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In Search of a Strategy for Making Growth More Pro-Poor in the Philippines

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Abstract

The main driver of poverty reduction has shifted from agricultural to non-agricultural income growth in rural Philippines in the past two decades. Agricultural growth is still relatively more important (vis-à-vis non-agricultural growth), however, in reducing rural poverty in relatively more isolated provinces. Our results suggest that agricultural investments should focus on areas with underdeveloped infrastructure but with comparative advantage in agriculture. At the same time, non-agricultural income growth can be made more pro-poor by investing in mobility infrastructure and health, facilitating international labor migration, and lowering income inequality.

1. INTRODUCTION

While the relationship between economic growth, on the one hand, and poverty and inequality, on the other, has long been debated among development economists, the increasing availability of household survey data over the recent decades has shown a robust negative correlation between economic growth and absolute poverty (or, at least, the general absence of trade-offs between the two). At the same time, those data also demonstrate that all growth episodes are not equally "good for the poor," with a great deal of variations, across countries and over time, in the extent to which the poor benefit from mean income growth. A key question that arises is: under what conditions can economic growth be more pro-poor?

Identifying the conditions for pro-poor growth based on cross-country data has been shown to face a number of difficulties. Kraay (2006), for example, finds no significant correlate of 'pro-poor growth' in cross-country data. Country-level studies, on the other hand, appear to be a more promising approach. Ravallion and Datt (2002), for example, identify several aspects of 'initial conditions' that make subsequent non-farm sector growth more pro-poor in India, including higher female literacy, lower infant mortality, higher farm yields, smaller urban-rural disparities and lower landlessness.

The literature further suggests, however, that important policy levers for promoting pro-poor growth may well differ from one country to another. Cross-country studies support the view that the relative roles of agricultural and of non-agricultural growth shift over the course of economic development (Bravo-Ortega and Lederman 2005; Cristiansean and Demery 2007; WDR 2008). In addition, the theoretical literature on the role of agriculture in development and poverty reduction suggests that theoretical predictions depend crucially on

the extent of mobility in the goods produced as well as in the factors of production (see next section). All those observations point to the importance of accumulating country-level studies for understanding "when growth is pro-poor." This paper addresses this issue by building on recent work in India (Ravallion and Datt, 1996, 2002) and China (Ravallion and Chen 2007; Montalvo and Ravallion 2009), as well as previous work at the cross-country level (Ravallion 1997; Kraay 2006; Bravo-Ortega and Lederman 2005, Cristiaensen and Demery 2007; Loayza and Raddatz 2009), and using the Philippines as a case study.

In contrast with the rapid poverty reduction found in much of Asia for the past few decades, the slow progress in the Philippines stands out (Balisacan and Fuwa 2007). Poverty incidence declined from 31 to 12 percent in the East Asian region during 1990-2000 but only modestly from 34 to 28 percent in the Philippines. Recent studies focusing on Philippine poverty further suggest that the relatively slow pace of poverty reduction is a result both of the slower growth in mean income and of the weaker responsiveness of poverty to a given rate of mean income growth (Balisacan and Fuwa 2004). On the other hand, an increasing number of micro-level studies (based on household-level panel data) on poverty dynamics in the rural Philippines argue that non-agricultural growth has increasingly played a crucial role in reducing rural poverty, in part due to the increase in the relative returns to human capital vis-à-vis agricultural land over the past few decades (e.g., Hayami and Kikuchi 2000; Estudillo et al 2007; Fuwa 2007). Important questions that arise in light of the existing literature are: is agricultural growth still the key to rural poverty reduction in the Philippines?; why is the 'growth elasticity of poverty reduction' in the Philippines so low? and how can more 'pro-poor' growth be promoted, especially in the (increasingly important) non-agricultural sector? What policy levers may be available so as to enhance the 'growth

elasticity' with respect to non-farm growth? This paper addresses those issues by building on the general approach developed by Ravallion and Datt (2002).

We find that the increasing shift from agricultural to non-agricultural income growth as the main driver of poverty reduction, as found in existing studies based on small samples, is indeed a nation-wide phenomenon, and that growth elasticity of poverty reduction is significantly larger with respect to non-agricultural growth than with agricultural growth. We further find that higher non-agricultural growth elasticity is significantly associated with lower (initial) child mortality, a larger share of international labor migration, higher road density and lower income inequality while higher agricultural growth elasticity is significantly associated with higher irrigation potential. We will also argue that one of our empirical findings is consistent with a key theoretical prediction regarding the role of agriculture in development; the relative importance of agricultural growth in poverty reduction critically depends on the closed economy assumption. Our results also support a view that agricultural investments should be targeted to the areas with relatively underdeveloped infrastructure but with land topography consistent with comparative advantage in agriculture.

The rest of the paper is organized as follows. The next section briefly reviews the existing literature on the relative role of agricultural and non-agricultural sector growth in rural poverty reduction as well as the literature on rural poverty dynamics in the Philippines. Section three discusses the dataset and then addresses the issue: to what extent does agricultural growth still hold key to rural poverty reduction? Section four attempts to identify significant correlates of sectoral growth elasticity of poverty reduction. Section five discusses potential policy implications focusing on sectoral growth strategies and investment priorities. Final section concludes the paper.

2. IDENTIFYING KNOWLEDGE GAPS IN THE LITERATURE

(a) Role of Agriculture in Poverty Reduction

The roles of agriculture in economic development have long been debated among development economists (e.g., Johnston and Mellor 1961; Timmer 200?). The traditionally recognized roles of agricultural sector growth in the process of development include:

- Supplying food for non-agricultural labor force and other raw materials for non-agricultural production
- Releasing 'surplus labor' to non-agricultural sectors
- Supplying markets for goods and services produced by non-agricultural sectors (demand linkages)
- Providing savings for the development of the industrial (and other non-agricultural) sectors
- Earning foreign exchanges to finance capital accumulation needed for industrialization

Despite the long standing debate on the 'roles of agriculture,' rigorous empirical evidence on the relative importance of agricultural and non-agricultural sector growth in poverty reduction appears to be scarce due to the paucity of appropriate data (Dercon 2009, Ravallion and Datt 1996, Foster and Rosenzweig 2008). Cross-country studies suggest that agricultural growth tends to have a larger impact on poverty reduction than does nonagricultural growth, but also that the pro-poor nature of agricultural growth (relative to that of nonagricultural growth) is likely to diminish as a country grows richer (Bravo-Ortega and Lederman 2005, Cristiaensen and Demery 2010, Ligon and Sadoulet, 2007). On the other hand, however, there are country-level studies pointing to growth in the non-agricultural sector as the main driver of rural poverty reduction. Most, if not all, of micro-level studies in

the Philippines (as we see below) fall into this category. MaCulloch, Weisbrod and Timmer (2007) similarly find that rural poverty reduction in Indonesia in recent years was mainly due to nonagricultural, rather than agricultural, income growth. In addition, Datt and Ravallion (1996) find in India that it is primary and tertiary sector growth (but not secondary sector growth) that has positive impact on rural poverty reduction, and that the quantitative impact of tertiary sector growth is larger than that of primary sector growth (although the difference is not statistically significant).

Historical records show that poverty reduction is accompanied by 'structural transformation,' and that the more successful is the structural transformation, the faster is the pace of poverty reduction (e.g., Timmer and Akkus 2008). This implies that agricultural productivity growth, poverty reduction, and nonagricultural sector growth are 'complements.' As Foster and Rosenzweig (2004, 509) argue, however, at local levels, it is not clear whether every poor region "should focus its public resources on agricultural development in order to raise the incomes of people now engaged in farming and whether such a policy is necessary for obtaining economic diversity." Theoretical models developed by Foster and Rosenzweig (2008) show that, at subnational levels, much of how growth in one sector affects growth in another sector is ambiguous, depending on the tradability of the goods produced by each sector, the degree of mobility in capital and labor across sectors and across geographical locations, and the extent of income transfer between rural and urban households. On the empirical front, Foster and Rosenzweig (2004) find that the productivity growth in agriculture and nonagricultural income growth were substitutes, rather than complements, in rural India over the period between 1971 and 1999.

