DETERMINANTS OF UNEMPLOYMENT IN THE PHILIPPINES:
A Spatial Autoregressive approach
by
Josiah Mikhail Z. Naromal and Ronald D. Estrada

Abstract

The main objective of this paper is to study and investigate the determinants of Regional Unemployment rate in the Philippines from 2005-2011. It sought to present the trend of unemployment by regions and to investigate whether these regions are correlated with one another across time and space using a spatial econometric method.

The estimation results found out that population and Gross Regional Domestic Product (GRDP) are both significant at a 5% level and have a positive influence to unemployment rate. Unemployment rate would increase by 1.44 percent for an increase of population by 1 percent. Also, unemployment rate would increase by 1.45 percent as GRDP increases by 1 percent.

The study also shows that spatial dependence among regions is evident. At a 5% level of significance, the results found out that unemployment rate in region \( i \) would increase by 0.37 percent if its neighboring region \( j \) would increase by 1 percent. Unemployment rate in one region affects the unemployment rate of its neighboring region. This made the spatial panel model fits the data better than the OLS model. The results confirmed that high amount of output induces migration which leads mismatch between demand and supply of labor due to high population.

**Keywords:** Regional Unemployment, Spatial Autoregressive, Spatial panel

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INTRODUCTION

In macroeconomics unemployed people are people who are registered as able, available, capable and willing to work at the going wage rate but who cannot find work despite an active search for work. Unemployment is defined as the state of having no job or being out of work. It is measured annually as percentage of labor force that can't find a job. People who voluntarily do not want to work, full time students, retired people and children are not included in unemployed category (IMF 1998).

In the Philippines context, a new definition of unemployment was adopted by the end of 2004. The old definition has been refined since there is a need to adopt the availability criterion of the International Labor Organization (ILO). This availability criterion is one of the three criteria prescribed by the ILO. Under the international standards, the unemployed comprise all persons above the age specified for measuring the economically active population, who, during the reference period were (a) without work; (b) currently available for work; and (c) seeking work (NSCB, 2006). As of the end of 2004, the new definition of unemployed persons (age 15 and over) in the Philippines is defined as:

- without work, i.e., had no job or business during the basic survey reference period; and
- currently available for work, i.e., were available and willing to take up work in paid employment or self-employment during the basic survey reference period, and/or would be available and willing to take up work in paid employment or self-employment within two weeks after the interview date; and
- seeking work, i.e., had taken specific steps to look for a job or establish business during the basic survey reference period; or not seeking work due to the following reasons: (a) tired/believe no work available, i.e., the discouraged workers who looked for work within the last six months prior to the interview date; (b) awaiting results of previous job application; (c) temporary illness/disability; (d) bad weather; and (e) waiting for rehire/job recall (NSCB, 2006).

Unemployment can be considered as a major problem in a country. It can give rise to different social and economic problems. Raper (1999) mentioned that unemployment is the prime mover or cause of hardships for hundreds of thousands of people affecting their families as well as their societies. Even the economy is affected by it. It can give rise to different economic problems like poverty and low government income. One form on which governments generates
its income is through imposing taxes on goods and services. If many people are unemployed, less people will spend or buy goods and services, thus leading to a fall of income. Because of this, some countries try to find ways to alleviate these problems. They try to create job opportunities, give subsidies and many more. Examples of these are by inducing investments and subsidizing or assisting the business sector in order to hire more labor. This is also why many studies had been conducted in different countries about the causes of unemployment.

Philippines also is not excused from escaping the problem of unemployment. Figure 1 shows the trend of unemployment rate in the Philippines from year 2002 to 2010. The graph suggests that in year 2004 unemployment rate is very high at a percentage of 11.9 but immediately decreased within the period 2005-2010. This immediate decrease of unemployment rate by the year 2005 was caused by the changed definition of ‘unemployed persons’.

