient in Korea, and draw some conclusions regarding possible labor market reforms to improve economic efficiency. The paper is organized as follows. The second chapter presents the literature review. The following chapter provides the methodology, the hypothesis and the model used for the analysis. The data used is also presented along with the rationale for its use. The fourth chapter presents the main empirical results and derives economic interpretations for them. The last chapter is devoted to the conclusion whereas the main findings of the paper are reviewed once more.

2. Literature Review

As Romer (2001) reports, there is a well-established stylized fact about the fluctuations in the US economy – that the employment rate is procyclical and the unemployment rate countercyclical. During all the recessions in the 1947-1999 period he finds that the employment fell 3.6% on the average, and also that the rate shrank during each of the periods. Because there is a statistical relationship between unemployment and output changes that has been verified over the business cycles, this relationship has become known as Okun's Law. In the original, Okun (1962) found that a deviation of 3% in the GDP will produce a rise by 1% in the unemployment rate.

After the publication of Okun's seminal paper, numerous studies were carried out in order to test Okun's Law for the US, as well as for other developed countries. However, most of the studies were concentrated on the case of the United States, like those worked out by Gordon (1984), Evans (1989), Prachowny (1993) or Weber (1995), to count only the most important ones.

Gordon (1984) starts from an identity between the real GNP and the unemployment rate together with a few other variables, like productivity or the labor force participation rate. He applies the logarithm function to the identity, and then he transforms it into a relation between the detrended components. When running the regressions between each component and the current and lagged values of the output gap (the latter as an independent variable), he obtains short-run Okun's coefficient of 0.23 and Okun's long-run coefficient of 0.5, much higher than the value given by Okun's long-run coefficient.

Evans (1989) uses data for the US economy from 1950 to 1989 in order to assess the relationship between the GDP growth and the unemployment rate. He finds a "substantial feedback" between the two variables, supported by the contemporaneous

correlation between them. Using a nonrestricted bivariate VAR he shows that there is a long-run relationship between the GDP growth and unemployment at about 0.30, in line with Okun's findings.

Prachowny (1993) extends the previous approaches by taking into account some of the factors that were neglected in the previous estimates of Okun's coefficient. He uses a production function in which he includes factors like capital utilization and the number of hours worked. He defines the potential output as the output obtained when the values of the factors in the production function are at their long-run equilibrium. When he runs the regressions between the output gap and the unemployment gap he finds much smaller values for the impact of a 1% unemployment reduction upon the output growth than in the case of Okun's paper.

Weber (1995) uses four different methods to extract the cyclical components of the output and the unemployment. He uses the cyclical components to derive estimates of Okun's coefficient for the US economy for the period of 1948-1988. As he underlines, these approaches are not different in their empirical design, but rather they are based on different economic conceptions of the output-unemployment rate relationship. His results show that the estimates of Okun's coefficient are influenced by the detrending methods used. He finds that the values of the coefficient range from -0.22 to -0.31, thus contradicting the claim that Okun's coefficient is rather stable around the -0.3 value.

A few studies have been conducted for groups of several industrialized countries, like Moosa (1997) or Lee (2000). Moosa (1997) uses the same model to measure Okun's coefficient as Weber (1995) did. However, he is among the first to approach this problem from a cross-comparison perspective. He computes Okun's coefficient for all the G7 economies from 1960 to 1995. Besides this international comparison, he also innovates, not only by using advanced econometric methods to extract the cyclical components of the output and unemployment, but also by checking for the stability of the relationship along the whole period studied. He finds Okun's coefficients ranging from -0.08 for Japan to -0.41 for the United States.

Table 2.1

Okun's Coefficient Dynamics in Time

Country	Maximum	Minimum	Mean	Coefficient of variation
United States	-0.477	-0.432	-0.456	0.036
Japan	-0.112	-0.063	-0.083	0.192
Germany	-0.642	-0.213	-0.410	0.320
France	-0.409	-0.243	-0.217	0.167
UK	-0.414	-0.369	-0.392	0.031
Italy	-0.285	-0.113	-0.175	0.337
Canada	-0.588	-0.423	-0.488	0.06

Source: Moosa, Imad, 1997, "A Cross-Country Comparison of Okun's Coefficient", Journal of Comparative Economics 24 (3): 335-356.