In addition, theoretical models suggest that the relative role of agricultural and

non-agricultural growth in poverty reduction may crucially depend on the degree of openness of the economy. Eswaran and Kotwal (1993) demonstrates, for example, that growth in agricultural productivity is the key to poverty reduction but productivity growth in the non-agricultural (i.e., industrial) sector has *no* impact on poverty under a closed economy regime (where neither agricultural nor industrial goods are traded across borders). The same model also shows that productivity growth in both the agricultural and non-agricultural sector can contribute to poverty reduction (as far as such productivity growth is faster than the productivity growth in its trading partners) under an open economy regime. Matsuyama (1992) similarly demonstrates that the positive effects of agricultural productivity growth on industrialization critically depend on the assumption of a closed economy (while the opposite results are possible under an open economy assumption). Applied to sub-national level variations, those theoretical results imply that increased flows of goods and services across regions, through better infrastructure for example, could weaken the crucial importance of agricultural growth in rural poverty reduction. We will test this theoretical implication in our empirical analysis in section three.

The issue of whether and to what extent agricultural growth is a necessary condition for poverty reduction and structural transformation *at the local level*, therefore, is an open question and is likely to be country (or location) specific. This paper intends to address this issue empirically based on a nationally representative dataset from the Philippines.

(b) Philippine Contexts

Recent empirical work in the Philippines has demonstrated that the slow poverty reduction in the country has been due to both slow growth and low responsiveness of poverty reduction to growth. The estimated 'growth elasticity of poverty reduction' in the Philippines

ranges between 1.4 and 1.6 (Balisacan and Fuwa 2004, Balisacan 2007), while similar estimates for developing countries as a whole fall in the neighborhood of 2.5 (Ravallion 2001) and those for Asian neighbors are even higher; growth elasticity estimates for Thailand, Indonesia and China are 3.5, 3.0 and 2.9, respectively (Cline 2004).

At the same time, however, the structural transformation in the Philippines has progressed in the past few decades with increasing diversification in rural economies. The share of agricultural GDP declined from 30% in 1970 down to 14% in 2006 while that of services increased from 39% to 54%. As a result, it is likely that the potential routes for escaping poverty in rural areas have also become increasingly diverse over time. In fact, there have been an increasing number of empirical studies focusing on rural poverty dynamics based on household-level panel data. While, in general, rural households can escape from poverty either through climbing the 'agricultural ladder' or through increased incomes from the non-agricultural sector, those studies invariably point to the crucial role played by the non-agricultural income growth and the associated increase in the relative returns to education vis-à-vis agricultural land. The main sources of the non-agricultural sector incomes, in turn, include the rural non-agricultural sector, the urban sector or international labor migration (e.g., Hayami and Kikuchi 2000; Estudillo et al 2007; Hossain et al. 2000; Fuwa 2007). Despite the importance of the non-agricultural sector growth in rural poverty reduction after the 1980s (which those studies cover), most of those studies also point to the dramatic increase in agricultural productivity due to the Green Revolution in the 1970s, which preceded the expansion in non-agricultural income opportunities. The increased income resulting from agricultural productivity growth allowed farm households to invest in their children's education, which, in turn, allowed those children to benefit from the expansion of the

employment opportunities in the non-agricultural sector (e.g., Otsuka et al. 2009).

A major limitation of those studies from policy makers' point of view, however, is the very limited geographical coverage of the data used in those studies. The conclusions have been drawn based on household panel data collected in a small number of rice-growing villages in Luzon and Panay islands. It is thus not clear to what extent the findings based on the micro-studies are generalizable to other parts of the country. In other words, to what extent is agricultural growth still the key to rural poverty reduction?; and, to the extent it is, which geographical parts of the country should be the focus of agricultural development in order to maximize the poverty reduction impact of agricultural development?

Given the mounting evidence suggesting non-agricultural growth becoming increasingly the main driver of rural poverty reduction, combined with the findings that the growth elasticity of poverty reduction in the Philippines appears to be lower than growth elasticities in its Asian neighbors, a poverty reduction strategy for the country should attempt not only to facilitate non-farm sector growth but also to make non-agricultural development *more pro-poor*. Nevertheless, little attempt has so far been made in the literature to empirically identify specific factors that make growth more pro-poor in the Philippine context. Exploring potential policy levers to raise the growth elasticity of non-farm growth is the main objective focus of section 4. In sum, the existing literature suggests that there are two key empirical questions: (1) To what extent is agricultural growth still the key to rural poverty reduction in the Philippines?; (2) What are critical policy levers that could make the rural sector growth (esp. in the non-farm sector) more pro-poor?

3. IS AGRICULTURAL GROWTH STILL THE KEY TO RURAL POVERTY REDUCTION IN THE PHILIPPINES?

(a) Provincial Panel Data

Our main data source for the evolution of poverty comes from the Family Income and Expenditure Surveys (FIES) conducted in every three years. FIES contains both total household incomes by sources as well as total household consumption expenditures. In order to analyze poverty dynamics covering the entire country, in the analysis that follows, household level data are aggregated into the provincial level (73 provinces, excluding Metro Manila) to form a panel with observation points in every three years (i.e., 1991, 1994, 1997, 2000, 2003 and 2006).[1] For each household, reported incomes from different sources are aggregated into agricultural and non-agricultural incomes. Those incomes from agricultural and non-agricultural sources are then aggregated into provincial averages, which constitute the unit of analysis. Provincial income and consumption expenditure data are then deflated using provincial cost of living indexes.[2]

Table 1 classifies the 73 provinces in terms of the change in poverty incidence and of the change in the share of agricultural incomes between 1991 and 2006. During this period, poverty incidence declined in 62 out of 73 provinces. In most (58) of the 62 provinces where poverty incidence fell, non-agricultural incomes grew faster than did agricultural incomes. In addition, instead of using the long-term growth episode during 1991-2006, the 3 year intervals of the FIES survey data can be used to examine the set of 3 year episodes across 73 provinces during 1991 and 2006, and lead us to similar (though somewhat less dramatic) conclusions. The headcount poverty ratio declined in a majority of the provincial 3-year growth spells (221

out of 365 province-growth spells), but it increased in 152 provincial growth spells. The growth rate in the non-agricultural income was higher in 235 out of 365 province-growth spells while that of the agricultural income was higher in 130 province-growth spells. The most common pattern, again, is the growth spell with poverty reduction and with faster growth in non-agricultural (than agricultural) incomes. The ratio of the frequency of non-agricultural-growth led poverty reduction to that of agricultural-growth led poverty reduction is now roughly two to one, rather than 58 to 4 as in Table 1.

(b) Estimating Sectoral Growth Elasticity of Poverty Reduction

By replicating earlier studies, we first confirm the relatively small growth elasticity of poverty reduction found in the Philippines based on the provincial panel data. We estimate the regression equation:

$$ln P_{it} = \alpha + \beta ln\,(Y_{it}) + \eta_i + \Sigma \rho_t D_t + \varepsilon_{it} \quad , \qquad (1)$$

where P_{it} is poverty incidence in province i and year t, Y_{it} is per-capita income in province i and year t, η_i is the time-invariant, province specific effect, D_t is a year dummy, and ε_{it} is a random error term. Equation (1) yields growth elasticity (β) of -1.416 (t-ratio = 13.40) and -1.026 (t-ratio = 11.37) by using the mean income variable (Y_{it}) as measured by percapita household consumption expenditures and by percapita household incomes, respectively.[3] The consumption based elasticity (-1.4) is the same as an earlier estimate using an earlier data period during 1988-1997 (Balisacan and Fuwa 2004) and is well below the estimated elasticities found in its neighboring countries in Asia. The main aim of this paper, however, is to go beyond the aggregate growth elasticity and estimate sectoral income growth elasticities of poverty reduction. This is done by applying the basic framework used by Ravallion and

Datt (1996) and Christiansen and Demery (2007) and by comparing the responsiveness of poverty incidence to income growth by different sectors.

$$lnP_{it}=\alpha + \pi_1 s_{ag,it} lnY_{agricultural,it}+\pi_2 s_{non\text{-}ag.,it} lnY_{non\text{-}agricultural,it} + \eta_i + \sum \rho_t D_t + \varepsilon_{it} \quad (2)$$

where $Y_{k,\,it}$ is per-capita income from sector k in province i and year t and $s_{k,\,it}$ is the share in the total percapita income of the income from sector k in province i and year t. π_k's are the key parameters to be estimated. We should note that while the π coefficients in those equations in Ravallion and Datt (1996) measure the change in the rate of poverty reduction corresponding to one percentage growth in income from particular sectors/sources with the sectoral income shares controlled, the estimated 'growth elasticity' reported here is defined as the marginal effects of sectoral income growth *multiplied by the income share*.[4] The π coefficients can be seen as representing a 'fair' comparison of the marginal impacts of a unit change in growth rate among sectors (Christiaensen, Demery and Kuhl 2011). If the cost of raising the growth rate of a sector by 1 % (say) is the same regardless of the size of the sectoral income shares, however, then investing in the sector with a higher 'elasticity' (rather than a higher 'π') would make much more sense, which would result in larger impacts on poverty reduction.

