EMPIRICAL EVIDENCE OF
OKUN'S LAW IN THE PHILIPPINE ECONOMY:
A COINTEGRATION ANALYSIS

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This study investigates the influence of relevant macroeconomic variables on unemployment in the Philippines. Specifically, it aims to: find a coefficient that would characterize the relationship of the between unemployment and GDP using a standard cointegration approach; investigate relevant macroeconomic factors that may affect unemployment; and draw economic and policy implications that will guide policymakers in crafting public policies in improving employment generation. It used quarterly time series data from the first quarter of 1989 to fourth quarter of 2004. Cointegration test was used to determine the long-run relationship while an error correction was employed to determine the short-run behavior of the data. Results of the study reveals that in the long-run a 1% increase in GDP is associated with a reduction in unemployment by 0.7%. While in the short-run, GDP has a larger effect on cutting unemployment; an increase in GDP by 1% results to a decrease in unemployment by 0.95%. Thus there is evidence to indicate that Okun's law is relevant in the Philippine economy. The sectoral analysis shows that the economy's industrial and agriculture sectors are found to have a negative effect on the general unemployment level. However, the service sector on the other has a positive effect, implying that as its output grows, unemployment tends to rise as well. This is probably due to job and skills mismatch in the service sector which leads to structural unemployment. It is recommended that the industry sector be prioritized especially the manufacturing and construction subsectors, in the development planning process.

Keywords: unemployment, economic growth, time series, sectoral analysis

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1.   INTRODUCTION

The Philippine economy has steadily risen in recent years. From being called as the "Sick Man of Asia," now it has captured the attention of the international business community for its newly found resilience and stability. The country's gross domestic product (GDP) has posed robust figures around 6-7% percent in recent years. Visions for the economy has been good; the country's banks are stable, international reserves are at a record high, strong domestic consumption fueled by remittances and a more efficient tax collection system. It has set itself relatively resistant from outward shocks as evident from the recent global financial crisis where the Philippines was one of the few countries that posted a positive growth amidst the turbulence occurring internationally. Amidst all these great feats that the country has achieved, a lot of woes are still recurring and all have contributed by dragging down the potential that the Philippines could have surpassed.

The unemployment problem remains a struggle. With the country's unemployment rate hovering at 7-8% (International Labor Organization (ILO), 2014) significantly unchanged in many years. It easily becomes one of the highest in the region. Unemployment, especially a high and persistent rate is economically and socially compelling. Loss to efficiency and productivity of the economy will result as valuable resources are left idle. This problem of high unemployment has long been plaguing the Philippines and it radically precedes other social dilemmas like, poverty, hunger and increased criminality. Thus a significant decline of the number of the unemployed could virtually bring improvements not only to the economy but also to the much broader social realm.

Economists often argue and has empirically proven that the growth of GDP leads to an increase in employment. In other words, an expansion of economic activity would directly affect the level of people working in the economy. Also, it can be applied, all other things being constant, that the contraction of the economy would result to increased unemployment.   An established economic theory called Okun's Law, after Arthur Okun who first documented it, suggests a negative relationship exists between the economy's total output and unemployment. The expansion and contraction of the economy, as depicted by the growth of GDP, is thought to have a direct effect on the level of employment. Okun's law further implies that by letting the economy grow near its potential, unemployment will decline close to its natural rate. Adding up to its simplicity, the law or more accurately termed as a rule-of-thumb enjoys a lot of empirical support with a huge base of literature backing-up its claims. Thus with

this, we could believe at once that the number of unemployed could drop sharply real soon since GDP has grown considerably well in recent years.

The longstanding problem of high unemployment poses a threat in sustaining this momentous growth. Inadequate skills and insufficient job creation especially in the domestic economy have been eyed as the specific grounds for this high unemployment problem. Will this feature of the economy prevent or at best slow-down the country's progression; a threat to its newly found economic resilience? Can we expect the unemployment rate to drop? This paper offers some answers to the following questions. (1) Does the relationship proposed by Okun hold true in the case of the Philippine economy? (2) If it exists, is the relationship strong and stable? (3) Does the relationship imply something about the structure of the Philippine economy especially its labor market.

2.   REVIEW OF RELATED LITERATURE

The Philippine economy and its constrained growth

With relatively high growth rates in recent years, projections for the Philippine economy are promising. In the medium term, the country is seen to experience a healthy economic expansion complemented with low and controlled inflation.

Nonetheless, long-term economic growth remains threatened by shortcomings chiefly associated with low levels of satisfactory infrastructure, excessive and unwarranted corruption, as well as by barriers to trade and investment. Potential foreign investors, as well as tourists, remain concerned about the rule of law, inadequate infrastructure, policy and regulatory instability, and governance issues. While trade liberalization presents significant opportunities, intensifying competition and the emergence of powerful regional economies also pose a challenge (Tolo, 2011). The structural flaws and weaknesses in the Philippines' economic and political systems as well constrain the attainment of a substantial long-term growth necessary to put an end to its lasting problems on unemployment and poverty.

A recent report by Organization for Economic Co-operation and Develoment (2013) for the Philippines has acknowledged the need for improving the country's infrastructure, access to education and development resources, and job creation. Both road transport and power are critical to a more closely integrated Philippine economy, helping to attract widely dispersed private-sector investment. In an archipelagic country like the Philippines with its fragmented pockets of development and weak geographical integration, there are not too

many sources for generating jobs with their ability to provide equal opportunities and, in the process, narrow employment access gaps and reduce welfare dependence. The government must give supplementary effort in distributing the gains of economic growth throughout the entire country especially in Visayas and Mindanao.