His main findings are that Okun's coefficient is higher in North America than in Europe or Japan, a difference that he explains through the different institutional settings of the labor market (that is, the labor market regulations are much more flexible for the Anglo-Saxon economies). The greater degree of flexibility of the Anglo-Saxon economies is also showed by the very low degree of variation of Okun's coefficient in the US, UK or Canadian economies. Another important finding is that he obtains rising values for France and Germany, which he attributes to the labor market reforms undertaken.

Lee (2000) makes a study on Okun's Law for 16 OECD countries, using post World War II data to assess differences between the countries at a statistical or quantitative level. He uses two different approaches, the first-difference and the "gap" model. For the second approach, in order to estimate the effect of different detrending techniques he makes use of the Hodrick-Prescott filter, the Beveridge-Nelson decomposition and the Kalman filter in the Nairu framework. He finds statistically significant Okun's coefficients for almost all countries, but some differences among the countries. Some countries are characterized by low absolute values of the coefficient, which he attributes mainly to rigidities in the labor market (the case of Japan, for example).

Of particular interest is the case of a paper written on this topic for the Japanese economy, Hamada and Kurosaka (1984). The importance of it stems from the similarities of Japan with Korea in terms of pattern of development, geographical proximity, social and economic institutions, which translate into common characteristics of the labor market.

Hamada and Kurosaka (1984) study Okun's law for the Japanese economy using annual data for the post World War II period. The first method they use relies on the assumption of a fixed relation between the real GNP and the rate of employment. Because of the different methods of compiling data in Japan (in the case of GNP), they divide the period into three subperiods, obtaining the following results:

Table 2.2

Okun's Coefficient in Japan

Okun Coefficient(á)	Periods		
	1953-65	1965-74	1974-84
α	0.054	0.03	0.075

Source: Hamada, Koichi and Kurosaka, Yoshio, 1984, "The Relationship Between Production and Unemployment in Japan", European Economic Review 25, 71-94.

The second approach assumes a certain trend for the potential growth. By running a regression between the unemployment and the GNP gaps they obtain a value of 0.035 for the entire period studied. Thus, they find a low elasticity of the labor market. Moreover, Okun's coefficient estimates for Japan prove to be unstable from one subperiod to the next.

Nevertheless, few studies were carried out for the case of late industrialized countries or developing ones, and for the particular case of Korea. The present paper tries to fill this gap by estimating Okun's coefficient for the Korean economy.

3. Methodology

In this paper, I will make use of one of the most important methods to derive Okun's coefficient, used by Okun himself (1970).

The model I am using is the Gap Model, and I present it as in Weber (1995). I denote by y_t^n, the potential output and by u_t^n, the natural unemployment rate. Then, the cycles in output and the unemployment gap can be determined as:

$$Y_t^c = Y_t - Y_t^n$$

$$U_t^c = U_t - U_t^n$$

To determine Okun's coefficient we run regressions between the output and unemployment gap, in the following way:

$$U_t^c = \alpha * Y_t^c, \text{ where } a<0.$$

The potential output and the natural unemployment is determined using the Hodrick-Prescott filter (H-P hereafter):

$$\text{Min}\left(\sum_{t=1}^{T}(Y_t - \tau_t)^2 + \lambda\sum_{t=2}^{T-1}\left[(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})\right]^2\right)$$

Y_t is the observed time series and τ_t is the trend component, while λ penalizes the volatility in the growth component.

There is a continuous debate regarding the optimal way of extracting the cycle component from a time series. I choose to use the H-P filter, as it is a standard way of detrending, and because it was used in many important papers on business cycles.

The first use of the H-P filter came in the Hodrick and Prescott (1980), where they analyzed the empirical regularities of the post-war American business cycle. Since then, the H-P filter has become the main econometric tool used to extract the business cycles. The H-P detrending method has many advantages, the most important being its flexibility and the fact that it is implemented in software packages (like E-views). The main disadvantages are its poor behavior at the end of the time series and its sensitivity to the choice of λ.