The relative magnitudes of the 'π_k' coefficients' (as defined in Ravallion and Datt (1996)) as well as the (unconditional) growth elasticity, between agricultural versus non-agricultural sector growth, are shown in Table 3. By disaggregating income between agricultural and non-agricultural sources, we find that the 'π_k' coefficient is somewhat higher for agricultural income (-0.98) than for non-agricultural income (-0.86). While the difference between the two elasticity figures is statistically significant, the difference in magnitude

appears to be relatively small.[5] We can disaggregate the non-agricultural income sources further among: industrial sector, service sector, unearned incomes, and remittance incomes (coming from abroad), and estimate the following regression equation:

$$lnP_{it}=\alpha + \pi_1 s_{ag,it} lnY_{agricultural,it}+\pi_2 s_{industrial.,it} lnY_{industrial,it} +\pi_3 s_{service.,it} lnY_{service,it}$$

$$+\pi_4 s_{unearned.,it} lnY_{unearned,it} +\pi_5 s_{remittance.,it} lnY_{remittance,it} + \eta_i + \sum \rho_t D_t +\varepsilon_{it} \qquad (3)$$

The estimated 'π_k' coefficients are surprisingly similar across all the income sources, once the differential income shares are controlled for (Table 3, column 2). Therefore, in contrast with similar analyses in India or China, the sectoral composition of income growth does not have a strong influence on the extent to which the poor benefit from mean income growth in the Philippines.[6]

The share of agricultural incomes, however, tends to be smaller than that of non-agricultural incomes. As a result, while π coefficients do not differ much between agricultural and non-agricultural growth, in most cases, the *unconditional* (on income shares) growth elasticity of poverty reduction (i.e., π_k multiplied by the income share) is significantly larger for non-agricultural growth than for agricultural income growth. Thus, a one percentage point increase in non-agricultural incomes tends to generate a larger impact on rural poverty reduction than does the same increase in agricultural incomes. [7] The general conclusions based on nationally representative data are thus consistent with those based on the small number of villages in Luzon and Panay.

4. IN SEARCH OF POTENTIAL POLICY LEVERS FOR MAKING GROWTH MORE PRO-POOR IN THE PHILIPPINES

Our analysis using provincial panel data so far has found that, consistent with the household-level studies, non-agricultural growth has increasingly become the main driver of poverty reduction in the Philippines. This observation, in turn, raises two policy questions that are critical in forming a development strategy for the Philippines; (1) what policy levers should command higher priority in order to make non-agricultural growth (which has increasingly become the main driver of rural poverty reduction in the country) more pro-poor?; (2) to the extent that there is still a role for agricultural development to play in accelerating rural poverty reduction in the Philippines, where should the geographical and policy focus be in targeting agricultural investments? This section addresses the first question while the next section addresses the second.

(a) The Empirical Specification

We follow the empirical framework developed by Ravallion and Datt (2002) for India, where potential policy levers can be explored by searching for multiplicative correlates of sectoral growth elasticity. Under the framework, the province-level poverty incidence is regressed on a combination of time-varying variables and the interaction between those variables and the 'initial conditions' around the time of the starting point of the panel observations. The time-dependent determinants of poverty reduction consist of: agricultural productivity growth and non-farm sector growth. The set of potential determinants of sectoral growth elasticity of poverty reduction consists of the initial stock of infrastructure, human capital (education, health and demography) and the extent of initial inequality.

We estimate the following equation by using the provincial panel data[8]:

$$lnP_{it} = \beta_1 lnNFP_{it} + \beta_2 lnAGP_{it} + \sum\beta_{1k} lnNFP_{it} * X_{ki} + \sum\beta_{2k} lnAGP_{it} * X_{ki} + \pi_t t + \eta_i + \varepsilon_{it} \quad (4)$$

where P_{it} is (as before) poverty incidence of province i in year t[9]; the time-varying determinants of provincial poverty consist of agricultural productivity (AGP; measured by the real agricultural income based on FIES income data, aggregated at the provincial level and divided by the area of total disposable and alienable land in the province in hectare) and non-agricultural productivity (NFP; measured by the real non-agricultural income percapita based on FIES income data aggregated at the provincial average). Those time varying determinants of provincial poverty are also interacted with a set of initial conditions X_{ki} of province i in (or around) year 1991. A time trend (t) and time-invariant province-level effects (η_i) are added as additional determinants of provincial poverty.

As a part of our empirical analysis, a test of theoretical insights in the literature is conducted by examining the effects of initial infrastructure, especially road density, on the relative magnitudes of agricultural and non-agricutral growth elasticities. The theoretical models by Ewaran and Kotwal (1994) and Matsuyama(1992) predict that the *relative* magnitude of agricultural (non-agricultural) growth elasticity is likely to be larger (smaller) in provinces where initial road infrastructure is relatively *less* (more) developed and thus provincial economies look relatively more like closed (open) economies.

Our selection of additional variables representing initial conditions builds on the empirical findings by Ravaiion and Datt (2002) but the list is expanded to account for some additional development features specific to the Philippines, such as the prevalence of international labor migration (e.g., Fuwa 2007) and of "political dynasty" (e.g., Balisacan and

Fuwa 2003). In addition to the initial level of infrastructure, additional potential correlates of sectoral growth elasticities consist of human capital, agricultural productivity potentials, and initial inequality measures. Specific measures of initial conditions included in the analysis are as follows:[10]

Infrastructure development

- Road density: quality-adjusted road density, as measured by the ratio of concrete and asphalt roads to total land area of the province in 1991.
- Irrigation development: proportion of irrigated farm area to total farm area in 1991.
- Electrification: proportion of households with access to electricity in 1991.
- Household water access: proportion of households with access to potable water in 1991.

Human capital:

- Educational attainment; simple literacy rate (% of adult population who can read and write in 1988); the provincial average years of schooling of the household head in 1991; or the provincial primary and secondary school enrolment rate in 1991.
- Malnutrition rate: proportion of malnourished 0-6 year old children (classified as underweight using weight-for-age as indicator in 1991.
- Mortality rate: mortality rate per 1000 of 0 to 5 year old children in the province in 1990.
- OFWs: proportion of 'overseas Filipino workers (labor migrants)' to total population in the province in 1991.

Agricultural Productivity Potential:

- Potential "irrigability": potential irrigable area based on the 3% slope criteria as the share of the total alienable and disposable land in the province (an area is assumed to be potentially 'irrigable' if its slope is 3% or less).
- The initial level of agricultural productivity measured by the rice yields per hectare in 1991.

Measures of initial inequality

- Income inequality: Gini coefficient of household income distribution based on 1991 FIES income data.
- Urban rural disparity: Ratio of mean consumption expenditure between urban and rural population in 1991.

Political characteristics

- Political "dynasty": proportion of local officials related to each other either by blood or affinity with respect to the total number of elective positions in 1988.
- President's party: dummy variable of political affiliation equal to one if governor of the province is in the same political party as the president as of 1988.
- MILF (Molo Islamic Liberation Front): number of MILF militants in the province in 1997.

Starting with this extensive list of variables, in a similar manner as in Ravallion and Datt (2002), equation (4) was estimated using alternative measures representing the initial condition variables, and the interaction terms that are not statistically significant are subsequently dropped to arrive at somewhat more parsimonious specifications.