A unique characteristic of the Philippine economy is the strong and stable presence of international remittances from overseas Filipino workers (OFW). Ang (2013) studied the contribution/effect of OFW remittances on economic growth and development in the national as well as the regional level. Results showed that worker's remittances from abroad do affect economic growth positively and significantly; however, when looking at the regional level, remittances do not affect economic growth positively. He opined a negative relationship exists between regions that send OFWs and their poverty rates implying that the poor are less able to migrate. Ang hypothesized that workers' remittances are not being properly utilized into productive and investment use and are only used in conspicuous consumption, thus limiting its effect on long-run economic growth in the Philippines. As parting shot he said that as long as policy initiatives remain in their status quo, OFWs will continue to be limited in transforming their communities and regions. He thus promoted reforms that will improve the domestic economy that will in turn create the necessary amount of new jobs crucial for sustained growth and the reduction of poverty and inequality.

Tolo (2011), identified the determinants that affect the economic growth of the Philippines. The study used panel data from 23 emerging markets (further classified into top performing, moderately growing and slower growing countries) for the period 1965-2008. The study revealed that agricultural exports, investment, research and development, population growth and political uncertainty as well as the budget deficit, inflation, trade openness, the current account balance, and the frequency of crisis episodes are significant determinants of growth. The analysis suggested that in order for the Philippines to catch up with its East Asian counterparts, it must (1) maintain macroeconomic stability, (2) expand its fiscal space, and (3) redirect public spending to agriculture, infrastructure, and research and development (Tolo, 2011).

Unemployment as the economy's perennial problem

High unemployment is socially wasteful. When the economy does not create enough jobs to employ everyone who is willing to work, a valuable resource is lost. Potential goods and services that might have been produced and enjoyed by consumers are lost. This lost output is the central economic cost of high

unemployment, and it is measured by comparing actual and potential GDP (Baumol & Blinder, 2009). With idleness of resources, labor in this case, considerable loss to efficiency occurs, thus failure to reach potential output happens. Involuntary part-time work, loss of overtime or shortened work hours, and discouraged workers are all examples of "hidden" or "disguised" unemployment.

Unemployment is a perennial problem in the Philippines; it continues to remain higher relative to its neighboring countries and is easily twice that of the size of unemployment in selected countries in the region (ILO, 2014). An increasing rate of unemployment and underemployment signifies the difficulty of job-seekers to find work best suited for their qualifications. Those who get employed often end up in jobs that entail lower than desired work hours or benefits.

Okun's Law

Arthur Melvin Okun recognized the negative relationship between GDP growth and the change in the unemployment rate during his studies in the 1960's. In his seminal work, he used the growth rate in GDP as a factor for explaining the rate of unemployment. The relationship justifies that the level of activity in the labor market affects the activity in the goods market during the business cycle (Mielcova, 2011).

The negative relationship between real GDP growth (relative to its potential) and unemployment (relative to its natural rate) is now referred to as Okun's law after Arthur M. Okun. Ben Bernanke, chairman of the Federal Reserve in the US, said that the Okun's law is a rule of thumb that describes the relationship between unemployment rate and the growth in real GDP and that to reduce the unemployment rate or to hold it steady, the economy must grow at a pace above its potential (Fuhrmann, 2015).

Okun's law, as argued by Hanusch (2012), is a rather crude approach in analyzing the transformation of economic growth into jobs as the law neglects the multiple structural mechanisms that affect the creation and destruction of jobs. Thus the interpretation of the Okun's law coefficient must be taken with caveat as it only provides a narrow depiction of the workings of a country's labor markets.

Regional and country specific studies about the Okun's law have been made in the past. Mielcova (2011) for example analysed the presence of a negative relationship between GDP growth and unemployment rate in the Czech Republic (a transitioning country), using the difference and dynamic versions. Results of the analysis showed that for the Czech Republic, a 12% increase in GDP, will result to

a 1% decrease in unemployment. France and USA on the other hand got considerably lower GDP-to-unemployment ratios, having 2.7% and 1.8%, respectively. The estimates may imply that transitioning countries like the Czech Republic will find it difficult to reduce unemployment as the relationship between unemployment and GDP is fairly elastic. Developed countries like France and the US with their relatively inelastic coefficients can easily reduce unemployment through policies that promote growth in GDP.

Nain (2012) tested the validity of Okun's law in selected ASEAN countries: Singapore, Thailand, Malaysia, Indonesia and the Philippines. She used the Pedroni cointegration technique to find long run relationship between unemployment and real GDP for the years in the 1980-2009 period. Vector Error Correction Model (VECM) was also used to assess the short term behaviour of real GDP on its long-run value. Simple regression was used to find an estimate of the Okun's coefficient for the five ASEAN countries. Empirical analysis showed the existence of okun's law in Malaysia, Singapore and Thailand. On the other hand, Okun's law was found non-existent in Indonesia and the Philipines.

Neely (2010) pointed out that most industrialized countries, like Japan, Germany and France, have larger Okun coefficients than do the United States, Canada and the United Kingdom; unemployment rates vary less for GDP fluctuations in most industrial countries than in the aforementioned countries. He explained that the reason behind this behaviour is that the three countries have less heavily regulated labor market, implying that businesses can lay-off workers more easily during times of low demands. Imposition of demanding labor market regulations (e.g. social job protections, strengthening unions, greater formal restrictions on releasing workers) makes firms reluctant in hiring workers. Countries that tend to heavily regulate their labor market, thus affecting labor flexibility, have higher unemployment rates, he said.

Hanusch (2012) made an estimation of the Okun's coefficient for East Asian countries- South Korea, Taiwan, Hong Kong, Singapore, China, Thailand, Malaysia and the Philippines, however instead of using the unemployment gap, he used the employment gap on the left side of the model as the variable to be predicted by output growth. He used the Seemingly Unrelated Regression method to take into account the connection of the countries as reflected by the correlation of the errors. The author made Okun's law estimates separately for agricultural and non-agricultural employment. Results of the analysis showed that at least in the short run, economic growth has created jobs. The author concluded that countries that have more flexibility in hiring and firing workers, benefit more by creating more jobs out of the growth in output. Also, the analysis has somehow

documented a "reverse Okun's law" for agriculture. Findings indicated that during negative shocks in output (recessions), the agriculture sector acts as shock-absorber in employing workers retrenched from other sectors due to the economic downturn (Hanusch, 2012).

