



Validity and Asymmetry of Okun's Law: Evidence from Asian Economies

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ABSTRACT

This study investigates the validity and asymmetry of output-unemployment relationship for three groups: high income, upper middle income and lower middle income Asian Economies over the period of 1980-2018. This study investigates whether the behavior of labor markets is rigid or flexible in these economies over the sample period. By using the Hodrick and Prescott filter, the study finds a statistically significant relationship between cyclical output and cyclical unemployment; hence provides the evidence of the existence of Okun's Law with more sensitive results for the lower middle economies as compared to other groups of countries. The study also discovers the evidence of asymmetric relationship of output-unemployment during the recessionary and expansionary period of economic growth. Although the value of coefficient varies due to asymmetry but the variation is found to be small across the three groups of the countries. The study concludes that sample economies have rigid labor markets indicating the persistence of structural unemployment.



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1. Introduction

Economic activity in labor and goods markets is an important indicator of economic growth. The outcome of labor market is associated with goods market directly which ultimately shows economic position of any economy. The employed workers generate goods and services through economic activities unemployed workers just consume them. It means unemployment is associated with decrease in real GDP (Mihaela, 2016)

A quantitative output-unemployment relationship is given by the rule of thumb called "Okun's Law" after Arthur Okun, who postulated that each extra percentage point in the unemployment rate above four percent (natural rate of unemployment) has been linked with three percent reduction in real GDP. The annual output growth must be at least 3% to prevent the increase in rate of unemployment due to increase in both labor and production growth (Goodwin, et al., 2018). The justification of this behavior of labor market is that some workers

are not concerned with the level of output and training cost. Due to high quasi-fixed costs¹, firms often do not lay off their experienced staff when the demand is low in goods market. Moreover, firms offer overtime to the existing staff when the demand for goods is high and do not hire new workers.

An important feature of output-unemployment relationship is to observe its asymmetric nature for the unemployment which responds differently to negative and positive output growth episodes. Frank and Bernanke, (2007) pointed out that cyclical unemployment is positive when the economy has a recessionary gap, negative when economy faces expansionary gap and zero when there is no output gap.

Furthermore, it is pertinent to know the relative importance of output-unemployment relationship and its structural break. First of all, public and private policymakers use output-unemployment statistics to monitor changes in the economy and to formulate appropriate policies. Secondly, it has an influential effect on the supply side economics. Thirdly, the GDP and Unemployment rate quantify the performance of the economy. It demonstrates the Human Capital usage in relation to productivity that describes how much loss is associated with the unemployment (For details see, Aguilera, and Ramos, 2016). Hence, it is more reasonable to say that Okun's Law focuses on the structure of the economies.

This study is an attempt to explore the validity and asymmetry of output-unemployment relationship for the selected Asian economies as well as their market structure whether it is flexible or rigid. Asia as a whole comprise more than four billion people, about sixty percent of the world population with 500 million workers either employed or unemployed. Here the population growth rates are high which results in large and growing "Youth Bulge". The benefits of this youth bulge cannot be realized because of low levels of investment and job creation (UNDP Youth Report, 2018). Furthermore, the situation of underemployment exists due to lack of unemployment benefits, minimum wage rates, job protection legislation and mandatory benefits and lower job opportunities. All these problems are related to labor markets which reduce the efficiency of other sectors and as a result economy ultimately remain as developing economies (Berg, 2015).

Keeping in view high population growth and formal employment projections there exists potential excess labor supply in Asian economies. The economic growth is constrained by the dominance of public sector, political instability, insufficient infrastructure and development policies, weak governance, helplessness to natural disasters and high costs of production (for details see, Koo and Deyo, 2018). In these economies, public sector is more powerful than private sector to promote job opportunities due to the differences of wages and salaries in both sectors. Wages are high in public sector because public sector is supported by foreign aid (Rickard and Caraway, 2019). Some Asian countries, in spite of all above problems, have set examples to the rest of the world just by increasing their human capital, hard work, female labor force participation in the labor market and encouraging their exports (World Bank, 2018). Furthermore, these countries have struggled to introduce reforms in their other markets. For example, actions have been taken for removing trade barriers, reshaping tax system, privatization of state-owned properties, reshaping government spending and financial liberalization.

