Going Beyond Cross-Country Averages: Revisiting Growth, Inequality and Poverty in the Philippines*

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Abstract

This paper proposes to analyze the processes of growth and poverty reduction simultaneously under a consistent framework based on a neoclassical growth model, using provincial-level data from the Philippines. We obtain a rate of absolute convergence across provincial incomes of 10%, a much higher rate than the 2% convergence rate typically found within currently developed countries. Our regression results indicate that there may be a disturbing trade-off between equity and growth/poverty reduction, rejecting a popular conjecture of the high inequality in wealth distribution being a major obstacle for growth/poverty reduction in the Philippines. The dominance of an oligarchic political regime is found to inhibit growth, however, supporting another popular view on the Philippine politics. Among policy variables, greater implementation of the agrarian reform program is positively associated with both growth and poverty reduction while terms of trade more favorable to agriculture facilitate poverty reduction. We also find that the slow poverty reduction in the Philippines is attributable not only to the slow growth but also to the low 'growth elasticity of poverty reduction.' The spread of industrialization does not appear to account for the provincial income convergence but does appear to reduce growth elasticity, which is also sensitive to initial poverty level, initial mortality and irrigation coverage.

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I. Introduction

This paper proposes to analyze the processes of growth and poverty reduction simultaneously under a consistent framework based on a neoclassical growth model,using sub-national (provincial) level data from the Philippines. As shown in Table 1, both growth and poverty reduction performances in the Philippines lagged behind those of its Southeast Asian neighbors in the past few decades (e. g., Ajuja, *et al*. 1997, Balisacan, *et al*. 2001). While the percapita GDP roughly quadrupled between 1965 and 1995 among other Southeast Asian countries and China, for example, the percapita GDP of the Philippines increased by only less than 50 percent during the same period. Comparing the changes over time in poverty, both Malaysia and Thailand started with much lower levels of poverty incidence than did the Philippines in the mid-1970s and then virtually eliminated poverty all together during the next two decades, while Indonesia and China started with much higher levels of poverty incidence than did the Philippines and nevertheless had lower levels of poverty than that of the Philippines by the mid-1990s.[1]

These observations raise a series of questions. Has the slow poverty reduction in the Philippines been simply due to slow income growth, or is it due also to the weak response of poverty reduction to a given rate of growth in aggregate income? Furthermore, the Philippines has long been known for its high level of inequality in the distribution of income and wealth. Has the high level of inequality been a main reason for slow growth and/or poverty reduction? In addition, the literature on Philippine politics suggests that the 'oligarchic' or non-competitive political system in the Philippines has been a major obstacle for implementing growth-enhancing policy reforms and thus for poverty reduction (e. g., Hutchcroft 1998, Balisacan, *et al*. 2001). Does the lack of competitive political regime hurt aggregate income growth and poverty reduction? Have the various policy measures by the government, such as land reform, price policies, and infrastructure investment, had any discernible impact on poverty? For example, one of the factors that likely affected the rural development and poverty reduction performances in the Philippines appears to be the persistent policy of industrial protection which, by depressing the relative price of agricultural

[1] This is based on headcount poverty ratios applied to per-capita consumption expenditures using the World Bank's 'dollar a day' poverty line as reporetd in Ahuja, et al. (1997).

products, functioned as a disincentive to agricultural sector development, especially by small farmers (e. g., Balisacan, *et al.* 2001). In this paper, we revisit all of these questions regarding the growth and poverty reduction performances in the Philippines with a neo-classical growth regression framework.

In the course of examining the provincial income growth in the Philippines we also relate our findings to two of the issues under ongoing debate in the cross-country growth literature—i. e., the rate of income convergence across economies and the relationship between inequality and growth. For the former, Sala-i-Martin (1996) once observed that the (cross-sectionally) estimated rate of convergence tended to be in the neighborhood of about 2% across a wide variety of data sets including cross-country data (i .e., conditional rate of convergence) as well as regional data within currently developed countries (i. e., absolute rate of convergence). Caselli, *et al.* (1996), however, obtained a much higher rate of convergence of 10% based on GMM estimation applied to cross-country panel data, which in turn has been challenged by Bond, *et al* (2001) who obtain, again, a 2% convergence rate based on a modified GMM estimation technique applied to the same data set as Caselli, *et al* (1996)'s. Similarly with the relationship between inequality and subsequent growth, while the recent conventional wisdom tends to support the view that 'initial inequality hurts subsequent aggregate growth' (e. g., Persson and Tabellini 1994, Bénabou 1996b, Deininger and Squire 1998), the issue remains an unsettled controversy in the cross-country empirical literature and thus deserves greater scrutiny in light of more recent empirical studies finding positive relationships between inequality and growth (e. g., Forbes 2000, Quibria 2001).

The use of sub-national level data has major advantages in addressing these and other issues over cross-country regression studies (e.g., Dutt and Ravallion 1998). For example, the problem of comparability across observation units of data on income, a serious caveat in any cross country study, is much less serious. The comparison of political characteristics across countries can also be difficult due to the diversity in historical experiences, cultural norms and institutional contexts; sub-national level studies would allow us to control for such contexts and to focus on specific aspects of the political system such as the degree of competitiveness among political actors, which we examine in this paper. In addition, one of the problems raised against the cross-section growth regressions is the potential bias due to

the correlation between the initial income level and the unobserved individual (country)-specific effects (e. g., Caselli, *et al*. 1996); such bias is likely to be less serious in sub-national contexts since the major sources of such heterogeneity —technologies, tastes, etc.— are likely to be relatively similar within a country.

The questions we will address in this paper are the following:

1. Is there absolute convergence among provincial incomes? If so, how fast are provincial incomes converging in the Philippines compared to the historical experiences in currently developed countries? And what are the possible processes behind convergence?
2. Does inequality in land distribution hurt subsequent growth and poverty reduction in the Philippines?
3. Does the 'oligarchic' political system that characterizes Philippine politics hurt growth and poverty reduction?
4. What policy measures have significant impact on growth and poverty reduction?
5. How responsive has poverty reduction been to economic growth in the Philippines? How does that compare to international standards? And what can account for such responsiveness?

The rest of the paper is organized as follows. Section II outlines our methodology. Section III reports on the patterns of provincial growth 'convergence.' Section IV reports on the determinants of differential growth rates across provinces. Section V employs the same framework in an attempt to identify some determinants of the rate of poverty reduction across provinces. Section VI examines the relationship between mean income growth and the rate of poverty reduction. And the final section summarizes our findings and concludes the paper with a discussion of some policy implications.

II. Methodology: a neoclassical approach to growth and poverty reduction

Since the aggregate income growth is a major determinant of the pace of poverty reduction, we first examine the patterns of provincial mean income (as measured by the consumption expenditure per capita) growth. Figure 2 shows the relationship between the log per-capita expenditures in 1988 and the average annual growth rate of per-capita

expenditures during 1988-97, suggesting a pattern of absolute β-convergence as predicted by neoclassical growth theories. We therefore adopt the neoclassical growth model, using the growth episode between 1988 and 1997 in each province in the Philippines as the unit of observation. As an initial step, we compare the speed of absolute 'convergence' in the Philippines with the historical experiences of currently developed countries by replicating Barro and Sala-i-Martin (1992)'s regression:

$$(1/T)\log(PCEXP97_i/PCEXP88_i)=\alpha - [(1 - e^{-\beta T})/T]\log(PCEXP88_i) + u_i, \qquad (1)$$

where T (=9) is the number of years between the two data points, $PCEXP88_i$ and $PCEXP97_i$ are the levels of per-capita expenditures for province i in 1988 (initial year) and 1997 (end year) respectively, and u_i is the error term.[2] The 'Beta convergence' coefficient (β) indicates the annual rate of convergence. In light of the controversy over the cross-country evidence on growth convergence (e. g., Sala-i-Martin 1996, Quah 1996), we also supplement our β-convergence estimation with the examination of the 'σ-convergence' and of the entire distribution of per-capita expenditures across provinces.[3]

We next seek to explain the differential rates of income growth across provinces by estimating the following equation:

$$GRPCEXP_i = a + b\log(PCEXP88_i) + \Sigma c_k \mathbf{X}_{ik} + u_i, \qquad (2)$$

where GRPCEXP is the annual average growth rate of per-capita expenditures between 1988 and 1997, X_k is a set of determinants of the steady-state income level, and u_i is the error term.[4] Following the spirit of the neoclassical cross-country growth regressions, we initially included the following variables, consisting of initial conditions and (time-varying) policy variables, as

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[2] Following Barro and Sala-i-Martin (1992), equation (1) is estimated by nonlinear least squares (NLLS) estimation.