Recent literature on Okun's law has examined the stability and asymmetries of the negative relationship between output and unemployment. Altig, Fitzgerald & Rupert (1997) in a commentary, supported the idea that the relationship between unemployment rate and GDP growth changes through time. They acknowledged the fact that the relationship over extended periods is not really constant, however, Okun's law is very much true in shorter time horizons and would characterize the business cycle. This, among other claims, has spurred skepticism about the robustness of the Okun's law.

Lee (2000) made a comprehensive study that examined the robustness of Okun's law among OECD countries. The analysis used four approaches: the first is the difference version, then the gap version that used the Hodrick-Prescott filter, the Beveridge-Nelson filter and an unobserved component model using Kalman filter based on the Non-Accelerating Inflation Rate of Unemployment (NAIRU) framework. Results show that the estimates across the countries differ remarkably as well as the estimates produced from the different approaches. Though a negative relationship is evident between unemployment and GDP of the OECD countries, the estimates however were less robust compared to Okun's estimates. The data showed strong evidence of structural change in the Okun relationship, in the recent decades smaller output losses are experienced at a given increase unemployment.

Knotek (2007) studied the stability of the Okun's coefficient over time. He associated changes in Okun's coefficient with business cycles in the United States. He found out using rolling regressions that the absolute of the Okun coefficient is, on average, smaller in expansions than during recessions. Knotek also finds that the contemporaneous correlation has decreased over time, while the dynamic correlation—that is, the correlation with the lagged values of output growth measures—has increased.

Amidst the criticisms about the stability of the Okun's law, an IMF working paper by Ball et al (2013) insisted the stability of the Okun's relationship over time, saying it has earned its stature of being a law. The paper studied the goodness of fit of Okun's law in short-run unemployment movements in the U.S. Findings assert that Okun's Law is a strong and stable relationship in most countries, one that did not change substantially during the Great Recession. The study also found out that the coefficient in the relationship—the effect of a one

percent change in output on the unemployment rate—varies substantially across countries, partly explained by idiosyncratic features of national labor markets, but it is not related to differences in employment protection legislation.

Generally speaking, the estimation of Okun's coefficient in most if not all literature has not included other important labor market variables that are necessary if we try to avoid committing omitted variable bias. This bias does tend to overstate or understate the coefficient as we restrict the value of the estimate if we stick to a univariate version of the model. Moreover, little attention has been given to the different sectors of the economy. This paper brings into light the relationship of the output levels of the different sectors towards the more encompassing measure of the level of unemployment in the economy. This sectoral analysis tries to answer which sector could contribute the most in alleviating the unemployment dilemma of the country.

3. THEORETICAL AND CONCEPTUAL FRAMEWORK

Okun (1962) used three methods in estimating a coefficient that would characterize the relationship between unemployment and output: (1) first difference, (2) trial gaps, and (3) fitted trend and elasticity. The first method used changes in rates of unemployment and GNP, the second method used levels of potential path and a natural rate of unemployment at 4%, and the third used levels but assumed constant elasticity relationship between actual and potential output and constant growth rates. His estimates showed a 3-to-1 link between output growth and the unemployment rate; that is a 3 percent increase in GNP reduces unemployment rate by 1 percent above its natural rate which Okun pegged at 4%. On the other hand, a reverse on the causality would say a 3 percent loss in GDP after a 1 percent increase in unemployment.

Since Okun's study was published, many economists made further empirical tests to assess the significance of the negative correlation between output and unemployment that Okun proposed. At present, several versions of the Okun's law exist that are stemmed from the original methods used by Okun.

We would presume that changes in the level of output that the economy produces directly affects the level of employment and is the only major factor that contributes to the movement of individuals into and out of the labor force; which implies that in the short run, to produce more means to employ more and by producing less, lesser labor is needed. Assuming an insignificant change in the growth of the labor supply, the unemployment level will move oppositely in expense to the change in employment. We further assume that there is a steady

state, a long run equilibrium, which characterizes output, employment and unemployment. Following Ball et. al. (2013), the relationships can be expressed as:

$$E - E^* = a\ (Y - Y^*) \qquad (1)$$
$$U - U^* = b\ (E - E^*) \qquad (2)$$

where E is the employment rate, Y is output growth and U is the unemployment rate; * reflects a long run level. By substituting equation 1 into equation 2 we get the gap version of Okun's law.

$$U - U^* = c(Y - Y^*) \qquad (3)$$

Figure 1 below shows the four major factors that will be hypothesized to affect the rate of unemployment in the Philippine setting. These include, the growth of the national economy, the labor force participation rate, cash remittances from migrant workers, and the growth of the three different sectors in the economy namely agriculture, industry and service sectors.

Literature that delve on Okun's law acknowledge the importance of the level of labor productivity as well as the rate of labor participation as they both determine the potential growth of output. When labor participation increases more than the growth in output, there will be lesser opportunities for new entrants to the labor market to get jobs, thus the unemployment rate will rise. Together with the change in the level of the economy's output, labor force participation is an important factor to consider in analysing for statistical results of the Okun's relationship.

The relationship between between real GDP growth and the change in unemployment rate is anticipated to be negative, being the vital feature of Okun's law. Again this is presumably because of the increase in the need for labor resources when the economy is expanding, decreasing the rate of unemployment. On the other hand, when the economy slumps firms cut-off workers due to reductions in product demand, thus increasing the rate of unemployment.
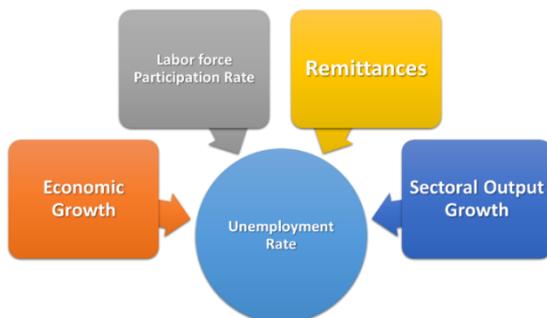

Figure 1. Conceptual Framework of the factors affecting the unemployment rate.