The present study has employed a sample of fifteen Asian economies (five from each group) randomly categorized by World Bank into different income groups such as High income, lower middle income and upper middle-income economies. The list of sample economies is presented in Appendix A. Over the last two decades, Asian economies have faced high rates of unemployment and inflation with sluggish economic growth and labor force participation. Almost everyone is adversely affected by rising unemployment, low purchasing power and less job security (Schmidt, 2019). Therefore, Asia has a special place from economic point of view. There

¹ Quasi-fixed labor costs are nonwage costs that firms bear to hire and training new employees, social insurance programs and privately negotiated employee benefits (such as health insurance, vacation and sick leave pay and pensions).

exists a lot of potential space for inclusive and sustainable economic development as these economies are rich in natural and human resources.

The major objective of the study is to check the validity of output-unemployment relationship for three groups (low middle-income countries, high middle income countries and high income countries) of Asian economies over the sample period from 1980 to 2018 and also to test the responsiveness of unemployment to GDP in these countries during expansion and contraction period i-e whether the relation is asymmetric or not? This study also observes the behavior of labor markets of these countries in terms of rigidity or flexibility.

The rest of the study is organized as follows. Section II presents the review of literature. Section III deals with methodological framework. The results are discussed in section IV. The last section concludes.

2. Review of Literature

"Okun's Law" describes an empirical reliability between unemployment and real output growth and hence less ambitious to theoretical background. It has established more robust relationship in modern macroeconomics. The validity of this law has been checked by a number of studies and is widely accepted. The literature available on individual countries, on cross countries panel and also on regional level supported the empirical validity of Okun's Law (for details see Gordon and Clark, 1984; Prachowny, 1993; Lee, 2000; Silvapulle, et al., 2004; Villaverde et al., 2007; Knotek, 2007 and Dritsaki and Dritsakis, 2009). Nevertheless, the values of the coefficient of Okun's Law vary according to the structure of the economies over time which depends upon several factors. Furthermore, some evidences show the structural breaks in the relationship. For example Lee (2000) showed the effect of the female participation in the labor market, labor productivity changes due to change in structure of the business activities.

Clark (1987) decomposed and industrial production stationary cycle components and non-stationary trend for the whole sample data. The results of the study showed that half of the quarterly innovations in US economy are attributed to the stationary cycle components. Prachowny (1993) focused on production function approach and found that one point reduction in unemployment results in 0.7% improvement in output, whereas the changes in weekly hours and movement in capability utilization have shown significant impact on the changes in cyclical output in US.

Currently, researchers and policymakers are more concerned with asymmetric or non-linear relationship of Okun's law. A strand of theoretical and empirical literature provides evidence of the nonlinear behavior of Okun's Law. This shows unemployment strongly reacts to contraction than from expansion period of a business cycle. Asymmetries arise due the factor substitutions during expansion and contraction period, deviations in multi-factor productivity and the changes in the general behavior of the labor market. Silvapulle et al., (2004) pointed out that labor market rigidity is highly important factor which is responsible for asymmetry. Furthermore, the institutional restrictions and higher quasi fixed costs force the employers not to fire their employees.

Presently, several studies are available in the literature which supported the idea successfully. Harris et al., (2001) describes four reasons to check asymmetry between output and unemployment that are very important. First, it discriminates the alternative theories of joint labor market and goods market behavior. Second, a symmetrical Okun's Law confirms the symmetrical Philips curve. Third, the existence of asymmetrical relationship is useful for structural and stabilization policies. Forth, if asymmetry in relation is ignored, forecasting error may arise. Harris and Silverstone (2001) showed the significance of the asymmetry of output and unemployment relationship which is necessary for the effectiveness of the unemployment policy and other macroeconomic issues responsible for higher unemployment in a country.

Weber and West (1996) found a strong support for Okun's law by using the double log functional form and parametric estimates. The study confirmed the key assumptions, technology

and results regarding the output and unemployment relationship. Prachowny (1993) found a very strong long run relationship of cyclical output and cyclical unemployment with the value of Okun's coefficient -2.25 for U.S. the study found not much association of other variables indicated by Silvapulle et al., (2004). Freeman (2000) used Baxter King Band pass filter to decompose the output and employment series and explored the regional differences on the behalf of Okun's Law. The study finds no differences in reaction of output to unemployment changes among regions.

