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Dynamics of Development in Rural Communities

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Abstract

This paper explores the complex process of rural development at the community level in the Philippines. From the complementation among the essential elements of rural development (social infrastructure, physical infrastructure, and financial services), linkages are traced towards the attainment of goals. Roads initiate the delivery of other physical infrastructure to the usually isolated rural community. Roads also facilitate the delivery of capacity building activities and community organizing, which empower the community. An empowered community, in turn, will be able to stride a sustainable path towards development.

Although development assistance requires a certain density of a bundle to exhibit an effect in a community, expansion of the coverage from the current rate will be needed. Without expansive coverage of a comprehensive package of interventions similar to those provided through official development assistance, manifestation of rural development may be delayed further. A comprehensive package of development projects may be identified and formulated through a participatory approach. Substantial funding that will enable both intensity of intervention and wider coverage will be more efficient than a project implemented in phases spread over time covering different communities. This simultaneous implementation will generate rural development constructs and an expected multiplier effect, both of which are long-term outcomes. This effort will require efficient coordination and synchronized implementation of various development assistance intended for the rural sector.

Keywords: rural development, rural infrastructure, development intervention, spatial autoregression

JEL Classification: R11, R12, H54

I. INTRODUCTION

The intervention strategy used by the Philippine Department of Agrarian Reform (DAR) has evolved over the years. The real benefit from agrarian reform depends on assistance/interventions beyond land distribution to enhance tenure. Because agrarian reform beneficiaries are faced with isolation within the community, necessary supports to uplift their living conditions should be community-based, e.g., rural infrastructure. Therefore the strategy of DAR was to launch community-building interventions where the beneficiaries come from agrarian reform communities (ARC), including but not limited to agrarian reform beneficiaries. Interventions like support services are planned to transform these communities and their corresponding organizations into viable entrepreneurs integrating production activities (farm and non-farm) of the households. This is a necessary sustainability infrastructure since land is often distributed through the agrarian reform program only to be given up by beneficiaries for fast cash, restarting the cycle of poverty. Thus, to ensure more sustainable development, the whole community is provided with development-inducing tools including rural infrastructure and capability building activities.

In rural development intervention, direct provision of amenities has been used for improvement of living conditions or to enhance production. The strategy can provide an easy remedy within the highly vulnerable segment but the effect is non-sustainable and short-lived. The emerging paradigm shift from direct provision to facilitating access of such, and from universal intervention to targeting requires a clear understanding of the spatial and possibly temporal dynamics of rural development and infrastructure provision.

The role of roads, other rural infrastructure, support services, and other interventions in rural development is not necessarily a new field. However, an empirical community model that integrates spatial dependencies will potentially contribute toward better understanding the policy directions needed in targeting rural development. This can help mitigate the wasteful allocation of development assistance in rural areas, and identify where it is needed most and where higher benefits are expected. Correct policies can be hoped to resolve the vulnerability and inequality dominating the picture of rural communities. Results of this study may also be extended to cross-country comparisons so that broader policy orientation can be generated.

This study hopes to explain the dynamics between development-facilitating assistance provided to the rural communities (including tenure-enhancing features of the agrarian reform program) and the community-wide rural development manifestations. We will also simulate the impact of policy directions enumerated in the Philippine Medium-Term Development Plan 2004–2010 on the rural communities.

II. RURAL COMMUNITY DEVELOPMENT

Rural development has become one of the major outcomes identified among various assistance/intervention programs of either the individual developing countries, or of multilateral institutions/donors. A clear understanding of rural development dynamics is necessary for it to prosper. In addition, the inadequate indicators of rural development became a constraint in development planning, for an information gap in one of its facets will cripple a program that should rather be integrated. Thus, any contribution towards the understanding of rural development is valuable.

