

Spatial Patterns of Economic Development, Inequality, & Poverty in the Philippines, 2000 and 2006

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I. Introduction

- **Tobler's First Law of Geography:**
Everything is related to everything else, but near things are more related than distant things...
- **It has that the rate of economic growth in a society and the degree of equality in the distribution of its income and wealth are not that independent**

I. Introduction

- **A core of long-term poverty especially in the rural areas**
- **The Philippines' lagging economy is a result of high income inequality brought about by urban-rural disparities in terms of social services and infrastructure**
- **Regions and provinces not in close proximity to the country's capital have been marginalized over the years.**

I. Introduction

■ Key Questions

- 1. Describe the spatial distribution of expenditure inequality, poverty rate and economic development by region, province and location**
- 2. Highlight and illustrate the relevance of spatial dependence of expenditure inequality, poverty and economic development**

I. Introduction

■ Key Questions

- 3. Explore alternative geographies such as analyzing at a more local level such as at the province level**

I. Introduction

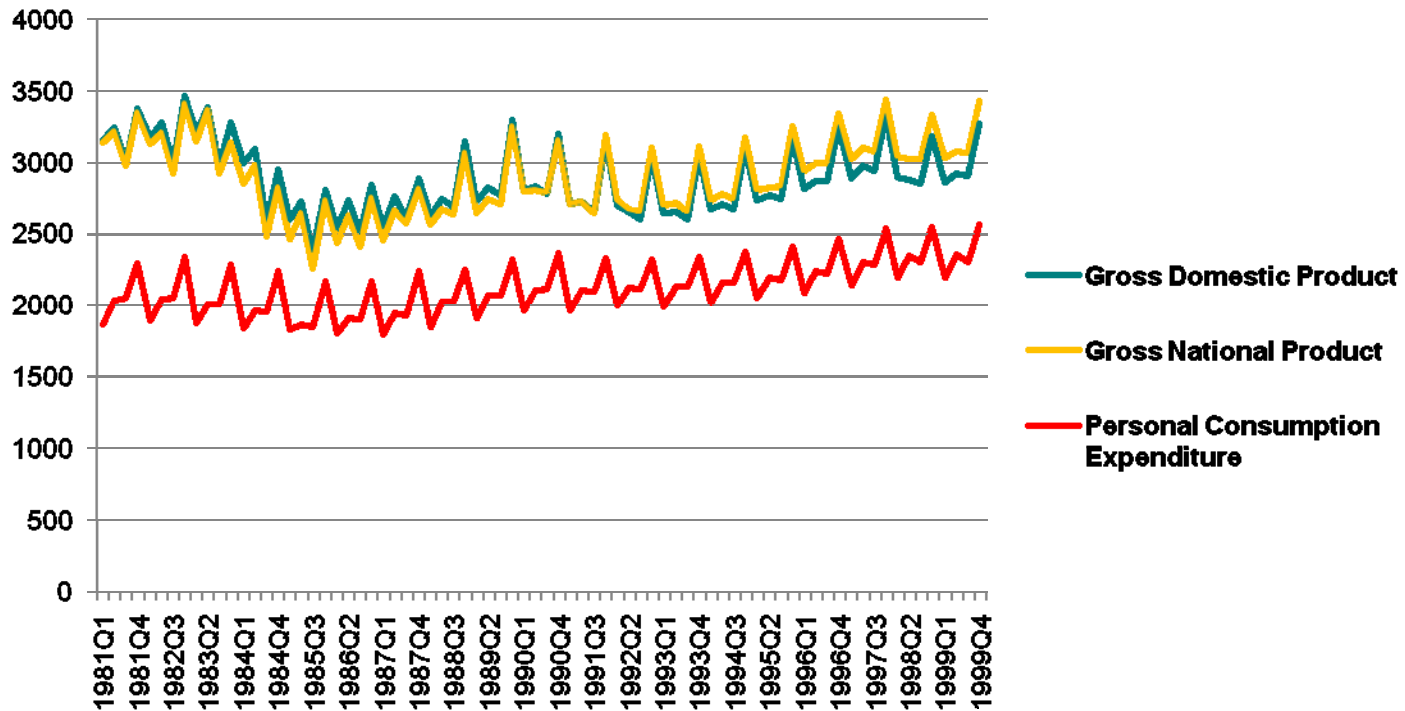
- **Estudillo (1997) analyzed income inequality from 1961 to 1991 among Philippine households and revealed that the stable high income inequality during the period was apparent in the urban locations.**
- **Balisacan and Fuwa (2004) found that spatial inequality accounts for a sizable but not an overwhelming portion of the national-level income inequality**

I. Introduction

- **Balisacan, Hill and Piza (2009) in their analysis of regional disparities in the Philippines found that there is a very strong spatial dimension in terms of the prevalence of poverty in the country and that regional and spatial development at present is highly characterized by export zones and where they are located.**

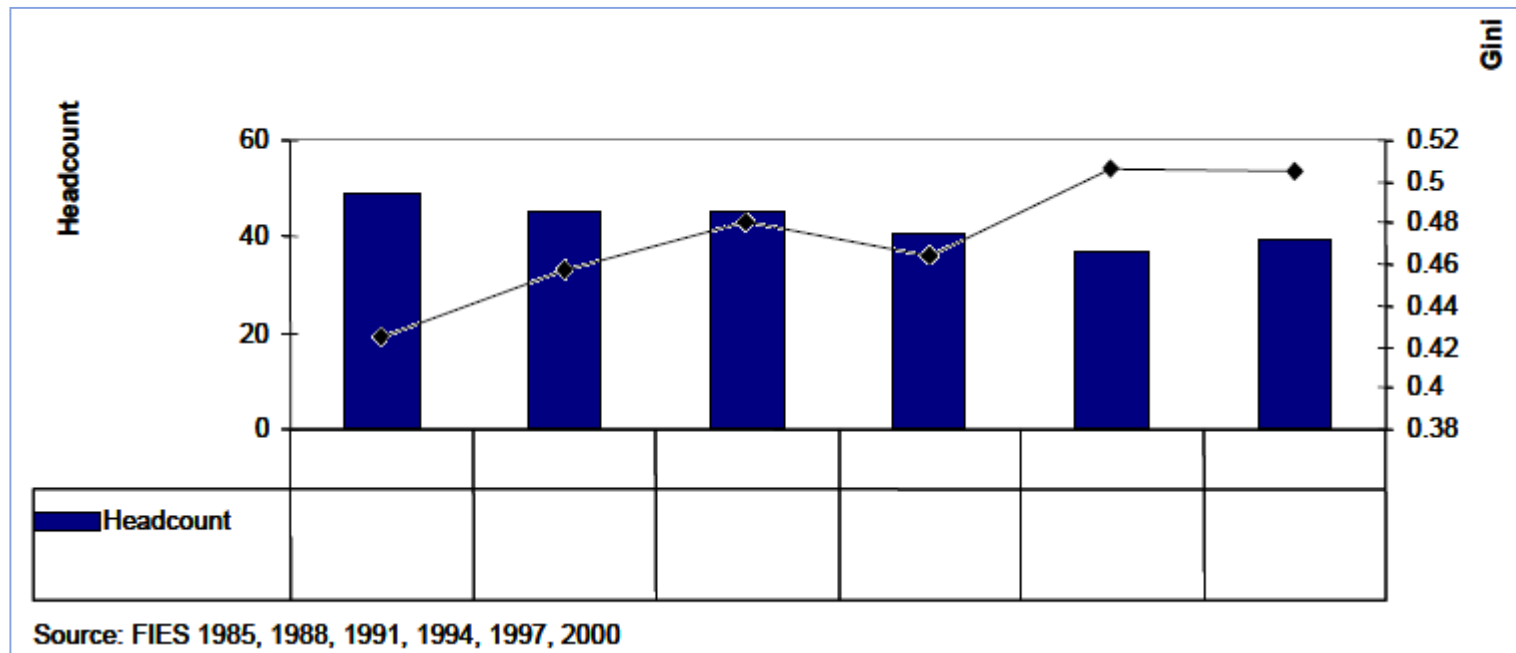
II. Economic Development, Inequality and Poverty in the Philippines: An Overview

Philippines: Per Capita: Gross Domestic Product, Gross National Product, and Personal Consumption Expenditure at Current Prices, Growth Rate, 1981–1999 (NSCB)



II. Economic Development, Inequality and Poverty in the Philippines: An Overview

Poverty & Income Distribution in the Philippines, 1985–2000



Cororaton, Caesar B. & Corong, Erwin & Cockburn, John, 2009. "Agricultural Price Distortions, Poverty and Inequality in the Philippines," Agricultural Distortions Working Paper 52790, World Bank.

IV. Methodology

- **Theil Decomposition Method as employed by Akita and Lukma (1999) by Region, Province and Location**
- **Poverty Decomposition: Focus only on Headcount Ratio by Region, Province and Location**
- **Exploratory Spatial Data Analysis (ESDA) similar to the study conducted by Celebioglu and Dall'erba (2009) using GEODA on growth, public investments, and log per capita GDP in Turkey (Province Level)**

IV. Methodology: The Dataset

■ Dataset

- Family Income and Expenditure Survey (FIES) of 2000 and 2006
- Done every three years
 - 1961, 1965, 1971 (published formats)
 - 1975 and 1979 (not published)
 - 1985 to 2006 (public-use format)
 - Sample size: almost 40,000
- Most studies use income data in measuring inequality in the Philippines. This study uses expenditure data
- 16 regions, 78 provinces, 4 districts for 2000
- 17 regions, 78 provinces, 4 districts for 2006

Philippines

Luzon

- Regions: National Capital Region, CAR, Ilocos, Cagayan Valley, Central Luzon, Calabarzon, Mimaropa, Bicol

Visayas

- Regions: Central Visayas, Western Visayas, Eastern Visayas

Mindanao

- Regions: Zamboanga Peninsula, Northern Mindanao, Davao, Soccksargen, ARMM, Caraga

Measures of Inequality

A. Group Decomposition

Let us define the following terms:

y_i = income of the i th household

n = number of households in the population

m = arithmetic mean income of the population

m^* = geometric mean income of the population

n_j = number of households belonging to the j th group

m_j = arithmetic mean income of the j th group,

m_j^* = geometric mean income of the j th group, and

F_i, F_{i-1} = cumulative income shares up to the i th and i th minus one household, respectively.