There is also some controversy regarding the proper choice of λ. As we know, the reference value for λ is that for the quarterly frequency data, namely ë=1600, which is a value derived from the specific dynamics of the American economy, as in Hodrick and Prescott (1980). A recent study by Ravn and Uhlig (2002) has shown that an optimal value for the monthly time series can be derived starting from the key value of λ =1600, based on the criteria that the H-P filter should be adjusted relative to the frequency of the observations. They suggest the use of a ë equal to 129600 for extracting the cycle in the monthly time series, which is the value that I use in my study.

A separate problem is that of the data used in both models. A first choice regards the frequency of the data. The trade-off is between the reliability of the data and the number of observations. The most reliable data are based on an annual frequency, but this choice suffers because of the low number of observations. At the other extreme we find monthly data, which offers the highest number of observations, but

for which there are no GDP estimates. As the number of observations is critical to a good analysis for my study, I opt for both the monthly frequency and quarterly frequency data. In this respect, I use the monthly unemployment data and the monthly index of industrial production, while for the quarterly frequencies I use quarterly GDP and quarterly unemployment rates.

Some controversy may also arise because of the use of the industrial production as a proxy for the aggregate activity. However, this series was also used in reference studies on the business cycles, like that of Stock and Watson (1998), who used the index of industrial production to study the business cycles in the USA. Nor is the choice of the index of industrial production influenced by a changing proportion of the industry in the aggregate activity. For example, some studies use this index to study the economic fluctuations in UK, though the industrial sector is in a long decline in this country. What is important is that I am interested in the economic cycles, which can be very well approximated by the cycles in industrial production.

An important issue related to the present study was raised by Hamada and Kurosaka (1984) in their study of the statistical data on unemployment in Japan. They have found significant differences between the official definitions of the unemployment in US and Japan, that were found to influence the value of Okun's coefficient obtained through the regression. As the definition of unemployment in Korea may be influencing the results of our analysis, I also use the employment ratio as a variable that captures the labor market volatility.

4. Empirical Analysis

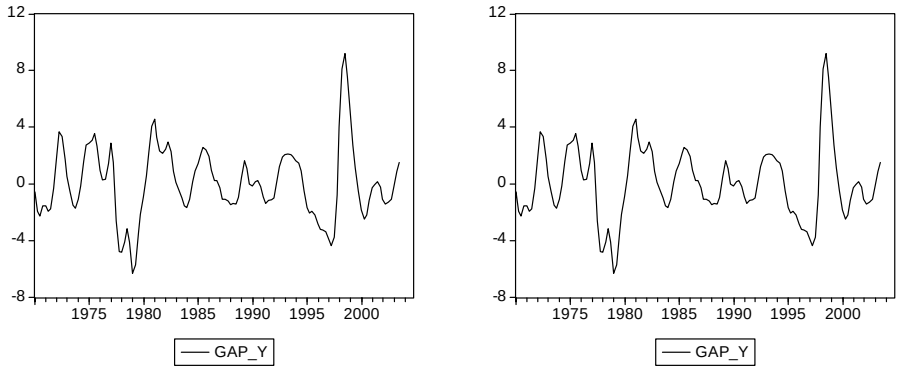
In this chapter, I implement the methodology discussed above and I also try to derive policy implications. In the first two sections, I analyze the cyclical behavior of output, and unemployment and employment ratios, respectively, for the Korean case. Then, I estimate the Okun coefficient, by applying several methods on the cyclical time series that I have previously obtained. In the last section, I present some interpretations of the results and also some policy implications.

4.1. The Dynamics of Output

To analyze the cyclical behavior of output we use the H-P filter, as previously mentioned, and apply it to both the monthly index of industrial production and the quarterly GDP. For the reasons stated above, I use a value of ë set to 129600 for the monthly data, while for the quarterly GDP I use the standard value of ë equal to 1600. The figures below illustrates the cyclical components for the two variables, expressed in deviations from trend in percentage points.

When addressing the issue of whether there are business cycles in an economy, there are four criteria by which we can assess this, namely: the duration, volatility, the persistence and the comovement. Duration refers to the necessary condition that the business cycles last for more than one year, and on the average they extend over a period between four and eight years.