[3] An additional criticism regarding Barro and Sala-i-Martin's (1992) cross-section regressions is the potential inconsistency due to the correlation between the initial income level and the unobserved individual (provincial)-specific effect (e. g., Caselli, *et al*. 1996). While it would be difficult to address this issue fully without panel data (which we do not have at the moment), the problem is likely to be less serious in a single country context, as we argued earlier, than in cross-country contexts. Furthermore, Casseli, *et al* (1996) show that, to the extent this poses a problem, it leads to a downward bias in the estimate of the convergence coeffcient; thus, our main qualitative finding of a high convergence rate (as we see below) would not be affeted (but rather enhanced).

[4] The initial per capita expenditures and the dependent variable come from the same set of variables and thus there is a potential that the common measurement errors contained in both the dependent and the independent variables could lead to spurious correlation. In order to address this potential problem, we use instrumental variable estimation with the household income per-capita as the instrument for the initial per capita expenditure variable.

the X_k variables.[5]

(1) Initial economic conditions: mortality rate per 1000 children age 0-5; simple adult literacy rate; the average years schooling of household heads; proportion of irrigated farm area to total farm area; gini ratio of farm distribution.[6]

(2) Initial political characteristic: political 'dynasty' (proportion of provincial officials related to each other by blood or affinity, as a proxy for political competitiveness).

(3) Time Varying Policy variables (difference between 1988 and 1997)[7]: agricultural terms of trade (the ratio of implicit price deflator for agriculture to implicit price deflator for non-agriculture); electricity access (the proportion of households with electricity); road density; Comprehensive Agrarian Reform Program(CARP) implementation (the proportion of cumulative CARP accomplishments to 1990 potential land reform area).

In addition, we make a crude attempt to explore the possible processes behind convergence by disaggregating the income growth by sector, as suggested by Bernard and Jones (1996). In particular, we explore the possibility that the spread of industrialization toward lower income provinces could account for the provincial income convergence.

In our next step, we shift our attention from the mean income growth to the rate of poverty reduction between 1988 and 1997. Since the pace of poverty reduction is closely related to the speed of mean income growth, we suppose that a similar reduced form specification can be used for the analysis of the rate of poverty reduction as for the rate of mean income growth. We identify the major determinants of the rate of poverty reduction by estimating the following equation:

$$\text{GRINCID}_i = a + b\log(\text{PCEXP88}_i) + \mathbf{\Sigma}_k c_k \mathbf{X}_{ik} + u_i, \qquad (3)$$

where the dependent variable, GRINCID_i, is the average annual rate of change in the

[5] As is often pointed out, cross-section growth regressions are potentially subject to endogeneity bias (e. g., Caselli, *et al*. 1996). While poilcy variables such as 'CARP implementation' are more likely to suffer from this problem (as we discuss below), we would expect the variables of our main interest here, such as land distribution and 'political dynasty', to be reasonably stable over time and thus likely to be relatively less 'endogenous' than are policy variables. We intend to address this issue more fully in our future work once a panel data set becomes available.

[6] See Table 2 for variable definitions, descriptive statistics and data sources.

[7] Agricultural terms of trade and CARP are defined at the 'regional' level, a higher-level aggregation of provinces, due to lack of data.

headcount poverty ratio between 1988 and 1997 for province i, and the same set of right hand side variables are included as in equation (2) in our initial analysis, i. e., the initial level of per capita expenditures, other initial economic and political conditions and policy variables.

We next attempt to examine the quantitative relationship between the aggregate income growth rate and the rate of poverty reduction. We address the question of whether the relatively poor performances in poverty reduction in the Philippines, vis-à-vis its Asian neighbors, is partially due to low responsiveness of poverty reduction to a given rate of aggregate growth by comparing the 'growth elasticity of poverty reduction' in the Philippines with its cross-country counterpart (Ravallion 2001). We estimate the growth elasticity by introducing the mean expenditure growth rate as an additional explanatory variable into equation (3). Since both the mean growth rate and the rate of poverty reduction are simultaneously determined in our framework, the former variable needs to be treated as endogenous. As we will see in section V, we find that the 'dynasty' variable is a significant determinant of the mean expenditure growth rate but not of the rate of poverty reduction, and so we initially used 'dynasty' as the identifying instrument for the mean expenditure growth. The introduction of the mean expenditure growth rate into equation (3), however, tends to reduce the explanatory power (in the sense of both lower values of coefficient estimates and smaller values of t statistics) of some of the determinants of poverty reduction suggesting that much of the effects of these variables on poverty reduction work indirectly through increasing aggregate growth. Those independent variables whose estimated coefficients are no longer significant are subsequently dropped from the set of explanatory variables but instead are included as identifying instruments for the mean expenditure growth rate variable. Our equation for estimating growth elasticity is:

$$\text{GRINCID}_i = a + e\text{GRPCEXP}_i + \mathbf{\Sigma}_k c_k \mathbf{Z}_{ik} + u_i, \qquad (4)$$

where the $\mathbf{Z}_{ik}$ vector is the subset of the original $\mathbf{X}_{ik}$ vector consisting only of significant determinants of GRINCID after the introduction of GRPCEXP. The coefficient *e* gives our estimated growth elasticity of poverty reduction. We estimate both equations (2) and (4) as a system by three stage least squares (3SLS).

Finally, we make some initial attempts to explore the factors determining the growth elasticity. We re-estimate equation (4) by including as an additional explanatory variable the

interaction term between the mean income growth ($GRPCEXP_i$) and potential determinants of the growth elasticity, including the change in the share of agricultural income, initial inequality, initial poverty incidence, and initial human capital stock. Following the approach taken by de Janvry and Sadoulet (2000), we do so by introducing the interaction term one at a time in separate regressions.

III. Absolute Convergence in Provincial Income Growth

We start with an analysis of absolute convergence across provincial incomes during 1988-97. Our estimated rate of convergence (β-convergence coefficient), based on equation (1), is 0.107 (with a standard error of 0.021).[8] In addition, the standard deviation of the log of per-capita expenditures across provinces fell from 0.303 in 1988 to 0.239 in 1994 (Table 2), suggesting that the cross-provincial income dispersion was declining (i. e., σ-convergence).[9] The same conclusion can be drawn from an inspection of the change in the kernel density of the per-capita expenditures between 1988 and 1994 as shown in Figure 3. Unlike the case of cross-country income distribution, where Quah (1993) observed a potential tendency toward 'twin-peakedness' rather than convergence, the cross-provincial income distribution patterns in the Philippines appear to be consistent with absolute convergence.

Compared to the historical (absolute) β coefficients estimated for regional income convergence in the United States, Japan and Europe, which are clustered around the neighborhood of 2%, the comparable estimate from the Philippines is thus strikingly high (Sala-i-Martin 1996).[10] With an annual rate of convergence (β) of 2%, the number of years required to close the gap between the initial income and the steady-state income levels up to a half is 35 years; with a β value of 10.7%, the half-life is only 6 years.

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[8] We have learned from the National Statistical Office that the survey results from the province of Sulu in 1997 may not be reliable due to the peace and order conditions in the province. Indeed the income and expenditure figures in Sulu in 1997 appear to be unsually low, making the observation from Sulu a clear outlier as we can see in Figure 1 (the observation at the middle bottom). If we include the province of Sulu, which is a clear outlier, the estimated 'Beta convergence' coefficient is 0.114.

[9] According to Bernard and Durlauf's (1996) terminology, we are addressing here their 'definition 1' of covergence, but not their stronger version of convergence (their 'definition2') since testing for the latter requires panel data which we do not have at this point.

[10] The only historical episode where the rate of convergence comes close to our Philippine case is that of Japan in the period 1970-75 (Barro and Sala-i-Martin 1992).

Needless to say, our finding has little to say about *international* income convergence; in fact, the high speed of convergence implies that the observed income levels could (already) be close to the steady-state level, suggesting, in turn, that provincial incomes within the Philippines may well be converging toward a low-level steady-state by international standards. Interpreting our results in reference to neoclassical growth theories, the high rate of convergence we obtain is consistent with open economy versions of growth models, and with 'non-augmented' (i. e., without human capital as an independent input) production function models with relatively low capital shares (e. g., Barro and Sala-i-Martin 1992, Caselli, *et al*. 1996).