There are however, other points-of-view concerning the land ownership issues. Using modern theory of agrarian organization, Conning and Robinson (2002) offered a reason why tenure improvement, despite its economic advantages, has been so little used in countries where agrarian reform is a salient political issue, explaining the relative failure of land reform

in Latin America. In the Philippines, resistance among the landowners was very common, so no tangible results were observed during the first few years after the implementation of the Comprehensive Agrarian Reform Program (CARP). Now that the resistance has been reduced to a few regions only, real progress among agrarian reform communities (ARC) is starting to show. The features of the enabling policies of the agrarian reform law, however, can possibly dampen agricultural development. The CARP allows retention of 7 hectares of land only among the landowners, while the tenants can own an indeterminately small parcel of land. The average farm size cultivated by households is just a little more than half a hectare. This makes it impossible for farmers to benefit from technology advancement and other farm implements because it is not cost-effective given such a small parcel. This is consistent with the observation of Mundlak et al. (2002) that new technology changed the returns to fertilizer, irrigated land and capital, all of which proved scarce to varying degrees, partially explained by farm size. Since much of the production is done on small farms, increasing concentration of production on small farms can contribute to the declining productivity.

The implications of the lowering of transportation costs include: people are no longer tied to natural resources, consumer-related natural advantages are becoming more important, population is increasingly centralized in a few metropolitan regions, people are increasingly decentralized within those regions, high-density housing and public transportation are becoming increasingly irrelevant, location of manufacturing firms is not driven by proximity to customers or suppliers, and education becomes easier to provide.

A more advanced econometric approach was used by Fedderke et al. (2006) in analyzing the effect of expenditures on infrastructures on long-run economic growth in South Africa. They used a vector error correction model (VECM) and concluded that the role of infrastructure is in terms of raising the marginal productivity of capital and in encouraging private investments. This is especially true for roads that generally bring down transaction costs of trading. Investment in infrastructure leads economic growth, but there is only weak evidence of feedback from output towards new infrastructure.

The role of community participation in enhancing local public service delivery is emphasized. The dynamics between the local governance system, the local administrators, the community, and higher level of administration can facilitate or be a hindrance to development (DasGupta et al., 2003). The role of community participation is important because of their knowledge/understanding of the environment and the asymmetries of information among the households and they are directly affected by the outcomes later. A development directed state-community synergy should be enhanced by interventions that could reduce power imbalance among community members, e.g., land reform, development of non-crop source of income, etc. Policies at the higher level of governance can bypass the vested interest of local administrators thereby becoming more responsive to the needs of the households. Institutional reforms at local and community level enhanced by various factors including the generation of community demand for better public goods and services (participatory in nature) in fostering development. This may include empowerment strategies like capacity building and rural infrastructure resulting to lower transportation cost, access to farm inputs and access to markets. Improved accessibility will minimized if not eliminate the information asymmetry between the suppliers (of inputs), the traders (of produce), retailers (of food products), and the producers.

Although they may be conceived with the best of intentions, stand-alone intervention strategies that spread resources too thin make benefits difficult to realize. Imagine, for instance, a one-kilometer rural road that adjoins the main road vein but is five kilometers away from the production area, or a solar dryer facility at the center of the community but without ample storage facilities. Similarly, a community could have a good road network with a well maintained irrigation system but these would be difficult to utilize without a source of

financing to procure production inputs; establishing a credit cooperative is a positive step, but it needs micro-enterprise to support its robustness to borrowing and lending behavior of members. Implementing a higher density of interventions in an area—while it might seem unfair at first—could allow each properly planned intervention to complement the others, resulting in multiplier effects that spread beyond the initially targeted community.

III. METHODOLOGY

The agrarian reform community (ARC) level of development assessment is panel data with ARCs as spatial units. It was collected for the years 2002, 2003, 2004, and 2005. An ARC may be composed of one or several *barangays* (villages; the smallest political unit in the Philippines). An ARC is formed based on the homogeneity of development-inducing endowments the barangays possess. The ARC level of development assessment was initiated in 1997; over the next couple of years it evolved, reaching a form in 2000 that is very similar to the most recent version in 2005. It is a complete enumeration of all ARCs launched by the Department of Agrarian Reform where intervention will be targeted. Not all households within an ARC are beneficiaries of the agrarian reform program. The data collected are specific indicators of the key result areas of agrarian reform, including tenure improvement, economic and physical infrastructure support, farm productivity improvement, and community development. Aside from the indicators that usually measure accomplishments in the provision of various infrastructure and support services, indices were computed for overall development (equated as an index of rural development), and for each of the key areas needed in the manifestation of rural development. The overall index provides a yardstick of development level of the community because it indicates how much effort that can stimulate development has been exerted.