Figure 4.1. Industrial Production Cycles **Figure 4.2. Quarterly GDP cycles**



Kim and Choi (1997) confirm in their study the existence of the business cycles in Korea, so that I consider this first criterion as fulfilled. The volatility of fluctuations is usually measured using the standard deviation. In the case of Korea, I find a volatility of the cycles of 3.16% for the monthly series and a volatility of 2.52% for the quarterly ones. This degree of volatility is much more in line with those of the emerging economies than with those of the industrialized ones, as we can see in the table below. Usually, the emerging economies exhibit fluctuations around the trend of a magnitude starting at about 3-4%. Another essential criterion is that of persistence. We use a persistence measure in order to check whether the fluctuations have a tendency to last, or they are just very short time movements. The industrial production cycles show a much higher degree of persistence than the quarterly GDP. Nevertheless, both cyclical components exhibit obvious persistent patterns.

Table 4.1

A Comparison of Output Cycles Stylized Facts

	Volatility	Autocorrelations		
		$\rho(1)$	$\rho(2)$	$\rho(3)$
Korea* (monthly series)	3.1	0.98	0.93	0.87
Korea* (quarterly series)	2.52	0.89	0.63	0.35
Chile	4.53	0.68	0.51	0.27
Malaysia	4.06	0.69	0.30	0.07
Mexico	3.31	0.72	0.40	0.14
Philippines	7.45	0.63	0.42	0.10
Turkey	3.67	0.38	0.14	0.06

**For Korea, the values come from author's computations.*

Source: Agénor, Pierre Richard, John McDermott and Eswar Prasad, 2000, "Macroeconomic Fluctuations

in Developing Countries: Some Stylized Facts", The World Bank Economic Review 14 (2): 251-285.

The comovement feature regards the fact that the fluctuations of the variable that we use as a proxy for the overall economic activity should measure business cycles that occur in all the sectors of the economy and involve all the main macro variables, both nominal and real ones. Since the business cycles identified above do correspond to periods in which the overall economic activity has experienced downturns and then upturns, I consider this criterion to be fulfilled, see Kim and Choi (1997).

4.2. The Dynamics of the Employment and Unemployment

I use two measures of employment in Korea, the unemployment rate and the employment ratio, both at monthly and quarterly frequencies. I apply the same detrending methods in order to extract the cycles in these series.

Figure 4.3. Monthly Unemployment Cycles

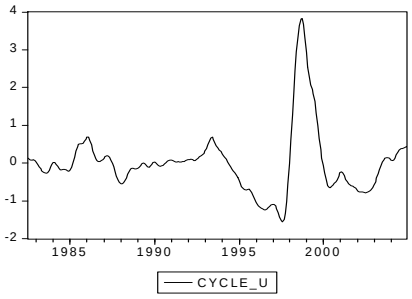
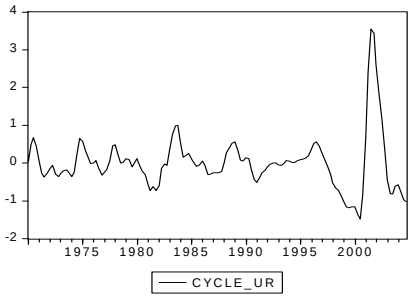


Figure 4.4. Quarterly Unemployment Cycles



The volatility of the unemployment rate cycles appears to be low, of a degree of about 0.86%. I can state that such a low figure may be another indication of the rigidity of the labor market, but I will look further to the evidence given by Okun's coefficient. For the employment ratio, the volatility is about the same, enforcing the evidence already given by the behavior of the unemployment rate.

Figure 4.5. Monthly Employment Cycles

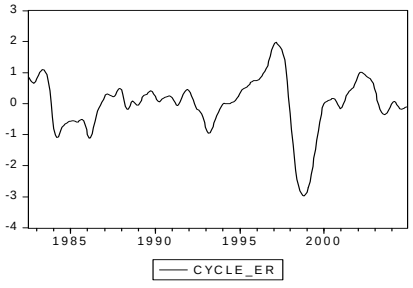
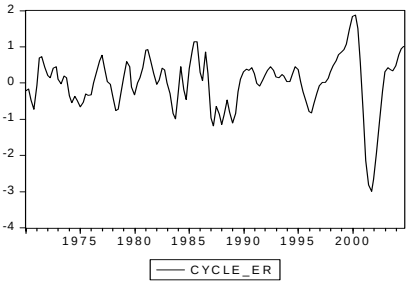


Figure 4.6. Quarterly Employment Cycles



In terms of persistency, I find a high degree of persistence, as in the case of the output cycles, for both unemployment rate and unemployment ratio. The persistence is a little lower for the quarterly data, but shows a consistent pattern of fluctuations in both series. Thus, it appears that by using any of the employment variables I obtain a similar picture of the fluctuations of the labor market.