IV. Determinants of Provincial Growth Rates

We continue to follow the neoclassical growth framework to seek explanations for the differential rates of income growth across provinces. The estimation results based on equation (2) are shown in Table 4.[11] In the final specification reported in column (b), all the insignificant variables are dropped. As we saw earlier, there is a strong convergence property among provincial income growth; after controlling for the factors affecting the steady-state level of per-capita income, the estimated conditional rate of convergence is around 9 percent per year. Among the initial economic conditions, the initial level of human capital stock as measured by the child mortality rate has significant effects; on average, a one standard deviation reduction in mortality rate raises the annual per-capita growth rate by a 0.9 percentage point.

Furthermore, we find significantly *positive* effects of the initial inequality in farm distribution; on average, a one standard deviation increase in the gini coefficient in land distribution is associated with a 0.7 percentage point increase in growth rates.[12] Contrary to

[11] Table 4 reports the results obtained from instrumental variable estimation (instrumenting the 1988 percapita expenditure by 1988 percapita income) but OLS estimation results produce quantitatively very similar results.

[12] Since this result runs directly counter to the recent conventional wisdom that 'initial inequality hurts subsequent economic growth,' we examined the robustness of this relationship. It turns out that the significantly positive coefficient on the 'land gini' variable tends to be quite stable among various specifications with various combinations of explanatory variables. In addition, we experimented with alternative measures of land distribution, such as the ratio of large to small land holdings, but we tend to find that an initially higher share of small or medium size farm holdings is negatively related to subsequent growth, and an initially higher

the popular conjecture, therefore, the high inequality in land distribution in the Philippines was *not* an obstacle to growth but rather the reverse was true, at least during the period 1988-97. Our finding implies that there may be a disturbing trade-off between social equity and growth. Although our results appear consistent with Forbes's (2000) based on cross-country panel data, the latter focuses on the relationship between initial *income* inequality and growth, while our findings on the positive relationship between initial *land* distribution inequality and growth may be difficult to interpret. (e. g., Deininger and Squire 1998, World Bank 2000: chapter 3)

One possible explanation could be that there emerged productivity differentials between small and large farms in the Philippines in the 1990s. While it is well documented that economies of scale do not operate in most of the developing agriculture, including that of the Philippines (e. g., Binswanger, *et al*. 1995, Hayami, *et al*. 1990), Hayami and Kikuchi (2000) recently reported significantly higher rice yields among larger farms than among smaller farms found in an East Laguna village (on Luzon Island) as of 1995—presumably due to the introduction by larger farmers of pump irrigation in response to the deterioration of the national irrigation system—, even though they had found no evidence of such scale-based productivity differentials during the 1970s and the 1980s.[13] They contend, however, that, if rental markets for irrigation pumps are to develop —as was the case with tractors introduced earlier—, then such productivity differentials would (again) disappear. From theoretical points of view, Bénabou (1996a) and Banerjee and Duflo (2000) also argue that the relationship between growth and inequality could differ between the short-run and the long-run. Therefore, we should perhaps be cautious in drawing a definitive policy conclusion at this point regarding the trade-off between growth and equity.

Our variable representing an initial political condition, the 'dynasty' (measured by the proportion of provincial officials related by blood or affinity), has significantly negative effects on subsequent growth; the provinces where provincial politics is dominated by closely related families and relatives tend to grow at a slower rate than the provinces where such

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share of large farm holdings positively related to subsequent growth (Appendix 1). We find no evidence of the conventional wisdom and a rather robust positive relationship between high inequality in farm distribution and subsequent income growth.

[13] We should note, however, that their threshold level distinguishing 'larger' and 'smaller' farms is a quite low level of 2 hectares.

relations among officials are weaker. A one standard deviation increase in the degree of political domination by a 'dynasty' is associated with a 0.4 percentage point fall in the growth rate. We thus obtain quantitative evidence confirming one of the major themes in much of the literature on the Philippine politics, i. e., the lack of a competitive political system. Such a political characteristic has generally been seen among many observers as one of the major factors leading to sub-optimal policy choices in the Philippine government and thus to the relatively poor economic performances compared to those of its Asian neighbors (e. g., Balisacan, *et. al.* 2001, Hutchcroft 1998, Montes 1991).

On the other hand, the estimated coefficients on many of what we regard as policy variables are found not to be significantly different from zero (Table 3 column (a)). The only exception is the increment of the land reform accomplishments under the Comprehensive Agrarian Reform Program (CARP) between 1988 and 1997; on average, a one standard deviation increase in the 'accomplishment' of land redistribution (as measured by the proportion of the covered areas by the redistribution program to the 'potential' land reform area) is associated with a 0.7 percentage point increase in annual growth in per capita expenditures.[14] The positive correlation between land reform implementations and growth may seem to contradict our finding above that inequality in farm distribution is positively related to growth. The growth impact of land reform implementation, however, could come through non-agricultural routes; land reform program re-distributed income from landowners to former tenants who subsequently invested in education and non-agricultural activities (e. g., Hayami and Kikuchi 2000). Micro studies tend to find that the main source of the income growth in rural Philippines after the mid-1980s was the non-agricultural sector (e. g., Estudillo and Otsuka 1998). Alternatively, the CARP implementation variable could be endogenous; the implementation of CARP was not random across regions but rather its implementation progressed faster in the areas with greater growth potentials. Indeed, Otsuka (1991) found that a higher yield increase in agriculture was a major determinant of the implementation of the agrarian reform program.[15]

[14] We must note here, however, that this variable is defined only at the level of the 'regions', which is a higher-level aggregation of provinces (due to the absence of the provincial level observations of the land reform accomplishment).

[15] In addition, some might argue that the land reform 'implementation' might have had relatively little impact on the actual farm distribution inequality and thus on the agricultural sector growth. While the official record

Was non-agricultural sector growth a source of convergence?

The high rate of convergence across provincial incomes raises a question: what are the processes behind provincial income convergence? While a full investigation of this question would be beyond the scope of this paper, one way of approaching this question is to disaggregate income growth by sectors, as suggested by Bernard and Jones (1996). Village-level studies in Luzon Island (mainly in the outskirts of the Metro Manila region), for example, document the spread of rural industries after the late 1980s (e. g., Hayami and Kikuchi 2000). This suggests that a gradual spread of (rural) industrialization toward lower income provinces might have been a part of the process behind the regional catching-up. We have therefore made a crude initial attempt to explore the possible linkage between sectoral income composition and income convergence. Figure 3 shows the relationship between the initial mean income (in 1988) and the subsequent growth rate disaggregated between agricultural income and non-agricultural incomes.[16] We find that the growth convergence pattern of non-agricultural incomes is quite similar to the convergence pattern of the total income (Figure 1) —with the estimated β-coefficient based on equation (1) of 0.106 (s.e. 0.189). On the other hand, the relationship is much less clear in the case of the agricultural income growth, although there still is a significantly negative relationship with the estimated β-coefficient based on equation (1) of 0.0211 (s.e. 0.0098). Furthermore, as shown in Figure 4, there is a moderate but statistically significant negative relationship between the initial *total* income level and the growth of non-agricultural income share (as measured by the ratio of the share of the non-agricultural income in 1997 to the share of the non-agricultural income in 1988), possibly indicating the gradual spread of industrialization toward lower income provinces in the 1990s.

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published by the Department of Agrarian Reform indicates a dramatic increase in the land reform 'accomplishment' during the Ramos administration (1992-1998) compared to the preceding Aquino and Marcos administrations (DAR 1998), little quantitative evidence appears to exist regarding how much impact such apparent 'accomplishments' had on the size distribution of farms (e. g., Riedinger 1995).

[16] Here, the agricultural income includes agricultural self-employment and wage incomes, while the non-agricultural income similarly includes self-employment and wage incomes from industrial and service sector activities. Included in neither of these two categories are rental, transfer (including remittances) and capital incomes.

We next re-estimated equation (2) by introducing the growth in non-agricultural income share as an additional explanatory variable as shown in Table 5, column (a).[17] We find a significantly positive association between the increase in the share of the non-agricultural income and the total income growth; our result indicates that a standard deviation increase in the share of non-agricultural income is associated with a modest 0.4 percentage point increase in annual per-capita growth rate controlling for the initial income level and other significant determinants of the steady-state income level. In order to further examine how the growth in the share of the non-agricultural income affects the rate of provincial income convergence, we also re-estimated equation (2) by including instead an interaction term between the log initial income and the growth in the non-agricultural income share as reported in Table 5, column (b). Surprisingly, the positive and significant coefficient on the interaction term indicates that the growth in the non-agricultural income share reduces (rather than increases) the rate of convergence. The quantitative magnitude of such an impact, however, is quite small; the impact of a standard deviation increase in the growth in the non-agricultural income share is only less than a 0.1 percentage point change in the rate of convergence.