![Unemployment rate in the Philippines](image)

**Figure 1 unemployment rate in the Philippines (2002-2010)**

*Source: World Bank*

The figures in the chart only reflect realities in the national level and are, therefore, not indicative of the current unemployment trend in the regional settings. The unemployment rate is a widely used and often conversed indicator for the economic well-being of a country. However, the discussion is mostly concentrated on national unemployment rates which give no information about the regional structure of unemployment (Franziska Lottmann, 2012).

Figure 2 shows the unemployment rate by region in the Philippines. As indicated in figure 2, the National Capital Region (NCR) has the highest or held the highest percentage of unemployment at 11%, in the year 2011, while region II has the lowest unemployment rate, with 2.9% in the same year – a difference of 8.1%. Disparities like this should be looked into and should figure in studies relating to national concerns, specifically, unemployment as this problem permeates all regions of the Philippines. Studies on this issue should be based not only on
national level but also on the regional and on factors that somehow create supply and demand of labor disparities among regions.

![Unemployment rate by Region](chart.png)

**Figure 2. Rates of Unemployment by Region in the Philippines (2011)**

*Source: NSCB*

**Rationale of the Study**

All countries, whether rich or poor have unemployment problems. But a persistently high unemployment rate, especially in a developing country like the Philippines, is not a good sign of economic well-being. Unemployment can give rise to a poor economy that can exacerbate prevailing social problems and even add to it -- social problems such as poverty in which other social issues are rooted. Among the studies that attempted to address the issue of high unemployment rate in the Philippines, only a few focused on the regional level.

Some studies suggested that in order to balance the labor market structure, regions that are plagued with unemployed people can let their excess supply of labor migrate to other regions that have great demands for it. Hence, this migration of workers from one region to the other would be beneficial for both regions. But still we can see in Figure 2 that the Philippines' unemployment rate remains disconcertingly high in some regions while others have remained very low. This interaction of labor force, including some others, between regions calls for a need to understand the causes of regional unemployment and its spatial relationship. As Mitchell and Bill (2004) said in their working paper about spatial dependence in regional unemployment in Australia, location and distance are important forces at work in human geography and market activity. Clustering of unemployment rates might occur because of spatial pattern of employment growth (demand) or the allotment of population characteristics such as job skills (supply), and some mismatch between them. In econometrics point of view neglecting these spatial effects would lead to insufficient information regarding the causes of unemployment.
Knowing the root causes of unemployment and its spatial effects among regions in the Philippines and coming up with pertinent and comprehensive solutions to this chronic problem can pave the way towards progress and peace in the country. Therefore, this study aims to further examine the determinants of regional unemployment in the Philippines from 2005-2011.

Objectives of the study
The general objective of this study is to investigate and to analyze the different determinants that cause regional unemployment in the Philippines. Specifically, this study aims to:

1. Present the trends of unemployment in different regions from year 2005-2011.
2. Determine economic and non-economic factors that influence regional unemployment.
3. To investigate whether unemployment rate among regions are correlated with each other.

METHODOLOGY

Conceptual Framework
Figure 3 presents the conceptual framework used in this study. It can be seen in the figure that Unemployment rate is considered as the dependent variable. The GRDP (Gross Regional Domestic Product), Inflation, Population and Minimum Wages are the independent variables. They are said to be independent variables since we assume that these factors affect the dependent variable which is Unemployment rate.

Data Source
All the data used in this study are drawn from secondary sources such as the National Statistical Coordination Board (NSCB) for the unemployment rate by region, GRDP, Inflation Rate by region and Population by region, and from websites like, www.pids.gov.ph, and www.nwpc.dole.gov.ph for the minimum wages per region.

**Statistical Method**

The spatial econometric literature shows that neglecting spatial effects yields biased and inefficient estimates. Therefore, this study applies a spatial econometric model to avoid these shortcomings.

**Spatial Auto-correlation**

The study of spatial auto-correlation was first introduced by Luc Anselin (1988) in his seminal textbook on spatial econometrics. The spatial auto-correlation will likely exist when the presence of the attribute in one place makes its presence in a nearby jurisdiction. Spatial auto-correlation is positive if close observations tend to be more similar than remote observations. It is negative if the nearby observations tend to be more diverse. There is no spatial auto-correlation if there is no relationship between the proximity of observations and their degree of resemblance (Choumert, 2009).