Community Development Model

The community level data (panel) will be postulated in a time series cross-section framework. The objective of the econometric specifications will be to account for the effect of rural roads and other infrastructure on specific rural development targets. Temporal aggregation will be annual and spatial units will be agrarian reform communities (ARCs). Park's mixed model with autoregressive error of order 1 will be postulated and given by $y_{it} = \alpha_i + \beta_t + \gamma x_{it} + \varepsilon_{it}$, where $\varepsilon_{it} = \rho_i \varepsilon_{it-1} + a_{it}$, $\varepsilon_{it} \sim N(0, \sigma_\varepsilon^2)$ independent of $\alpha_i \sim N(0, \sigma_\alpha^2)$, β_t is a temporal effect and may possibly vary across time points, and α_i is a spatial random factor. x_{it} is a vector of covariates including indicators of presence/quality of roads and other infrastructure.

The dependent variable will be the community-level index of rural development and income per household averaged at the community level. Total and breakdown of income from different sources will be analyzed. The covariates will include the magnitude and proportion of accomplished rural infrastructure projects (proportion computed over estimated needs), tenure improvement, and aggregate impact of various official development assistance received by the community.

IV. INFRASTRUCTURE AND RURAL DEVELOPMENT IN AGRARIAN REFORM COMMUNITIES

The community level models shall be able to characterize the multiplier effect that any targeted intervention is expected to generate, not only among the direct beneficiaries, but among the indirect beneficiaries as well. Even if only a segment of the community directly benefited from an intervention, if there is a viable sustainability facility for that intervention,

then the whole community can benefit as well. This analysis is expected to provide evidence on how the benefits received by direct beneficiaries are spread into the whole community. This evidence will further support the idea that resources should not be spread too thin, that a few bundles should be implemented instead of plenty single/stand alone interventions. This strategy will provide optimal gains and better chances of observing multiplier effects and subsequent sustainability.

Panel models are used to generate evidence on the accumulation effect of infrastructure and other development interventions at the community level. This will provide simple evidence of sustainability of development gains of the current strategies.

The Rural Communities

The data used here came from the Agrarian Reform Communities Level of Development Assessment (ALDA) conducted by the Department of Agrarian Reform. The yearly activity is aimed to generate information about the different aspects of development among the agrarian reform communities supported by the department. It collects basic indicators at the community level and aggregates them into an index for each of the key result areas (described in the next paragraph) and finally into an overall index. The index is a measure of a community's development, so if interventions among key result areas are accomplished, rural development will be feasible.

The department's major goal is land distribution. Since land distribution alone will not necessarily result in tenure improvement and eventually in rural development, other support services are also provided either directly or through facilitation of access to such. The key result areas of the department include land tenure improvement (LTI), economic and physical infrastructure support services (ECOPISS), farm productivity and income (FPI), organizational maturity (OM), basic social services (BSS), and gender and development (GAD). An index or a score (range of 0–100) is computed for each of the key result areas before the overall index is completed. The indicators are immediate outputs (either directly provided or facilitated to be attained), intended to meet the key result. A community's score depends on the amount of output resulted from the interventions delivered.

The department does not necessarily deliver all those services, but facilitates for other departments to deliver such in the ARCs. An ARC is comprised not only of agrarian reform beneficiaries (ARB), but of all households in the community regardless of whether they are beneficiaries. The idea is to develop the entire community for sustainability of the development gains. At present, the ARCs account for approximately 20% of all rural communities in the country.