Thus, while we can observe the gradual spread of industrialization toward lower income provinces and also the positive (though modest) effects of the growth in the non-agricultural income share on the total income growth, such a process of the spreading industrialization, typically observed in the surrounding regions of Metro Manila, does not appear to account for the high rate of provincial income convergence.[18] We will further investigate the processes behind the provincial income convergence in our future work.

V. Reduced Form Determinants of Poverty Reduction

We now shift our focus from mean income growth to the rate of poverty reduction during 1988-97 by extending our neoclassical growth framework. Table 4 presents our

[17] Coefficients are estimated by OLS since we found in estimating equation (2) that results were nearly identical between OLS and instrumental variable estimates (fn. 11).

[18] We also re-estimated equation (2) with an additional interaction term between the initial income and one of the other initial conditions (i. e,. mortality rate, literacy, land inequality, political dynasty, and irrigation), one at a time in separate regressions. None of these additional terms, however, is found to be statistically significant.

estimation results for the determinants of poverty reduction based on equation (3).[19] Since our dependent variable here is the annual rate of increase in the headcount poverty ratio between 1988 and 1997 for each province, a negative coefficient on a variable means that the variable has *positive* effects on *poverty reduction*. Not surprisingly, among the explanatory variables included in our analysis, the set of variables found to have a statistically significant association with the rate of poverty reduction was quite similar to those found to be significant determinants of the mean income growth. Reflecting the income convergence property, the level of initial per-capita expenditures is significantly negatively related to the rate of subsequent poverty reduction; a one percent increase in the initial mean expenditure level is associated with roughly a 0.15 percentage point decrease in the rate of poverty reduction. Initial human capital stock, as measured by the child mortality rate, has significantly positive effects on the pace of poverty reduction; a one standard deviation decrease in the child mortality rate is associated with a 1.8 percentage point increase in the rate of poverty reduction. In accordance with our finding in the previous section, higher inequality in land distribution has significantly *positive* effects on the rate of poverty reduction; a one standard deviation increase in the gini coefficient is associated with a 1.9 percentage point increase in the poverty reduction rate. Also in line with our previous findings is the significantly positive association between agrarian reform (CARP) implementation and the rate of poverty reduction; a one standard deviation increase in the CARP accomplishment is associated with a 1.6 percentage point increase in the rate of poverty reduction.

In contrast with our results in the previous section, the 'dynasty' variable is not significantly associated with the rate of poverty reduction. Among the policy variables, however, the change in the agricultural terms of trade is significantly associated (albeit marginally) with poverty reduction. Our results suggest that a one standard deviation increase in the agricultural terms of trade is associated with a one percentage point increase in the rate of poverty reduction. Since this policy variable is not a significant determinant of the per-capita expenditure growth, it appears that the change in the agricultural terms of trade has independent positive effects on poverty reduction, quite apart from the change in the level

[19] Table 4 reports results by instrumental variable estimation (instrumenting the 1988 percapita expenditure by 1988 percapita income) but OLS results are quantitatively very similar.

of poverty induced by the mean income growth, by affecting income distribution.[20] While the depression of the relative price of agricultural commodities through industrial protection policies was quite common in many developing countries before the 1980s (e. g., Krueger, Schiff and Valdez 1988), such policies persisted for a much longer period in the Philippines than in other Asian countries (e. g,. Akiyama and Kajisa 2001). Our result suggests that the persistence of the industrial protection policies was partially responsible for the slow poverty reduction in the Philippines vis-à-vis the pace of poverty reduction in other Asian countries.

By way of comparing the relative impacts on poverty reduction of the variables that could potentially be manipulated by policy interventions, a one standard deviation difference in the mortality rate, the gini ratio of farm distribution, CARP implementation and the agricultural terms of trade are associated with, respectively, 1.8, 1.9, 1.6 and 1 percentage point changes in the annual rate of poverty reduction. It appears, therefore, that the relative magnitudes of the effects of policy-related variables on poverty reduction are quite similar among each other, with a possible exception of the somewhat smaller quantitative impact of the agricultural terms of trade, assuming that the cost of changing these variables through policy interventions by the amount equivalent to one standard deviation is roughly equal across different policy variables. This may suggest that there is no single 'policy lever' that could make a dramatic difference in poverty reduction.

These results are obtained based on the rates of change in the headcount poverty ratios (the incidence of poverty) across provinces as the dependent variable. In addition, we also conducted similar analyses of the determinants of poverty reduction by replacing the headcount poverty ratios with alternative poverty measures such as the poverty gap (the 'depth' of poverty) and the squared poverty gap index (the 'severity' of poverty). Qualitative results are very similar with only one difference: the effects of the agricultural terms of trade are not statistically significant with the use of the alternative poverty measures (see Appendix 2).

[20] Here again, however, we must note that this variable is defined at the 'regional' level, a higher-level aggregation of provinces, due to the absence of the provincial-level data required to define the terms of trade.

VI. How Does Poverty Reduction Respond to Growth in the Philippines?

In this section we attempt to examine the quantitative relationship between the mean income growth and the rate of poverty reduction, by adding the growth rate of per-capita expenditure (GRPCEXP) as an additional (endogenous) explanatory variable into equation (3). Our estimation results of equation (4), based on 3SLS estimation by combining equations (2)[21] and (4), are reported in Table 6.[22] Once GRPCEXP is introduced, the initial income and the child mortality rate are no longer statistically significant, and thus are dropped from equation (4) but instead are included in the instrument set. The land gini is still marginally significant (at the 10% level) in explaining poverty incidence (i. e., headcount ratio) but insignificant in explaining poverty depth (i. e., poverty gap) or poverty severity (i. e., squared poverty gap). This appears to suggest that the effects of the initial conditions on poverty reduction, as we saw in the previous section, are mostly indirect, working through increasing the mean income growth. Among policy variables, the change in the agricultural terms of trade and the implementation of agrarian reform have direct effects in reducing poverty incidence (though the latter only marginally so), presumably through their re-distributive effects. The effects of the terms of trade on poverty reduction, however, is not quite robust with respect to the uses of alternative poverty measures; such effects are statistically significant only for the headcount poverty measure. The CARP implementation, on the other hand, has statistically significant effects on the change in the headcount ratios and the poverty gap (PG) index (though marginally again) but not in the squared poverty gap (SPG) index.

As expected, there is a significant *positive* relationship between the rate of mean income growth and the rate of poverty *reduction*. Our estimated 'growth elasticity of

[21] The coefficient estimates of equation (2) based on 3SLS are nearly identical to those reported in Table 3, and thus are not reported here.

[22] We have tested for the validity of the over-identifying restrictions and for the exogeneity of the mean expenditure growth rate. The tests of over-identifying restrictions (e. g., Greene 1997: 762) were not rejected, suggesting that the set of instruments used for our final specification was valid. Rather suprisingly, however, the Hausman-Wu test for the exogeneity (Hausman 1978) of the mean expenditure growth rate was not rejected either, suggesting that the expenditure growth rate could be treated as exogenous. Indeed the value of coefficients estimated by OLS are very similar to those estimated by 3SLS. While our discussion in the text is based on the estimates using 3SLS, our arguments are not affected whether the mean expenditure growth rate is treated as exogenous or endogenous in the estimation of our final model. Appendix 3 reports the results of these statistical tests as well as the results of our OLS estimates.

poverty reduction' is around 1.6 to 1.7 based on the headcount poverty ratios (Table 6, first two columns).[23] The magnitude of the growth elasticity, however, appears to be relatively small compared to the similar estimates obtained from cross-country data. For example, Ravallion (2000) estimated the growth elasticity of poverty reduction by a bivariate regression of the proportionate change in the poverty rate on the proportionate change in mean income (with intercept) based on a sample of 47 developing countries in the 1980s and 1990s; he obtained an estimated elasticity of 2.50. An equivalent bivariate regression estimate (without any additional covariates and without instrumenting for the right hand side variable; not reported in the table) for our data from the Philippines is 1.63, which is about the same as the estimate from our full specification as reported in Table 6. Thus, the degree of responsiveness of poverty reduction to the aggregate income growth is about 35% smaller in the Philippines compared to the (cross-country) developing country average. Therefore, the disappointing performance in the rate of poverty reduction found in the Philippines vis-à-vis its Asian neighbors is partially attributable to the low responsiveness of poverty reduction to a given rate of aggregate growth.

In addition, it has been observed in the Philippines that while there was relatively little poverty reduction during the period of high aggregate income growth in the 1960s and 1970s, poverty reduction accelerated after the mid-1980s through the 1990s despite the fact that there was a series of booms and busts during the period (e. g., Balisacan, *et al*. 2001). Since our estimates are obtained from the 1988-97 period—the period of relatively higher responsiveness of poverty reduction to growth than in the 1970s—, it appears to indicate a rather grim picture that even the relatively high growth elasticity by *the Philippine standard* is relatively low by *the international standard*.