**Integration of Spatial Parameter in the Model**

For this study, a different specification is used depending on how the spatial panel parameter is integrated in the model to investigate spatial effects. It is called autoregressive-regressive panel model or spatially lagged dependent variable panel model. The panel model is as follows:

\[ UR_{it} = \delta W_{it} UR_{it} + \beta_0 EX_{it} + \beta_1 \log GRDP_{it} + \beta_2 \log Pop_{it} + \beta_3 INR_{it} + \beta_4 MW_{it} + \varepsilon_{it} \]

\[ \varepsilon \sim N(0, \sigma^2 I) \]

Where;

- \( i (i = 1, ..., N) \) = Region
- \( t (t = 1, ..., T) \) = time
- \( \delta \) = spatial autoregressive coefficient
- \( EX \) = is a \( N \times p \) matrix of \( p \) exogenous explanatory variables (\( p \geq 0 \))
- \( W_i \) = an \( (n \times n) \) spatial weight matrix
- \( UR \) = Unemployment Rate that contains an \( (n \times 1) \) vector of cross sectional of dependent variables
- \( GRDP \) = Gross Regional Domestic Product
- \( INR \) = Inflation Rate
- \( Pop \) = Population Growth
- \( MW \) = Minimum Wage
\[ \epsilon_t = \text{error term in year } t \]
\[ \beta_0 = (p \times N) \text{ matrix of fixed but unknown parameters.} \]
\[ \beta_1, \beta_2, \text{ and } \beta_3 = \text{the parameters to be estimated} \]

This model contains a spatially lagged dependent variable which indicates that UR of one unit relies on the same UR of neighboring or other units in space over time.

**Weight Matrix**

For a set of \( R \) observations, the matrix \( W \) is an \( R \times R \) matrix. The matrix specifies the structure and intensity of spatial effects. Hence, the element \( W_{ij} \) represents the intensity of effects between two regions \( i \) and \( j \). A frequently applied weight specification is a binary spatial weight matrix such that \( W_{ij} = 1 \) if the regions \( i \) and \( j \) share a border and \( W_{ij} = 0 \) otherwise.

**RESULTS AND DISCUSSIONS**

**Trend of unemployment rate by region in the Philippines**

Figure 4 presents the short trend of unemployment in different regions of the Philippines from 2005 to 2011. The graph shows that all regions have different trend of unemployment rate across time and one is not the same as of the others.

There are at least four regions that posted a high unemployment rate compared to the others during those seven years, namely: NCR with an average of 12.76\%, Region IV-A with 9.94\%, Region III with 9.44\% and lastly Region I with 8.37\%. These Regions experience a sudden decrease in percentage in unemployment rate by the year 2006 to 2007. NCR’s unemployment rate decrease from 14.4\% to 12.2\%, Region IV-a from 10\% to 9.2\%, Region III from 10.6\% to 10\% and Region I from 8.7\% to 8.4\%. But among these regions, NCR’s and Region IV-a’s unemployment rate immediately went up by the year 2008. This is because the employment rate in these regions decreased slightly due to layoffs in several export-oriented industries during the latter part of the year (BSP 2008).

Among all the other regions, ARMM, Region II and Region IX have the lowest unemployment rate with an average of 3.56\%, 3.17\% and 3.57\% respectively during the years 2005 to 2011. The decrease of unemployment rate in ARMM from 3.8\% in 2007 to 2.3\% in 2009, was attributed to the significant expansion in agricultural output and microfinance loans. ARMM also has the largest volume of production in fishery and in swine. In Region II the decrease of unemployment rate was due to the increased in investments in the industry sector, particularly in manufacturing, agriculture-based productions, trading and service sectors in the area. The low unemployment rate also in Region IX is reflective to the rise in the number of chicken contract growers and commercial farms in the area (BSP 2008).