(b) Estimation Results

Table 4 reports select results from the analysis, containing a longer version of the model (containing many variables that are insignificant) (column 1), and our relatively parsimonious "preferred models" (column 2 and 3). While the interaction term between the agricultural income and the "dynasty" variable is found to be statistically significant in some 'long' specifications (column 1), such significance turns out to be not robust (columns 4), and so it is excluded in the 'preferred' model. Based on the preferred specification, the negative and significant coefficient of time trend (year) suggests that there was a downward trend in poverty incidence, common across provinces, that is independent of income growth during the period 1991-2006, as was in India during 1960-1994. Somewhat similar also to the findings by Ravallion and Datt (2002) who find that the growth elasticity of poverty reduction with respect to agricultural growth does not vary significantly among states in India, most of the interaction terms between the real agricultural income per hectare and initial condition variables turn out to be not statistically significantly associated with provincial poverty incidence. A major exception, however, is the 'irrigability of land'. We find that agricultural growth elasticity is significantly higher in the provinces with comparative advantage in agricultural production in terms of its topography. Since the 'irrigability' measure is a physical characteristic that is exogenous to poverty incidence, unlike measures such as actual *availability* of irrigation which could potentially be endogenous with respect to poverty, there is no room for ambiguity in terms of the direction of causality.

On the other hand, the variations across provinces in non-agricultural growth elasticity of poverty reduction are significantly associated with the initial conditions in terms of human capital endowments (measured by child malnutrition rate and by the stock of

overseas migrant workers), infrastructure development (measured by road density) and intra-provincial income inequality (measured by the gini coefficient).

We find that access to better road infrastructure is significantly associated with higher growth elasticity with respect to non-agricultural growth. This result appears to be consistent with the theoretical prediction that the relative importance of agricultural growth as the main driver of rural poverty reduction is more pronounced relative to that of non-agricultural growth in closed economy settings (infrastructure underdeveloped), while non-agricultural growth becomes relatively more important in open economy settings (e.g., better developed road). In addition, however, better infrastructure could potentially enhance pro-poor growth through a variety of routes. For example, the poor tend to be relatively more constrained in their access to infrastructure and markets than the non-poor, and thus the poor could gain relatively more from relaxing such constraints than do the non-poor (Ravallion and Datt 2002, 385). In addition, better infrastructure could increase the rates of returns to investment, which, in turn, could increase employment opportunities, indirectly benefiting the poor (Ravallion and Datt 1998, 19). Our results are consistent with those possibilities as well.

Greater initial inequality in the distribution of income (or wealth) is likely to hamper the pro-poor nature of subsequent growth for a number of reasons. While there have been a number of studies, both at the cross-country and sub-national levels, finding negative impacts of initial inequality on subsequent growth rates, our results suggest that initial inequality in percapita income could additionally make subsequent growth *elasticity* smaller, a finding that is also consistent with recent studies on India and China (Ravaiion and Dutt 2002, Ravaillion and Chen 2007). While there are various aspects of inequality, the gini index for incomes can be thought of as a product of various dimensions of inequality (Ravallion and Datt 2002, 384).

In an economy where income inequality is persistently low one would expect that the poor will tend to obtain a higher share of the gains from income growth than in an economy with high income inequality. The relatively high elasticity of poverty reduction with respect to agricultural growth in China, for example, seems to be in part due to the relatively low inequality in land distribution (Ravallion and Chen 2007). Ravallion and Datt (2002) similarly find that greater inequality in land distribution (as measured by the share of landless households) is significantly associated with smaller impact of non-agricultural growth on poverty in India.[11] In the Philippine context, earlier micro-level studies (e.g., Fegan 1989; Otsuka 1990; Hayami and Kikuchi 2000) suggest that the geographically limited (mostly limited to central Luzon) but successful implementation of land reform during the Marcos presidency in the early 1970s likely had similar positive impacts on the effectiveness of non-farm sector growth in reducing rural poverty. Our results, while documenting a different time period, are consistent with this literature.

In addition, inequality in human capital among the population can be seen as an important dimension of inequality. We find that better initial human capital endowments, as measured by lower rates of child malnutrition, enhances the pro-poor nature of non-agricultural growth. While Ravallion and Datt (2002) find in India that higher literacy has similar effects, in our dataset, the effects of schooling or literacy are found to be insignificant (or not robustly associated with growth elasticity). Our results thus appear to imply that among potential areas for additional human capital investments reducing malnutrition (or, improving health conditions more generally) should arguably command higher priority than other aspects of human capital development in the case of the Philippines.

A distinctively Philippine phenomenon that emerges in our analysis is the role played by the 'Overseas Filipino Workers (OFWs)'. Our results suggest that a larger initial stock of OFWs (as the share of total population) tends to enhance the pro-poor nature of subsequent non-agricultural sector growth. While international labor migration did not seem to originate from poor households during the early years of the labor migration boom in the Philippines (i.e., in the 1970s to early 1980s), as the opportunities for international migration expanded OFWs have increasingly come from relatively lower income households as well. Micro-level studies have documented that remittances from OFWs have been invested in small scale businesses, such as "sari-sari stores" (local convenience stores) or "tricycle" (local public transport using a motorcycle with a side car with the capacity of 4 to 5 people) business, or small-scale money lending businesses, which may potentially relax credit constraints among the rural poor, as well as in education (e. g., Banson-Baustista 1989; Fuwa and Anderson 2007). While government policies supporting or encouraging international labor migration, either tacitly or openly, have often drawn controversies in the Philippines, our finding implies that, as a result of the often-cited 'sacrifices' made by the millions of OFWs, the non-farm sector growth in the rural Philippines has been made relatively more pro-poor, and, thus, OFWs should not be discouraged (at least) if accelerating rural poverty reduction is of high priority.

Many of the recent studies based on small-scale household panel data, while highlighting the increasing importance of non-agricultural income growth in rural poverty reduction, have also emphasized the critical role played by the spread of modern rice varieties (i.e., the Green Revolution) through the 1970s, leading to a rapid increase in farm incomes, part of which was invested in children's education (e.g., Hayami and Kikuchi 2000; Estudillo

et al. 2007, Estudillo, et al. 2009). While we would expect that the effects of technological change in agriculture on sectoral growth elasticity are likely to be captured, at least partially, by the 'irrigability' variable, it is worthwhile to investigate how the green revolution, through the "initial" (as of 1991) level of rice yields, may have affected agricultural and non-agricultural growth elasticity of poverty reduction. The 5th column of Table 4 reports the result with our "preferred" specification with the initial level of rice yield added as a possible correlate of sectoral growth elasticities; we find that the initial rice yield is a significant correlate of agricultural growth elasticity of poverty reduction, while the effect of irrigation potential on the agricultural elasticity now becomes smaller (by nearly a half) and insignificant. In the specification reported in the final column of Table 4, the interaction term between agricultural income and the irrigation potential is dropped; the effects of initial rice yields on both agricultural and non-agricultural growth elasticity increase slightly and the latter is now marginally significant (p-value = 0.11), but the impact on elasticity is larger on agricultural growth than on non-agricultural growth. It appears that the high productivity in agriculture enhances the pro-poor nature of subsequent growth but such impacts are larger on the poverty reduction impact of agricultural income growth. To the extent there is a room for improving agricultural productivity in areas that are relatively remote/isolated but endowed with natural environments favorable to agriculture, focusing agricultural investments in such areas would likely yield high pay-offs in terms of reducing rural poverty.[12]

5. HOW SHOULD AN AGRICULTURAL INVESTMENT STRATEGY BE TARGETED?

In light of the empirical evidence on the increasing shift from agricultural to non-agricultural income growth as the main driver of poverty reduction, another crucial policy

question is: to the extent that there is still a role to play for agricultural development, where should the geographical and policy focus be in targeting agricultural investments in accelerating rural poverty reduction? The empirical results reported in the previous section provide some initial clues. We find that the 'irrigability' index (measuring comparative advantage in agriculture) is positively and significantly associated with agricultural growth elasticity of poverty reduction. We also find that better access to road infrastructure significantly enhances the poverty reduction impact of *non-agricultural* growth, relative to that of agricultural growth, suggesting that access to better road infrastructure facilitates the shift from agricultural to non-agricultural growth as the main driver of rural poverty reduction.