Exploring Determinants of Growth Elasticity of Poverty Reduction

The relatively small value of growth elasticity raises a question: what are the sources affecting the growth elasticity? In order to approach this question, we first examine the

[23] The measures of the responsiveness of poverty reduction to mean income growth can be (and have been) defined in various ways. Lipton and Ravallion (1995), for example, collect such estimates based on the 'growth elasticity' with controlling for the income distribution, while our estimates and Ravallion (2000) do not control for change in distribution.

relationship between the change in the sectoral income growth and the magnitude of the growth elasticity of poverty reduction (using the headcount ratio as the poverty measure) by re-estimating equation (4) with the interaction term between the mean income growth and the growth of the agricultural (or non-agricultural)-sector income share as an additional right hand side variable. Table 7 reports the estimated coefficients on the mean income growth and the interaction term, as well as the implied growth elasticities corresponding to the observed highest and lowest growth in the agricultural income share.[24] The interaction term between the mean income growth and the agricultural income growth is statistically significant while a similar interaction term between the mean income growth and the non-agricultural income growth is not significant (thus not reported here). We find that an increase in the share of agricultural income leads to the higher growth elasticity of poverty reduction with a substantial magnitude. Using the ratio of the agricultural income share in 1997 to the agricultural income share in 1988 as the measure of relative agricultural income growth, the implied growth elasticity for the province with the largest increase in the agricultural income share (East Samar) is –2.61, while the implied growth elasticity for the province with the largest decrease in the agricultural income share (Misamis Oriental) is –1.30 (Table 7, 1st row). The implied growth elasticity of the provinces with the largest increase in the agricultural income share coincides with the international average obtained by Ravallion (2001), while that of the province with the highest decline in the agricultural income share is about half the international average.

Furthermore, in order to examine the potential impact of initial conditions on the growth elasticity, we re-estimated equation (4) by introducing the interaction terms, one such term at a time in separate regressions, between the mean income growth and the initial condition variables, following the approach taken by de Janvry and Sadoulet (2000). While de Janvry and Sadoulet (2000) find that higher initial income inequality significantly reduces growth elasticity in Latin American countries, we find no such evidence in our Philippine context; the interaction term between the mean income growth and initial inequality (measured either by land or by expenditures) is not significant.[25] However, we do find, as

[24] Coefficients are estimated by OLS. We found that OLS and 3SLS estimates were quantitatively quite similar, nor does Hausman test reject the exogeneity of PCEXP (fn. 21).
[25] Detailed results are not reported here but available upon request.

did de Janvry and Sadoulet (2000), that the initial poverty incidence and the initial human capital significantly affect growth elasticity. High initial poverty incidence significantly reduces the implied growth elasticity—ranging between –1.1 (the province of Bohol, with the highest poverty incidence in 1988) and –2.7 (the province of Pampanga, with the lowest poverty incidence in 1988) (Table 7, 3rd panel). In addition, a high initial mortality rate also reduces growth elasticity, while irrigation investment raises growth elasticity; the range of the implied growth elasticity in each case is in a similar range of between –1 and –2.5 (Table 7, 4th and 5th panels). The 'dynasty,' however, is not found to have a significant effect on the growth elasticity. We thus find that the growth elasticity of poverty reduction tends to be higher when agricultural income share is increasing rather than decreasing, the initial level of poverty is lower, the initial mortality rate is lower and a larger proportion of agricultural land is irrigated.[26] While industrialization raises mean income growth slightly (as we saw in Section VI), it also reduces the responsiveness of poverty reduction to a given rate of aggregate growth.

VII. Conclusions

In this paper, we analyzed the processes of growth and poverty reduction in the Philippines under a consistent framework based on neoclassical growth theories. We find that there was a tendency of absolute convergence across provincial incomes between 1988 and 1997. The estimated rate of convergence of 10% is quite high compared to the historical experiences of absolute convergence within currently developed counties as well as to the earlier cross-country estimates of the conditional rate of convergence (about 2%), and it is close to the estimated conditional rate of convergence obtained by Caselli, *et al*. (1996). The regional income dispersion was declining in the Philippines in the 1990s, and provincial incomes were converging possibly toward a relatively low-level steady-state. We then examined the determinants of provincial mean income growth. Among the initial conditions, higher initial human capital stock (measured by mortality rate) and *higher* inequality in the

[26] Alternatively, we also regressed the simple elasticity of poverty with respect to mean income growth on a set of similar explanatory variables as found in equaiton (2). Although we do not report the results here, the significant determinants are essentially the same as the ones discussed here (i.e., initial poverty incidence, mortality rate and irrigation).

initial land distribution lead to a higher rate of mean income growth. In addition, we find that the more the elected officials are related with each other by blood or affinity the lower is the subsequent income growth. Among policy variables, greater implementation of agrarian reform (CARP) is positively related to growth rate; this result could be due to the increased investment in human capital and non-agricultural activities by the land reform beneficiaries, or to the selective implementation of CARP targeting the provinces with higher growth potentials.

The rate of poverty reduction across provinces can be explained by a similar set of variables as in the case of the mean income growth; lower initial income level, higher initial human capital, *higher* initial land inequality and greater implementation of CARP are all positively related to faster poverty reduction. Most of the effects of the initial conditions, however, appear to affect poverty reduction only indirectly, through raising mean income growth. Terms of trade more favorable to agriculture, on the other hand, tend to facilitate poverty reduction directly through their income re-distribution effects. As expected, faster economic growth helps poverty reduction, but the strength of such a relationship appears rather weak in the Philippines by international standards; the estimated growth elasticity of poverty reduction is around 1.7 while the international standard appears to be around 2.5. Therefore, the slow poverty reduction in the Philippines compared to its Asian neighbors is due not only to the relatively slower aggregate income growth but also to the low responsiveness of poverty reduction to aggregate growth. We also find, however, that such growth elasticity is rather sensitive to changes in the sectoral income and some initial conditions; aggregate income growth leads to substantial poverty reduction (only) if: the initial poverty level is not too high, the initial mortality rate is not too high, agricultural land is irrigated and the share of agricultural income is increasing rather than decreasing. This last finding implies a rather disturbing dilemma that the spread of industrialization, a part of the genuine economic development process, may reduce the poverty reduction impact of aggregate income growth.

In terms of policy implications, our findings support a few of the familiar policy measures as effective tools for poverty reduction, such as the positive impact of the human capital stock for subsequent growth and poverty reduction, the positive effects of the relative

price of agricultural products and of the agrarian reform program in facilitating poverty reduction. Our result suggests that the disappointing performance in poverty reduction in the Philippines could be partly attributable to the depression of the relative price of agricultural products as a result of the persistence of industrial protection policies. The relative magnitude of the coefficients among various policy variables suggests, however, that there is no single policy 'lever' that likely has a predominantly large impact on the speed of poverty reduction (assuming that the cost of changing these policy variables by one standard deviation is roughly equivalent across policy measures). In addition, we find some quantitative evidence that the dominance of an oligarchic political regime could hurt growth, confirming the popular perception found in the literature on Philippine politics.

On the other hand, our results contradict another popular conjecture on Philippine development—the relatively high level of wealth inequality, compared to the Asian miracle economies, has been a major obstacle for faster growth. Instead, there might be a disturbing trade-off between growth and equity. We should perhaps be cautious in drawing a definitive policy conclusion, however, given the limited nature of our findings at this point. Further research is needed. For example, more recent theoretical as well as empirical studies suggest differential implications of the inequality-growth relationship between the short-run and the long-run (e. g., Bénabou 1996, Forbes 2000, Banerjee and Duflo 1999). We would need to further investigate whether similar findings could be obtained from other growth episodes (such as the 1970s) or from growth episodes of a longer time span. Furthermore, while we provided some speculative interpretations of our results, specific mechanisms that lead to the macro-level inequality-growth relationships would need to be investigated more fully at the micro level.

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Bank.