Lee (2000) examined the robustness of Okun's Law and showed that it is statistically valid for most of the countries but it is sensitive on the choice of models. Mixed evidence of asymmetric behavior of the law but structural breaks around 1970's are found in it as after 1970 many countries experienced a small output loss to high unemployment.

Calmfors and Holmlund (2000) have analyzed the increase in the unemployment and its impact on output growth from theoretical and empirical point of view. They have used the Philips Curve and Beveridge Curve (BC) for equilibrium of unemployment to illustrate dynamic adjustment to shocks. The results of the study showed that a decrease in unemployment may result in an increase of output in the short run but the relation in long run is ambiguous, cannot guarantee the negative relationship of unemployment output growth.

Izyumov and Vahaly (2002) have checked Okun type relationship for 25 transition economies of EU. The results showed that the relationship between growth and unemployment emerged statistically significant for reform leaders and insignificant for reform laggards. The reason is that the structure of the labor markets in both these groups is different from each other. Reform leaders have a flexible labor market whereas it is rigid in reform laggards. Tavera and Perman, (2004) pointed out that differences in levels and flexibility in real wages, the strength of labor union, geographic mobility of labor force, softness of budget constraints, non-wage privileges and the level of unemployment benefits are responsible. Moosa (2008) was of opinion that Okun's Law for the four Arabs states: Algeria, Egypt, Morocco and Tunisia is not applicable due to structural unemployment and the rigidness of the labor market. Rubcova, (2010) failed to find the possible asymmetries of Okun's law over the business cycle. The results supported the classical linear version of the Law. Lal et al., (2010) pointed out that Okun's law is not applicable for the Asian countries due to asymmetric problems. Pierdzioch and Rülke (2012) used survey data for G7 countries and found that the results are consistent with the Okun's Law but magnitude of Okun's coefficient is different over the years.

Huang and Lin (2006) originated an asymmetric relationship between cyclical unemployment and cyclical output and confirmed the validity of Okun's law. The motivating observation is that the fluctuations between output and unemployment are small when the cyclical output is small and unemployment is large when it is large.

Tasci and Zenker (2011) argued that countries with very flexible institutions and labor market polices, like the U.S., have practiced substantial increases in unemployment during recession while countries with relatively rigid institutions and strict labor market policies, such as France, fared better. However, evidence proposed that flexible labor markets keep unemployment lower in the long run. By affecting these flow rates, labor-market institutions and policies influence both short and long-term unemployment rates. Tang and Bethencourt (2017) investigated the presence of asymmetries and appropriateness of a linear specification or nonlinear. The study concluded that in the presence of asymmetries linear specification is preferred.

Palombi, Perman and Tavéra (2015) examined the medium run asymmetric behavior of Okun's law for the UK regions. The empirical findings of the study confirmed the fact that unemployment falls as the regional output increases. The study also concluded that the impacts of economic expansion on unemployment are smaller as compared to economic contraction. These findings are consistent with Arabaci and Arabaci (2018). Louail and Riache (2019) have also analyzed the asymmetric nature of Okun's Law in case of developing and particularly for Saudi Arabia. This study used ARDL bound testing model, and confirmed the existence of

negative relationship between economic growth and unemployment through gap version. Similar findings for the Spanish economy have been found by Cutanda (2020) who addressed cyclical asymmetry between economic growth and unemployment that plays a crucial role in determining the macro stability of the country. On the other hand, Zwick (2020) pointed out instable asymmetric Okuns coefficients in Eurozone. The results showed that labor markets cyclical output is more responsive in the short run, while corrections are weaker in the long run. Moreover, government expenditures and the balance of trade may have an impact on the asymmetric relationship between unemployment and output. Furthermore, the implementation of effective reforms may be helpful in avoiding the asymmetries of labor market.

Hongo et al., (2020) investigated the trade-off between output and unemployment and related it with the subjective well-being. The study stressed that for off-setting the inflationary impact, output gap is important for formulating the better fiscal policies. Widarjono (2020) investigated the asymmetric avoidance of Okun's law in case of ASEAN-3. The results of pool mean group and nonlinear autoregressive distributed lag model found the asymmetric relationship of output and unemployment. The study showed that positive and negative episodes of economic growth have different effect on unemployment. Moreover, economic distress is more powerful impact on unemployment.