Measures of Inequality

- When the Theil's first measure called Theil T, the formula is as follows:

$$T = \frac{1}{n} \sum_i \frac{y_i}{m} \log \frac{y_i}{m}$$

- When (called Theil index L), which is the Theil's second measure or the mean logarithmic deviation, the formula is given by:

$$L = \frac{1}{n} \sum_i \log \frac{m}{y_i}$$

Measures of Inequality

- The decomposition equations for T, L, V when households are segregated into mutually exclusive and exhaustive group

$$T = \sum_j \left(\frac{n_j}{n} * \frac{m_j}{m} \right) T_j + \sum_j \left(\frac{n_j}{n} * \frac{m_j}{m} \right) \log \left(\frac{m_j}{m} \right)$$

$$L = \sum_j \left(\frac{n_j}{n} \right) L_j + \sum_j \left(\frac{n_j}{n} \right) \log \left(\frac{m}{m_j} \right)$$

Measures of Inequality

where T_j , L_j , and V_j are, respectively, the Theil indices (T and L) and the variance of log income corresponding to the j th household group. Now, if we define:

$$v_j = \frac{n_j}{n} \quad k_j = \frac{m_j}{m} \quad k_j^* = \frac{m_j^*}{m^*}$$

We can rewrite the equations:

$$T = \sum_j v_j k_j T_j + \sum_j v_j k_j \log k_j$$

$$L = \sum_j v_j L_j - \sum_j v_j \log k_j$$

Measures of Poverty

- Poverty incidence (recognized in this study as headcount ratio) is defined as the proportion of the population whose expenditure is below the poverty threshold or the poverty line set by the NSCB. This is the Foster-Greer-Thorbecke measure of poverty when $\alpha = 0$, also known as P_0 .

$$FGT(\alpha) = \frac{1}{N} \sum_{y < z} \left(\frac{z - y}{z} \right)^\alpha$$

Measure of Spatial Dependence

- Analysis begins with the descriptive statistics and a basic provincial map of each variable. Then, global spatial autocorrelation (Moran's I) is calculated according to k-nearest neighbors contiguity matrix.
- The precise definition of Moran's I is given below for a specific variable at location i .

$$I = \frac{n \sum_i \sum_j w_{ij} (y_i - \bar{y})(y_j - \bar{y})}{\sum_i \sum_j w_{ij} \sum_i (y_i - \bar{y})^2}$$

Note: Moran's I varies between -1.0 and + 1.0. The higher the value, the higher the degree of positive spatial autocorrelation. Negative values indicate degree of negative spatial autocorrelation (Moran 1950)

Measures of Spatial Dependence

- To verify the deviation from complete spatial randomness of the poverty, inequality, and mean per capita household expenditure points, a local cluster analysis is conducted.

Another index, Local Indicators of Spatial Association (LISA), can be employed to further examine at a more localized scale the difference of each location in terms of spatial autocorrelation. The indicator for each location is given as follows:

$$I_i = \frac{\sum_j W_{ij}(z_i - \bar{z})(z_j - \bar{z})}{\sum_i (z_i - \bar{z})^2}$$

V. Patterns of Expenditure Inequality & Poverty, by Region

Ranking of Each Region - Mean Per Capita Household Expenditure

Region	2000			2006		
	Rural	Urban	All	Rural	Urban	All
NCR		1	1		1	1
CAR	5	3	4	5	2	4
Ilocos Region	3	8	6	3	11	5
Cagayan Valley	4	5	7	4	7	6
Central Luzon	1	6	3	1	4	3
Southern Luzon	2	2	2			
Calabarzon				2	3	2
Mimaropa				12	15	13
Bicol Region	7	9	11	10	6	11
Western Visayas	6	4	5	6	5	8
Central Visayas	10	11	9	14	8	7
Eastern Visayas	13	10	12	8	10	12
Zamboanga Peninsula	14	13	15	15	12	16
Northern Mindanao	12	12	10	9	13	10
Davao Region	8	7	8	7	9	9
Soccksargen	9	14	13	13	14	14
ARMM	15	16	16	16	17	17
Caraga	11	15	14	11	16	15

Inequality Decomposition by Location

Location	Theil L		Theil T		Gini	
	<i>2000</i>	<i>2006</i>	<i>2000</i>	<i>2006</i>	<i>2000</i>	<i>2006</i>
Urban	0.340	0.308	0.404	0.343	0.447	0.427
(% share)	(45.9)	(44.0)	(63.4)	(59.5)		
Rural	0.235	0.244	0.270	0.281	0.379	0.387
(% share)	(32.4)	(35.4)	(19.3)	(23.1)		
All	0.366	0.347	0.438	0.391	0.466	0.455
W-location	0.287	0.276	0.362	0.323		
(% share)	(78.3)	(79.5)	(82.7)	(82.6)		
B-location	0.080	0.071	0.076	0.068		
(% share)	(21.7)	(20.5)	(17.3)	(17.4)		

Poverty Incidence (Headcount Ratio) in the Philippines by Region and Location, 2000 and 2006

Region	2000						2006					
	All	Rank	Urban	Rank	Rural	Rank	All	Rank	Urban	Rank	Rural	Rank
NCR	0.084	16	0.084	16			0.066	17	0.066	17		
CAR	0.361	10	0.383	12	0.360	9	0.322	9	0.355	10	0.308	9
Ilocos Region	0.358	11	0.347	13	0.361	8	0.247	13	0.274	14	0.233	13
Cagayan Valley	0.310	13	0.420	9	0.275	13	0.210	14	0.305	12	0.187	14
Central Luzon	0.214	15	0.257	14	0.183	15	0.145	16	0.172	15	0.110	16
Southern Luzon	0.231	14	0.250	15	0.224	14						
CALABARZON							0.149	15	0.167	16	0.137	15
MIMAROPA							0.420	4	0.481	5	0.405	4
Bicol	0.493	3	0.608	2	0.464	3	0.417	5	0.532	4	0.369	6
Western Visayas	0.387	7	0.389	10	0.386	7	0.298	11	0.289	13	0.299	10
Central Visayas	0.384	8	0.453	6	0.350	10	0.277	12	0.344	11	0.259	12
Eastern Visayas	0.426	6	0.447	7	0.421	5	0.386	6	0.426	8	0.379	5
Zamboanga Peninsula	0.435	5	0.547	4	0.406	6	0.457	2	0.556	2	0.439	2
Northern Mindanao	0.373	9	0.439	8	0.344	11	0.376	7	0.437	7	0.357	7
Davao	0.332	12	0.387	11	0.311	12	0.309	10	0.400	9	0.280	11
SOCCSKSARGEN	0.494	2	0.549	3	0.481	2	0.374	8	0.469	6	0.329	8
CARAGA	0.687	1	0.712	1	0.684	1	0.610	1	0.696	1	0.581	1
ARMM	0.449	4	0.527	5	0.424	4	0.454	3	0.551	3	0.423	3

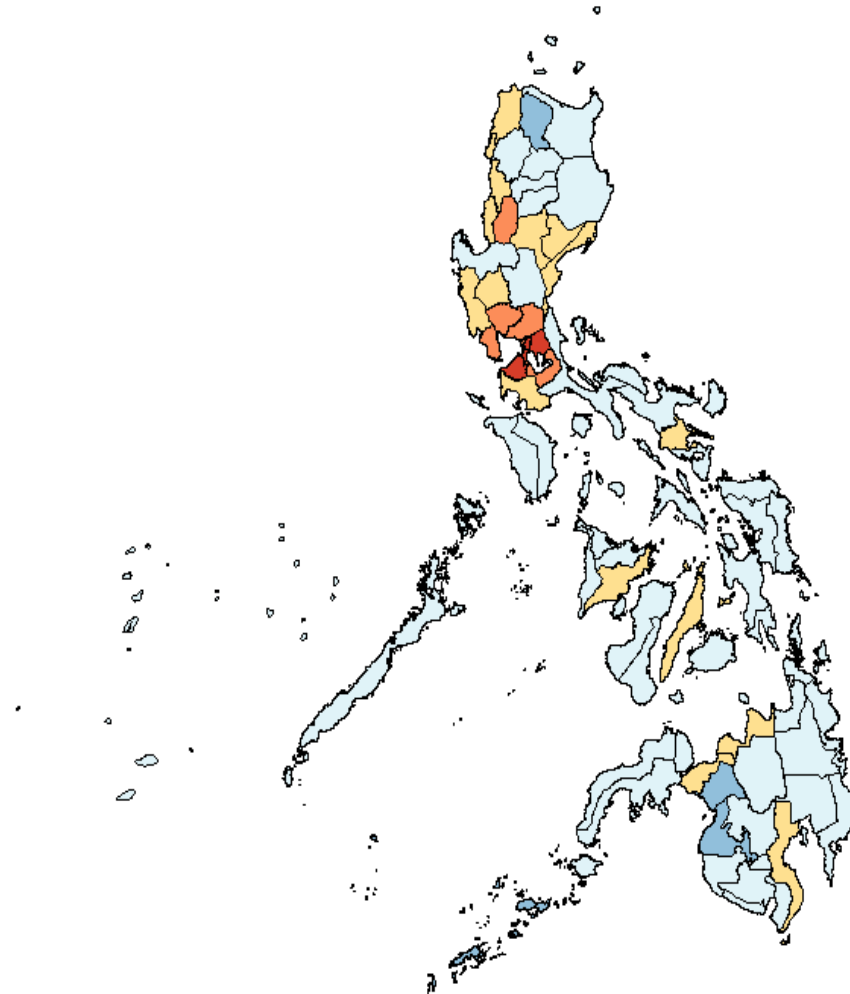
VI. Patterns of Expenditure Inequality and Poverty, by Province

Highlights of Provincial Expenditure Levels

- ❑ **NCR-4th district, the country's main business district, had the country's highest mean per capita urban household expenditure as expected**
- ❑ **Most of the provinces in Mindanao registered smaller-than-average mean per capita expenditure by urban households throughout the 2000–06 period**
- ❑ **Presence of a highly urbanized city in a province registered those provinces with the highest level in their respective regions (i.e. Davao del Sur, Benguet, and Cebu)**
- ❑ **Pampanga moving from 34th to 8th rank overall in MPCE**
- ❑ **Outliers such as Tawi-Tawi (very low) and Batanes (very high) register “interesting levels” of MPCE**

Map of Mean Per Capita Household Expenditure

- Standard Deviation
- Map of Overall Mean Per Capita Household Expenditure



Decomposition of Expenditure Inequality by Province

Highlights:

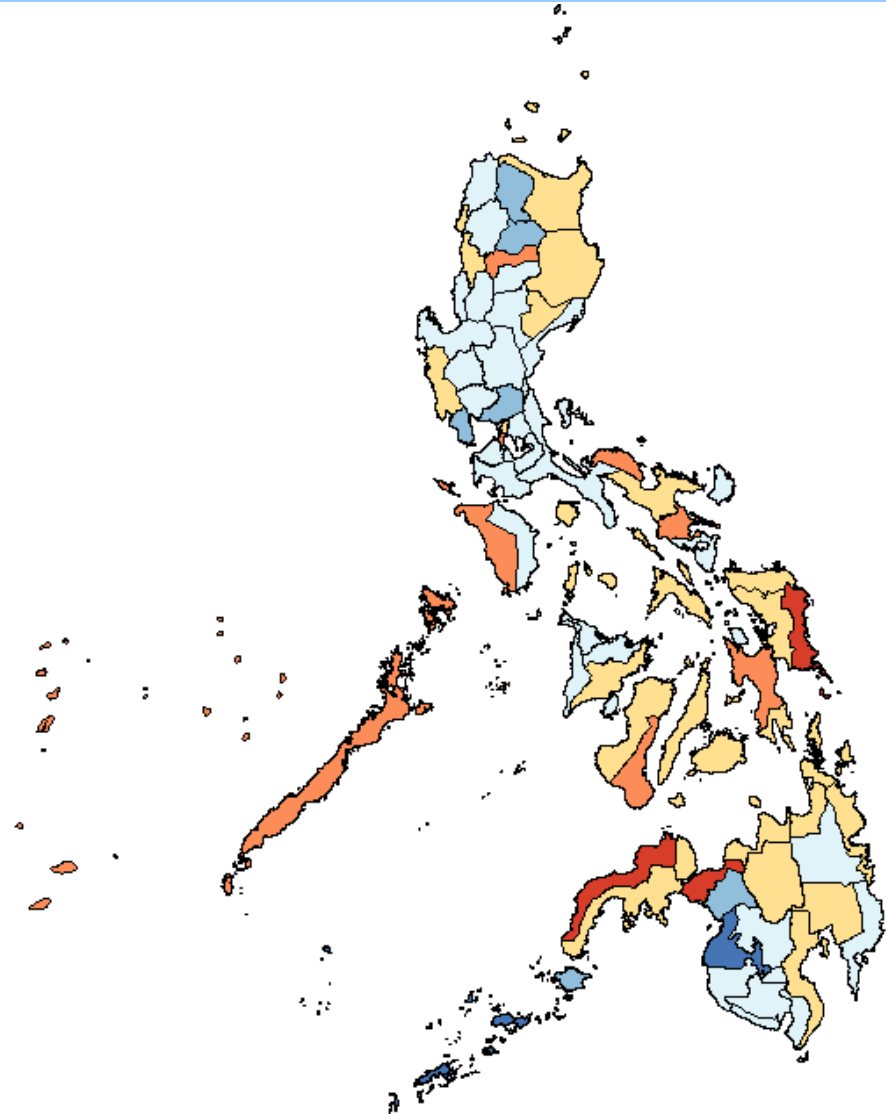
- ❑ Inequality rose in 46 of the 81 provinces between 2000 and 2006
- ❑ Most of the provinces which registered high inequality in 2000 declined or increased at a slower pace by 2006 (Catanduanes, NCR – 4th district, Zamboanga del Norte, Rizal, and Romblon)
- ❑ Provinces which registered the lowest inequality in 2000 such as Sulu, Lanao del Sur, Apayao and Pampanga had increased their inequality in 2006

