Inequality within Philippine Provinces: Determinants and Validity of the Kuznets Curve

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Abstract

Several studies evaluating the determinants of growth and poverty have been conducted, but there is limited literature on inequality determinants, in particular inequality of income distribution within Philippine provinces. Using a five-year panel data of 73 provinces, this study tests the validity of the Kuznets curve and evaluates the determinants of intraprovince inequality using Gini coefficient. The results show that the inverted U-shaped Kuznets curve is observed and that human and physical capitals are significant in decreasing both income and consumption inequality. There is lower inequality among agricultural households compared to non-agricultural households. However, agricultural households have lower average income. Policy interventions should prioritize human capital investment, address the poor income performance of agricultural households, and focus on more pro-poor growth policies.

Keywords: expenditure inequality; fixed effects; Gini coefficient; human capital; income inequality; physical capital

Acronyms:

ADB – Asian Development Bank
APIS – Annual Poverty Indicator Survey
CPH – Census of Population and Housing
FIES – Family Income and Expenditure Survey
GDP – gross domestic product
NSO – National Statistics Office
PhP – Philippine peso

Introduction

The Philippines, at the national level, had experienced a slight decrease in inequality, along with increase in total family income from 1997 to 2009 (Figure 1). However, the improvement in national-level inequality is not satisfactory. The share in total family income of the richest 10% is more than 17 times that of the share of the poorest 10% in 2009 and the richest 20% consistently commanding more than 50% of the total family income (Table 1).

Moreover, intraprovincial inequality remains to be a problem. Provincial-level income Gini, a measure of inequality, ranged from Sulu's 0.227 to Catanduanes's 0.557 in 2009, and 30 out of 78 provinces experienced an increase in Gini from 1997 to 2009 (Figure 2).

This persistent inequality is not just problematic from the perspective of fairness. High and persistent levels of inequality can also dampen the positive impacts of economic expansion (ADB, 2009) or cause a feedback loop that leads to worsening economic outcomes over time (Altman, 2008). Given the adverse effects of inequality, it is important to give attention to studying the determinants of inequality.

Inequality research has lagged behind growth research, and most of the inequality researches focused on the relationship between growth and inequality and not on the determinants of inequality itself (Hopkins, 2004). Existing studies on inequality determinants are either focused on cross-country studies or interregional or interprovincial differences.

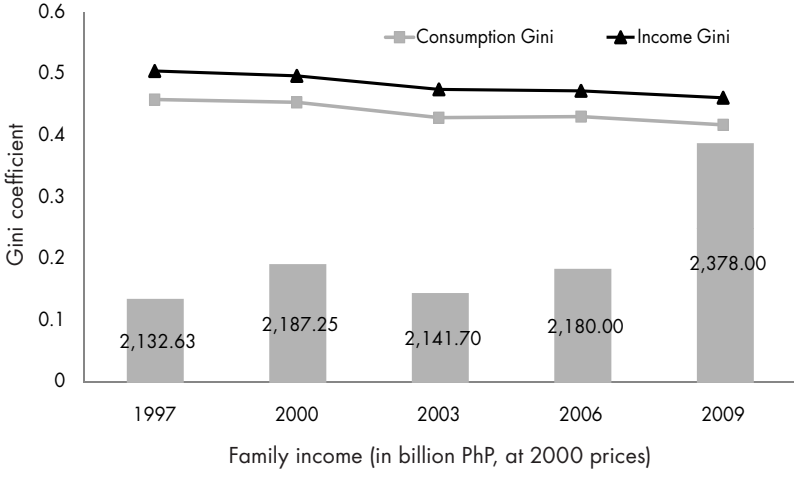

Figure 1. Total family income and Gini indices, Philippines, 1997–2009

Table 1. Total income (%) of families at current prices by income decile, Philippines, 1997–2009

Income decile	1997	2000	2003	2006	2009
1st (poorest)	1.70	1.70	1.80	1.90	2.00
2nd	2.70	2.70	2.90	2.90	3.10
3rd	3.50	3.50	3.80	3.80	3.90
4th	4.30	4.40	4.70	4.70	4.80
5th	5.40	5.50	5.80	5.80	5.90
6th	6.80	6.90	7.20	7.20	7.30
7th	8.70	8.80	9.10	9.00	9.20
8th	11.50	11.70	11.90	11.90	11.90
9th	16.20	16.30	16.60	16.90	16.60
10th (richest)	39.30	38.30	36.30	36.00	35.30
Richest/poorest 10%	23.38	22.70	20.09	19.32	17.92
Share of richest 20%	55.50	54.70	52.90	52.90	51.90