Bod'a and Povazanova (2021) investigated growth-unemployment association by using a two state Markov Regime Switching Model in Zimbabwe over the time span 1991-2018. The study used both the approaches of gap and first difference by employing the Hodrick-Prescott (HP) and the Butterworth filters in defining the cyclical mechanisms. The results showed the existence of the validity of Okun's Law during positive episodes of economic growth. The insignificant coefficients during expansionary period of growth confirmed the structural reasons of unemployment rather than to be cyclical. Duran (2021) showed the asymmetric gender-specific analysis of the labor market for the OECD countries and confirmed a greater magnitude for the economic down turn.

The review of the literature presented above points out that Okun's Law is an empirical reliability, irrespective of the countries or the sample periods used in the studies. Most of the studies estimated and analyzed Okun's Law for developed and developing countries. These studies used different specifications of the model for observing the magnitude of the coefficients of the Okun's Law which differ in terms of variables, dynamic structure and the estimation techniques. The present study is an attempt to observe the validity and asymmetry of Okun's Law for selected Asian countries.

3. Methodological Framework

This study follows the theoretical base of Prachowny, (1993). Consider a Cobb-Douglas aggregate production function:

$$Y = (k + \tau)^{\alpha}(\rho w + \mu h)^{\beta} \mathfrak{D} \quad (1)$$

By taking logarithms, we get the following equation.

$$y = \alpha(k + \tau)\beta(\rho w + \mu h)\mathfrak{D} \quad (2)$$

Here y is the log of GDP, k is the capital stock and τ is its consumption rate, w symbolizes the number of workers and h is the hours worked. While α and β are output elasticity, while ρ and μ are workers' and working hours contribution to the final production respectively. The coefficient \mathfrak{D} is productivity factor. The possible GDP is derived from the similar equation, where the long-term levels of output production function:

$$y^* = \alpha(k^* + \tau^*)\beta(\rho w^* + \mu h^*)\mathfrak{D}^* \quad (3)$$

Hence, the GDP gap can be calculated by taking the difference between the potential GDP minus the actual GDP growth as follows:

$$(y - y^*) = \alpha(k - k^*) + \alpha(\tau - \tau^*) + \beta\rho(w - w^*) + \beta\mu(\bar{h} - \bar{h}^*) + (\bar{p} - \bar{p}^*) \quad (4)$$

As we know that $u = (1 - n)$ shows the unemployed workers as the subtraction of the employed workers from total labor force. So, for simplicity we assume that $k = k^*$ and $\tau = \tau^*$, and transformation of the above equation will be as:

$$(y - y^*) = \alpha(\tau - \tau^*) + \beta\rho(w - w^*) - \beta\rho(u - u^*) + \beta\mu(\bar{h} - \bar{h}^*) \quad (5)$$

Here the coefficients $\beta\rho$ fundamentally displays the degree of connection between unemployment and GDP gap. To simplify the gap version from this equation and keeping all some variables constant we have the following equation:

$$(y - y^*) = \beta(u - u^*) \quad (6)$$

OR

$$(u - u^*) = \frac{1}{\beta}(y - y^*) \quad (7)$$

Hypothesis Formulation

The theory states that there exists a three to one relationship between these variables. But it is expected that this relationship is not strong rather it varies across countries and regions. So, it might be possible that relationship may turn out to be positive or negative.

To confirm the evidence of asymmetry the null hypothesis will be $H_0: \beta=0$ against the alternative $H_1: \beta \leq 0$. The assumption of alternative hypothesis is that unemployment is more responsive to negative cyclical output growth. Otherwise, the alternative hypothesis will be $H_2: \beta \neq 0$. To prove the claim that Okun's coefficient in both contraction and expansion period is not equal, means $\beta^+ < \beta^-$ then the null against the alternative hypothesis will be $H_0: \beta^- - \beta^+ = 0$ against the alternative $H_1: \beta^- - \beta^+ \leq 0$.

To check whether the labor markets are flexible or rigid, Parchowny (1993), Lee (2000), Gordon (2003), Forteza and Rama (2006) and Valadkhani and Smyth (2015) have proposed in Table 1.

Table 1
Labor Market Characteristics Rigidity/Flexibility

	High unemployment	Low Unemployment
Rigid Labor Markets	Low to moderate and output-unemployment coefficient unstable	High and stable value of output-unemployment coefficient.
Flexible labor market	High and unstable value of output-unemployment coefficient.	Low to moderate and output-unemployment coefficient stable.