To be able to deliver all those results, regular appropriation from the government as well as development assistance from multilateral agencies (grants or loans) are used. The development assistance called foreign-assisted projects (FAP) usually includes the following menu: physical infrastructure (construction and/or rehabilitation), community and institutional development support, agricultural productivity and rural enterprise development, basic education support (construction/rehabilitation of school buildings), and primary health care (construction of health centers, provision of medicines, etc.). Some projects include all these support services, while others include a subset and or only one of them.

As of 2005, the households in the ARCs have an average total income of PhP 92,773 per household, of which an average of PhP 53,802 comes from agricultural sources and PhP 39,420 comes from non-agricultural sources. These figures are along the same lines as those presented earlier, considering that the coverage is 20% of all communities only (total income is PhP 110,482). The ARCs have been in progress for about 8 years as of 2005.

The average overall index for all communities is 71.52, indicating that there is still ample room for the department to provide rural development inducing interventions. Among the key result areas, LTI is the only one approaching completion (100) with the average index of 92; the target is to complete land distribution by 2008. The BSS also yield a higher average score of 87, followed by ECOPISS with 68, OM with 67, FPI with 66, and GAD with 51. The communities are better served in terms of basic social services but work needs to continue, and even grow in intensity when it comes to economic and physical infrastructure, farm productivity improvement and gender and development.

The total land area distributed relative to scope averages 92% per ARC, consistent with the actual ARBs relative to the ARB scope of 93%. One negative effect of agrarian reform is that some beneficiaries did not appreciate the purpose and were easily lured by the quick cash value of the land. Only 77% of the ARBs are still cultivating the land as of 2005.

In terms of physical infrastructure, accomplishment rates are similar. Accomplishment of rural roads (length) averages 60%, 65% for bridges (length), 69% for the number of irrigation systems required, and 62% for area coverage of irrigation (relative to total irrigable area); 67% of ARBs needing irrigation are actually served, and 73% requiring post-harvest facilities (warehouse, dryers, etc.) are served.

For the economic infrastructure, accomplishment in credit provision is at 54%. This can be attributed to the low repayment rate at 44%. Some credit facilities are not sustainable because funds are easily drained due to low repayment rates. The adoption rate of modern agricultural technologies is low at 38%.

Among the foreign-assisted projects, the best profile of supported communities can be observed from the Agrarian Reform Communities Development Program by the World Bank (ARCDPWB), with an average index of 75.96, the highest among the projects as of 2005. This is supported with the highest income of PhP 102,300 per annum per household. One important feature of the project is that aside from the bundles of intervention provided, it implements a cost-sharing arrangement among stakeholders (beneficiaries, local government, and national government).

The Microfinance project has an average index of 75.29, also among the highest, but the average income is lower at PhP 90,915. This is one highly specialized project without diversity in menu, focusing only in credit, with minimal institutional capacity development. Similar is true for Agrarian Reform Infrastructure Support Project (ARISP) focusing on rural infrastructure with some institutional development, usually related to the infrastructure (user's group).

The Belgian Integrated Agrarian Reform Support Project (BIARSP) has a wide menu of interventions, thus the average index is high at 73.02, but income is only PhP 83,940. Although the menu is diverse, provision to a community is not necessarily bundled, spreading resources to several communities.

The Western Mindanao Community Initiatives Project (WMCIP) yields the lowest index (64.03) and income (PhP 72,471). Aside from a limited project menu, it was also implemented by government line agencies, local government units, and non-government organizations. The usual implementers of such projects are development consulting groups with established track records. The package of implementers could be detrimental to the project because of the complex political dynamics they engaged in.

The importance of bundling and diversity of interventions in rural development has been initially illustrated in the household data, and now in community-level data.

Rationale for the Models

The community (ARC) level data (ALDA) is a panel data of four years from over 1,000 communities. Models for overall index of rural development, indices for each of the key result areas, farm income, non-farm income, and total income are fitted using mixed panel models with and without autoregressive errors. Estimation was also done using the hybrid backfitting algorithm.