Highlights... continued

- ❑ A very small positive relation existed between rural mean per capita household expenditures and rural inequalities in Philippines' provinces in 2000 and 2006. In particular, a simple correlation coefficient of 0.06 was found for 2006
- ❑ Urban inequality is consistently relatively high in the provinces of NCR-4th district, Zamboanga del Norte, Occidental Mindoro, Romblon, Masbate, Antique, Lanao del Norte and Iloilo, and consistently relatively low in the ARMM provinces such as Tawi-Tawi, Sulu, Basilan and Lanao del Sur

Map of Inequality

Standard
Deviation Map of
Theil T (All)

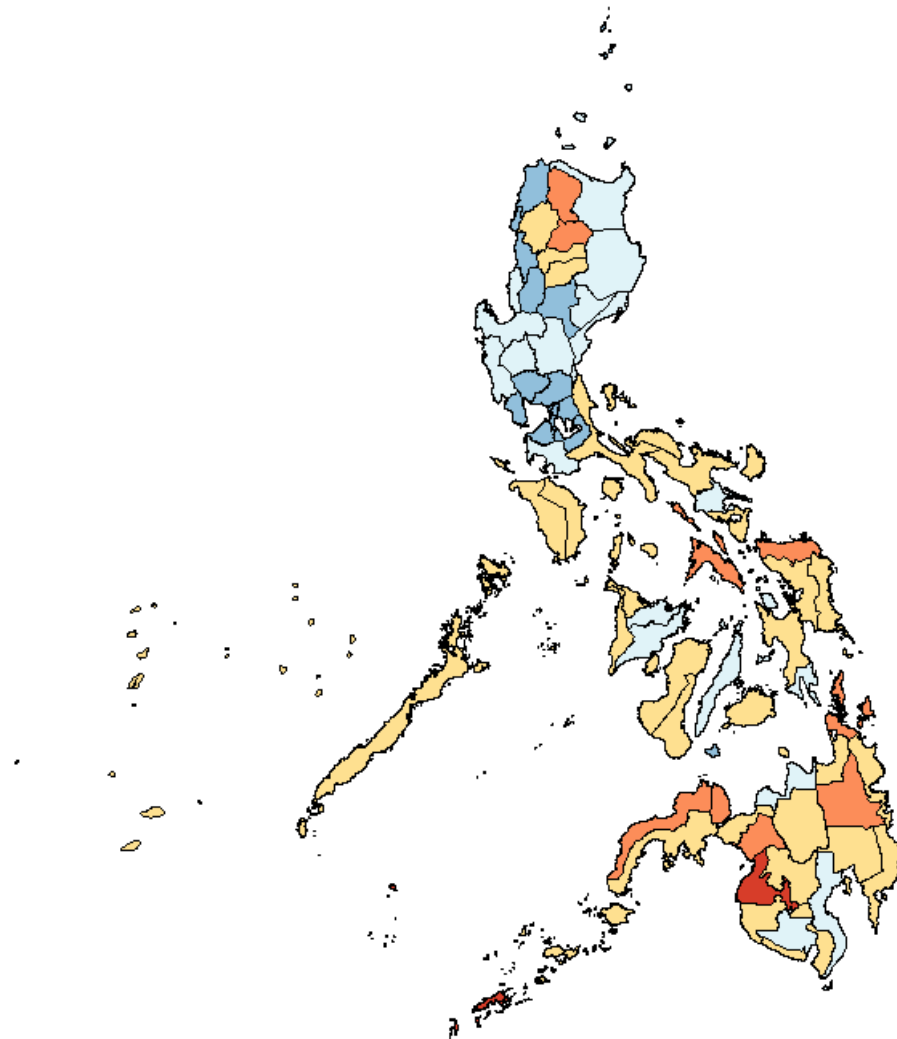


Patterns of Poverty, by Province

- ❑ **Poverty is most widespread in Mindanao**
- ❑ **8 of the top 15 provinces in terms of poverty incidence are from Mindanao**
- ❑ **Upland provinces in the island of Luzon such as Abra, Mountain Province and Kalinga Apayao also ranked high**
- ❑ **Provinces where the poverty rates are the lowest are near large urban centers (Rizal, Davao del Sur, Cebu, Benguet and districts in NCR)**

Map of Poverty Incidence

- **Standard Deviation**
Map of Poverty
Incidence



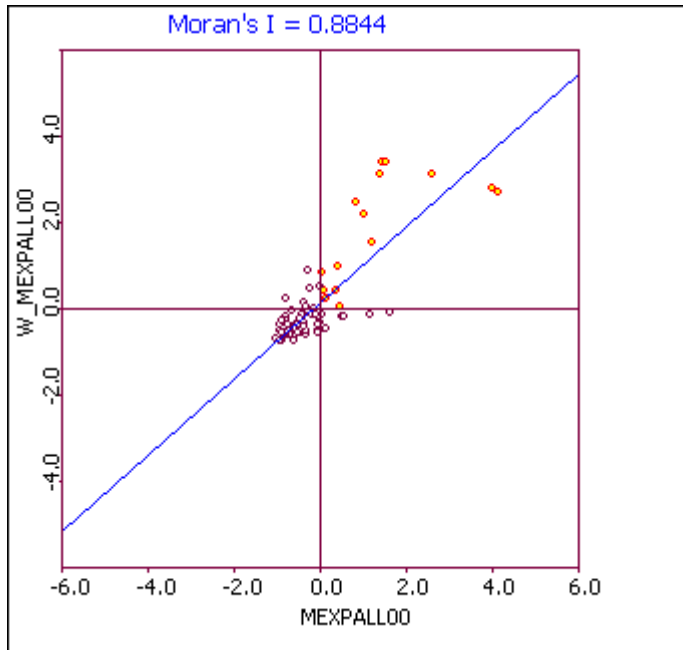
VI. ESDA of Economic Development, Expenditure Inequality & Poverty Across Provinces

Moran's I Statistics of Economic Development, Poverty and Inequality: By Province and Location

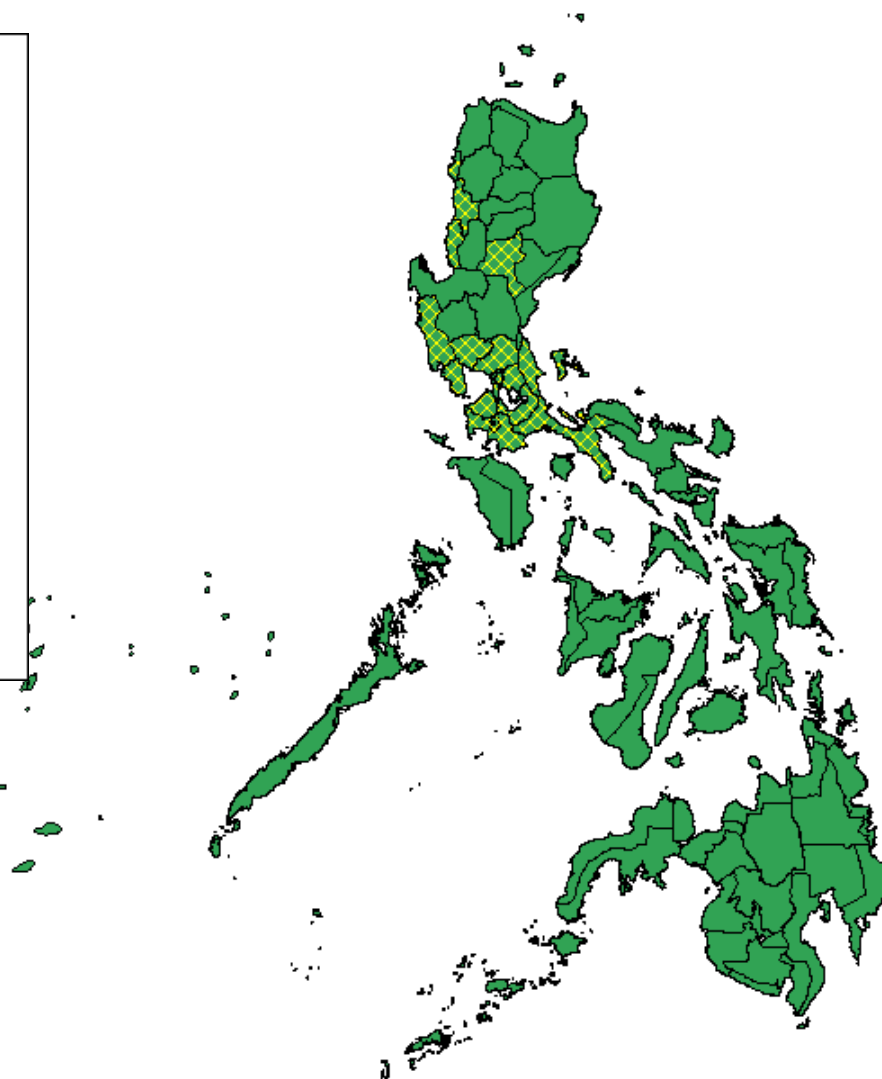
Indicator	2000			2006		
	Rural	Urban	All	Rural	Urban	All
Theil T	0.0087	0.2956	0.2336	0.2179	0.0956	0.1002
Gini	0.0521	0.2847	0.2181	0.2469	0.1345	0.2003
Mean PC Expenditure	0.5893	0.7142	0.8844	0.4736	0.6495	0.8679
Headcount Ratio	0.3492	0.4428	0.5462	0.3375	0.6115	0.4916