Parchowny (1993), Lee (2000), Gordon (2003), Forteza and Rama (2006) and Valadkhani and Smyth (2015)

The objective of this study is not to find the substitutable and analogous results rather to create the factual position from the used methodology and data. To analyze the relationship between unemployment rate and output, two methods have been considered; Difference and Gap versions.

The study deals with the three groups of Asian Economies categorized by World Bank with respect to national income. The data used in this study has been obtained from the World

Development Indicators (WDI). For the gap specification, first of all HP filter has been employed to find out the output gap and unemployment gap for each country. The study has used the panel data techniques (Fixed Effect Model) supported by Houseman test.

To capture the effect of asymmetric behavior of output-unemployment across business activity, cyclical output has been divided into two groups to take into the account of parametric change. For this purpose, we will divide the sample period into recessionary phase and concretionary phase with a threshold value of zero.

In the last labor market characteristics are analyzed on the behalf of cyclical output-unemployment coefficient of individual economies.

Gap Version

Let we denote

$$y^c = y - y^* \quad (8)$$

And

$$u^c = u - u^* \quad (9)$$

The final econometric equation for some selected Asian economies are:

$$y_{it}^c = \alpha + \beta u_{it}^c + \varepsilon_{it} \quad (10)$$

i denotes countries and t refers time 1980-2018

y_{it}^c The cyclical output, u_{it}^c The cyclical unemployment rate, ε_{it} Error term

The equation mentioned above for the gap version does not allow for checking asymmetry in the relationship of output and unemployment. For that purpose first of all, let us decompose

y_{it}^c into two components:

$$y_t^{c+} = y_t^c I_t^c \geq 0 \quad \text{and} \quad y_t^{c-} = y_t^c I_t^c \quad (11)$$

Where I_t^c is an indicator function with threshold parameter 0, that are positive and negative cycle periods respectively? We set our definition for upturn and downturn in the economy corresponding to positive and negative output gaps.

Our approach has two steps in which we estimate asymmetry of output-unemployment relationship. At the first step, positive business cycle period and negative business cycle period will be constructed. Then following equation of Gap version will be re-estimated for the positive and negative output gap periods. The automatable equation will be as:

$$u_{it}^c = \alpha + (-\beta y_{it}^{c-} - \gamma y_{it}^{c+}) + \varepsilon_{it} \quad (12)$$

u_{it}^c Cyclical Unemployment rate, y_{it}^{c-} Negative cyclical output growth
 y_{it}^{c+} Positive cyclical output growth, ε_{it} Error term

In order to find the flexibility and rigidity of labor market we have divided the whole sample period into two periods such as from 1980 to 1995 and 1996 to 2018 for the three groups of Asian Economies. We will follow the table (3) proposed by Prachowny (1993), Lee (2000), Gordon (2003). Forteza and Rama (2006) and Valadkhani and Smyth (2015) to find whether the Asian labor markets rigid or flexible.

4. Results and Discussion

First Hypothesis

The cyclical time series of output growth and unemployment data are stationary at level by default. As Houseman test supports fixed effect method for the sample data, so we use it for the estimation procedure. The necessary number of auto-regression is estimated to remove the auto-correlation problem.

The results presented in table 2 indicate a significant relationship between unemployment rate and GDP growth rate. For gap version, results point out that a 1 percentage decline in cyclical output is correlated with a 0,017, 0.021, 0.003 percentage point rise in cyclical unemployment in high income, upper middle income and lower middle income economies. These results are consistent with Freeman (2000) and Alexei and John (2003).

The values of the coefficients of Okun's Law are small and negative which reveal a significant deviation in responsiveness for various groups. Overall the lower middle income countries have weaker linkages between unemployment and output because the gap between actual and potential output is larger in these economies. As unemployment increases in lower middle income economies, output falls more than unemployment. Another reason is that the structure of the economies is quite different from developed economies where it is valid. So, on the basis of our findings the null hypothesis is rejected and it is concluded that unemployment has a negative impact on real output growth.