In the Visayas, all regions have an average unemployment rate between 4 to 8\% percent. But in 2011 all regions in Visayas experienced a decrease in unemployment rate. Region VI’s
unemployment rate decreased from 7.1% to 6.7%, Region VII from 7.6% to 6.7% and Region VIII from 5.5% to 5.3%. This decreased was primarily caused by the increase in employment rate in the regions.

Indeed, the trend shows that Regions in the Philippines have relationship across time and space in the years 2005 to 2011. Regions marked by high unemployment as well as regions with low unemployment rates have a tendency to cluster in space.
Figure 4. Unemployment rate by region in the Philippines: 2005-2011
Source: National Statistical Coordination Board, PSY(2012)
Estimating Regional Unemployment in the Philippines

Results of the regression using the spatial autoregressive with fixed effects model are presented in Table 1 then proceeds with a comparison with an OLS estimation in Table 2.

Table 1. Estimates on Regional Unemployment in the Philippines

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>t-stat</th>
<th>z-prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>constant</td>
<td>-45.881391</td>
<td>-13.129267</td>
<td>0.000000</td>
</tr>
<tr>
<td>INR</td>
<td>0.031415 ns</td>
<td>0.791202</td>
<td>0.428826</td>
</tr>
<tr>
<td>Pop</td>
<td>1.440424*</td>
<td>3.357462</td>
<td>0.000787</td>
</tr>
<tr>
<td>GRDP</td>
<td>1.446828*</td>
<td>4.033341</td>
<td>0.000055</td>
</tr>
<tr>
<td>wage</td>
<td>-0.002386 ns</td>
<td>-0.416574</td>
<td>0.676990</td>
</tr>
<tr>
<td>W*UR</td>
<td>0.370956*</td>
<td>5.323397</td>
<td>0.000000*</td>
</tr>
</tbody>
</table>

R-squared | 0.7694
Adj. R-squared | 0.7098
log-likelihood | -196.78134

Legend: *significant at 5-percent level
ns not significant at the 5-percent level of significance

In the regression results, it can be noted that out of the four explanatory variables there are two significant factors which affects regional unemployment in the Philippines at a 5% level of
significance namely, population and gross regional domestic product (GRDP). The regression results also exemplifies that spatial relationship among regions are significant.

The coefficients of the explanatory variables show their relationship towards the dependent variable. The variable population explicates a direct relationship towards unemployment. Meaning its impact towards unemployment is positive. If the population in the region gets high the unemployment rate in that region would also go high. Elasticity of this factor at means of 1.44%, implying that if population is increased by 1 percent the unemployment rate will also increase by 1.44 percent.

The GRDP is another explanatory variable which the regression portrays to also have a positive impact on unemployment rate. The elasticity with respect to this factor reveals that increasing the GRDP by 1 percent will also increase the unemployment rate by 1.45%. Interestingly, this relationship contradicts the Okun’s Law theory of unemployment. The Okun’s Law emphasizes that output has an inverse relationship with unemployment. However, the significance of population in unemployment may somehow explain the positive relationship between GRDP and unemployment. As regions that are plague with people have sufficient labor that can produce a large amount of output but still the labor supply exceeds its labor demand, thus still leading to unemployment. In another way around, regions that have a large amount of output (GRDP) are likely to induce migration from neighboring regions that also leads to a rise in unemployment. In theory the Marxists’ point of view can in some way postulate also the positive relationship of population and GRDP towards unemployment. Marxian theory emphasizes that capitalists tries to overwork some people while others would be kept unemployed for future purposes that’s why regions that have high GRDP and population are also those regions with high unemployment rate.