Source: NSO-FIES (1997, 2000, 2003, 2006, 2009)

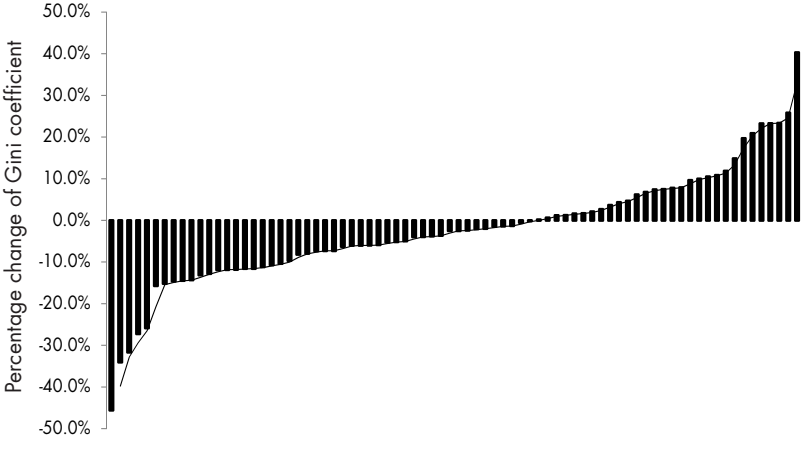

Figure 2. Distribution of Philippine provinces by percentage change of Gini coefficient, 1997–2009

This study investigates the relationship between income and inequality, as well as the importance of access to different forms of capital on intraprovince inequality in the Philippines. This paper adds to the existing inequality literature by probing beneath national averages and analyzing intraprovincial inequality in the country. The model tested is as follows:

$$\text{Inequality} = f(\text{Income, Humancapital, Financialcapital, Physicalcapital, Demographics}) \quad (1)$$

In particular, we tested Kuznets inverted U-shaped hypothesis and the hypothesis that increase in access to different forms of capitals decreases inequality in income and consumption expenditure distribution among households within the province (Kuznets, 1955).

We use the provincial level because it is a more relevant space of comparison than the national level as it compares households within a smaller community. In addition, measuring intraprovince income inequality is one way of capturing relative poverty, i.e., how households fare with households of the same community. The results of this paper can also serve as a guide to policy decisions at the provincial level.

Kuznets Curve: Economic Growth and Inequality

One of the most investigated hypotheses on the relationship between economic growth and inequality is Kuznets inverted U-shaped pattern of income inequality, where the initial phase of development results to an increase in inequality that eventually decreases after a certain level of development is reached. The explanation behind Kuznets hypothesis is a structural change in the economy, where development is seen as a move from the rural agricultural sector to the urban industrial sector (Kuznets, 1955; Kakwani et al., 2000). The policy implications of the relationship between economic growth and inequality are critical. If overall economic growth directly leads to reduction in inequality through increase in income of the poor (Dollar and Kraay, 2004), then policy makers need not follow pro-poor strategies but focus on growth-maximizing policies. However, if inequality does not necessarily decrease with development, then growth alone will not be sufficient to narrow the gap between the rich and the poor, implying that more direct measures to reach the poorest are needed (Kakwani et al., 2000).

Studies testing Kuznets hypothesis used different functional forms. Inequality measure can be regressed against per capita income and its square (Milanović, 1994; Gregorio and Lee, 2002) or per capita income and its inverse (Anand and Kanbur, 1993). Other approaches have also been used Thiel-T and Thiel-L Inequality Index (Anand and Kanbur, 1993) or the decomposition of inequality into different sources or sectors (Estudillo, 1997).

Determinants of Inequality Other than Income

Although economic growth can affect inequality, it explains only a little of the variations of inequality over time or across countries (Barro, 1999), and growth by itself is not a sufficient condition to lowering inequality (Ali and Son, 2007). In a study of Philippine growth and inequality, income growth alone does not translate one-for-one to improving inequality gap. Education, infrastructure, terms of trade, agrarian reform, governance, and some geographic attributes in improving the conditions of the poor are also important (Balisacan and Pernia, 2002).