2000 – MPCE

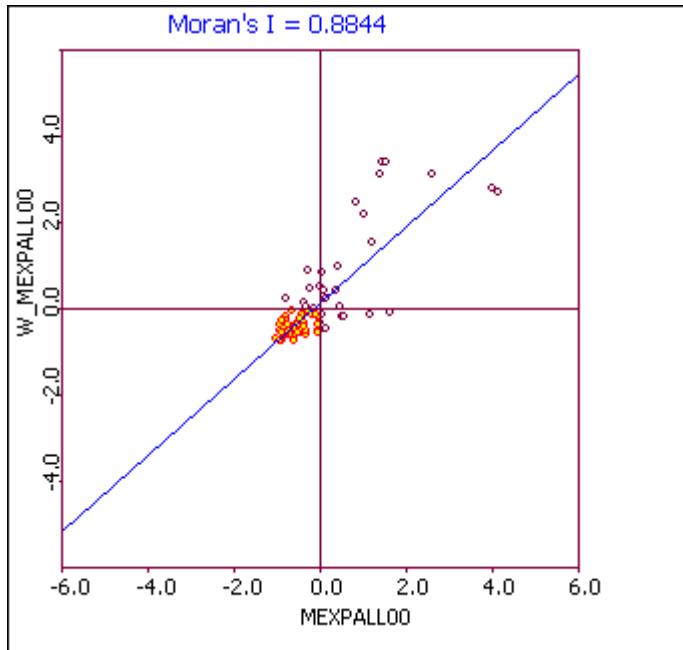
HH Neighboring Provinces



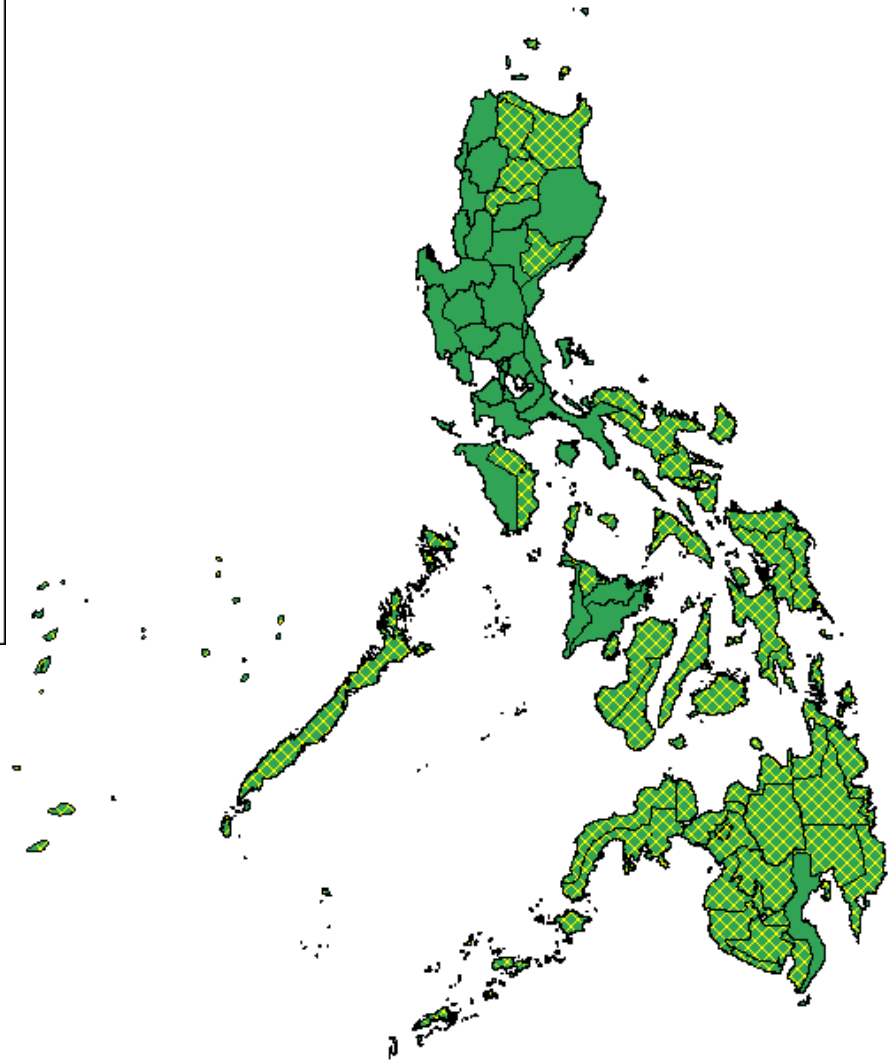
16 Provinces



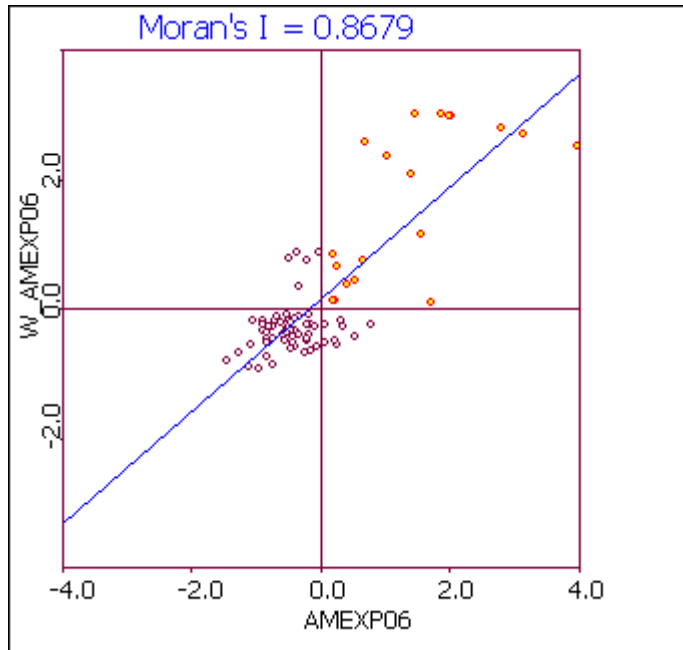
2000 – MPCE LL Neighboring Provinces



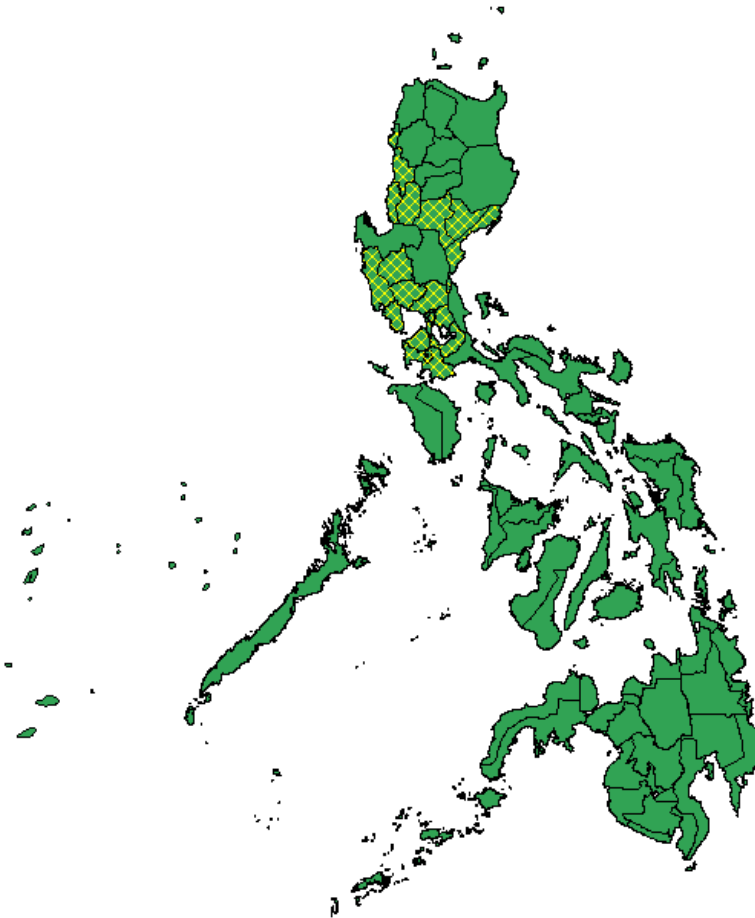
51 Provinces



2006 MPCE-HH Neighbouring Provinces

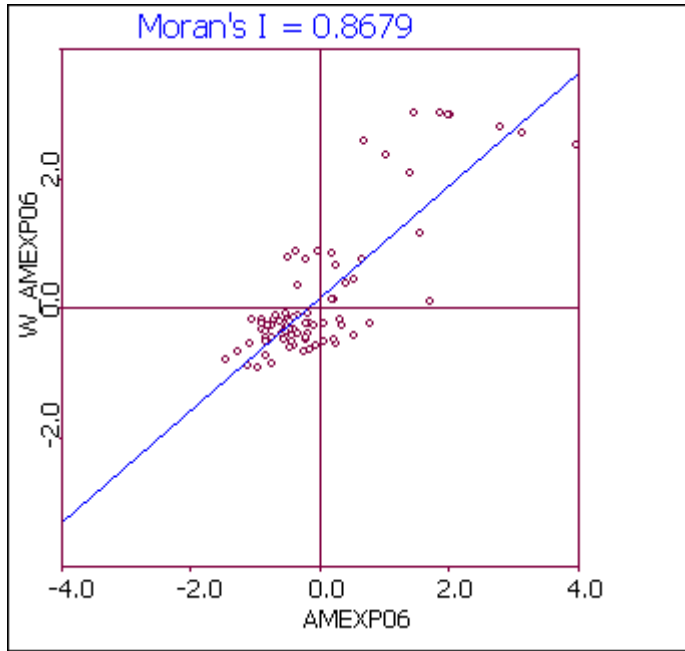


19 Provinces

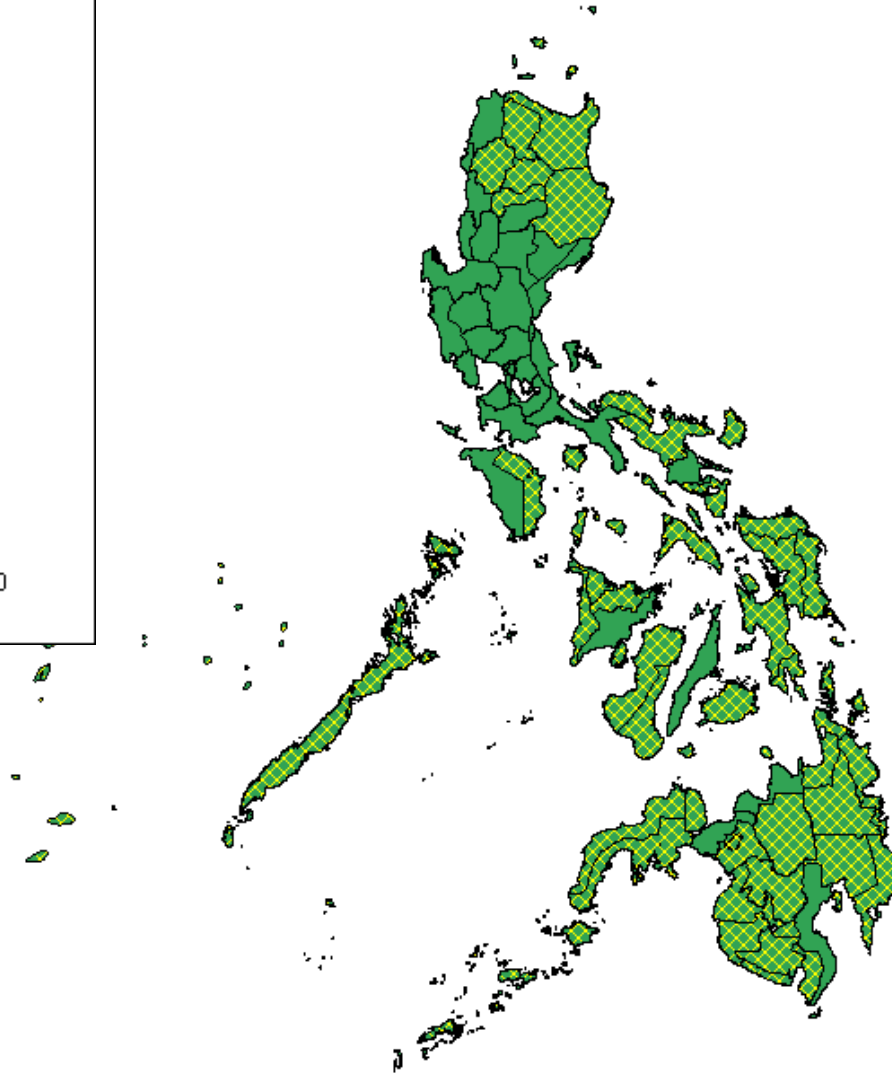


2006 MPCE - LL

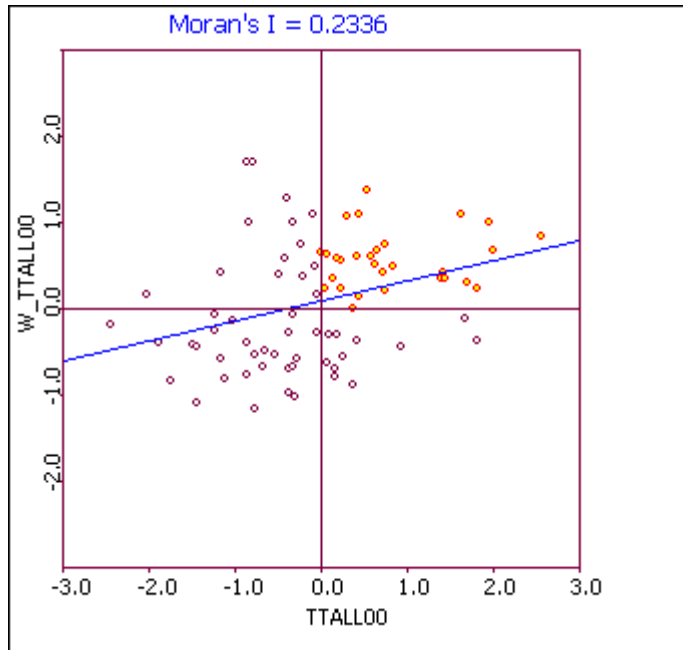
Neighboring Provinces



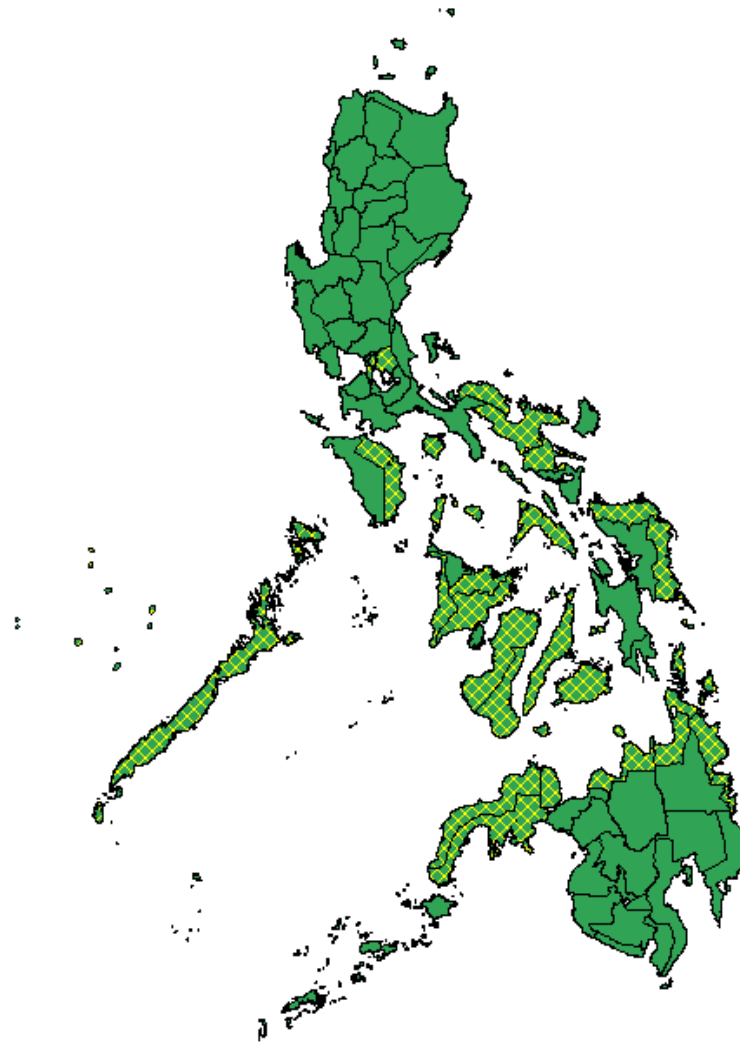
49 provinces



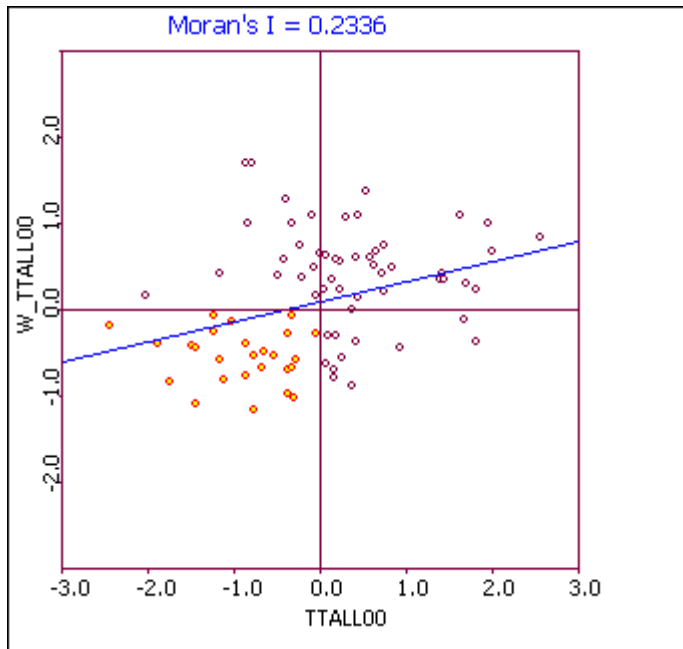
2000 – Theil T HH Neighboring Provinces