The labor participation rate and the employment rate have an identity relationship with unemployment; labor participation rate is equal to the employment rate plus the unemployment rate. Holding other factors constant, as labor participation rate increases, unemployment will increase, also when the employment rate increases, unemployment will decrease. Thus labor participation and unemployment is hypothesized to have a positive relationship while employment rate and the unemployment rate have a negative one.

Growth in the three different sectors are added in the model to identify which sector would be more sensitive to the change in unemployment. While the industrial and the service may be thought to have a negative relationship with unemployment, the critical analysis to consider would be that of the agricultural sector. This study will hypothesize, following the findings of Neely (2004), that growth in the agricultural sector will have a positive relationship with unemployment. This may be explained that during times of economic downturns, the agriculture sector will serve as the "shock-absorber" of retrenched labor from other sectors of the economy.

The effect of remittances on unemployment is hypothesized to be negative. Cash remittances serve as additional source of funds for domestic consumption, thus when aggregate demand picks-up, labor resources will be employed (Drinkwater, 2003).

4. METHODOLOGY

The study used quarterly time series data from the first quarter of 1989 until the fourth quarter of 2004, giving a total of 64 data points, of selected economic and employment indicators. It was in 1989 where monthly data for remittances were first collected. Meanwhile, the unemployment definition changed during the first quarter of 2005. The data of the variables are thus constrained in both ends and so this time span was chosen as the sample period to be studied. Data from the Labor Force Survey, conducted by the Bureau of Labor & Employment Statistics (BLES), regarding the levels and rates of unemployment, employment, and labor participation, were procured from the website of the Philippine Statistics Authority, 2014. Growth rates and levels of Gross Domestic Product (GDP), as well as the Gross Sectoral Products of the three sectors of the Philippine economy were also obtained from PSA. Data for cash remittances were procured from the database of the Bangko Sentral ng Pilipinas (BSP), 2015.

Unit Root Test

A time series must be stationary first, that is it fluctuates around a constant mean, before a meaningful economic relationship can be observed. Thus, each variable was tested for the presence of a unit root using the Augmented Dickey-Fuller Test that includes an intercept (4) and an intercept with a time trend (9) in the form:

$$\Delta y_t = \alpha + \gamma y_{t-1} + \sum_{s=1}^{m} a_s \Delta y_{t-s} + v_t \qquad (4)$$

$$\Delta y_t = \alpha + bT + \gamma y_{t-1} + \sum_{s=1}^{m} a_s \Delta y_{t-s} + v_t \qquad (5)$$

The hypothesis of stationarity or nonstationarity are expressed in terms of γ. The null hypothesis is H$_o$: $\gamma = 0$ as compared to the alternative hypothesis H$_a$: $\gamma > 0$. When $\gamma = 0$ it is said that the series is nonstationary or has a unit root. The *tau* value or the t-statistic of the estimated γ will be compared to critical values of the Dickey-Fuller test. If the t-statistic is less than the critical value then we can reject the null hypothesis is nonstationary. Maximum lag length is set to 4 since the data is on a quarterly basis. Testing was done in levels and in first-differences where it is presumed that unit-roots will not be present anymore.

Data Analysis

To get a unified view of the Okun's Law, its long-run relationship and study other possible economic predictors of unemployment, two multiple regression analysis were employed and will take the following statistical form:

$$LnU_t = \beta_0 + \beta_1 LnU_{t-1} + \beta_2 LnGDP_t + \beta_3 LnLaborForce_t + \beta_4 LnRemit + \varepsilon_t \qquad (6)$$

where:

LnU = natural logarithm of the unemployment level
$LnGDP$ = natural logarithm of the gross domestic product
$LnLaborForce$ = natural logarithm of the labor force participation
$LnRemittance$ = natural logarithm of cash remittances
ε = error term

$$LnU_t = \beta_0 + LnU_{t-1} + \beta_2 LnAgriculture + \beta_3 LnIndustry + \beta_4 LnService + \beta_5 LnLaborForce_t + \beta_6 LnRemittance + \varepsilon_t \qquad (7)$$

where:
  LnU = natural logarithm of the unemployment level
  LnAgriculture = natural logarithm of the agriculture gross value added
  LnIndustry = natural logarithm of the industry gross value added
  LnService = natural logarithm of the service gross value added
  LnLaborForce = natural logarithm of the labor force participation
  LnRemittance = natural logarithm of cash remittances
  Ɛ = error term

      Remittances were included into the model to control for an external source of funding that has greatly affected and fueled the growth of the economy and the citizen's standard of living. The estimated models were subjected to diagnostic tests to check for any serious problem related to acceptability of the model.

Cointegration Test
      A process is said to be cointegrated if the difference of two or more time-series, i.e. the estimated residuals, is in the order I(0). Cointegration would then imply that the series share similar stochastic trend thus their movement would not diverge far from each other. In this study, the cointegration test were carried on by testing the stationarity of the estimated least squares residuals using an Augmented Dicky-Fuller test. If the estimated residuals are not cointegrated, it will lead to what is called spurious regression; any relationship observed may be misleading.

Error Correction Model
      Two time-series if cointegrated is said to exhibit a long-run equilibrium relationship between them. In the short-run however, disequilibrium can occur. The error correction model shows the short-run dynamics; i.e. how fast the variables return-back to their long-run relationship. Two error correction models were set, one for each long-run model. The model was analyzed with the first lag of the independent variables included. Dummies for the three quarters with the first quarter as the base reference were included in the error correction model to control for the inherent volatility of the variables. The lagged residuals of the long-run regressions served as the basis for the error correction term. The important thing to consider here is the significance of the coefficient of ECT_{t-1}. The direction of the relationship, whether positive or negative indicates the short-run dynamics of the variables.