Table 2
Gap Version Results by using Fixed Effects Method

	Okun's coefficient	t-value	P-value	D. Watson	Adj. R^2
Whole sample	-0.012***	-9.50	0.000	2.09	0.50
Group 1	-0.017***	-3.06	0.002	1.90	0.38
Group 2	-0.021***	-5.28	0.000	2.22	0.59
Group 3	-0.003*	-1.87	0.06	2.11	0.44

*** and * indicates level of significance at 1% and 10% respectively

Second Hypothesis

The objective of our second hypothesis is to verify the asymmetric behavior of economic growth towards unemployment during the expansionary period of growth (when economic growth is positive) and contractionary period of growth (when economic growth is negative). This is to find whether unemployment is more responsive to negative cyclical output growth. We have divided the same data into two categories such as expansion and contraction period with a threshold value of zero.

The results presented in Table 3 are based on the assumption of asymmetry, postulating that the response of cyclical unemployment to negative cyclical output growth is high. The empirical results are solid as the theoretical case has been explained empirically for high and upper middle income countries. But for the lower middle income countries, the case is opposite.

Table 3
Results for the Expansionary and Contraction Period of Business Cycle

Statistics	Whole Group	Group 1	Group 2	Group 3
β	-0.026***	-0.025**	-0.100***	-0.01
t-statistic	(-2.37)	(-2.07)	(-4.63)	(-0.21)
P-value	0.01	0.03	0.000	0.83
γ	-0.014**	-0.007	-0.06***	-0.10***
t-statistic	(-2.82)	(-0.05)	(-2.85)	(-2.6)
P-value	0.05	0.95	0.0050	0.000
$\beta - \gamma$	-0.01	-0.025	-0.037	0.09
D-Watson	2.015	1.88	2.157	2.07
Adj. R-square.	0.379	0.38	0.537	0.23

*** and ** indicates level of significance at 1% and 5% respectively

The results showed strong evidence in favor of the hypothesis that the value of the Okun's coefficient is different for the positive and negative output gap period. Hence it is concluded that the different values of the Okun's coefficient for positive and negative output gap period have an interesting implication of its limited importance because its use varies according to time and region. Our results are in line with Knotek, (2007).

Third Hypothesis

Following Prachowny (1993), Gordon (2003), Forteza and Rama (2006) and Valadkhani and Smyth (2015) we divided the whole sample period into groups to show the behavior and trend of Asian labor markets. The duration is divided arbitrarily from 1980-1995 and 1996-2018 to check whether the labor markets are flexible or rigid over time. The results (presented in Table 4) for the both early and late 1990's period showed that the interactions between cyclical unemployment and cyclical output are statistically significant for the three groups of sampled economies. In the later period, output-unemployment relationship is not so stronger for the high income countries in the sample because in these economies the unemployment rate is not so high. The results in Table 4 showed that output-unemployment relationship is more stable and consistent across the upper middle income and lower middle income countries in both time spans with high unemployment rate. However, this relationship for the lower middle income economies is more sensitive. The coefficient values show that almost all economies have rigid labor markets with low or high unemployment rates. The presence of output-unemployment relationship in both time spans explains the structure of labor market of these economies.

Table 4
Results: Labor Market Rigidity or Flexibility

Years		Okun's Coeff.	t-value	P-value	D. W	Adj. R ²
1980-1995	1	-0.02***	-4.949	0.00	2.77	0.53
1996-2018		-0.01***	-7.96	0.000	1.74	0.54
1980-1995	2	-0.02***	-2.716	0.008	1.46	0.46
1996-2018		-0.03***	-6.078	0.000	2.23	0.58
1980-1995	3	-0.003***	-2.87	0.005	2.04	0.33
1996-2018		-0.005**	-2.33	0.02	0.86	0.018

*** and ** indicates level of significance at 1% and 5% respectively

In early 1990's most of high-income economies experienced employment growth that consistently outpaced labor force growth so that the unemployment rate demonstrated a declining trend. But in the late period, some countries face a recessionary condition after enjoying many years of healthy growth. The lower middle-income countries confronted the economic difficulties like financial crises, high inflation, adverse law and order condition, internal disputes, political instability and the recently forced economic sanctions materialize to have had unfavorable effects on growth (Maynard and Feldman, 2011). The climax of natural environmental disasters has affected the agricultural and industrial sectors (de Oliveira, 2019). In the upper middle-income economies, new trends in globalization, labor market reforms such as information technology and tele communication have brought a lot of changes. The middle income has also experienced high employment growth that has outpaced the labor force growth, and resultantly decreasing unemployment (Kumar and Schenk, 2019). A deep insight into the results for the period of 1995-2018 reveals that the value of the coefficient is relatively lower in high and lower middle-income countries. However, for the lower middle income countries it turned out very high. Hence it is obvious that the labor markets are more rigid here.