Table 1. Per-capita GDP and Headcount Poverty Ratio in Selected Asian Countries

	Per capita GDP (1995 PPPUS$)		Headcount poverty ratio (%)*			
	1965	1995	1975	1985	1993	1995
Philippines	**1,736**	**2,475**	**35.7**	**32.4**	**27.5**	**25.5**
Malaysia	2,271	9,458	17.4	10.8	<1.0	<1.0
Thailand	1,570	6,723	8.1	10.0	<1.0	<1.0
Indonesia	817	3,346	64.3	32.2	17.0	11.4
China	771	2,749	59.5	37.9	29.7	22.2

source: Ahuja, Bidani, Ferreira and Walton (1997)

*: based on the 'PPP US$1 per day' poverty line calculated by the World Bank; —：not available

Table 2. Descriptive Statistics

Variable name	Description	mean	Standard deviation	min	Max
PCEXP88[1]	Per-capita consumption expenditure 1988	16,598.38	5,133.671	6,818.222	31,993.09
PCEXP97[1]	Per-capita consumption expenditure 1988	19,842.54	4,383.013	7,754.623	30,304.10
Lpcexp88[1]	Log of per-capita expenditures in 1988	9.672	0.303	8.827	10.373
Lpcexp97[1]	Log of per-capita expenditures in 1997	9.869	0.239	8.956	10.319
GRPCEXP[1]	Average annual growth rate of per capita expenditures	0.023	0.032	-0.090	0.105
GRINCID[1]	Annual average rate of change in headcount poverty rate	-0.016	0.065	-0.146	0.259
GRDEPTH[1]	Annual average rate of change in the depth of poverty	-0.022	0.089	-0.188	0.307
GRSEVER[1]	Annual average rate of change in the severity of poverty	-0.023	0.110	-0.234	0.323
Initial Conditions:					
Land gini[2]	Gini coefficient of farm distribution	54.16	6.55	36.49	75.77
Mortality rate[3]	Mortality rate per 1000 children age 0-5	84.99	14.71	55.92	121.12
Literacy rate[4]	Simple adult literacy rate	87.57	7.37	56.7	96.6
Irrigation area[5]	Share of irrigated farm area	0.27	0.22	0.015	0.95
Dynasty[6]	Proportion of the provincial officials related by blood or affinity	0.815	0.199	0	1
Time Varying Variables:					
Chg.CARP[7]	Change in CARP accomplishment 1988-97	1.340	1.089	0.4730	4.6851
Chg.road dencity[8]	Change in road density 1988-97[11]	0.0820	0.0839	-0.2141	0.4047
Chg.Ag.terms of trade[9]	Change in agricultural terms of trade 1988-97[12]	0.4481	0.0784	0.24	0.58
Chg. electricity[10]	Change in share of households with electricity 1988-97	11.3789	12.9160	-21	61.8

Sources: [1.] Family Income and Expenditure Survey (National Statistical Office); [2.] Census of Agriculture (National Statistical Office);[3.] 1990 Women & Child Health Indicators (National Statistical Coordination Board);[4.] FLEMMS (National Statistical Office);[5.] Census of Agriculture (National Statistical Office);[6.] collected by the authors by interviews;[7.] Department of Agrarian Reform;[8.] Department of Public Works and Highway;[9.] Regional Accounts of the Philippines (NSCB);[10.] Family Income and Expenditure Survey (National Statistical Office).

Additional definitions: [11] Total road length with quality adjustment by the average unit cost of upgrading roads across different types, divided by total land area; [12] Implicit agricultural GDP deflator divided by implicit non-agricultural GDP deflator.

Table 3. Reduced Form Provincial Growth Regression Results (Instrumental Variable Estimation: t-ratios in parentheses)

Dependent variable = annual growth rate of mean consumption per capita

Independent variables:	(a)[2]	(b)[2]
Initial conditions:		
Log (Per capita expenditure 1988)[1]	**-0.088(10.24)****	**-0.085 (11.59)**
Mortality rate	**-0.001 (3.04)****	**-0.0007 (-4.37)**
Literacy rate	0.0001 (0.16)	
Dynasty	**-0.026 (2.24)****	**-0.022 (2.17)**
Irrigation area	0.002 (0.14)	
Land gini	**0.001 (3.05)****	**0.001 (3.41)**
Policy variables:		
Chg. CARP	**0.006 (2.11)****	**0.006 (3.15)**
Chg. Electricity	-0.00003 (0.13)	
Chg. Ag. terms of trade	0.016 (0.52)	
Chg. road density	0.018 (0.64)	
Constant	0.849 (8.52)	0.833 (10.59)
Adj. R-squared	0.6799	0.6967
Sample size	65[3]	70

[1]Per capita income used as instrument. (see footnote 4 in text)
[2]Outlier observation (Province of Sulu) excluded.
[3] Provinces where at least one explanatory variable is missing are excluded.
*: statistically significant at 10% level; **: statistically significant at 5% level.

Table 4. Non-agricultural Sector Growth and the Regional Income Growth[1] (OLS: t-ratios in parentheses)

Dependent variable = annual growth rate of mean consumption per capita

Independent variables:	(a)	(b)
Initial conditions:		
Log(pcexp88)	**-0.0795(10.29)****	**-0.0817(11.13)****
Non-ag. income growth*Log(pcexp88)		**0.0019 (1.89)***
Non-ag. income growth	**0.0176 (1.86)***	
Mortality rate	**-0.0006 (-4.21)****	**-0.0006 (-4.24)****
Dynasty	**-0.0181 (-1.80)***	**-0.0181 (-1.80)***
Land gini	**0.0012 (-3.60)****	**0.0012 (-3.60)****
Policy variables:		
Chg. CARP	**0.0054 (2.76)****	**0.0053 (2.76)****
Constant	0.7569 (8.67)	0.7781 (9.49)
Adj. R-squared	0.7076	0.7082
Sample size	70[2]	70[2]

[1]Outlier observation (Province of Sulu) excluded.
[2] Provinces where at least one explanatory variable is missing are excluded.
*: statistically significant at 10% level; **: statistically significant at 5% level.

Table 5. Reduced Form Provincial Poverty Reduction Regression Results: Headcount ratio (Instrumental Variable Estimation: t-ratios in parentheses)

Dependent variable = annual rate of change in the headcount poverty ratio (HC)

Independent variables	(a)[2]	(b)[2]
Initial conditions:		
Log (Per capita expenditure 1988)[1]	**0.145 (7.12)****	**0.143 (7.89)****
Mortality rate	**0.002 (2.97)****	**0.001 (3.00)****
Literacy rate	0.001 (0.96)	
Dynasty	0.039 (1.40)	
Irrigation area	0.029 (0.79)	
Land gini	**-0.003 (3.15)****	**-0.003 (3.67)****
Policy variables:		
Chg. CARP	**-0.019 (2.84)****	**-0.014 (3.11)****
Chg. Electricity	0.0003 (0.54)	
Chg. Ag. terms of trade	**-0.127 (1.79)***	**-0.128 (1.89)***
Chg. road density	-0.047 (0.69)	
Constant	-1.427 (6.04)	-1.266 (6.65)
Adj. R-squared	0.5038	0.5148
Sample size	65	70

[1]Per capita income used as instrument. (see footnote 4 in text) [2]Outlier observation (Province of Sulu) excluded. *: statistically significant at 10% level; **: statistically significant at 5% level.

Table 6. Estimating Growth Elasticity of Poverty Reduction with Alternative Poverty Measures [1](3SLS: t-ratios in parentheses)

Independent Variables	*Poverty measure used as the dependent variable:* Headcount Ratio (HC)	Poverty Gap (PG)	Squared Poverty Gap (SPG)
GRPCEXP	**-1.6381**	**-2.2985**	**-2.8979**
	(-11.61)[** 2]	**(-11.47)**[** 2]	**(-10.57)**[** 2]
Land gini	**-0.0010**	-0.0008	-0.0008
	(-1.79)*	(-1.01)	(-0.71)
Chg. CARP	**-0.0057**	**-0.0076**	-0.0088
	(-1.86)*	**(-1.78)***	(-1.50)
Chg. Ag. terms of trade	**-0.0947**	-0.0857	-0.1233
	(-2.23)**	(-1.44)	(-1.51)
Constant	0.1254	0.1222	0.1516
	(3.25)	(2.26)	(2.05)
R-squared	0.7651	0.7702	0.7369
Sample size	70	70	70