Based on those findings, an initial and crude attempt has been made toward geographical targeting of agricultural development in the Philippines by classifying the 77 provinces into nine (3 by 3) categories according to those two aspects of provincial characteristics that have been identified as important determinants of the relative importance of agricultural versus non-agricultural growth as the driver of rural poverty reduction; along one dimension, urbanization, provinces are classified into three types by the degree of urbanization (rural, peri-urban and urban[13]), and along the other dimension, irrigability, provinces are classified into three types by the degree of comparative advantage in agriculture (low, medium and high). Table 5 presents a 3 by 3 matrix summarizing a few key characteristics of the provinces in each type, and the list of provinces belonging to each type is found in Appendix table A4. We can make three observations based on Table 5. First, as expected, high levels of urbanization are associated with low levels of poverty and high dependence of households on non-agricultural sources of incomes, *even in areas with high*

potential for agricultural development. For the 35 provinces characterized by semi- to high levels of urbanization, agricultural development may not be as powerful stimulus to rural poverty reduction as non-farm development. Second, the potential for agricultural development as pathway out of poverty is high to semi-high in 33 highly rural provinces. Accounting for roughly one-third of the population, these provinces represent about 44% of the poor people in 2000. Third, of the 44 highly rural provinces, 11 have low potential for agricultural development owing to poor quality of agricultural land endowment. For these provinces, arguably the optimal 'pathway' out of rural poverty may have to lead out of rural areas altogether.

As we saw in section two, once the level of income shares is controlled the impact of sectoral income growth on poverty (the π_{ik} coefficients) is similar across different types of income sources; in other words, the sectoral composition of growth does not seem to matter much in terms of the impact of mean income growth on poverty reduction. This implies, in turn, that the relative impacts of a one percent growth in the incomes from different sectors on poverty reduction (i.e., the unconditional sectoral growth elasticities of poverty reduction) are roughly proportional to the share of income from respective income sources/sectors. Table 5-b contrasts the average share of agricultural income in 1988 and in 2006 across the nine types of provinces. The table shows a rapid and dramatic structural transformation in income sources, as well as a great deal of heterogeneity across different types of provinces, with a clear pattern emerging across different levels of urbanization (across columns) but negligible variations across the degree of comparative advantage in agriculture (across rows). In 1988, the share of agricultural income was relatively low (between 20-30%) among highly urban provinces while the share of agricultural income occupied roughly a half of the total income among the

rest of provinces. By 2006, however, the difference between 'high rural' and 'peri-urban' provinces appear to have widened; while the agricultural income share declined to around 20% among 'peri-urban' provinces, the agricultural income share in 'highly rural' provinces remained somewhat higher at the level of 20 to 30%, with the highest share found, not surprisingly, in the 'highly rural and high comparative advantage in agriculture' category (the bottom left cell). Among the 'highly urban' provinces, the average share of agricultural income further declined to less than 10%.

Our analysis suggests that prime candidates for targeting investments in agricultural development can be found in the category of low urbanization and high agricultural potential (left-bottom cell). Among those provinces, on average, the relative share of agricultural income is still comparatively high, and the incidence of poverty is by far the highest.

In general, of course, one would expect that various aspects of location attributes other than the two specific aspects of our current focus, such as land quality, weather conditions, proximity to large city centers, existing industrial compositions and local institutions, to name only a few, are likely to affect the relative advantage of agricultural versus non-agricultural development as the engine of rural poverty reduction. What we have presented here should therefore be seen as a crude *cetris paribus* exercise in the direction of developing a (possibly more sophisticated) provincial typology for targeting agricultural investments.

6. CONCLUSIONS

At the macro level, both slow growth and the low 'growth elasticity of poverty reduction' have been responsible for the disappointing performances in poverty reduction in the Philippines. At the micro level, recent empirical studies based on household panel data

have documented the increasing shift from agricultural to non-agricultural income growth as the main driver of rural poverty reduction. All of those studies, however, narrowly (in a geographical sense) focus on rice growing villages in Luzon, as well as a few villages in Iloilo Province on Panay island. Our empirical analysis based on provincial panel data confirms that such a shift from agricultural to non-agricultural growth is indeed a nationwide phenomenon; among the 62 provinces (out of the total of 73 provinces analyzed, excluding Metro Manila) where poverty incidence declined during the period 1991-2006, the growth rate of non-agricultural income was faster than that of agricultural income in 58 provinces. The non-agricultural income growth elasticity of poverty reduction, without controlling for income shares ('participation effect'), is found to be roughly twice the agricultural income growth elasticity on average.

In light of those empirical findings, this paper further addresses two questions that are likely to be critical in forming a policy prescription for the Philippines; (1) what policy levers should command higher priority in order to make non-agricultural growth (which has increasingly become the main driver of rural poverty reduction in the country) more pro-poor?; (2) to the extent that there is still a role for agricultural development to play in accelerating rural poverty reduction, where should the geographical focus be in targeting agricultural investments?

In addressing the first question, we build on the analytical approach developed by Ravallion and Datt (2002) and find that, among the long list of potential correlates of sectoral growth elasticity, the initial level of income inequality, the initial malnutrition rate, the initial share of OFWs to total population and the initial stock of (quality adjusted) road infrastructure are found to be significantly associated with *non-agricultural* growth elasticity. We thus find

empirical support for one of the key theoretical predictions regarding the role of agriculture in development; i.e., the extent to which agricultural growth is key to rural poverty reduction depends on the degree of openness of the regional economy, which is proxied in our empirical analysis by the degree of development in road infrastructure. Our results suggest that public investments in road infrastructure and in the efforts to reduce the number of undernourished children should command a high priority. Furthermore, while our results do not point to specific policy instruments, we find that international labor migration is consistent with pro-poor non-farm growth and that effective policy measures to reduce income inequality would be a powerful tool for making the rural poor benefit more from non-farm growth.

With respect to the second question, to the extent that the focus on agricultural development should be targeted to the area where agricultural growth *elasticity* is relatively higher, our empirical results suggest that such a focus should be placed on the areas where the land topography is consistent with comparative advantage in agricultural production but where transport infrastructure is relatively underdeveloped. By building on our empirical results, we have also made a crude initial attempt toward developing a typology of provinces based on the degree of urbanization and of agricultural potentials. While crude, such an exercise can identify prime candidates for targeting investments in agricultural development by focusing on the areas with low urbanization but with high agricultural potentials. Such areas are found to have relatively high shares of agricultural incomes and highest incidence of poverty.

Notes

[1] While FIES data are, in fact, available in every 3 years starting 1985, due to the substantially smaller sample sizes prior to the 1991 FIES, the 1985 and 1988 rounds of FIES were excluded from this analysis.

[2] One difficulty in using the FIES income data to obtain sectoral incomes is that the existence of the unearned income category (including domestic and foreign transfers, rents, etc.) makes the interpretation of sectoral incomes somewhat ambiguous. Ideally, the unearned incomes should be assigned to the sectors where they originate (e.g., the rental income from land comes from the agricultural sector), but FIES data do not provide sufficient information for such classification. As a result, we had to categorize unearned incomes as non-agricultural income sources. One consequence of this would be that, when the total household income is disaggregated between the agricultural and non-agricultural incomes (including unearned incomes), the share of agricultural income is likely to be underestimated (since this calculation implicitly assumes that all the unearned incomes come from either secondary or tertiary sectors). Since our panel analyses mainly rely on variations within provinces overtime, rather than the levels of sectoral incomes, the existence of a systematic underestimation of the level of agricultural income would not appear to suggest particular directions of bias. If there is a tendency for the share of agricultural sector incomes to decline within the category of unearned incomes, however, then arguably our methodology may overestimate the growth rate of agricultural income.

[3] Alternative estimates by regressing the *change* in poverty on the *change* in mean income with province fixed effects and year dummies (i.e., $\Delta Ln P_{it} = \alpha + \beta \Delta Ln\ (Y_{it}) + \eta_i + \rho_t + \varepsilon_{it}$) yield very similar results; growth elasticities using percapita consumption and percapita income on the right hand side are -1.396 (t-ratio = 12.51) and -0.978 (t-ratio = 9.84), respectively.

[4] On the other hand, however, Christiaensen and Demery (2007) call the π coefficients in Ravallion and Datt (1996) as the 'elasticity of poverty' and the π coefficients multiplied by the income shares as 'participation effect'.