5. RESULTS AND DISCUSSION

Table 1 outlines the performance of the different variables when it comes to growth rates or in percent of total. The unemployment rate of the country, measured as the number of unemployed as a fraction of the total labor force has a relatively very high mean of about 10% throughout the period. Its minimum value which is still considerably high is about 7.4%. Real GDP growth is seen to be weak with just an average annual growth quarter-to-quarter of just 3.53%. Throughout the period, the economy has experienced several negative growths as depicted by the minimum growth rate of -3.1%.

Among the three sectors in the economy, the service sector was the top performer with an annual growth performance of 4.25%. The industry sector then followed with 3% and lastly the agriculture sector with only 2.42% annual growth rate. As shown by the standard deviation statistic, the agriculture sector depicted larger fluctuations as compared with the other sectors. It even posted a minimum growth rate of -13.35%. This kind of fluctuations in the output of the agriculture sector can be explained by the seasonality of the crop harvests as well as the calamities related to the weather that frequently visits the country and inflicts great strain on the sector's production.

Table 1. Summary of the macroeconomic variables (percent)

Variable	Mean	Standard Deviation	Minimum	Maximum
Unemployment Rate	10.02	1.80	7.40	14.40
Real GDP growth	3.53	2.42	-3.11	7.70
Agri sector growth	2.42	4.42	-13.35	12.78
Industry sector growth	3.02	4.00	-6.41	11.47
Service sector growth	4.26	2. 10	-0.91	9.66
Labor Force Participation Rate	65.82	1.88	62.60	71.39
Remittances, growth rate	18.31	27.77	-33.20	123.14

n = 64

The country's labor force has not drastically change in terms of quantity throughout the period. Its mean is about 66% of the country's total population. The remittances on the other hand posted a very high performance in terms of growth rate based from its mean of 18.3% throughout the period. However, its standard deviation is comparatively high vis-à-vis the other variables, its standard deviation is 27.7% which indicates that it has drastically changed in several points

thru the period. Its minimum growth rate is -33.20 while its maximum reached to a large growth rate of 123.14%. This numbers would tell us that remittances have shown episodes of great volatility which maybe because of the conditions of the country's economy where the donor works.

Trends of the Relevant Macroeconomic Variables against Time

It is customary in every time series analysis to conduct a visual inspection before starting any empirical analysis. The following figures show the graph of the variables plotted against time. Unemployment shows no definite trend from the beginning of the period until about 1997-1998. However, after this point, the series clearly shifted and began an increasing trend (Figure 2). GDP as shown in Figure 3, projected an increasing trend even from the start of the series. The spikes of the series indicate the seasonality of the economy's output, with the fourth quarter, having the highest output as compared with the other quarters.

The agriculture sector is seen in Figure 4, to have very wide spikes indicating that its output is greatly affected by the season. Still, it shows a clear increasing trend. The industry sector's output is also seasonal, its long-run trend is also increasing but it has some episodes where it became steady (Figure 5). The service sector's output on the other hand as shown in Figure 6, has a clear increasing trend.

The country's labor force also show an increasing trend, which can be explained by the fast growth of the country's population (Figure 7). It is not quite affected by seasonality. Lastly the series for cash remittances also show a discernible increasing trend (Figure 8). Interestingly, the steep trend was interrupted during 1998 and then started to pick-up in the early 2000's.

It can be observed from the figures, that some variables did shift trends during the period within 1997-1998, which coincides with the economic contagion in the financial markets in Asia; more commonly referred to as the Asian Financial Crisis. The level of unemployment in particular did start to rise during this period and did not significantly drop since. The output in the industrial and agriculture sectors did show signs of stagnation for several sectors, but did rise nonetheless after. Remittances, on the other hand did reach a peak during this period and then dropped significantly thereafter. Noland (2000) studied the fate of the country during the crisis and he found out that relatively the Philippines performed better than its neighbouring countries in East Asia due to financial market reforms it has undertaken beforehand.

In general, an increasing trend is present in all variables in the study. Thus a unit-root test is deemed necessary.
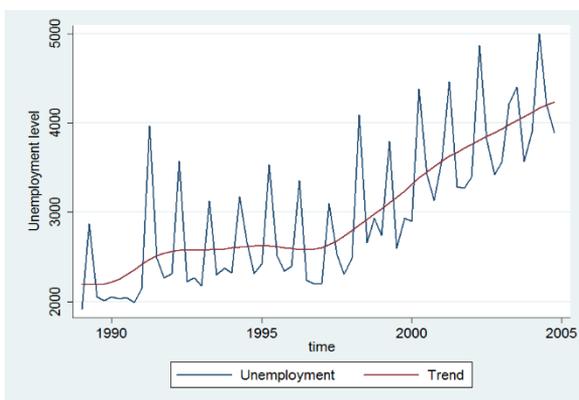
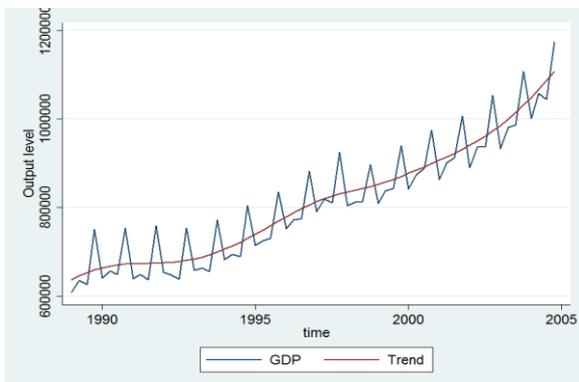Figure 2. Level of Unemployment, in thousands