Table 4.2

Basic Statistics Regarding the Employment and Unemployment Cycles

Variables	Volatility	Skewness	Kurtosis	Autocorrelations		
Monthly Data				$\rho(1)$	$\rho(2)$	$\rho(3)$
Unemployment Cycles	0.86	2.05	9.35	0.98	0.95	0.90
Employment Cycles	0.88%	-1.02	5.40	0.98	0.95	0.89
Quarterly Data						
Unemployment Cycles	0.72%	2.06	11.04	0.89	0.65	0.36
Employment Cycles	0.76%	-1.04	5.97	0.86	0.65	0.43

4.3. Okun's Coefficient

In order to assess what kind of relationship exists between the employment and unemployment cycles and the economic activity gap, I use the cross-correlations coefficients. There are two key characteristics I can study through the cross-correlations tables. The first one refers to whether a variable is countercyclical, procyclical or acyclical. A contemporaneous correlation coefficient which is high and negative indicates a countercyclical variable, a high positive coefficient shows a procyclical one, while a low coefficient indicates a rather acyclical variable. The second feature is that of phase-shifting feature of a variable. This is given by the lag at which the correlation coefficient is highest in absolute value.

Table 4.3

Cross-correlations between Quarterly Unemployment Gap and Quarterly GDP Gap

	Lag j										
	-8	-4	-3	-2	-1	0	1	2	3	4	8
Unemployment Gap	0.18	-0.09	-0.14	-0.19	-0.21	-0.23	-0.23	-0.23	-0.24	-0.25	0.05
Employment gap	-0,24	0.08	0.14	0.19	0.22	0.24	0.26	0.28	0.28	0.25	-0.05

The above table indicates that unemployment and employment ratios appear to be weakly countercyclical and procyclical, respectively. The sign of the coefficient appears as expected, while the value indicates a rather loose relationship. It is interesting that with regard to phase-shifting, both variables are lagging behind the output cycle.

The second table reveals the same cross-correlations coefficient, but this time at a different time frequency (monthly data), while the proxy for economic activity is the industrial production. Again, there is no significant difference between the employment and the unemployment rate responses.

Table 4.4

Cross-Correlations between Monthly Employment Gaps and Monthly Industrial Production

	Lag j										
	-8	-4	-3	-2	-1	0	1	2	3	4	8
Unemployment Gap	0.10	-0.33	-0.44	-0.53	-0.62	-0.69	-075	-0.78	-0.80	-0.79	-0.62
Employment gap	-0.08	0.32	0.41	0.49	0.55	0.61	0.64	0.66	0.67	0.66	0.54

They are again countercyclical and procyclical, respectively, but the correlation coefficients indicate a much stronger relationship. With regard to the timing, they appear again as lagging, but only by three periods.

From this evidence, I can conclude that there is no significant difference in respect to how the employment and unemployment rates fluctuate. The response conforms to the economic theory, with respect to the comovement character, while it appears that there is a lag of three months to a year in the labor market response to the output cycles.

I run regressions between the unemployment rate and the employment ratios as dependent variables, and the cycles of monthly industrial production and quarterly gross domestic product as independent variables. Although there is some limitation in the data used, it provides a good picture of the phenomenon for the 1970-2004 period in the Korean economy.

Table 4.5

Regression Results

Variables	Cycle_Ur =α* Cycle_IP (monthly data)	Cycle_Ur =α* Y_gap (quarterly data)	Cycle_Er =α* Cycle_IP (monthly data)	Cycle_Er =α* Y_gap (quarterly data)
α	-0.076	-0.065	0.026	0.065
t-stat	-5.63	-2.81	2.13	1.83
R^2	0.96	0.96	0.99	0.84

Note: Cycle_IP is the cycle of the monthly industrial production.

Cycle_Ur is the cycle of the monthly, and the quarterly unemployment gap, respectively.

Cycle_Er is the cycle of the monthly, and the quarterly employment gap, respectively.