Remarkably, the result confirms that spatial autocorrelation, represented by $W*UR$, is significant at a significance level of 5%. This implies that spatial autocorrelation among regions are present in the Philippines. $W*UR$ has an elasticity of 0.37%. It indicates that if the unemployment rate of the neighboring region i increase by 1 percent, unemployment rate in region j would increase by 0.37%. This significant relationship among regions gives emphasis on their co-relatedness in space and their possible interaction. For example, assuming that firms do not restrict their hiring in one location and job searchers might accept a job in a different area as suggested in spatial theory. If region i would have a vast industrial expansion, it would give job opportunities not only to the people living in region i but also people living in region j. Thus, a decrease in unemployment in region i would also give a decrease in unemployment in region j. Vice versa, if region i have layoffs in industrial sector many people would be jobless. This layoff would not only affect people from region i but also people from region j since some of the workers in that sector are from region j. Consequently, this would lead to a rise in unemployment not only in region i but also in region j. The weight matrix W gives emphasis to the structure and intensity
of spatial effects between neighboring regions. It assumes that regions that shared a common border would tend to be more co-related to each other rather than regions that are diverse to each other.

The adjusted $R^2$ points out that 76.94% of regional unemployment rate from 2005 to 2011 are explained by the model. The remaining 23.06% is explained by other factors that are not included in the study.

Table 2. Comparison between Spatially lagged and OLS

<table>
<thead>
<tr>
<th></th>
<th>Spatial Autoregressive model</th>
<th>OLS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coefficients:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population</td>
<td>1.440424</td>
<td>1.534955</td>
</tr>
<tr>
<td>GRDP</td>
<td>1.446828</td>
<td>1.557056</td>
</tr>
<tr>
<td>$W^*UR$</td>
<td>0.370956</td>
<td>-</td>
</tr>
<tr>
<td><strong>t-stat:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population</td>
<td>3.357462</td>
<td>3.137332</td>
</tr>
<tr>
<td>GRDP</td>
<td>4.033341</td>
<td>3.785511</td>
</tr>
<tr>
<td>$W^*UR$</td>
<td>5.323397</td>
<td>-</td>
</tr>
<tr>
<td><strong>R-squared</strong></td>
<td>0.7694</td>
<td>0.7087</td>
</tr>
</tbody>
</table>

Table 2 above also shows the comparison between the spatially autoregressive estimates and the ordinary least squares estimates. The $R^2$ would be sufficient enough to tell the difference between the two since the $R^2$ illustrates the goodness of fit of the model. The $R^2$ of a
spatial autoregressive model is 0.7694 while an OLS model would only have a 0.7087 $R^2$. This demonstrates that 76.94% of the variation in regional unemployment is explained by the variables inflation, population, grdp and minimum wage using a spatial autoregressive model, while OLS model would only demonstrate a 70.87%. The study shows that neglecting spatial autocorrelation would lead to biased and insufficient estimates.

Summary and Conclusion

In this paper, it was shown that regional unemployment rates in the Philippines are characterized by substantial regional differences. The estimation results point out that population and gross regional domestic product (GRDP) are both significant at a 5% level and have a positive relationship with unemployment. It is true indeed that regions in the Philippines that have a large population have also high unemployment rates because people tend to cluster in and around those regions. Interestingly, GRDP is also significant and have a positive coefficient where it somehow violates the Okun’s law which postulates an inverse relationship between output and unemployment. Explanations however can be assumed to this kind of situation like the Marxist theory of unemployment, high amount of output induces migration, and the mismatch between supply and demand of labor due to high population.

The study also shows that spatial relationships among regions are present. Unemployment rate in one region affects the unemployment rate of its neighboring region. That’s why spatial panel model fits our data better than the basic model.

Recommendations

Based from the results and findings of the study we therefore recommend the following:

1. To consider programs and policies that can mitigate unemployment not only on a specified region but also on its neighboring regions.
2. Neighboring regions, especially regional authorities like DOLE, should collaborate or cooperate with one another on how to mitigate unemployment.
3. Regions with a large population should specify on projects that can utilize the excess supply of labor.
4. To strengthen labor and employment policy reforms in the regional level.

Areas for Further Research

The analysis on this study is based on a spatial autoregressive panel model. The study can be further analyzed by using a different spatial model called spatial error panel model. The study also has limited explanatory variables, which the results would have been better if many
explanatory variables were included.

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