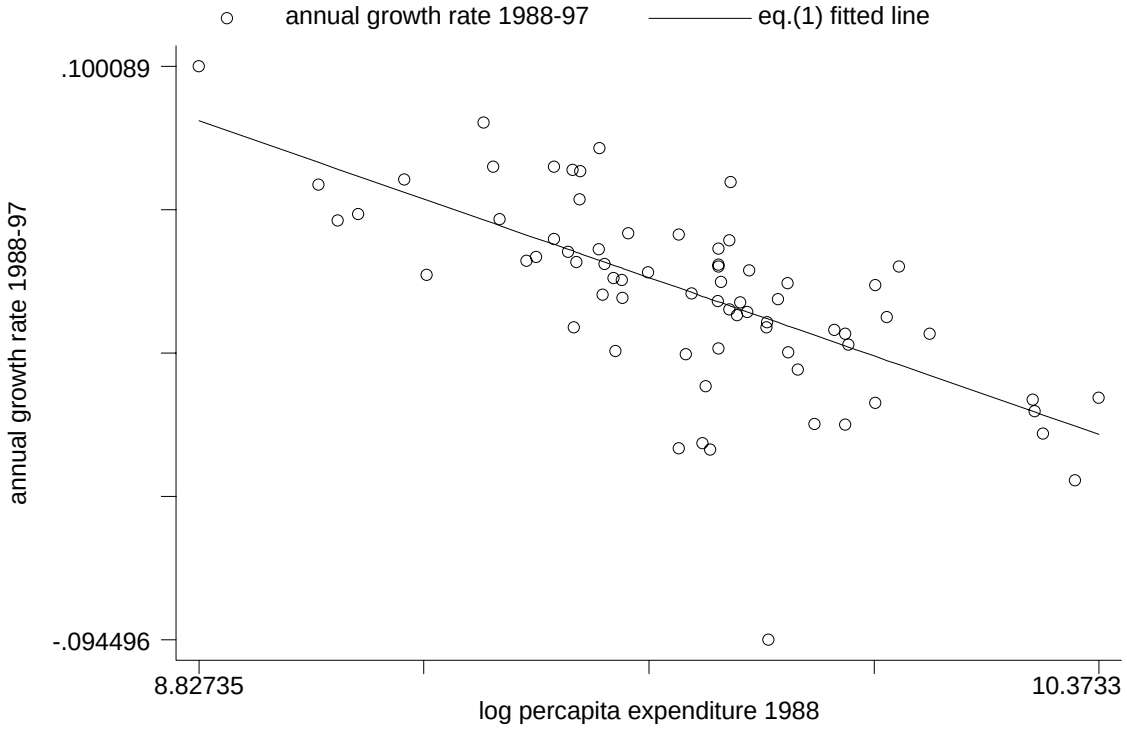
[1]Equations (2) and (4) estimated as a system by three stage least squares. Outlier observation (Province of Sulu) excluded. [2]Identifying instruments for mean expenditure growth rate: dynasty, log(pc income 88), mortality.
*: statistically significant at 10% level; **: statistically significant at 5% level.

Table 7. Qualifiers of Growth Elasticity of Poverty Reduction[1]
(OLS: t-ratios in parentheses)

	Coefficient (t-ratio)	Implied overall growth elasticity	
		lowest	highest
Mean income growth rate interacted with agricultural income growth (ratio)			
GRPCEXP	-0.9510 (-2.48)	-1.304	-2.610
ag..income growth*GRPCEXP	-0.9035 (-1.83)	(Misamis Or.)	(E.Samar)
Mean income growth rate interacted with initial poverty incidence			
GRPCEXP	-2.7203 (-9.90)	-1.013	-2.677
Poverty incidence*GRPCEXP	0.01996 (4.34)	(Bohol)	(Pampanga)
Mean income growth rate interacted with initial mortality rate			
GRPCEXP	-2.8938 (-5.25)	-1.008	-2.023
mortality*GRPCEXP	0.01557 (2.36)	(W.Samar)	(Pampanga)
Mean income growth rate interacted with initial irrigation			
GRPCEXP	-1.2137 (-6.49)	-1.235	-2.589
irrigation* GRPCEXP	-1.4482 (-2.78)	(W.Samar)	(Tawi-tawi)

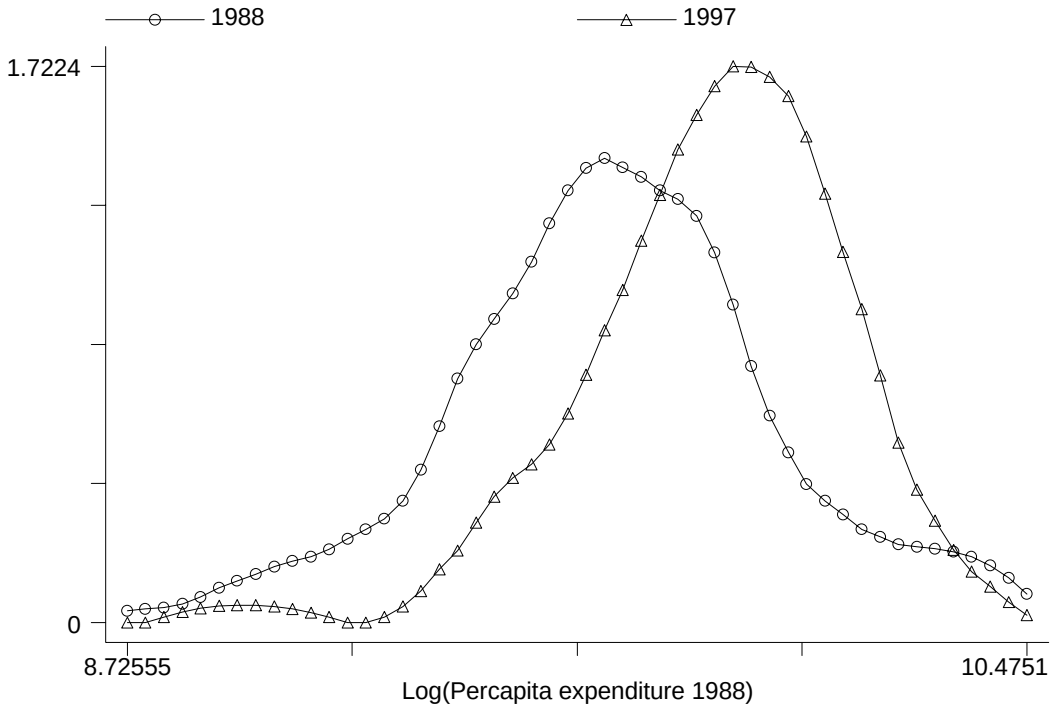
[1]The same set of additional explanatory variables as in Table 6 (b) are included but not reported. Estimation by OLS.

Figure 1. Absolute Beta Convergence across Provincial Income



* The outlier observation at the middle bottom is that of the province of Sulu.
(source: Family Income and Expenditure Survey)

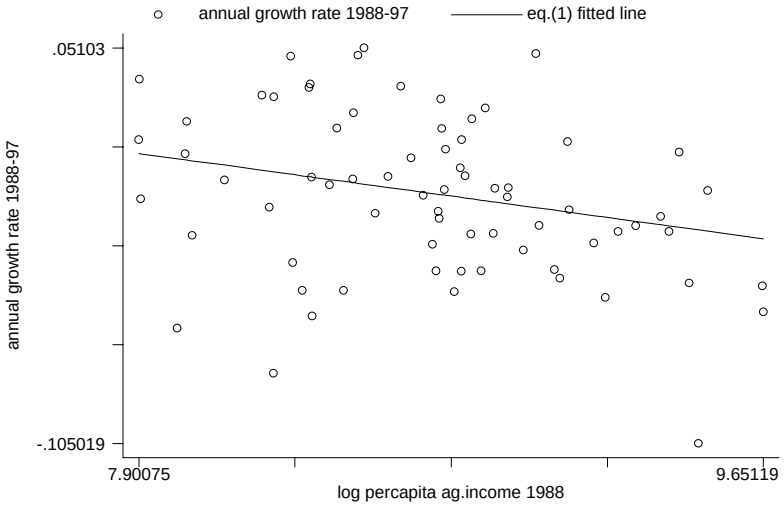
Figure 2. Kernel Density of Log of Per-capita Expenditures: 1988 vs. 1994



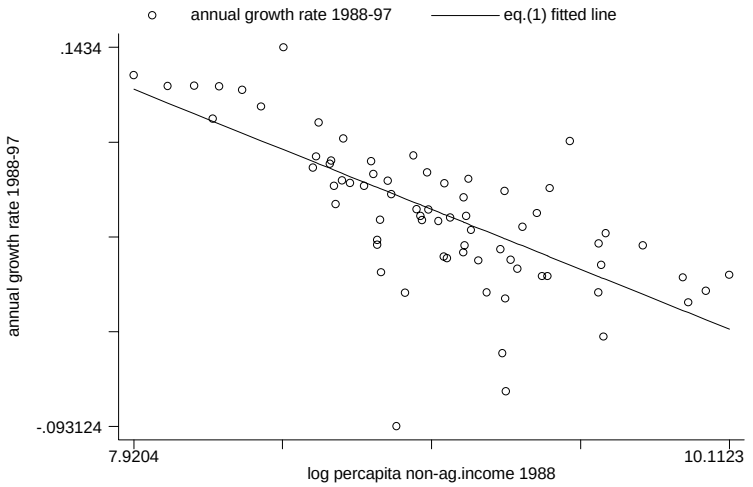
(source: Family Income and Expenditure Survey)

Figure 3. Provincial Income Convergence: Agricultural vs. Non-agricultural Income

(a) Agricultural income only



(b) Non-agricultural income only



(source: Family Income and Expenditure Survey)

Figure 4. Initial Per-capita Expenditures and Non-agricultural Income Share Growth[1]

[1] non-agricultural income growth = share of non-agricultural income in 1997/share of non-agricultural income in 1988.
(source: Family Income and Expenditure Survey)

Appendix 1: Effects of Farm Distribution Inequality using Alternative Land Distribution Measures

This table summarizes qualitative results on the estimated coefficients on the alternative measures of land distribution as substituted for the Gini coefficients of farm distribution in the corresponding specifications in the Tables (with all the other covariates kept as the same). The sign "+ (-)" signifies that the estimated coefficient is positive (negative) while the one (two) asterisk(s) means that the coefficient is statistically significantly different from zero at 10% (5%) level of significance or less. (See below for the definitions of alternative land distribution measures used.)