The empirical models therefore assess the dynamics between rural infrastructure and rural development indexed by a typical household in the community, based on short- and long-term outcome indicators. The outcome indicators are perception (summarized into an index), actual income measurements, or community level aggregate index representing various targets of the development interventions of the government.

The Dynamics of Rural Community Development

The availability of panel data (ARC level over a 4-year period, most recent is 2005) enabled the analysis to be conducted over time and space. The panel models with and without autocorrelation are fitted to investigate the dynamics of community level rural development across the ARCs and over time. The scores of each community for overall index, for each of the key results areas, farm, off-farm, non-farm, and total income were regressed on some infrastructure indicators provided to the community.

Two panel data models were fitted: a ordinary random effects model (results in Appendix 1), and a random effects model with autoregressive errors (results in Appendix 2). Models for income data have poor performance while those for indices yield adequate fit. The generation of income data that is based on some ad hoc procedure could have tampered with data quality, thus affecting model fit. Some statistics on model fit and model performance are summarized in Table 4.1.

Table 4.1: Random Panel Data Models for Community-Level Data

Dependent Variable	Random Effect Panel Data				Random Effect Panel Data with AR(1)			
	σ_{ARC}		σ_{error}	MAPE(%)	σ_{ARC}	σ_{error}	MAPE(%)	ρ
Overall Index	6.57	3.355	4.573	6.56	1.029	5.189		-0.3367
Farm Income	143.77	21130	23863	141.15	10313	25684		-0.3304
Off-Farm Income	119.18	9526	9808	114.55	5809	10228		-0.2632
Non-Farm Income	179.20	15861	14635	170.94	9752	15342		-0.2627
Total Income	40.52	34478	38571	38.96	16955	41311		-0.3278
OM	16.79	10.067	8.470	16.75	6.150	9.169		-0.2349
LTI	6.46	3.053	5.230	6.45	0	5.956		-0.3177
FPI	21.88	6.986	13.665	21.90	0	15.002		-0.3298
BSS	11.23	7.035	8.304	11.24	3.817	8.979		-0.2490
GAD	28.26	9.978	10.210	27.98	5.233	11.234		-0.2894
ECOPISS	12.03	4.32	7.79	12.10	0	9.339		-0.4130

The random variation of the indices and income data across the communities are clear in Table 4.1. This could mean that even if similar interventions are implemented, there is still an ARC-specific source of variation that will make the actual outcome different from the one expected from that intervention. The significance of the autoregressive parameter is evidence of the accumulation of outcomes in the key result areas as exhibited by the ARCs over the years. This could mean that the kinds of interventions currently implemented in these ARCs are leading towards sustainability. The basic strategy used by the Department of Agrarian Reform in the delivery of development intervention is a mixture of direct provision and facilitation. While facilitation is used for budget coming from the general appropriations,

direct provision and facilitation are used for foreign-assisted projects. The benefit of the facilitation effort is not only limited to cost minimization, but also the building up of the sustainability infrastructure, where the communities are gradually being empowered in the process.

Two sets of indicators at the community level are analyzed: the indices for each of the key result areas and the overall index representing the output level measures as a result of the intervention. On the other hand, average household income at the community level can be considered as the outcome (not necessarily immediate result) of various efforts/interventions including infrastructure and other development assistance.

The constant estimates for each of the models are summarized in Table 4.2 along with the average values of the indicators as of 2005. Considering that panel data is used, the constant can be used as a benchmark or a recurring level over the years. This is the value of the indicator cumulated over the years. The difference between the current level and this benchmark is a result of the efforts specific to the current period, the model specifying the details on who contributed what. Stability/robustness of the indicator to various recurring factors is said to have been established if the benchmark is equal to the current level. The proportion or percentage of the benchmark relative to the current level will give an indication of how stable the indicator is to the fluctuations of various determinants.