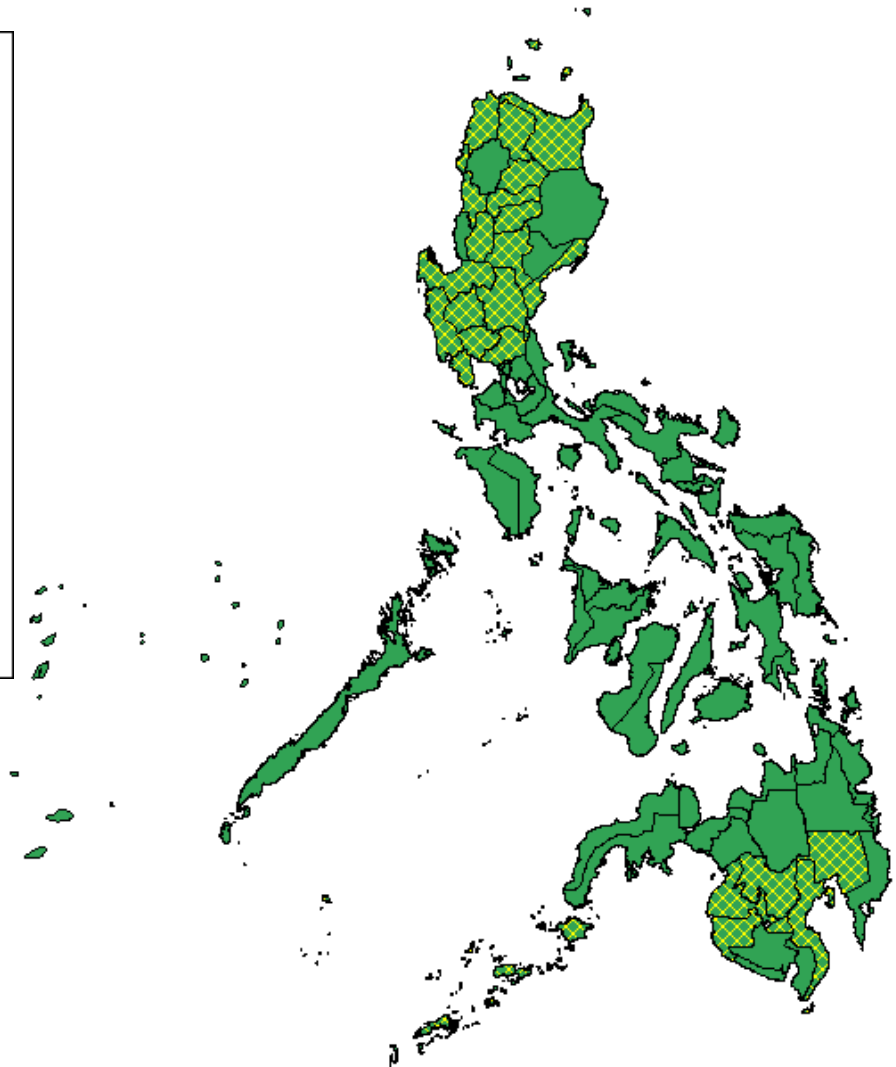
31 Provinces



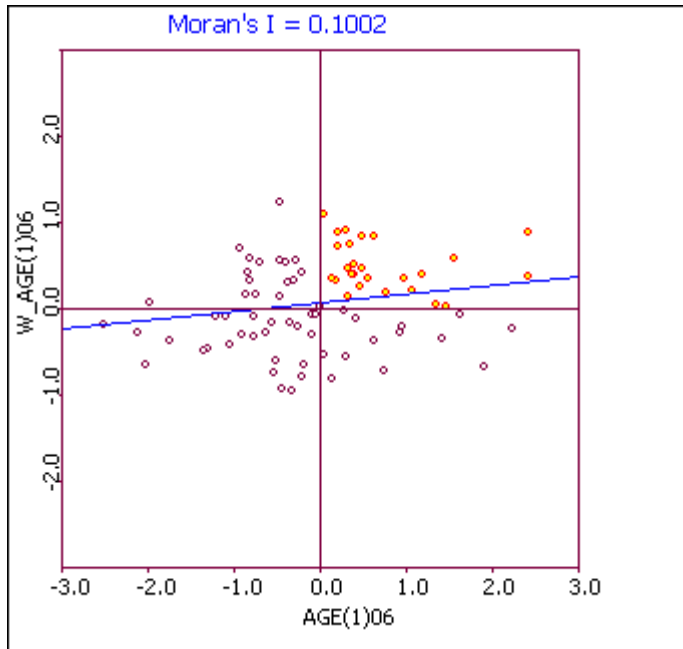
2000 – Theil T LL Neighboring Provinces



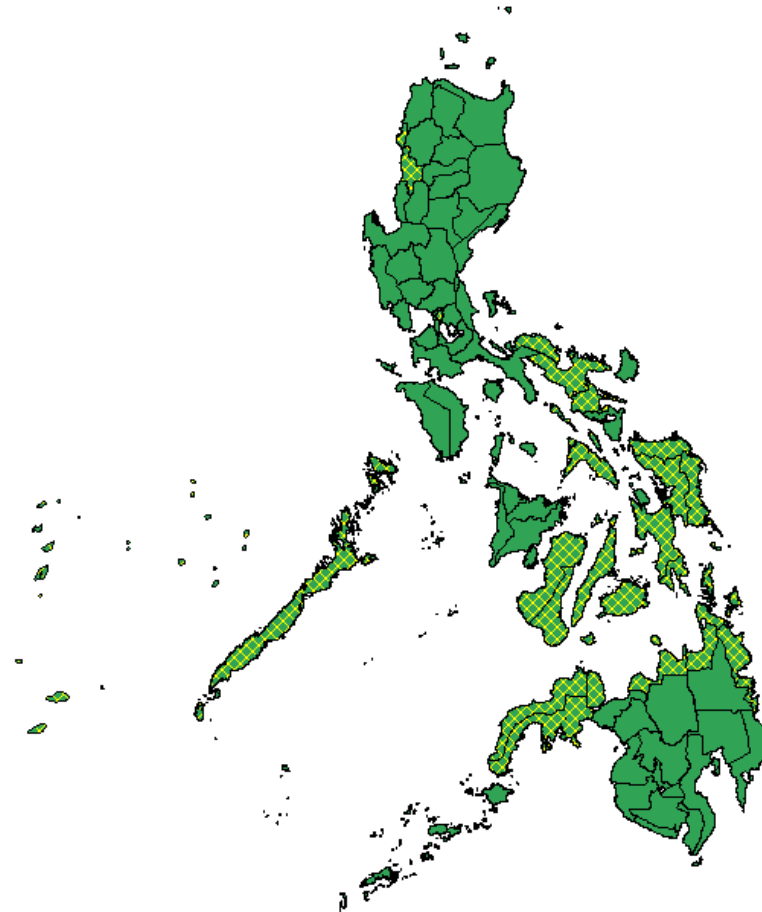
26 Provinces



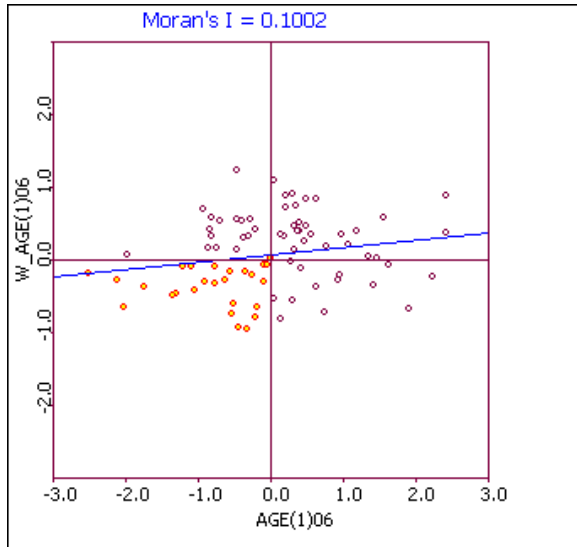
2006 Theil T - HH Neighboring Provinces



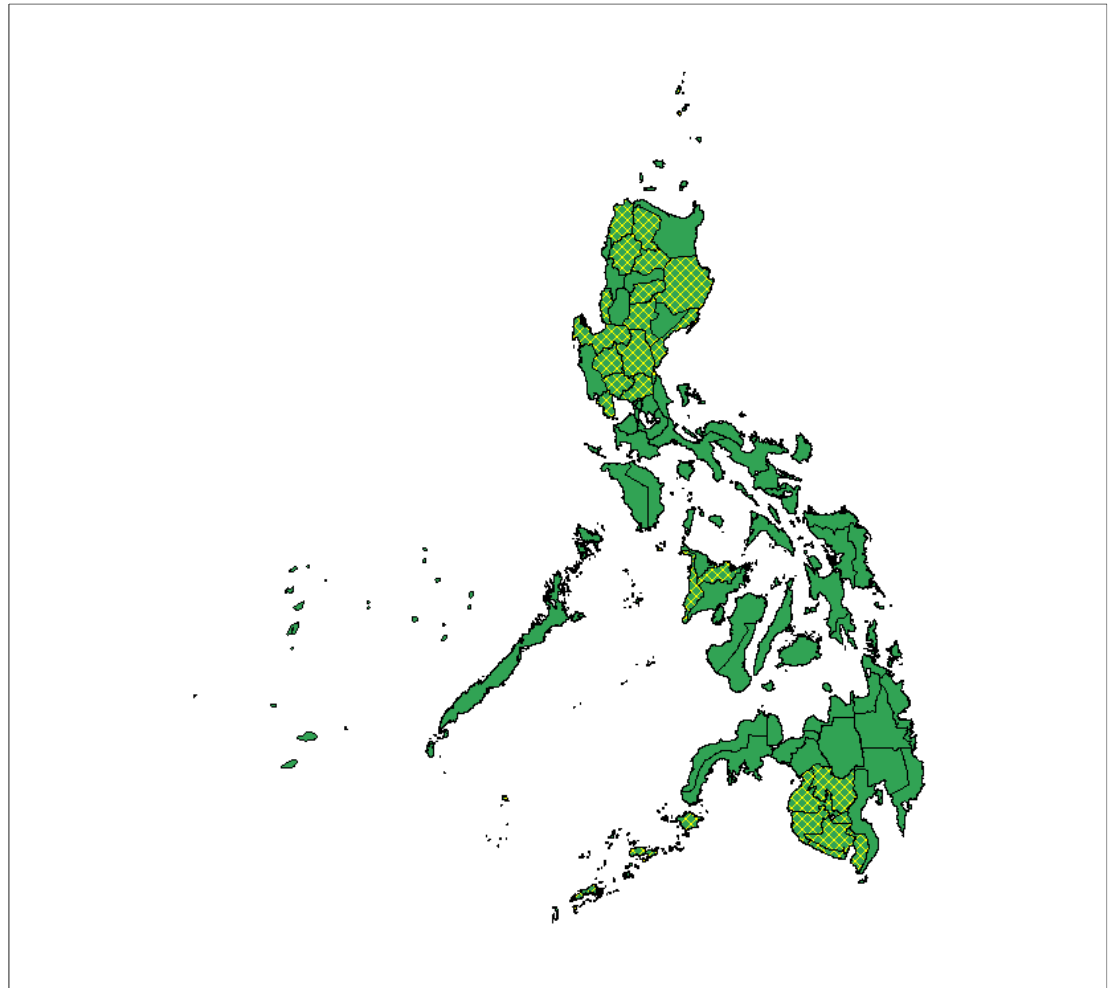
26 Provinces



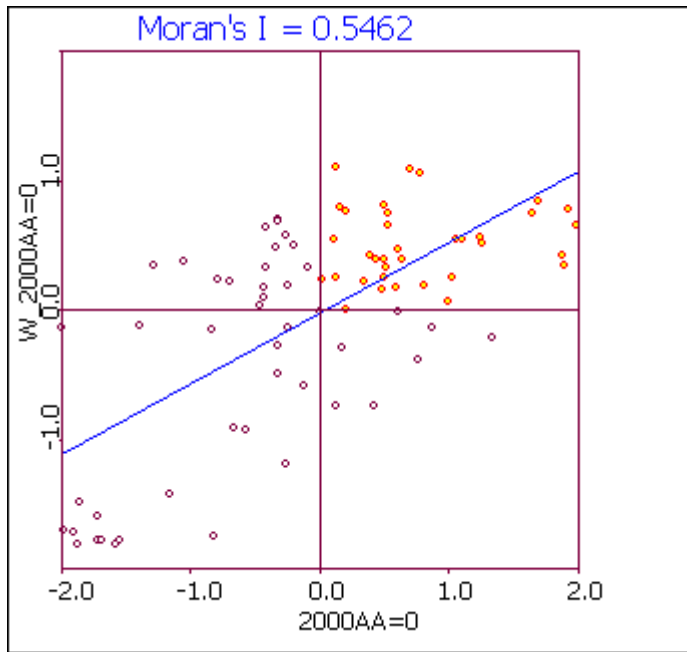
2006 Theil T - LL Neighboring Provinces



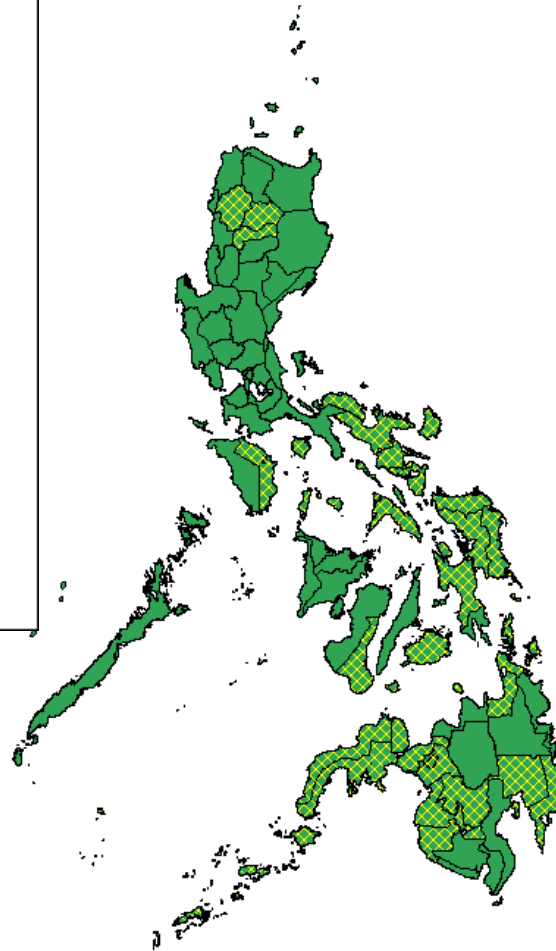
25 Provinces



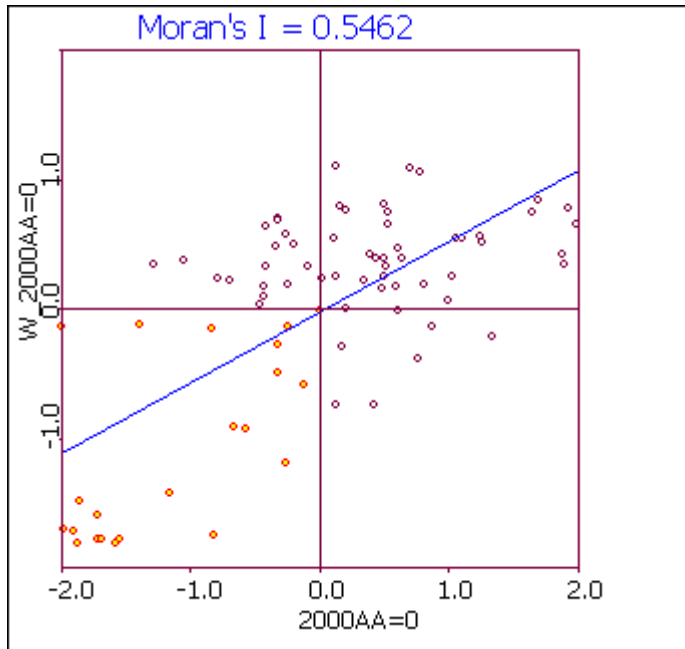
2000 HCR – HH Neighboring Provinces



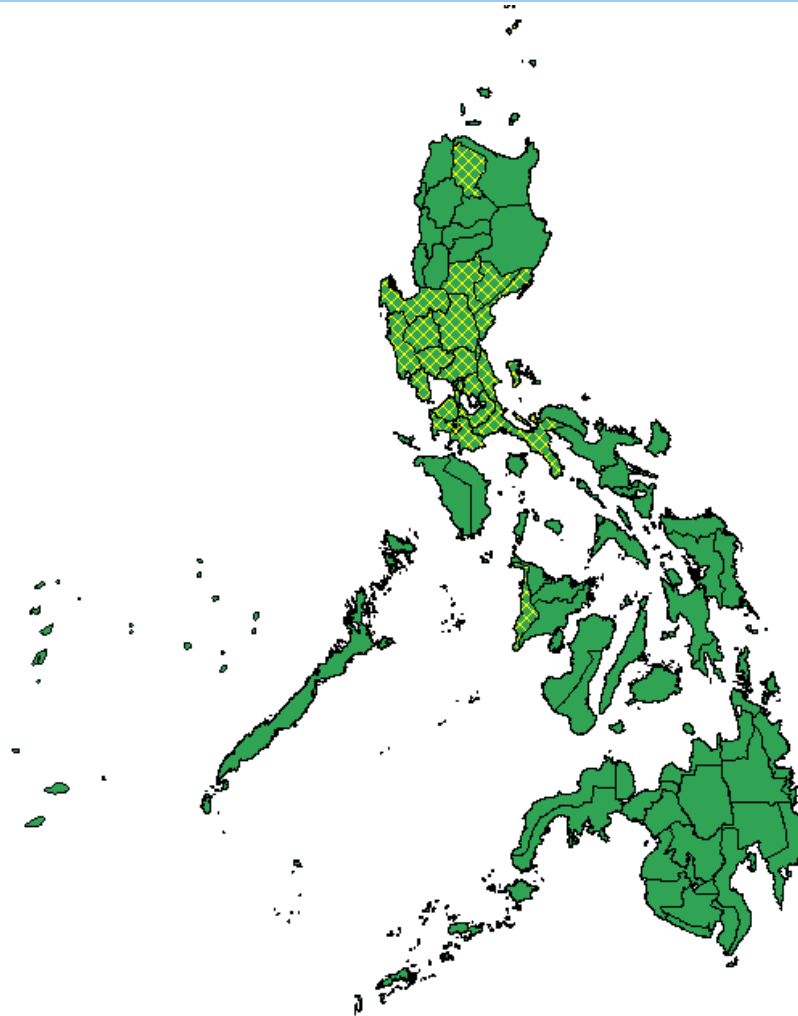
36 Provinces



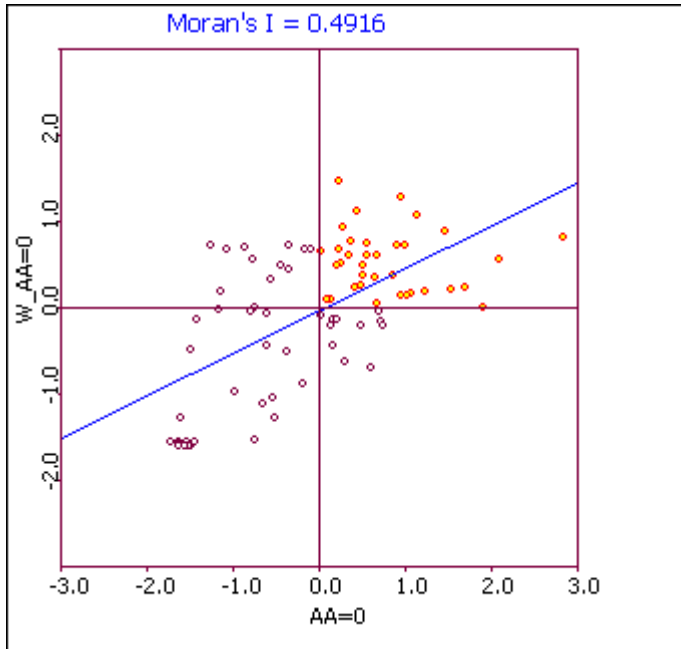