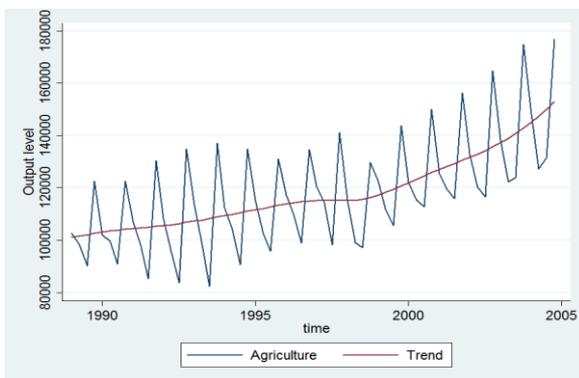Figure 3. Gross Domestic Product (GDP), in million pesos

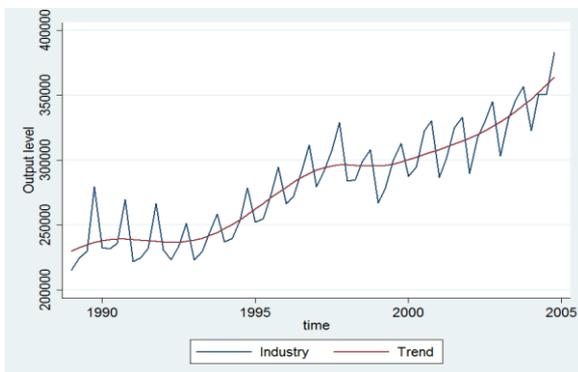Figure 4. Agricultural Gross Value Added, in million pesos

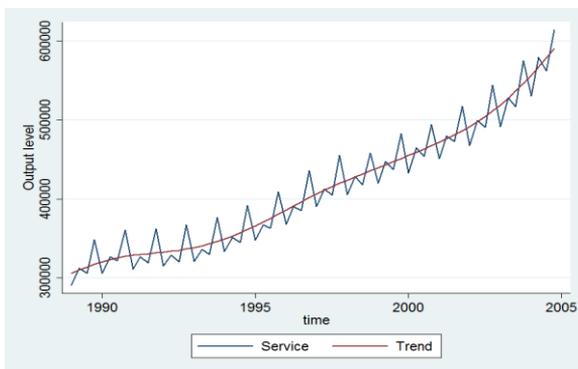Figure 5. Industry Gross Value Added, in million pesos

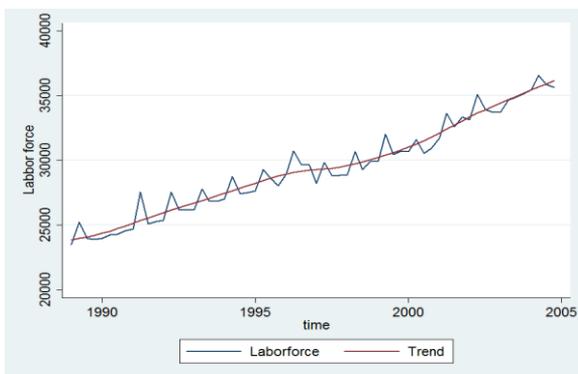Figure 6. Service Gross Value Added, in million pesos
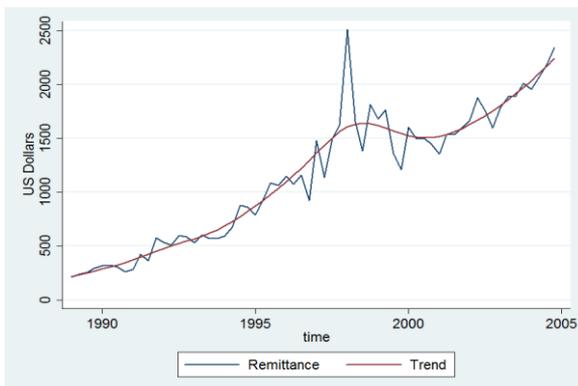

Figure 7. Labor Force, in thousands

Figure 8. Cash Remittances, in million dollars

Unit root test

The results of the Augmented Dickey-Fuller (ADF) test for stationarity are shown in Table 2. It shows that all of the variables are non-stationary at levels, however most are stationary at first-difference. The results imply that all variables have a trend or changes directions at least one point throughout the period. On the other hand, first differencing eliminates the problem of non-stationarity for most variables. Thus it can be said that Agriculture, unemployment, industry, remittance, and labor force are integrated of order 1 or I(1). GDP and service sector remains nonstationary even at first difference. After second-differencing, GDP and service have become stationary. With these results, our use of a cointegration approach is justified.

Table 2. Unit root test for stationarity at levels and first-difference

Variables	Levels		First-Difference	
	Intercept	Intercept & Trend	Intercept	Intercept & Trend
Unemployment	0.06	-2.08	-3.69***	-3.78**
GDP	1.61	-1.42	-1.82	-2.63
Agriculture	1.36	-0.82	-3.40**	-3.89**
Industry	0.40	-2.88	-2.88**	-3.02
Service	2.36	-0.50	-0.84	-2.27
Laborforce	0.62	-2.53	-4.30***	-2.53
Remittance	-0.27	-2.03	-3.61***	-3.58**

Note: *, **, *** indicates significance at 10%, 5%, and 1% respectively
   lags = 4

Long-run Dynamics of the Model

Table 3 shows the regression results of the first long-run model. The estimate for the lag value of unemployment is not significant, thus the past level of unemployment is not a significant factor of the current level of unemployment. The log of GDP is highly significant at 1% level. Its negative sign conforms to what Okun's law postulates. The estimate suggests that a 1% increase in the nations' output decreases unemployment by 0.7%. This observation is possible since more demand in the economy for goods and services would require more labor resources in the production process. With an increase in the level of employment, unemployment levels would drop given a relatively constant labor force. Thus this result confirms the presence of Okun's law in the country's economy.