5. Conclusion

Output-unemployment relationship is statistical rather than compositional in nature that describes an ever-changing macro economy. By using the Hodrick and Prescott filter, the cyclical

output and cyclical unemployment has been estimated. Output-unemployment relationship is stable and significant in the three groups of Asia with an inverse relationship over the period of 1980-2018 for the both specifications. The structural unemployment is one of the most important long-term problems in Asian sample economies. The sustained reduction in the unemployment rate requires robust GDP growth. The structural and cyclical unemployment are most important factors. The existence of structural unemployment is due to rigid labor markets. There is evidence of asymmetry for the Law as the unemployment is more sensitive to output growth in recession. The value of the coefficient fluctuates but not much more for the expansion and contraction period indicating that these economies have rigid labor market where recession effects are not severe. That's why the recent financial crises did not affect the Asian region as in European Union or United States. The results of third hypothesis show that the labor markets are rigid in all of these countries where public sector gives the job protection. It is supposed that the main reason for the existence of structural unemployment in these regions is rigid labor markets with more or less sensitivity. This is proposed that labor market improvements are necessary, because the labor market policies provide the main explanation for the extensive unemployment and underemployment across Asia. So the governments should adopt the expansionary fiscal and monetary policies during the downturn of the economy. In this way, the objective of paradigm shift of rigid structure of labor market can be transformed into the flexible labor market. It is also proposed that modern technologies should be introduced very carefully because Asian economies are labor intensive rather than capital intensive. This mismatch of technology with the local environment may lead them towards lack of competition in key markets and lack of appropriate macroeconomic policies.

5.1. Future Research Path

Future research can be organized for different sizes of Okun's coefficients across the age (young and old), gender (male and female) and educational attainments (skilled Vs Non-skilled). Moreover, the institutional arrangements for labor market inflows and outflows and training costs can be considered for the Okun's coefficient.

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Appendix 1

List of the Economies in Three Groups for the Sample

High Income	Upper Middle Income	Lower Middle Income
Israel	China	Indonesia
Japan	Jordan	Pakistan
Kuwait	Malaysia	Philippine
Korea	Thailand	Sri Lanka
Singapore	Turkey	Nepal
Group 1	Group 2	Group 3

Source: World Bank

Appendix (B): Cyclical Output and Unemployment

To separate trend from cycle, Hodrick and Prescott (1980, 1997) filter has been used so that the gap between actual and potential output be measured. It has developed into a standard method for removing trend activities in the production cycle literature. It divides an incorporated time series into a stochastic trend and a cyclical component by minimizing the variance of the cyclical component focusing to a penalty for discrepancy in the second difference of the drift component. Although the use of the HP filter may be constrained to criticize and to somewhat more complicated decomposition procedures have been introduced such as (Beveridge-Nelson (1981) BN method, the Harvey (1985) structural time series approach, or the Baxter and King BK (1995) Band-Pass filter). Anyhow, the Hodrick-Prescott filter remnants one of the standard methods for de-trending. The use of the Hodrick-Prescott filter in this study also permits to take into account of the possible subsistence of stochastic trends in the unique output and unemployment series.

The Hodrick and Prescott (HP) Filter

The Hodrick and Prescott filter (1997) is a mathematical tool used in macroeconomics, especially in real business cycle theory separates the cyclical components of a time series data. It's smoothed non-linear representation of data and is more responsive to long run than short run fluctuations. The series y_t consists of a trend (τ), and a cyclical component (c) such that:

$$y_t = \tau_t + c_t.$$

Given a positive value of τ , there is trend component that will minimize:

$$\min \sum_{t=1}^T (y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} [(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})]^2$$

The first term shows the sum of squared deviation, penalizing the cyclical component. The second term is the multiple τ of the sum of the squares of the trend component at second difference. Trend will be smoother for the higher values of τ . If τ tends to zero, trend adjusts to its original time series. Hodrick and Prescott (1997) suggest the value of τ equals to 100, 1600 and 44000 for annual, quarterly and monthly data respectively. The variable $y_t - \tau_t$ applied to output and unemployment series produce output and unemployment gap respectively.

Relationship of Cyclical Output and Cyclical Unemployment