2000 HCR – LL Neighboring Provinces



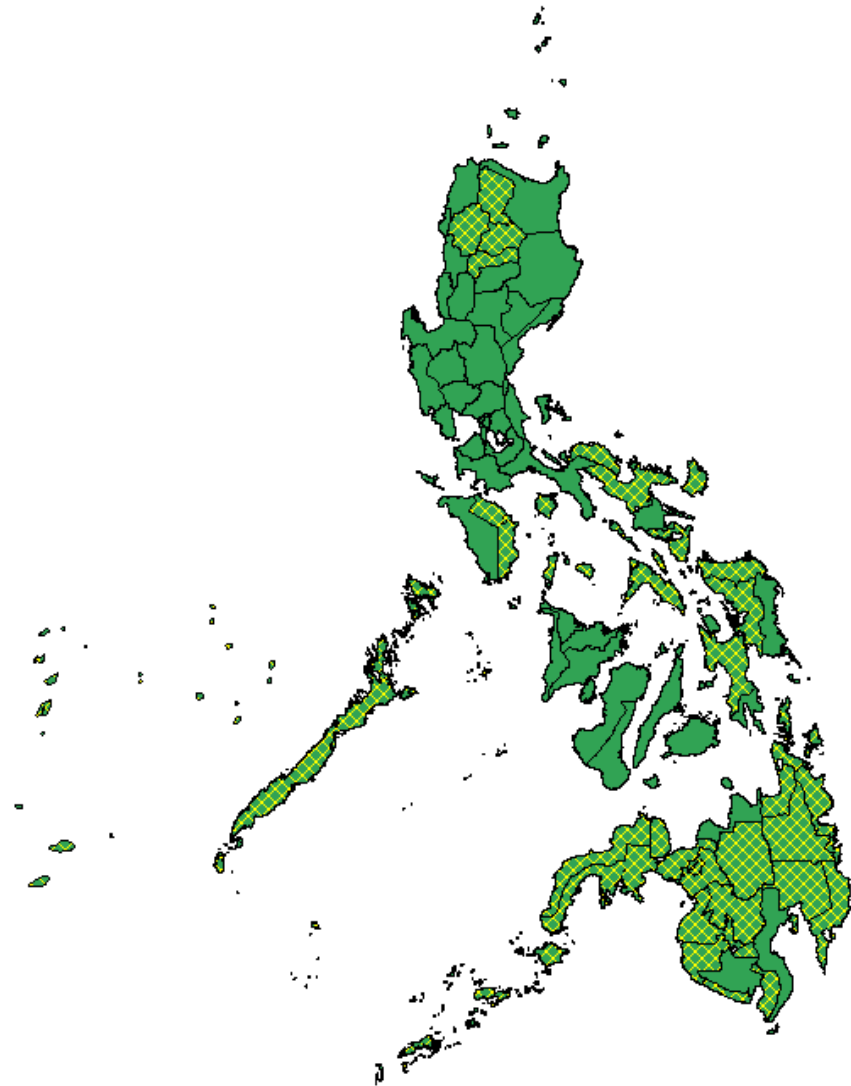
22 Provinces



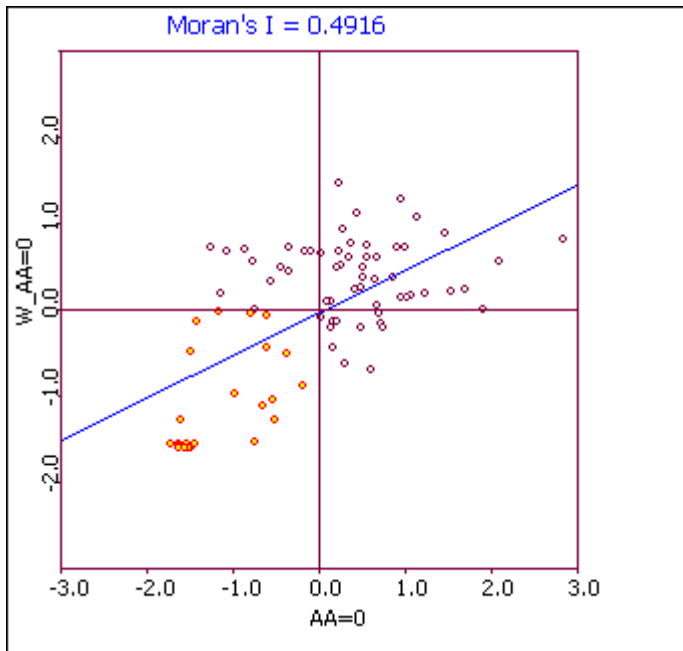
2006 HCR - HH Neighboring Provinces



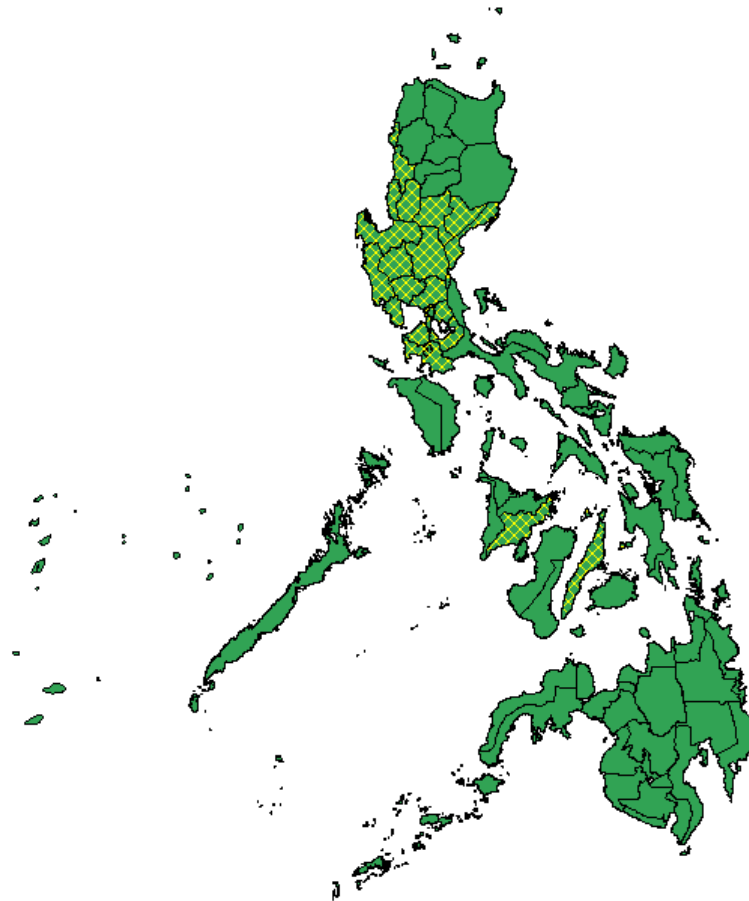
35 Provinces



2006 HCR – LL Provinces



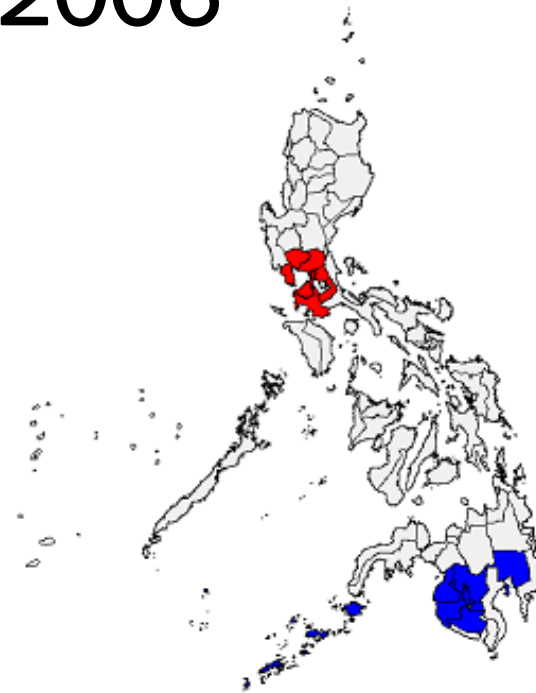
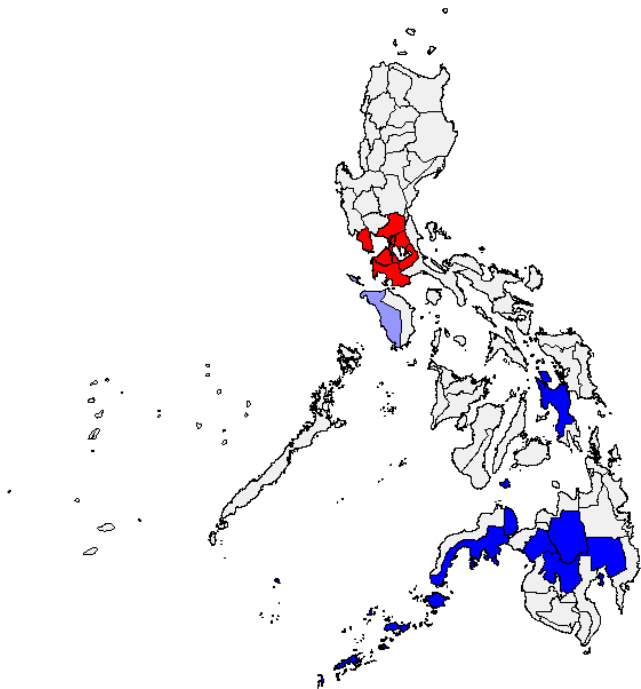
23 Provinces



Mean Per Capita Household Expenditure (LISA Maps)

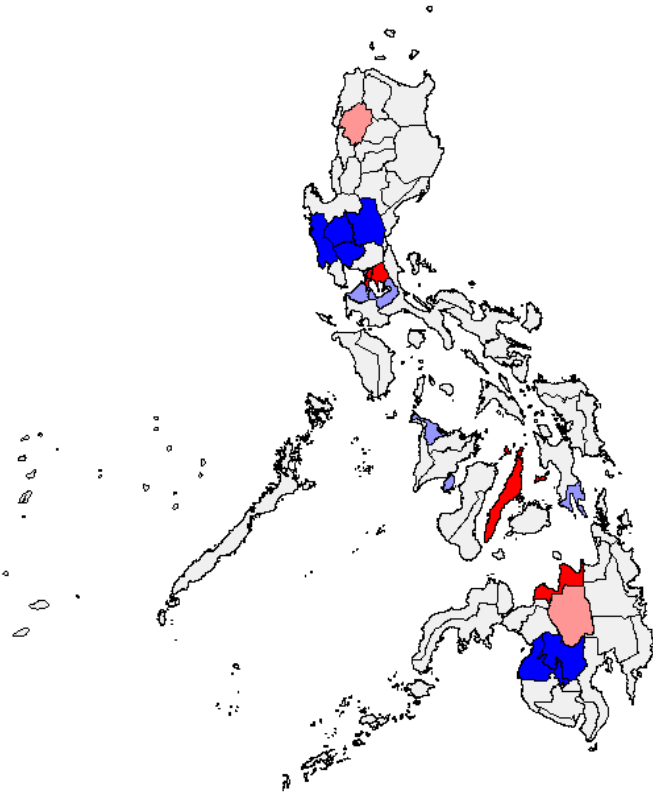
2000

2006

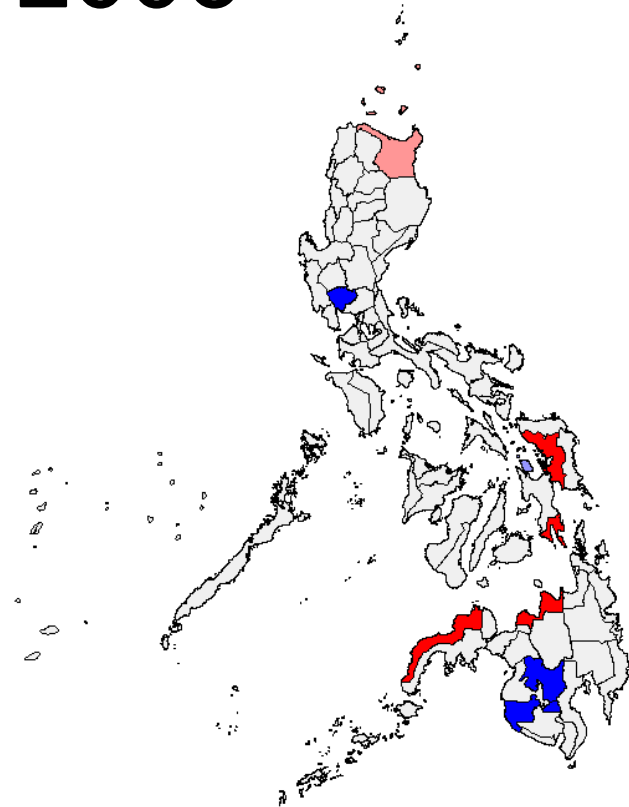


Provincial Inequality, based on Theil T (LISA Maps)

2000

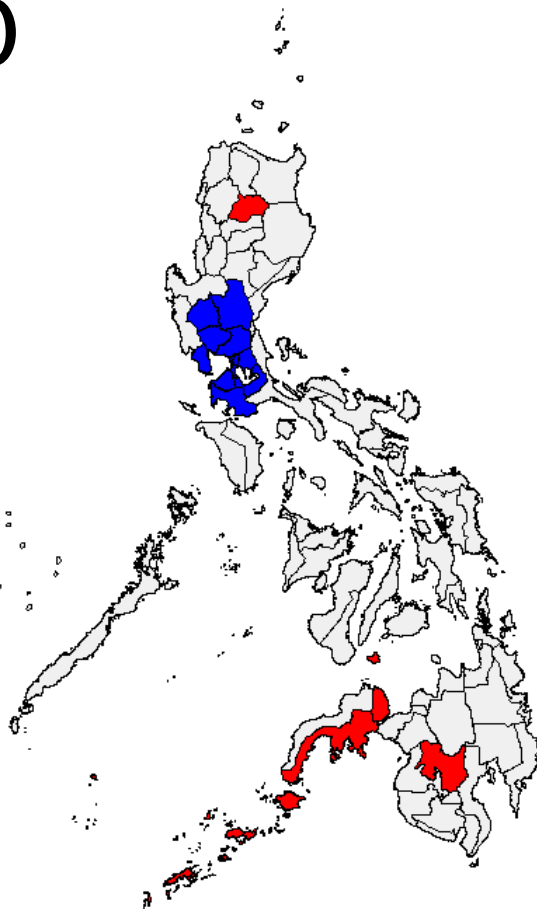


2006