Y_gap denotes the cycle of the quarterly GDP.

We can see that there is consistency in the results when they are applied to the two employment variables, irrespective to their frequency, either monthly or quarterly. Okun's coefficient has values in the lower range, around 0.07 (in absolute values) indicating the slow response of the labor market to the output fluctuations, except for the employment elasticity in the monthly data case, where the response is not in line with the others. Moreover, irrespective of the character of the data or their frequency, the best regressions are fitted to the lagged independent values of the output, be it the monthly industrial production or the quarterly GDP.

When compared to the figures in other OECD countries, the Korean case is one which is usually taken as an evidence for a rigid labor market. That is, the institutions of the labor market are set in such a way that the labor market responds either too slow, and/or with low intensity to the fluctuations in the economic activity.

Table 4.6

Cross-country Comparison of Okun's Coefficients

Country	The Coefficient Value
US	-0.45
Japan	-0.08
Canada	-0.49
France	-0.36
Germany	-0.40
UK	-0.37
Italy	-0.18

Source: Moosa, Imad, 1997, "A Cross-Country Comparison of Okun's Coefficient", Journal of Comparative Economics 24 (3): 335-356.

These results indicate that Korea's case is much closer to that of Japan, which is considered to have one of the most rigid labor markets not only among the G7 countries, but also among the OECD economies. Some other studies were made to estimate Okun's coefficient in the Japanese economy, as I have already shown in the literature review section. For example, Lee (2000) estimates the coefficient for a number of OECD countries using four different methods to extract the gap components. In the case of Japan, he finds a coefficient ranging from as low as -0.08 to as high as -0.22.The Hamada and Kurosaka (1984) study also estimate values in the same range. Thus, I can conclude that there is a general agreement that Okun's coefficient in Japan is a low one, indicating a lack of flexibility of the labor market. Given the similarity of the two economies, and of their labor markets, respectively, we can conclude that the Korean labor market shares the same rigid features.

4.4. Policy Implications

In a comparative study regarding the employment protection in the OECD countries, an OECD study (1999) found that Korea ranked among the countries with a high degree of employment protection[1]. The OECD report underlines that Korea's performance in this field has been greatly affected by the fact that the employers need to have long consultations with the employees' representatives in case they are willing to fire workers during difficult economic times. While at the overall level of employment protection Korean is ranked the 17th among the 27 OECD countries, in the particular case of regular worker dismissal the Korean performance was much worse, being ranked as the second most restrictive country.

Another rigid feature of the labor market in Korea, which is significant for this study, was the way the irregular workers are hired. There are strict labor regulations which

[1] *Employment regulation means the rules which are set for both hiring and firing of workers.*

make the hiring of irregular workers a resource-consuming activity. The results in this paper add to the other evidences that point to a rigid Korean labor market. Although Okun's coefficient gives us a measure of the labor market elasticity to the output cycles in aggregate terms, nevertheless, there is a wide agreement that it is a good measure of the degree of flexibility of the labor market.

There are two types of policy implications to which I will refer. One is that it should be done a continuous effort in order to make the Korean labor market more flexible, in terms of making the regulations of hiring and firing workers more adaptable to the market conditions. Such reforms would change the Korean economy into a more competitive one, as they would help the firms to respond better to the permanent changes in the economic conditions.

A second set of the implications regards the macroeconomic aspects. In terms of stabilization policies, like the disinflation policies, the low volatility of the labor market implies that potential inflationary shocks can be treated with much lower risks, as the employment variables would respond slowly. Moreover, policies to raise the employment during the recessions, whenever there are large negative shocks to the economy, like the one during the 1997 crisis, would imply more efforts to boost the aggregate demand, as the low elasticity of the labor market implies a slower response of the employment to the growing output.

5. Conclusion

This paper has addressed the problem of estimating Okun's coefficient in Korea. In order to do this, I have used a regression in which the dependent variable was the unemployment (or the employment) gap, while the independent variable was the output gap. Two different estimates were made. The first one was made using the quarterly GDP and employment data, starting from 1970, while in the second approach, I have used the monthly index of industrial production and the monthly employment data (the series run from July 1982 to December 2004).