Consider farm income where the benchmark is 62% of the 2005 average. This means that new efforts in 2005 aimed to increase farm income resulted in one third more than what was expected (as a result of the cumulative efforts over the years), which is PhP 33,403 among typical rural households. The off-farm income, which can still be agriculture-based but was gained from different land cultivated by the household, has a lower benchmark at 42%. The non-farm income is worst at only 25%. This means that the activities in the past intended to generate non-farm income among rural households in the ARC have not been sustainable enough to expect more recurring income. The non-farm income level is determined mostly (75%) by the current interventions. This high percentage may also reflect problems of design specifics of an intervention that is not necessarily sustainable. Whatever gains were generated for the current year cannot be expected to happen again in the future. For the total income, which is like the weighted average of farm, off-farm and non-farm income, the benchmark is close to half of the current level. This means that as a whole, the income-generating interventions provided among the ARCs still require further tightening to make sure that gains they generate can be expected to recur in the future.

The proportion of the benchmark of ***overall index*** is similar to the one on farm income. The fact that ***farm productivity and income***, which have been in the mandate of many departments, have very high proportion (84%) of benchmark can be interpreted as meaning that the interventions among the ARCs are focused mostly on farm income generation. There are less intensive, perhaps not sustainable interventions intended to generate non-farm income, confirmed by the low percentage of the benchmark of ***economic and physical infrastructure support services*** with only 21%. Although in terms of welfare (***basic social services*** and ***gender and development***), farm productivity and institutional development (***organizational maturity***) interventions towards the ARCs have been relatively successful, two key areas still need further improvement. Although ***land tenure improvement*** has been the flagship goal of the Agrarian Reform Program, and the Department is indeed relatively successful in land distribution, the problem occurs after land distribution. Land tenure improvements do not recur because there are beneficiaries who are easily tempted by easy cash and often exchange tenure for some money, either for a long period or permanently. Even if more land is distributed, the tenurial profile among the ARCs is not really improving; intensifying efforts towards income diversification would be more effective. However, while there is massive provision of rural infrastructure, maintenance and sustainability is not properly institutionalized before the project is turned over to the beneficiaries or the local

government. Furthermore, economic infrastructure activities are scanty (or nonexistent) or incorrectly designed. Even if roads are constructed to a reasonable length, they will not be optimally used without marketing support for both the agricultural produce and the products of microenterprises.

Table 4.2: Benchmark and Current Community Level Indicators

Indicator	Benchmark (Constant)	Average as of 2005	% Benchmark to 2005 Ave.
Farm Income	33,403	53,802	62
Off-Farm Income	6,706	16,012	42
Non-Farm Income	5,785	23,408	25
Total Income	44,953	92,773	48
Overall Index	44.35	71.52	62
Organizational Maturity	49.79	66.58	75
Land Tenure Improvement	28.76	92.42	31
Farm Productivity and Income	55.93	66.35	84
Economic and Physical Infrastructure Support Services	14.56	68.18	21
Basic Social Services	70.88	87.10	81
Gender and Development	44.79	50.95	88

The non-recurring part of the indicators is explained in terms of age of the ARC, tenurial conditions, rural infrastructure, credit, technology adoption, and benefits from official development assistance.

The age of the ARC is the number of years since the community was launched. The mechanism of identifying communities where the agrarian reform beneficiaries belong and helping not just the beneficiaries but the whole community was started in the early 90's. There are ARCs that have been launched only recently. Since intervention is provided for the whole community, it is expected that gains or status of the ARCs will be proportional to the age (on the assumption that the design of the intervention is correct). Farm income ($p<0.000$), off-farm income (0.001), total income ($p<0.000$), organizational maturity ($p<0.005$), and economic and physical infrastructure support services ($p<0.000$) are all increasing over the years. For every year added to the age of the ARC, these indicators are expected to grow as well. However, land tenure improvement ($p<0.000$) is declining over the years. This is consistent with the discussion above, explained by the difficulty in ensuring that the beneficiaries will continue cultivating the land and do not forego their tenurial right over it.