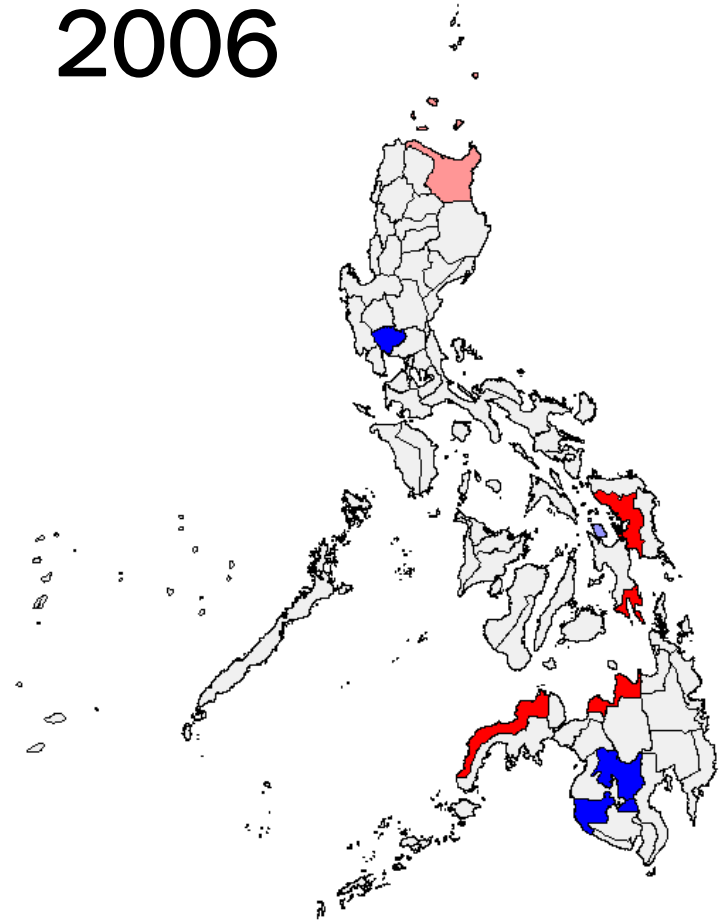


Provincial Poverty Incidence (Headcount Ratio) (LISA Maps)

2000



2006



VIII. Conclusions & Policy Recommendations

- ❑ **Proximity to the capital region has implications on economic development, inequality, and poverty**
- ❑ **Despite an average 5% growth rate in GDP, the expenditure inequality remained quite stable during the period between 2000 and 2006.**

VIII. Conclusions & Policy Recommendations

- **There were minor reductions in poverty incidence as well.**
- **As of 2006, the mean per capita expenditure of the highest (NCR) is approximately four times than the lowest (ARMM) of the 17 regions.**
- **ESDA results show that neighboring provinces affect their nearby neighbours (spatial dependence).**

VIII. Conclusions & Policy Considerations

- ❑ **Recognizing that rural sector is increasingly a major component of overall inequality and that poverty is relatively high in these locations, policies must focus on rural development.**
- ❑ **Spatial regression on the interaction between provinces in terms of environment, culture, migration, employment, and trade could further shed light as to how geography is a critical component in addressing growth, inequality and poverty problems in the country.**

Thank You