Access to the different types of capital can contribute to improving economic growth and poverty levels (ADB, 2005) and may reduce inequality. Higher levels of human capital, for example, can give better job and income opportunities and can potentially reduce inequality (Barro, 1999; Hopkins, 2004). Barro (1999) showed that primary schooling reduce inequality, secondary is not significant, but higher education is positively related to inequality.

Physical capital, which comprises the basic infrastructure and services, can also help people out of poverty. Essential physical capital includes access to roads and transportation, adequate housing, potable water supply, affordable energy and communication (ADB, 2005).

Financial capital denotes the financial resources that people are able to access (ADB, 2005). The effect of financial service development on income distribution is not straightforward. On one hand, developed financial services enable the poor to borrow capital, which can decrease income inequality. On the other hand, development also locks in inequality because all the agents can increase their financial assets at the same rate. Also, developed financial services are often unavailable for the poor due to credit constraints arising from information asymmetries or transaction costs. In this case, financial development can accelerate income inequality (Motonishi, 2003). Related to financial capital is their source of financial income. Lower inequality was observed in countries where a larger fraction of the labor force is employed by the government because of more standardized salaries (Milanović, 1994).

Materials and Methods

Data of 73 provinces were used in the analysis. This is based on the list of 78 provinces in 1997; thus, provinces that were created after 1997 were considered as part of the original province from 1997 to 2009 (for example, Zamboanga Sibugay is included in Zamboanga del Sur). Only those with sample size of at least 100 were used to maintain data quality (i.e., 73 out of the total 78). Excluded in the analysis are the provinces of Aurora, Batanes,

Camiguin, Guimaras, and Siquijor. Panel regression was used with 5 time periods (i.e., 1997, 2000, 2003, 2006, 2009) stacked across 73 provinces.

Following different functional forms in the literature, we ran eight regression models to test our hypothesis (Table 2). Four of the models used per capita income and its square, and the other four models used per capita income and its inverse. In addition, the first four models are used to test Kuznets hypothesis (hence, they include only income variables) while the latter four models also test the significance of capital variables. Different turning points were derived using the maximization rule by getting the first derivative with respect to income, equating to zero, and then solving for the value of income where inequality is highest.

X vector includes human capital such as life expectancy (lifexp), percent of high school graduates among 18-year-olds and above (hsgrad), and average years of schooling (aveyrschool), financial capital proxy in terms of percentage of households with major income coming from wages and salaries (pwages), physical capital proxied by house ownership (ownhouse), demographic variable such as percentage of agricultural households (pagrifam) and population density (popden).

We also analyzed the models using lagged values of previous observation and tested other variables to exhaust all other possible determinants but were dropped in the final model as they do not significantly add to explaining the variations in inequality. Table 3 summarizes the variables used in the final model.

Several tests were conducted to determine the best model to use among pooled least squares, fixed effects, random effects, and robust fixed effects. The

Table 2. Models used to test the hypothesis

Model	Description	Regression model
1	Expenditure Gini = f(income, income squared)	Random effects
2	Expenditure Gini = f(income, inverse of income)	Random effects
3	Income Gini = f(income, income squared)	Random effects
4	Income Gini = f(income, inverse of income)	Random effects
5	Expenditure Gini = f(income, income squared, X vector)	Robust fixed effects
6	Expenditure Gini = f(income, inverse of income, X vector)	Robust fixed effects
7	Income Gini = f(income, income squared, X vector)	Robust fixed effects
8	Income Gini = f(income, inverse of income, X vector)	Robust fixed effects