[5] We obtain qualitatively same results if the left hand side variable of equation (2), the log of headcount poverty ratio, is replaced by alternative poverty measures. The ratios for agricultural and non-agricultural income are , -1.38 and -1.23, respectively, for the log of poverty gap, and , -1.67 and -1.50, respectively, for the log of squared poverty gap. The differences are statistically significant at 5% or less.

[6] This conclusion is not affected when poverty gap and squared poverty gap indices are used on the left hand side of equation (3).

[7] It is arguable, however, that this analysis does not fully capture the indirect poverty reduction impact of agricultural sector growth through stimulating nonfarm growth (e.g., post-harvest activities, such as agro-processing, packaging of farm produce and transport services) via labor market, for example. Such indirect effects are beyond the scope of our current analysis, but such attempts can be found in World Bank (2005) and Bravo-Ortega *et al.*(2005).

[8] Ravallion and Datt (2002) additionally include public investments (measured by real state development expenditure per capita) as a time-dependent determinant of state-level poverty. Our preliminary analysis using (time-varying) provincial public expenditure (available only for the period 1991-2000) revealed that the variable is not statistically significant. As a result, government expenditure is excluded from our empirical specifications. Furthermore, while Ravallion and Datt (2002)'s original specification includes both time trend (t) and inflation rate (INF_{it}), in our dataset, those two variables have been found to be highly correlated (with a correlation coefficient of 0.909). When both variables are entered in regressions, the coefficient of neither variable is statistically significant. As a result, only the time trend is retained in the analysis.

[9] In addition to head count poverty ratios, we also used poverty gap and squared poverty gap indices as alternative poverty measures. The results are presented in appendix tables A2 and A3 and are briefly summarized in footnote below.

[10] In the analysis that follows, the 'initial conditions' are fixed at year 1991 (or the year closest to 1991 for the variables for which 1991 data are not available) and interacted with 3 year growth episodes during the period between 1991 and 2006, rather than the 3 year episodes being interacted with the 'initial' conditions at the time of the first year of respective 3 year episodes. While this modeling approach directly follows Ravallion and Datt (2002)'s analysis, the choice of year 1991 (or, the beginning of the 1990s more generally) as the 'initial condition' has additional significance in the Philippine case. Unlike the latter half of the 1980s marked by cycles of boom and bust as well as political turmoil during the Aquino presidency, the Philippine economy in the 1990s saw the start of reasonably stable growth and substantial poverty reduction, induced, in part, by a series of policy reforms under the Ramos presidency which took office in 1992.

[11] Arguably, initial inequality in land ownership, rather than in income, could be a more preferable determinant. (e. g., Deininger and Squire 1998) While data on inequality in land ownership are not available in the Philippines, we examined the effects of initial inequality in operated farms (rather than owned land) by replacing the gini in income inequality with the gini in operated farms; the coefficient was, however, not statistically significant. One possible reason is that due to the implementation of the land reform program by President Ferdinand Marcos dating back to the late 1960s, which prohibited sale of land covered under the program, land markets had become largely inactive. Inactive land markets, in turn, likely kept the poor land reform beneficiaries from expanding access to credit (by using land as collateral), thereby severely hampering the direct link between the redistribution of farmland and poverty reduction.

[12] As an additional robustness check, we conducted the same analysis by replacing the left-hand-side variable of equation (4) by alternative poverty measures, i.e., poverty gap and squared poverty gap measures. The results are reported in appendix tables (A2 and A3), and, as we can see, most of the qualitative results are invariant. Based on our 'preferred' specification (column (2)), except that the coefficients for the initial road and irrigation are only marginally significant when squared poverty gap is used.

[13] A province is classified as 'rural' if 30% or less of the provincial population live in urban areas, as 'peri-urban' if the share of provincial population living in urban areas is between 30% to 60%, and as 'urban' if 60% or more of its population live in urban areas.

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Table 1. Changes in Poverty Incidence and growth of ag. versus non-ag income among 73 provinces, 1991-2006

		Ag. vs. non-ag income growth rate during 1991-2006	
		Δag.income > Δnon-ag income	Δag.income < Δnon-ag income
Δpoverty incidence during 1991-2006	increase	3	8
	decrease	4	58

Table 2. Number of Province-Growth Spells by Change in Poverty Incidence and by Income Growth by Sector: FIES provincial panel 1991-2006 (every 3 years)

	Number of province-growth spells	
	Δ ag income>Δ non-ag income 1991-2006	Δ ag income<Δ non-ag income 1991-2006
Poverty reduction	72 (2000.0)*	149 (1998.8)
Poverty increase	58 (2002.7)	86 (2000.2)

*Year average across growth spells

Table 3. Sectoral Growth Elasticity of Poverty Reduction (1991-2006)

	LnP_{it}	LnP_{it}
pi(π) coefficient (controlling for income share) [3]		
agricultural income	-0.982 (10.53)	-0.776 (6.42)
non-ag income	-0.855 (10.98)	--
industry income	--	-0.720 (4.77)
service income	--	-0.777 (7.14)
unearned income	--	-0.773 (6.60)
remittance income	--	-0.738 (4.29)
p-value for the difference between ag. vs. non-ag	0.00	--
Ag. vs. ind	--	0.41
Ag. vs. service	--	0.98
Ag. vs. unearned	--	0.95
Ag. vs. remittance	--	0.66
Growth elasticity of poverty reduction (=π*average income share) [4]		
agricultural income	-0.283	-0.224
non-ag income	-0.608	--
industry income	--	-0.108
service income	--	-0.156
unearned income	--	-0.225
remittance income	--	-0.051
p-value for the difference between ag. vs. non-ag	0.00	--
Ag. vs. ind	--	0.00
Ag. vs. service	--	0.98
Ag. vs. unearned	--	0.00
Ag. vs. remittance	--	0.00
No. of Obs.	365	365
R-squared	0.502	0.478

[*] T-ratios in parentheses.
Province fixed effects and year dummies are also included.
[1] The provincial average incomes by sources/sectors are the average of percapita household income by five distinct sources (earned agricultural income, earned manufacturing sector income, earned service sector income, unearned income, and remittances from abroad) in FIES income data. These income components consist of 5 sources.
[2] The sectoral income at the provincial aggregates are estimated by multiplying the shares of the (provincial) average earned sectoral (agricultural, manufacturing, and services) incomes in FIES (as obtained above) with the provincial average percapita consumption expenditures in FIES. These income components consist of 3 sectors/sources.
[3] Those correspond to the regression coefficients π_k in Equation (10) in Ravallion and Datt (1996), namely, the change in the rate of poverty reduction corresponding to a percentage increase in the sectoral income growth *after controlling for the sectoral income share*.
[4] Those correspond to the "growth elasticity" as defined in Ravallion and Datt (1996), namely, $\pi_k * s_k$: the (unconditional on the income shares) change in the rate of poverty reduction corresponding to a percentage increase in the sectoral income growth.

Table 4. Initial Conditions Affecting the Sectoral Growth Elasticity of Poverty Reduction, 1991-2006 (fixed effects model) dependent variable = lnP_{it} (standard errors in parentheses)