There are three tenure indicators used in the analysis. Percentage of agrarian reform beneficiary to potential beneficiaries will indicate accomplishment level of the scope of the program. The percentage of distributed area to total area covered by the program will complement the counts of the number of beneficiaries. Then the percentage of beneficiaries who are still cultivating the land is a measure of maintenance of tenure after land distribution. Expectedly, all the three indicators contributed significantly to the land tenure improvement index. The total income is not affected significantly by any of these three tenure indicators because farm income, which comprises a big part of total income, is also not directly affected by these tenure indicators. Non-farm income, however, is affected by percentage of area distributed, while off-farm income is affected by percentage of beneficiaries to the potential number. Through land distribution alone, it is not really expected that income will increase instantaneously, until other dimensions of agrarian life also improve. In addition to land tenure improvement, indices for other key result areas will also improve, including the overall index. The proportion of accomplishment in area or beneficiary coverage will affect organizational maturity and gender and development indices because the institutional

strengthening efforts are intensified in areas where there are more beneficiaries. Economic and physical infrastructure support and correspondingly farm productivity indices are also affected by indicators of accomplishment in land tenure improvement.

Among the types of rural infrastructure usually provided or facilitated for the agrarian reform communities, rural roads exhibited effects on the largest number of indicators. Income from all sources as well as the total income increases for every accomplishment in roads constructed or rehabilitated relative to the demand identified by the communities. Rural roads facilitate accessibility by bringing the community out of isolation and exposing them to development in other areas. This will lead to growth in demand for other infrastructure and other development interventions. The expected mode of delivery of such intervention is not necessarily direct provision, but beneficiaries are willing to cooperate/contribute for as long as access to such needs will be facilitated. Among the indicators, only land tenure improvement and farm productivity did not exhibit direct benefits from meeting the needs for rural roads. Understandably, accomplishment in land distribution is dominated mostly by socio-political and legal factors, while farm productivity is dependent on soil fertility as well as on farming systems. These factors, however, can be enhanced with improved accessibility, thus resulting in indirect benefits from rural roads. Along with roads, bridges are needed to complete the accessibility network in rural areas, so similar benefits from bridges also manifest.

The irrigation indicators used include proportion of the number of irrigations to the identified needs, proportion of the serviced area to the total irrigable area, and proportion of agrarian reform beneficiaries with access to total beneficiaries within the service area. As expected, the indicators contribute to the index on economic and physical infrastructure support. This support also appeared to be an important determinant of the overall index, illustrating its role in the development of the community. However, the indicators do not contribute significantly to any of the income indicators or to indices of attainment of other key result areas. Irrigation will definitely have an indirect effect but the absence of a direct effect on other indicators may be explained by some details of the irrigation system. First of all, many canals are built without using concrete. Earthen canals have short lives and holes can be easily created by rodents and from cracks during dry spells in summer months. Maintenance of the canals would often be a major stimulus of conflicts among users, eventually threatening the sustainability of the infrastructure. For better understanding of the impact of irrigation, some indicators on how many of these irrigation systems are properly maintained may help. Similar results for post-harvest facilities hold.

Credit is as important as any other intervention. All the income indicators and indices except one index are affected positively by the proportion of credit needs met in the ARC. Farm productivity is not directly affected by credit because the loan proceeds must be spent on input procurement or planting before they result in increased productivity.

Adoption of farming technologies also affected almost all indicators, except off-farm income. Trainings on different farming technologies, although they may not individually benefit some households, can generally produce a positive effect for the whole community.

The Effect of Official Development Assistance

The effect of the different projects funded through official development assistance (ODA) could have been accounted for in the previous section since most of the projects included rural infrastructure in their menus. The effects presented here will be isolated as additional contributions of the project. Those presented above can be considered as the pooled effect of various efforts (including ODA) at the ARC level intended to push rural development. Organizational maturity can simplify the facilitation of access to development interventions.