Table 3. Variable code, description, and source used in the final model

Variable	Description	Source
Incgini	Measure of inequality in income distribution among households of the province	NSO-FIES (1997, 2000, 2003, 2006, 2009)
Expgini	Measure of inequality in total expenditure distribution among households of the province	NSO-FIES (1997, 2000, 2003, 2006, 2009)
Avinc	Average family income of households in the province ('000 PhP)	NSO-FIES (1997, 2000, 2003, 2006, 2009)
Avincsq	Square of Avinc ('000 PhP)	
Invinq	Inverse of Avinc ('000 PhP)	
Lifeexp	Life expectancy at birth (years)	Cabigon and Flieger (1999); Cabigon (2009)*
Hsgrad	Percent of high school graduates (18 and above)	NSO-APIS (1998, 1999, 2002, 2004, 2007, 2008)†
Aveyrscol	Average years of schooling is computed as the sum of the enrollment rate per age level, from ages 6 to 24.	NSO-APIS (1998, 1999, 2002, 2004, 2007, 2008)†
Pagrifam	Percentage of families in the province tagged as agricultural (i.e., major income source is from agricultural activities)	NSO-FIES (1997, 2000, 2003, 2006, 2009)
Pwages	Percentage of families in the province with wages and salaries as the main type of their income	NSO-FIES (1997, 2000, 2003, 2006, 2009)
Ownhouse	Percentage of households in the province who own the house they are living in	NSO-APIS (1998, 1999, 2002, 2004, 2007, 2008)†
Popden	Population density per square kilometer	NSO-CPH (1995; 2000)‡

Notes:

* For years 1997, 2003, 2006, and 2009, authors' linear projections were used based on Cabigon and Flieger (1999) and Cabigon (2009).

† For years 1997, 2000, 2003, 2006, and 2009, authors' linear projections were used using the two nearest years when the Annual Poverty Indicator Survey (APIS) was conducted. The APIS is undertaken in the years when the Family Income and Expenditure Survey (FIES) is not conducted.

‡ For year 1997, authors' linear projection was used using data from the Census of Population and Housing (CPH) by the National Statistics Office (NSO-CPH, 1995; 2000). But for years 2003, 2006, and 2009, NSO's medium series projections were used.

results of the test for differing intercepts, test for random effects, simultaneity, and homoscedasticity are summarized in Table 4. The results suggest we use random effects for the first four models and robust fixed effects for the latter four models.

The models' standard error of the regression, R-squared or adjusted R-squared, p-value of F test, log-likelihood, Akaike criterion, Schwarz criterion, and Hannan-Quinn criterion are shown in Table 5.

Results and Discussion

A positive coefficient implies that there is an increase in inequality in terms of Gini coefficient. The signs of the coefficients of all variables are consistent, indicating that the independent variables considered have robust effect on the dependent variable (Table 6).

Validation of Kuznets Hypothesis

The regression results show that the variable average income and its square (Model 3) or its inverse (Model 4) are significantly affecting inequality in terms of income but not true in terms of consumption (Models 1 and 2). This specification captures the inverted U-shape relationship of income to inequality, implying that Kuznets inverted U-shape hypothesis holds true in the case of the Philippines. Furthermore, income inequality increases during the early stage of development and is at its highest level at annual average family income of PhP211,054 to PhP408,367 but decreases as it continues to advance. On the other hand, expenditure inequality increases from PhP225,527 to PhP417,528 but decreases as it progresses.

Other Determinants of Inequality

The three human capital variables were consistently significant as a determinant of inequality in the four models. A higher life expectancy at birth and a higher high school graduate ratio results to lower intraprovince inequality. Models 5 and 6 indicate that an additional one year in life expectancy at birth decreases inequality by 0.46% to 0.48%, and income inequality by 0.68% to 0.72% (Models 7 and 8). A one-percentage point increase in high school graduate ratio decreases expenditure inequality by 0.12% to 0.13% (Models 5 and 6) and income inequality by 0.29% to 0.32% (Models 7 and 8).

Expected years of schooling is statistically significant and positively related to inequality, where an additional one average year of schooling increases expenditure inequality by 0.64% (Model 5) and income inequality by 0.78% to 0.88% (Models 7 and 8). This is consistent with results from Barro (1999) that higher education is positively related to inequality due to