Variable	(1) Long specification	(2) 'preferred' model	(3) 'preferred' with symmetry	(4) 'preferred' plus Dynasty	(5) 'preferred' plus rice yield (1)	(6) 'preferred' plus rice yield (2)
Time varying variables						
Ln(non-agricultural	-1.011	-1.670***	-1.635***	-1.666***	-1.518***	-1.482***
Income percapita)	(0.617)	(0.358)	(0.336)	(0.369)	(0.321)	(0.310)
Ln(agricultural	0.882	-0.230***	-0.066	-0.268**	-0.250	0.309
income per hectare)	(0.556)	(0.083)	(0.575)	(0.123)	(0.188)	(0.186)
Time trend (year)	-0.011***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Ln(non-ag. income) interacted with initial conditions as of 1991						
Ln(non-ag. income)*	-0.429***	-0.501***	-0.510***	-0.498***	-0.506***	-0.495***
OFW share	(0.087)	(0.116)	(0.125)	(0.114)	(0.099)	(0.094)
Ln(non-ag. income)*	-0.021					
Schooling of head	(0.068)					
Ln(non-ag. income)*	5.671**	6.309***	6.289***	6.354***	5.476***	5.378***
Malnutrition	(2.311)	(2.122)	(2.079)	(2.062)	(1.860)	(1.841)
Ln(non-ag. income)*	-0.218		-0.192			
irrigation potential	(0.221)		(0.207)			
Ln(non-ag. income)*	-0.309	-0.372***	-0.366**	-0.379***	-0.352**	-0.354***
Road density	(0.188)	(0.134)	(0.151)	(0.135)	(0.137)	(0.135)
Ln(non-ag. income)*	1.420	1.877**	1.918**	1.870**	2.151**	2.133**
Income inequality	(1.251)	(0.846)	(0.838)	(0.844)	(0.839)	(0.832)
Ln(non-ag. income)*	-0.063			-0.038		
'dynasty'	(0.217)			(0.206)		
Ln(non-ag. income)*	0.0001					
MILF	(0.0001)					
Ln(non-ag. income)*	0.006					
urban-rural disparity	(0.096)					
Ln(non-ag. income)*	-0.010					
Non ag. income	(0.016)					
Ln(non-ag)*	-8.622e-06					
Ag.income	(7.253e-06)					
Ln(Non-Ag income)*					-0.076	-0.087
Rice yield					(0.055)	(0.053)
Ln(ag. income) interacted with initial conditions as of 1991						
Ln(Ag income)*	-0.279		-0.321			
OFWs	(0.345)		(0.249)			
Ln(Ag income)*	-0.051					
Schooling of head	(0.056)					
Ln(Ag income)*	2.409		2.790			
Malnutrition	(3.357)		(3.192)			

Variable	Long specification	'preferred' model	'preferred' with symmetry	'preferred' plus Dynasty	'preferred' plus rice yield (1)	'preferred' plus rice yield (2)
Ln(Ag income)*	-0.409	-0.674**	-0.606**	-0.624*	-0.332	
irrigation potential	(0.299)	(0.312)	(0.262)	(0.340)	(0.375)	
Ln(Ag income)*	0.146		0.162			
Road density	(0.292)		(0.244)			
Ln(Ag income)*	-1.960		-0.995			
Income inequality	(1.444)		(1.217)			
Ln(Ag income)*	0.435**			0.122		
Dynasty	(0.213)			(0.234)		
Ln(Ag income)*	-0.0001					
MILF	(0.0003)					
Ln(Ag income)*	-0.150					
urban-rural disparity	(0.117)					
Ln(Ag income)*	0.00001					
Ag.income	(8.027e-06)					
Ln(Ag income)*	0.00001					
Non.ag income	(0.00003)					
Ln(Ag income)*					-0.230***	-0.289***
Rice yield					(0.086)	(0.075)
_constant	29.927***	27.745***	27.575***	27.817***	28.026***	29.283***
	(6.465)	(6.324)	(6.352)	(6.391)	(6.216)	(6.352)
Number of obs.	401	402	402	402	396	396
R-squared	0.579	0.550	0.559	0.551	0.571	0.569
F-test (all coefficients zero)	38.128	39.116	28.189	32.325	39.90	43.80

* significant at 10%; ** significant at 5%; ***: significant at 1% or less (provpandl9106_11e.log)

Table 5. Typology of Philippine Provinces by Agricultural Potentials and Urbanization: summary of province characteristics

			Urbanization (level of commercialization/openness?)		
			Low (highly rural)	**Mid (Peri-urban)**	**High (urban)**
Geo-physical endowments (Irrigation potential)	# of provinces	**High**	11	3	1
	Pop'n share:		4%	1%	1%
	Poverty incidence:		24%	19%	12%
	Share to total poverty:		4%	0.6%	0.4%
	Share of non-Ag income (1988):		50%	50%	21%
	Share of non-Ag income (2006):		24%	18%	9%
	# of provinces	**Mid**	25	17	3
	Pop'n share:		22%	29%	9%
	Poverty incidence:		32%	25%	23%
	Share to total poverty:		28%	29%	8%
	Share of non-Ag income (1988):		42%	45%	32%
	Share of non-Ag income (2006):		18%	20%	5%
	# of provinces	**Low**	8	6	5
	Pop'n share:		10%	11%	12%
	Poverty incidence:		41%	25%	7%
	Share to total poverty:		16%	11%	3%
	Share of non-Ag income (1988):		51%	47%	21%
	Share of non-Ag income (2006):		52%	21%	5%

APPENDIX TABLES

Table A1: Descriptive Statistics of Potential Regressors used for the analysis

Variable name	obs	mean	Std.dev	Min	Max
Poverty incidence	438	0.35365	0.172431	0.045	0.9384
non-agricultural income per capita	438	18860.8	7949.257	3337.19	47696.84
agricultural income per hectare	438	19626.83	9257.193	4112.629	65446.72
Time trend (year)	438	1998.5	5.129334	1991	2006
Share of OFWs (%)	438	0.4709589	0.4391301	0.04	2.04
Years of schooling of the household head	438	6.50274	1.000465	2.53	8.47
Malnutrition rate	408	0.1171103	0.0184525	0.0877	0.1527
Mortality rate	432	84.9999	14.6223	55.92	121.12
Share of potentially irrigable land	396	0.2709848	0.2206898	0.015	0.95
Water access	438	0.7008479	0.2204459	0.0467	0.9886
Electricity access	438	0.5011219	0.2128169	0.0868	0.9734
Gini ratio of income distribution	438	0.4028123	0.0533053	0.2643	0.5691
Total government expenditure per capita	432	0.1778559	0.0732718	0.0416414	0.6099634
Urban-rural mean consumption ratio	432	1.588955	0. 502316	0.758087	3.240372
Cost of living index	438	0.4807808	0.0819038	0.3466	0.765
School enrolment ratio	432	0.8151208	0.0891658	0.4348	0.991
Simple literacy rate	432	0.9323611	0.0631241	0.6797	0.9838
Road density (quality adjusted)	432	0.374125	0.3565373	0.012	1.562
Political dynasty	438	0.1320548	0.2394786	0	1
Political party	438	0.6164384	0.4868092	0	1
MILF	437	138.6728	523.5636	0	3550

Table A2. Initial Conditions Affecting Sectoral Growth Elasticity of Poverty-Gap, 1991-2006 (fixed effects model) (robust standard errors in parentheses)

Variable	(1) Long specification	(2) 'preferred' model	(3) 'preferred' with symmetry	(4) 'preferred' plus Dynasty	(5) 'preferred' plus rice yield (1)	(6) 'preferred' plus rice yield (2)
Time varying variables						
Ln(non-agricultural	-1.237	-2.294***	-2.357***	-2.328***	-2.235***	-2.142***
Income percapita)	(0.815)	(0.608)	(0.549)	(0.625)	(0.540)	(0.521)
Ln(agricultural	1.992**	-0.403***	0.209	-0.374*	0.051	0.202
income per hectare)	(0.839)	(0.144)	(1.037)	(0.196)	(0.308)	(0.324)
Time trend (year)	-0.016***	-0.015***	-0.015***	-0.015***	-0.014***	-0.015***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Ln(non-ag. income) interacted with initial conditions as of 1991						
Ln(non-ag. income)*	-0.687***	-0.751***	-0.782***	-0.755***	-0.763***	-0.735***
OFW share	(0.135)	(0.148)	(0.172)	(0.148)	(0.141)	(0.135)
Ln(non-ag. income)*	-0.031					
Schooling of head	(0.086)					
Ln(non-ag. income)*	7.766**	7.535**	8.389**	7.851**	7.147**	6.895**
Malnutrition	(3.367)	(3.318)	(3.164)	(3.221)	(3.057)	(3.006)
Ln(non-ag. income)*	-0.264		-0.123			
irrigation potential	(0.272)		(0.272)			
Ln(non-ag. income)*	-0.389	-0.396**	-0.307	-0.395**	-0.383*	-0.389*
Road density	(0.244)	(0.184)	(0.205)	(0.188)	(0.199)	(0.199)
Ln(non-ag. income)*	1.175	2.905**	2.878**	2.926**	3.169**	3.123**
Income inequality	(1.748)	(1.368)	(1.345)	(1.382)	(1.399)	(1.389)
Ln(non-ag. income)*	-0.133			-0.115		
'dynasty'	(0.295)			(0.289)		
Ln(non-ag. income)*	0.0002					
MILF	(0.0001)					
Ln(non-ag. income)*	0.012					
urban-rural disparity	(0.123)					
Ln(non-ag. income)*	0.008					
Non ag. income	(0.024)					
Ln(non-ag)*	-1.56E-05					
Ag.income	(1.02E-05)					
Ln(Non-Ag income)*					-0.058	-0.086
Rice yield					(0.080)	(0.077)
Ln(ag. income) interacted with initial conditions as of 1991						
Ln(Ag income)*	-0.507		-0.658			
OFWs	(0.559)		(0.409)			
Ln(Ag income)*	-0.106					
Schooling of head	(0.082)					
Ln(Ag income)*	3.555		4.773			
Malnutrition	(5.032)		(5.501)			