Table 3. OLS estimates of the long-run model

Variable	Coefficient	Standard Error
LnUnemployment$_{t-1}$	-0.10	0.08
LnGDP	-0.70***	0.20
LnLaborforce	3.74***	0.35
LnRemittance	-0.18***	0.05
Constant	-18.96***	2.70
R-square	0.82	
F-statistic	64.06***	
Root MSE	0.11	

Note: *, **, *** indicates significance at 10%, 5%, and 1% respectively
    n = 63

The log of labor force (LnLaborforce) has a positive sign and is also significant at a 1% level. This implies that as the country's labor force increases, the unemployment also increases. The estimate tells us that a 1% increase in the labor force, will result to an increase of the level of unemployment by 3.7%. This effect of the labor force on unemployment is quite huge and this would imply that the economy has problems in absorbing and providing employment for new entrants into the labor force.

Growth in remittances, in the long-run, decreases the level of unemployment. The estimate is significant at the 1% level. A 1% increase in cash remittances of Filipino workers abroad will result to a decline in unemployment by 0.18%. This result becomes true if we think of the remittances as a case in creating a great surge in domestic demand thereby increasing the need for labor services. This relationship as described by Drinkwater et al (2003) was because of firms in developing countries are mostly credit-constrained. Remittances available

for investment are then used to relax these constraints and increase the level of capital stock. If this "investment effect" becomes a significant mover of the economy, then remittances will have the effect of reducing the unemployment rate. However, we cannot claim this explanation to be true for the Philippines as we cannot directly attribute the growth in the country's level of investment to be mainly contributed by cash remittances. Other factors also play a relevant role in the level of investment in the economy such as the interest rate, the foreign exchange rate and policies, public debt and the overall level of business confidence.

The sectoral analysis of Okun's law is presented in Table 4. The first lag of the log of unemployment is now significant at 5% level. This implies that controlling for the output levels of the three different sectors, current levels of unemployment become a significant factor in predicting future unemployment.

Table 4. OLS estimates of the long-run sectoral model

Variable	Estimate	Std. Error
LnUnemployment$_{t-1}$	-0.19**	0.09
LnIndustry	-1.22***	0.38
LnAgriculture	-0.62***	0.15
LnService	1.54***	0.50
LnLaborforce	2.44***	0.47
LnRemittance	-0.18***	0.05
Constant	-11.75***	3.57
R-squared	0.86	
F-statistic	56.43***	
Root MSE	0.10	

Note: *, **, *** indicates significance at 10%, 5%, and 1% respectively
       n = 63

Looking at the estimates, all of the three sectors are significant predictors of the level of unemployment. Intriguingly, the service sector does not conform to the Okun's relationship. Its sign is positive indicating that in the long-run, unemployment increases as the service sector grows. The coefficient tells us that a

growth in the service sector of 1% increases the level of unemployment by 1.5%. Given that the effect is quite huge, we can say that the notion of "jobless growth" maybe is true for this sector of the economy. Job and skills mismatch, or simply structural unemployment in the country's labor market may also have caused this kind of behavior. It is worth noting that during this period (1989-2004), technology has greatly sped up; the use of computers has significantly spread throughout the business process. Thus, technological progress probably has caused a considerable percentage of the number of unemployed in the economy by displacing labor in favor of machines. This result is supported by Bockerman (2004) where he concluded that a high share of service sector pushes up the unemployment rate in Finland.

The industry and agricultural sectors follow the relationship proposed by Okun. Both sectors have a negative relationship with unemployment. However, the effect of the growth of the industry sector in reducing unemployment is greater than the effect of the agriculture sector. The industry sector's effect on unemployment is easily twice that of the agriculture sector. Since the industrial sector attracts laborers and unskilled workers, which was the largest occupational group in 2001 reaching a level of 28.9% (DOLE, 2011), the unemployment problem of the economy could significantly diminish if we allow the sector to grow fast and occupy a greater share of the economy's output. Manufacturing and construction are within this sector.

The same conclusions can be drawn for the agriculture sector which employs the second largest occupational group which is farming and fishing. The estimate of the effect of the growth of the agriculture sector towards unemployment is less than 1. This effect could reflect the fact that the sector has appreciably decreased its share of employment in the economy through the years due to migration of labor to urban cities preferring service jobs. In this way, growth in this sector could not give a large reduction in the number of unemployed people.

Cointegration Test

A cointegration test is employed to validate a long-run relationship of the variables at levels using the Augmented Dickey-Fuller (ADF) test to detect for the presence of unit-root in the residuals. As shown by the ADF statistic, model 1 is stationary in both intercept & trend and intercept only versions of the ADF test. The ADF statistic for model 2 in both versions are highly significant, thus the series of the residuals for model 2 is stationary. With the given results of the cointegration tests we can say that the variables share the same long-run pattern,

further implying that we can use the dependent variables as predictors in forecasting future levels of unemployment.

Table 5. Cointegration test for the stationarity of the residuals

	Intercept	Intercept & Trend
Model 1 residuals	-3.841***	-3.805**
Model 2 residuals	-5.147***	-5.117***

Note: *, **, *** indicates significance at 10%, 5%, and 1% respectively

    lags = 4

Error Correction Model and Short-run Dynamics

This study employed an error correction model to explain the short-run behavior of the relationship and explain disequilibrium brought by shocks coming from other exogenous factors.

Results of the error correction model reveal that a short-run equilibrium between the variables is evident as shown by the error correction term which is significant at 5% level. The error-correction term is negative and significant indicating that deviations from the long-run equilibrium because of shocks are corrected at about 41% every quarter.

GDP is negatively correlated with unemployment during the same period, and the coefficient is significant at 1%. The relationship is very close to unison, intuitively a 1% change in the economy's real output results to a corresponding 1% change in the unemployment, ceteris paribus. There appears to be a larger effect on the short-run than in the long-run. This result is still consistent with the Okun's law.

The labor force still has a positive relationship with unemployment during the same quarter. However, the short-run coefficient for the first lag of the log of labor force is negative. This is similar with the findings of Hornstein and Rhodes (2013) where they suggested that the negative relationship between unemployment and labor force is due to the fact that unemployed participants are far more likely to leave the labor force than employed participants while non-participants are less likely to join the labor force especially in times where the economy is sluggish.