Table 4. Hypothesis testing among different types of regression

Hypothesis testing	Model	Test statistic	*p*-value	Decision (at 5% alpha)
Fixed effects vs Pooled least squares Ho: The groups have a common intercept (Pooled Least Squares) Ha: The intercepts vary (Fixed effects, proceed to Breush-Pagan test)	1	F(72, 290) = 12.6072	0.00	Reject Ho. Proceed to Breush-Pagan test.
	2	F(72, 290) = 12.5486	0.00	Reject Ho. Proceed to Breush-Pagan test.
	3	F(72, 290) = 8.78561	0.00	Reject Ho. Proceed to Breush-Pagan test.
	4	F(72, 290) = 8.69127	0.00	Reject Ho. Proceed to Breush-Pagan test.
	5	F(72, 283) = 11.8035	0.00	Reject Ho. Proceed to Breush-Pagan test.
	6	F(72, 283) = 11.818	0.00	Reject Ho. Proceed to Breush-Pagan test.
	7	F(72, 283) = 11.1026	0.00	Reject Ho. Proceed to Breush-Pagan test.
	8	F(72, 283) = 10.9854	0.00	Reject Ho. Proceed to Breush-Pagan test.
Fixed effects vs Random effects Breush-Pagan test Ho: The variance of random effects = 0 (Fixed effects) Ha: The variance of random effects ≠ 0 (Proceed to Hausman test)	1	Chi-square(1) = 353.553	0.00	Reject Ho. Proceed to Hausman test
	2	Chi-square(1) = 351.282	0.00	Reject Ho. Proceed to Hausman test
	3	Chi-square(1) = 257.979	0.00	Reject Ho. Proceed to Hausman test
	4	Chi-square(1) = 252.248	0.00	Reject Ho. Proceed to Hausman test
	5	Chi-square(1) = 239.784	0.00	Reject Ho. Proceed to Hausman test
	6	Chi-square(1) = 235.546	0.00	Reject Ho. Proceed to Hausman test
	7	Chi-square(1) = 212.234	0.00	Reject Ho. Proceed to Hausman test
	8	Chi-square(1) = 205.759	0.00	Reject Ho. Proceed to Hausman test

Table 4. Cont.

Hypothesis testing	Model	Test statistic	*p*-value	Decision (at 5% alpha)
Fixed effects vs Random effects Hausman test Ho: Random effects are not correlated to regressors (Random effects) Ha: Random effects are correlated to regressors (Fixed effects, proceed to Wald's test)	1	Chi-square(2) = 0.42604	0.81	Fail to Reject Ho. Random effects model is appropriate.
	2	Chi-square(2) = 0.790982	0.67	Fail to Reject Ho. Random effects model is appropriate.
	3	Chi-square(2) = 4.01808	0.13	Fail to Reject Ho. Random effects model is appropriate.
	4	Chi-square(2) = 5.20459	0.07	Fail to Reject Ho. Random effects model is appropriate.
	5	Chi-square(9) = 59.8671	0.00	Reject Ho. Proceed to Wald's test
	6	Chi-square(9) = 64.0189	0.00	Reject Ho. Proceed to Wald's test
	7	Chi-square(9) = 67.3822	0.00	Reject Ho. Proceed to Wald's test
	8	Chi-square(9) = 72.7283	0.00	Reject Ho. Proceed to Wald's test
Fixed effects vs Robust fixed effects Wald's test for heteroscedasticity Ho: Homoscedastic (fixed effects) Ha: Heteroscedastic (robust fixed effects)	5	Chi-square(73) = 3725.43	0.00	Reject Ho. Robust Fixed effects model is appropriate.
	6	Chi-square(73) = 3954.59	0.00	Reject Ho. Robust Fixed effects model is appropriate.
	7	Chi-square(73) = 7073.34	0.00	Reject Ho. Robust Fixed effects model is appropriate.
	8	Chi-square(73) = 10695.2	0.00	Reject Ho. Robust Fixed effects model is appropriate.

Table 5. Robust panel regression diagnostic

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Mean dependent variable	0.37	0.37	0.43	0.43	0.37	0.37	0.43	0.43
Standard deviation dependent variable	0.05	0.05	0.06	0.06	0.05	0.05	0.06	0.06
Sum squared residual	0.99	0.99	1.22	1.22	0.20	0.20	0.28	0.28
Standard error of regression	0.05	0.05	0.06	0.06	0.03	0.03	0.03	0.03
R-squared					0.80	0.80	0.77	0.77
Adjusted R-squared					0.74	0.74	0.70	0.70
F(81, 283)					13.87	13.89	11.73	11.58
P-value(F)					0.00	0.00	0.00	0.00
Log-likelihood	560.43	560.44	523.22	522.68	852.20	852.50	792.15	790.32
Akaike criterion	–1114.86	–1114.88	–1040.40	–1039.36	–1540.40	–1541.00	–1420.29	–1416.65
Schwarz criterion	–1103.16	–1103.18	–1028.74	–1027.66	–1220.61	–1221.21	–1100.50	–1096.85
Hannan-Quinn	–1110.21	–1110.23	–1035.79	–1034.71	–1413.32	–1413.91	–1293.20	–1289.56
rho					–0.11	–0.10	–0.07	–0.07
Durbin-Watson					1.81	1.80	1.75	1.74