Variable	Long specification	'preferred' model	'preferred' with symmetry	'preferred' plus Dynasty	'preferred' plus rice yield (1)	'preferred' plus rice yield (2)
Ln(Ag income)*	-0.761*	-1.012*	-0.843**	-1.054***	-0.853	
irrigation potential	(0.415)	(0.586)	(0.395)	(0.626)	(0.682)	
Ln(Ag income)*	0.365		0.566			
Road density	(0.414)		(0.356)			
Ln(Ag income)*	-4.480**		-2.726			
Income inequality	(1.985)		(2.027)			
Ln(Ag income)*	0.509*			-0.122		
Dynasty	(0.303)			(0.382)		
Ln(Ag income)*	-7.71E-05					
MILF	(0.0004)					
Ln(Ag income)*	-0.238					
urban-rural disparity	(0.179)					
Ln(Ag income)*	-2.77E-05**					
Ag.income	(1.15E-05)					
Ln(Ag income)*	3.24E-05					
Non.ag income	(4.09E-05)					
Ln(Ag income)*					-0.187	-0.338***
Rice yield					(0.127)	(0.125)
_constant	44.286***	40.779***	40.320***	40.752***	38.698***	41.934***
	(9.642)	(9.454)	(9.197)	(9.440)	(8.860)	(9.371)
Number of obs.	401	402	402	402	396	396
R-squared	0.570	0.527	0.544	0.528	0.544	0.537
F-test (all coefficients zero)	27.968	41.015	28.899	33.508	42.042	43.154

* significant at 10%; ** significant at 5%; *** : significant at 1% or less (provpandl9106_11e.log)

Table A3. Initial Conditions Affecting Sectoral Growth Elasticity of Squared Poverty Gap, 1991-2006 (fixed effects model) (robust standard errors in parentheses)

Variable	(1) Long specification	(2) 'preferred' model	(3) 'preferred' with symmetry	(4) 'preferred' plus Dynasty	(5) 'preferred' plus rice yield (1)	(6) 'preferred' plus rice yield (2)
Time varying variables						
Ln(non-agricultural	-1.508	-2.883***	-2.927***	-2.946***	-2.820***	-2.671***
Income percapita)	(1.068)	(0.858)	(0.772)	(0.878)	(0.750)	(0.722)
Ln(agricultural	2.832**	-0.504**	0.494	-0.433	-0.073	0.168
income per hectare)	(1.191)	(0.209)	(1.534)	(0.278)	(0.452)	(0.485)
Time trend (year)	-0.021***	-0.020***	-0.019***	-0.020***	-0.018***	-0.020***
	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Ln(non-ag. income)*	-0.878***	-0.949***	-0.988***	-0.956***	-0.964***	-0.919***
OFW share	(0.191)	(0.209)	(0.242)	(0.209)	(0.203)	(0.192)
Ln(non-ag. income)*	-0.017					
Schooling of head	(0.108)					
Ln(non-ag. income)*	9.809**	9.226**	10.254**	9.777**	8.840**	8.438**
Malnutrition	(4.487)	(4.586)	(4.335)	(4.485)	(4.226)	(4.153)
Ln(non-ag. income)*	-0.435		-0.202			
irrigation potential	(0.348)		(0.371)			
Ln(non-ag. income)*	-0.433	-0.401*	-0.256	-0.396	-0.378	-0.388
Road density	(0.290)	(0.242)	(0.264)	(0.247)	(0.260)	(0.265)
Ln(non-ag. income)*	0.888	3.785**	3.684**	3.828**	4.040**	3.967**
Income inequality	(2.235)	(1.820)	(1.799)	(1.845)	(1.866)	(1.853)
Ln(non-ag. income)*	-0.211			-0.189		
'dynasty'	(0.376)			(0.372)		
Ln(non-ag. income)*	0.000289**					
MILF	(0.0001)					
Ln(non-ag. income)*	0.061					
urban-rural disparity	(0.152)					
Ln(non-ag. income)*	0.017					
Non ag. income	(0.032)					
Ln(non-ag)*	-2.24E-05					
Ag.income	(1.38E-05)					
Ln(Non-Ag income)*					-0.061	-0.106
Rice yield					(0.107)	(0.104)
Ln(ag. income) interacted with initial conditions as of 1991						
Ln(Ag income)*	-0.759		-0.954*			
OFWs	(0.722)		(0.542)			
Ln(Ag income)*	-0.119					
Schooling of head	(0.108)					
Ln(Ag income)*	4.717		6.140			
Malnutrition	(6.605)		(7.995)			

Variable	Long specification	'preferred' model	'preferred' with symmetry	'preferred' plus Dynasty	'preferred' plus rice yield (1)	'preferred' plus rice yield (2)
Ln(Ag income)*	-0.988*	-1.392	-1.103*	-1.494	-1.364	
irrigation potential	(0.551)	(0.860)	(0.572)	(0.915)	(0.990)	
Ln(Ag income)*	0.569		0.934**			
Road density	(0.547)		(0.460)			
Ln(Ag income)*	-6.805**		-4.147			
Income inequality	(2.633)		(2.854)			
Ln(Ag income)*	0.676*			-0.282		
Dynasty	(0.401)			(0.531)		
Ln(Ag income)*	-2.5E-05					
MILF	(0.0005)					
Ln(Ag income)*	-0.320					
urban-rural disparity	(0.240)					
Ln(Ag income)*	-4.14E-05***					
Ag.income	(1.53E-0)5					
Ln(Ag income)*	5.16E-05					
Non.ag income	(5.41E-05)					
Ln(Ag income)*					-0.155	-0.397**
Rice yield					(0.178)	(0.185)
_constant	56.781***	52.481***	51.704***	52.396***	48.160***	53.333***
	(12.492)	(12.308)	(11.766)	(12.247)	(11.177)	(12.152)
Number of obs.	401	402	402	402	396	396
R-squared	0.552	0.499	0.520	0.500	0.516	0.504
F-test (all coefficients zero)	21.255	34.260	25.414	28.057	34.326	33.117

* significant at 10%; ** significant at 5%; *** : significant at 1% or less (provpandl9106_11e.log)

Table A4. Typology of Philippine Provinces by Agricultural Potentials and Urbanization: List of Provinces

		Level of commercialization (Urbanization)		
		Low (highly rural)	**Mid (Peri-urban)**	**High (urban)**
Geo-physical endowments (Irrigation potential)	**Low**	Abra Antique Catanduanes Ifugao Kalinga Apayao Mt.Province Nueva Vizcaya Quirino Romblon Southern Leyte	Aurora Bananes Mindoro Occidental	Benguet
	Mid	Agusan del sur Aklan Albay Bohol Cagayan Davao del sur Ilocos Norte Ilocos Sur Isabela La Union Lanao del Norte Marinduque Mindoro Oriental Misamis Occ. Negros oriental Northern Samar Samar (western) Siquijor Sorsogon Sultan Kudarat Zamboanga del norte	Bukidnon Camiguin Capiz Davao Davao Oriental Eastern Samar Iloilo Lanao del Sur Leyte Negros Occidental Palawan Quezon South Cotabato Surigao del Norte Zambales Zamboanga del sur	Cebu Misamis Oriental Rizal
	High	Camarines Norte Cotabato Masbate Nueva Ecija Sulu Tarlac Tawi-Tawi	Agusan del Norte Basilan Batangas Camarines Sur Maguindanao Pangasinan	Bataan Bulacan Cavite Laguna Pampanga