The estimate of the log of remittances during the current quarter is still negative. However, it changes to positive after one quarter which is contradictory to its long-run estimate. Thus, in the short-run, cash remittances induce recipients to rely on the senders and chooses to become less productive because they are dependent on the money sent by their OFW family members. However, the estimates are not significant.

Table 6. Error correction estimates for the first model

Variable	Estimate	Standard Error
ΔLnGDP	-0.95*	0.56
ΔLnLaborforce	3.60***	0.59
ΔLnLaborforce$_{t-1}$	-1.45**	0.62
ΔLnRemittance	-0.01	0.07
ΔLnRemittance$_{t-1}$	0.08	0.07
Quarter 2	0.17	0.15
Quarter 3	0.04	0.09
Quarter 4	0.07	0.14
ECT $_{t-1}$	-0.41***	0.11
Constant	-0.06	0.09
R-squared	0.92	
F-statistics	57.20***	
Root MSE	0.08	

Note: *, **, *** indicates significance at 10%, 5%, and 1% respectively

$\Delta = 1$, n = 62

The error-correction model for the sectoral Okun's relationship is presented in Table 7. The error correction term is negative and significant at 1% level indicating that a short-run equilibrium is evident. The coefficient tells us that deviations from the long-run equilibrium are corrected at about 54% every quarter. The industry sector remains to have a negative relationship with unemployment, however its estimate is not significant. The agriculture sector's estimated coefficient is slightly lower than the long-run estimate but is still significant at 10% level. The relationship conforms with Okun's law at the current quarter. However, the coefficient becomes positive at first lag. This result conforms with the findings of Hanusch (2012); his analysis has somehow documented a "reverse Okun's law" for agriculture. Findings indicated that during negative shocks in output (recessions), the agriculture sector acts as shock-absorber in employing workers retrenched from other sectors due to economic downturns. It must be true for the Philippines as most of the workers in urban cities came from rural provinces where agriculture remains as one of the major means of employment. This should be taken with caution as the estimate is not significant. The estimate of the service sector is still positive but is not significant.

Table 7. Error correction estimates for the second model

Variable	Estimate	Standard Error
ΔLnIndustry	-0.53	0.37
ΔLnAgriculture	-0.36*	0.21
ΔLnAgriculture t-1	0.07	0.24
ΔLnService	0.73	1.00
ΔLnLaborforce	3.47***	0.56
ΔLnLaborforce t-1	-1.17*	0.60
ΔLnRemittance	0.02	0.06
Quarter 2	-0.07	0.22
Quarter 3	-0.04	0.11
Quarter 4	-0.14	0.24
ECT t-1	-0.54***	0.11
Constant	0.06	0.13
R-squared	0.94	
F-statistics	48.26***	
Root MSE	0.07	

Note: *, **, *** indicates significance at 10%, 5%, and 1% respectively

Δ = 1, n = 62

6. SUMMARY, CONLUSIONS and POLICY IMPLICATIONS

This study has empirically proven the presence of Okun's Law in the Philippine economy in the long-run as well as in the short-run. In the long-run an increase in GDP by 1% has the effect of reducing unemployment by 0.7%. In the short-run on the other hand, GDP has a greater effect on unemployment; an increase in GDP by 1% results to a decrease in unemployment by 0.95%.

Looking at the sectoral level, the industry sector contributes more in diminishing the level of unemployment in the long-run as compared to the agriculture and service sectors. This can be explained by the fact that this sector rely on relatively unskilled labor, thus entrants can enter this sector easily with minimal barriers. The service sectors estimates were both positive in the long-run and the short-run. This sector may be considered to be on full capacity, such that more growth in its output would not translate to reductions in unemployment. In the short-run, the agricultural sector has a positive relationship with unemployment, which is the same with the findings of Hanusch (2012). Evidence suggests concluded that the agriculture sector acts as shock-absorber in employing workers retrenched from other sectors of the economy.

Results also show that the level of unemployment is highly dependent on the level of the country's labor force participation, particularly when the labor force naturally shoots up e.g. in March and April where new graduates enter the labor force. In the long-run an increase in the labor force by 1% results to an increase in unemployment by about 2%-4%. Evidence of a positive relationship between the levels of the labor force and unemployment has also been observed, however its explanation is not clear.

Remittances have been shown to have a negative effect on unemployment in the long-run. The estimates reveal that an increase in cash remittances by 1% reduces unemployment by roughly 0.2%. We can then say that the rise in domestic demand brought by an additional source of income by households will result to a considerable decline in the unemployment level.

It is recommended that the country deregulate some of its economic and labor policies such that rigidities in the labor market will be minimized and that the economy's growth can bring forth employment for the country's citizens. Also, in the development planning process, the industry sector, especially the manufacturing and construction subsectors, should be put forward amongst the other sectors as its growth can provide more employment opportunities for laborers and unskilled workers which is for a fact the largest occupation group in the country's labor market. The development of the agriculture sector should also be eyed as a key for the progress of rural provinces where most rely their source by tilling the soil. This sector can significantly help reduce unemployment.

The source of unemployment should also be clearly identified by agencies like the National Economic Authority (NEDA), whether it is caused mainly by search frictions, structural change in the labor market or because of low aggregate demand for commodities. This is essential as to which policy strategy will be used in alleviating unemployment since demand stimulus wouldn't naturally work on unemployment caused structural change.

Efforts in increasing the social capital of the country should not stop. Adequate infrastructure should be developed, and the role of education should not be put in vain by the government. An educated workforce becomes necessary in an economy where the service sector dominates. Thus the phenomenon of "brain drain" should be put as a major agenda by the government. Although cash remittances from migrant workers has saved the country from experiencing deep contagion in the past, remittances' effects on reducing unemployment is minimal, thus dependency on remittances should not be the norm in a country where the domestic economy is still developing.

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