We find that larger ratios of farm areas of the small to medium size farms to large size farms are associated with lower per-capita expenditure growth and with a slower rate of poverty reduction—similar relationships hold with the land distribution measures defined as: the ratio of the total area of the farms of size below 5 hectares to the total area of the farms over 10 hectares, the ratio of the total area of the farms of size between 1 and 5 hectares to the total area of all farms; the ratio of the total area of the farms of size 3 and 10 hectares to the total area of all farms. The share of very large farms (measured by the ratio of the total area of the farms of size over 25 hectare to the total area of all farms), on the other hand, is significantly positively associated with higher growth and faster poverty reduction. Some of the measures are not significantly associated with growth or poverty reduction. None of the measures of land distribution support the recent conventional wisdom that 'initial inequality hurts subsequent growth.' Furthermore, we also examined the effects of the gini coefficient of the distribution of per-capita consumption expenditures with the same result; a higher initial inequality is positively associated with subsequent growth rates.

Table A-1. Effects of Alternative Measures of Land Distribution on Growth and Poverty Reduction

Land	Specifications as reported In:				
Distribution	Table 3		Table 5		Table 6
Measures	(a)	(b)	(a)	(b)	(HC)
Farm03/3	+	+	-	-	-
Area03/3	+	+	+	+	+
Farm05/10	-	-	+*	+**	+*
Area05/10	-**	-**	+**	+**	+**
Farm02/10	-	-	+	+	+
Area02/10	-	-	+**	+**	+**
Area02/all	+	+	-	-	+
Area03/all	+	-	+	+	+
Area15/all	-**	-**	+**	+**	+**
Area310/all	-**	-**	+**	+**	+
Area25/all	+**	+**	-**	-**	-**
Egini	+**	+**	-**	-**	-**

*:statistically significant at 10% level; **:statistically significant at 5% level;

Variable definitions:

Farm03/3: Ratio of the total number of farms under 3 hectares to the total number of farms over 3 hectares
Area03/3: Ratio of the total areas of the farms under 3 hectares to the total area of the farms over 3 hectares
Farm05/10: Ratio of the total number of farms under 5 hectares to the total number of farms over 10 hectares
Area05/10: Ratio of the total areas of the farms under 5 hectares to the total area of the farms over 10 hectares
Farm02/10: Ratio of the total number of farms under 2 hectares to the total number of farms over 10 hectares
Area02/10: Ratio of the total areas of the farms under 2 hectares to the total area of the farms over 10 hectares
Area02/all: Ratio of the total areas of the farms under 2 hectares to the total area of all the farms
Area03/all: Ratio of the total areas of the farms under 3 hectares to the total area of all the farms
Area15/all: Ratio of the total areas of the farms of the size between 1 and 5 hectares to the total area of all the farms
Area310/all: Ratio of the total areas of the farms of the size between 3 and 10 hectares to the total area of all the farms
Area25/all: Ratio of the total areas of the farms over 25 hectares to the total area of all the farms
Egini: Gini coefficient of per-capita consumption expenditures.

Appendix 2: Reduced-Form Determinants of Poverty Reduction

Table A-2. Reduced Form Provincial Poverty Reduction Regression Results: Poverty Gap (Instrumental Variable Estimation: t-ratios in parentheses)

Dependent variable = annual rate of change in the poverty gap index (PG)		
Independent variables	(a)[2]	(b)[2]
Initial conditions:		
Log (Per capita expenditure 1988)[1]	**0.2022 (6.84)****	**0.1995 (7.62)****
Mortality rate	**0.0019 (2.48)****	**0.0014 (2.34)****
Literacy rate	0.0018 (1.08)	
Dynasty	0.0547 (1.35)	
Irrigation area	0.0306 (0.56)	
Land gini	**-0.0036(-2.79)****	**-0.0035(-3.03)****
Policy variables:		
Chg. CARP	**-0.0266(-2.68)****	**-0.0204(-3.07)****
Chg. Electricity	0.0005(0.75)	
Chg. Ag. terms of trade	-0.1200 (-1.16)	-0.1114 (-1.14)
Chg. road density	-0.1017 (-1.04)	
Constant	-2.0266 (-5.91)	-1.8044 (-6.54)
Adj. R-squared	0.4834	0.4924
Sample size	65	70

[1]Per capita income used as instrument. (see footnote 4 in text)

[2]Outlier observation (Province of Sulu) excluded.

*: statistically significant at 10% level; **: statistically significant at 5% level.

Table A-3. Reduced Form Provincial Poverty Reduction Regression Results: Squared Poverty Gap (Instrumental Variable Estimation: t-ratios in parentheses)

Dependent variable = annual rate of change in the squared poverty gap index (SPG)		
Independent variables	(a)[2]	(b)[2]
Initial conditions:		
Log (Per capita expenditure 1988)[1]	**0.2567 (6.71)****	**0.2522 (7.43)****
Mortality rate	**0.0022 (2.25)****	**0.0015 (2.06)****
Literacy rate	0.0023 (1.06)	
Dynasty	0.0637 (1.22)	
Irrigation area	0.0605 (0.86)	
Land gini	**-0.0042(-2.47)****	**-0.0042(-2.80)****
Initial conditions:		
Chg. CARP	**-0.0353(-2.75)****	**-0.0253(-2.94)****
Chg. Electricity	0.0009 (1.02)	
Chg. Ag. terms of trade	-0.1516 (-1.13)	-0.1438 (-1.13)
Chg. road density	-0.1147 (-0.91)	
Constant	-2.5826 (-5.82)	-2.2739 (-6.36)
Adj. R-squared	0.4698	0.4787
Sample size	65	70

[1]Per capita income used as instrument. (see footnote 4 in text)

[2]Outlier observation (Province of Sulu) excluded.

*: statistically significant at 10% level; **: statistically significant at 5% level.

Appendix 3: Testing the Validity of Instruments and Exogeneity of Mean Expenditure Growth Rate

Table A-4: Tests for over-identifying restrictions and Hausman-Wu test of exogeneity

Dependent variable	Headcount	Poverty gap	Squared poverty gap
Test of over-identification:*			
Chi-square test statistic (p-value)	0.8967 (0.64)	1.1765 (0.56)	1.9585 (0.38)
Hausman-Wu test of exogeneity of GRPCEXP: T-test statistic (p-value)	0.209 (0.84)	0.632 (0.53)	0.422 (0.68)

*Instruments: Dynasty; log (per-capita income 1988); mortality rate

Table A-5: OLS estimates of growth elasticity of poverty reduction (additional regressors: Land Gini, CARP, Ag. Terms of trade, w/o Sulu) (t-ratios in parenthesis)

Dependent variable	Headcount	Poverty gap	Squared poverty gap
Growth elasticity	-1.6193 (-13.57)**	-2.3452 (-14.02)**	-2.9522 (-12.89)**
Landgini	-0.0010 (-1.79)*	-0.0008 (-0.93)	-0.0007 (-0.64)
CARP	-0.0057 (-1.80)*	-0.0076 (-1.70)*	-0.0087 (-1.44)
Ag.terms of trade	-0.0940 (-2.14)**	-0.0902 (-1.47)	-0.1280 (-1.52)
constant	0.1564 (2.09)	0.1225 (2.19)	0.1518 (1.98)
Adjust. R-squared	0.7585	0.7563	0.7210

*: statistically significant at 10% level; **: statistically significant at 5% level.