Table 6. Regression estimates

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8	
const	0.342352	***	0.385009	***	0.380834	***	0.458009	***	0.729716	***	0.818034	***	0.771689	***	0.995395	***
avinc	0.000326	**	0.000003		0.000588	***	–0.000018		0.000904	***	0.000392	***	0.002193	***	0.000763	***
avincsq	–0.000001				–0.000001	**			–0.000001				–0.000003	***		
invinc			–1.686570				–2.933910	*			–3.118030	*			–7.512150	***
lifeexp									–0.004616	**	–0.004823	***	–0.006766	***	–0.007221	***
hsgrad									–0.001319	**	–0.001234	**	–0.003190	***	–0.002866	***
expyrscol									0.006362	*	0.005957		0.008836	**	0.007849	*
pwages									–0.043615		–0.047031		–0.042499		–0.045209	
ownhouse									–0.105776	***	–0.105201	***	–0.030129		–0.029737	
pagrifam									–0.105101	**	–0.099210	**	–0.047198		–0.041253	
popden									–0.000019	***	–0.000023	***	–0.000015	**	–0.000031	***
Turning point	225.526548		-		211.053576		408.367314		417.527844		-		349.193153		-	

Notes:
*** Significant at 0.01 alpha
** Significant at 0.05 alpha
* Significant at 0.10 alpha

the larger wage difference among those that have higher education than those with only primary and secondary education. This could also be the case in the Philippines, which should be further investigated in another study.

The percentage of households with wages and salaries as its main income has a negative relationship with inequality but is not statistically significant. Access to physical capital, as proxied by a household owning a house, appeared to be significant and negatively related to inequality. House ownership affects consumption behavior of households and narrows the gap among households in terms of consumption spending, with a one percentage increase lowering inequality by 10.52% to 10.58% (Models 5 and 6) but not income inequality.

For the demographic variables, the percentage of agricultural households is statistically significant and has a negative relationship with expenditure inequality. A one percentage point increase in the percentage of agricultural households decreases inequality by 9.92% to 10.51% (Models 5 and 6).

To explain this, we regressed expenditure Gini against pagrifam and showed that this variable explains 69.9% of the variation. Moreover, the average income standard deviation of the provinces with more than 50% agricultural households is 21,864 while that of those with less than 50% is 51,401. This implies that agricultural households are more homogeneous in terms of income and expenditure compared to non-agricultural households, which explains why there is less inequality. However, the average family income of provinces with more than 50% agricultural households is lower than provinces with less than 50% agricultural households (PhP89,277 vs PhP139,007). Lower inequality, in this case, is not necessarily better in terms of standards of living.

Lastly, population density is statistically significant in explaining inequality but with almost zero coefficient.

Policy Implications

The Kuznets curve results where average income has a quadratic relationship with inequality shows the need for the government to be more intentional in targeting the poorer households and not just rely on macroeconomic growth to improve the status of living of the poor.

Policies targeting the poor can focus on human capital and physical investment. Human capital expands opportunities and choices people have and can reduce the gap between the intrinsically rich and the intrinsically poor. Although several studies on poverty and growth have shown the importance of human capital investment, it still needs to be translated into more concrete policy actions. The public spending on education as a percentage of government expenditure has only slightly increased from 13.95% in 2000 to 16.94% in 2008. The expenditure per student can still be increased, with primary

spending per student at 8.9% of GDP per capita, 9.8% of GDP per capita for secondary level, and 9.55% for tertiary level (World Bank, 2012).

The results show homogeneity of income and expenditure levels among agricultural households, but the average income is lower compared to non-agricultural households. It will be worthwhile for the government to assist agricultural households since most of the poor are in the agricultural sector. The poor performance of the agricultural sector has been attributed to bad weather, weak property rights, inadequate delivery of agricultural services, and weak governance (ADB, 2009).

In summary, interventions should consider factors affecting intraprovincial inequality. To encourage a more equitable growth in the Philippines, there is a need to (1) prioritize human capital investment (health and education), (2) address the poor income performance of agricultural households, and (3) focus on more pro-poor growth policies.

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