For a better estimation and in order to have a first glance at the relationship between the two types of variables, I have run the cross-correlation coefficients, including for the employment ratios data, both at quarterly and monthly frequencies. The results show that there is a consistency with regard to employment and unemployment cyclical behavior, irrespective of the frequency. First, they have a cyclical behavior corresponding to the economic theory – unemployment is countercyclical, while the employment appears as procyclical, at both frequencies. Moreover, they respond similarly with regard to timing, only that the lag differs with respect to the data frequency. For the monthly data, the employment variables are lagging by three periods, while for the quarterly data there is a lag of four periods.

When running the regressions, I obtained a similar response to that given by the cross-correlation approach; that is, Okun's coefficient is estimated at around 0.07 (in absolute values). Such a low coefficient is usually taken as an indicator of a rigid labor market. I put this evidence in the light of the OECD study (1999), which shows that the Korean labor market is one of the heaviest regulated among the developed

economies. This evidence supports the rationale for a labor market reform, in terms of making both hiring and firing to be much more flexible.

References

Agénor, Pierre Richard, John McDermott and Eswar Prasad, 2000, Macroeconomic Fluctuations in Developing Countries: Some Stylized Facts", *The World Bank Economic Review, 14* (2): 251-285.

Friedman, Benjamin and Mark Wachter, 1974, "Unemployment: Okun's Law, Labor Force and Productivity", *The Review of Economics and Statistics,* 56 (2): 167-176.

Gordon, Robert and Peter Clark,1984, "Unemployment and Potential Output in the 1980's", *Brooking Papers on Economic Activity,* 15 (2): 537-564.

Hamada, Koichi and Yoshio Kurosaka, 1984, "The Relationship between Production and Unemployment in Japan", *European Economic Review,* 25 (1): 71-94.

Hahn, Jinsoo, 1996, "The Natural Rate of Unemployment in Korea: Estimation and Implications", *Journal of Comparative Economics,* 22 (1): 63-76.

Lee, Jim, 2000, "The Robustness of Okun's Law: Evidence from OECD Countries", *Journal of Macroeconomics,* 22 (2): 331-356.

Hodrick Robert and Edward Prescott,1980, "Post-War US Business Cycles: An Empirical Investigation", *Journal of Money, Credit and Banking,* 29 (1): 1-16.

Kim, Kunhong and Yong-Yil Choi, 1997, "Business Cycles in Korea. Is There Any Stylized Fact?", *Journal of Economic Studies,* 24 (5): 275-293.

Lucas, Robert E., 1977, "Understanding Business Cycles", in *Stabilization of the Domestic and International Economy*, Ed. Karl Brunner and Allan Meltzer, Amsterdam: North Holland Company, 7-29.

MacKinnon, James G., 1996, "Numerical Distribution Functions for Unit Root and Cointegration Tests", *Journal of Applied Econometrics,* 11(6): 601-618.

Moosa, Imad, 1997, "A Cross-Country Comparison of Okun's Coefficient", *Journal of Comparative Economics,* 24 (3): 335-356.

Okun, Arthur, 1970, "Potential GNP: Its Measurement and Significance", in *The Political Economy of Prosperity*, New York: Norton, 132-145.

Prachowny, Martin, 1993, "Okun`s Law: Theoretical Foundations and Revised Estimates", *Review of Economics and Statistics,* No. 55 (May): 331-336.

Ravn, Morten and Harald Uhlig, 2002, "On Adjusting the Hodrick-Prescott Filter for the Frequency of the Observations", *The Review of Economics and Statistics,* 84 (2): 321-380.

Romer, David, 2001, *Advanced Macroeconomics*, 2nd edition, New York: McGraw-Hill/Irwin.

Stock, James and Mark Watson, 1998, "Business Cycles Fluctuations in U.S. Macroeconomic Time Series", *NBER Working Paper,* No. W6528, http://www.nber.org/papers/w6528, (January 10, 1006).

Weber, Christian, 1995, "Cyclical Output, Cyclical Unemployment, and Okun's Coefficient: A New Approach", *Journal of Applied Econometrics,* 10 (4): 443-445.

*** The Organization for Economic Cooperation and Development (OECD), 1999, "Employment Protection and Labor Market Performance", *OECD Employment Outlook*. http://www.oecd.org/dataoecd/9/46/2079974.pdf, (January 10, 2006).