The effects of some ODA-funded projects on target output or outcome (income and indices on key result areas) are explored below. ARISP is a project that was funded through a loan from the Japan Bank for International Cooperation (JBIC) and was followed by a second phase that is still on-going. The project menu of Phase 1 was dominated by rural infrastructure that includes irrigation, rural roads, and post-harvest facilities. There was an institutional development component, but the purpose was mainly the development of viable organizations or cooperatives of users that will ensure sustainability of the infrastructure. Still including the menu under Phase 1, Phase 2 includes potable water system, agricultural development support, and livelihood projects. Total income, farm income, and non-farm income of ARCs covered by ARISP are higher than those not covered. In addition, the overall index among beneficiary ARCs are also higher. This is an example of a comprehensive project that started with infrastructure and expanded to include other support services, resulting in actual income increase among beneficiaries.

The ARCDP project funded through a loan from ADB is also a comprehensive package of development interventions, but with a different implementation strategy, following a demand-driven approach. The project menu also includes rural infrastructure (roads, irrigation, and potable water), land surveying and titling (in support of land tenure improvement), agricultural development, rural enterprise development, community and institutional development, and credit. Total income and farm income of households in the ARC beneficiaries are higher. Although the project menu includes certain elements of non-farm income generation, no significant effect was established, probably because the menu is too diverse. In addition to income, farm productivity, economic and physical infrastructure support, and overall indices are also better among ARC beneficiaries.

Another ARCDP project, funded this time through a loan from the World Bank, started with a menu of rural infrastructure (roads, irrigation, and potable water), community development, technical assistance, and agriculture and enterprise development and in Phase 2, credit was included. The implementation strategy is innovative: cost-sharing between the beneficiaries, the local government, and the national government was required. Because of the arrangement, more ARCs were covered to be part of the project. Substantial dilution in the benefits could have occurred, judging by the fact that none of the income indicators among the ARC beneficiaries appeared to be different from those of the non-beneficiaries. The overall index, though, and those of some key result areas are better among beneficiary ARCs. This is an example of a project where, although the menu is good, spreading it too wide may have watered down the effect.

Finally, the BIARSP project with funding from the Belgian government has a wide range of interventions in the menu, including basic education, agricultural production, primary health care, water and sanitation. The menu excludes rural infrastructure. None of the income indicators are different among the ARC beneficiaries compared to the non-beneficiaries. Although farm productivity and the overall index of ARC beneficiaries are better off, all other indicators show no difference. This project illustrates the importance of rural infrastructure in targeting income increase as part of the development goals.

Some of the key development learning here highlights the importance of rural infrastructure if it is intended to target income increases. With rural infrastructure alone, income will not change, but with substantial support services, infrastructure will be used optimally. Given a good project menu, potential benefits will not be optimized if interventions are spread among too many areas. Although project diversity is good, making project menus exceedingly diverse is too much of a good thing.

V. SIMULATION

The data on the current state of the economy were obtained from the National Economic and Development Authority (NEDA, 2005), the macroeconomic plans also from NEDA (2004), the profile of the rural sector from the National Economic Development Authority and World Bank's Asia-Europe Meeting (NEDA-WB-ASEM, 2005), the income and expenditure structure of the rural Philippines from the National Statistics Office (NSO, 2004), community level data from DAR (2005), and the national expenditure program from the Department of Budget and Management (DBM, 2005). The data were then plugged into the models to assess the possible scenario should these plans and programs be implemented.

The Present Situation

In 2005, the population is projected at 85.2 million with a density of 282 per km^2, the highest in Southeast Asia (except for Singapore with 6,222 per km^2); most other countries in the region have 2-digit population densities per km^2. In the 2000 Census, 51.9% of the population resided in rural areas.

Also in 2005, while 33% of the employed individuals are working in agriculture, the share of gross value added by the sector is only 14.4% of GDP. While the annual growth of GDP is 5.1%, growth in the agriculture sector is only 2%. Total revenue is 14.8% of the GDP, while total expenditure is 17.5% of the GDP, amounting to a budgetary deficit of 2.7% of the GDP.

The bulk of national government expenditures go to social services, social service subsidies to local government units (LGU), net lending, debt services, and land distribution with 41.85% of the total expenditures in 2005. Other expenditure items are economic services (17.2%), general public services (15.4%), education (14.7%), defense (4.8%), social security and welfare (4.4%), health (1.4%), and housing and other community amenities (0.2%). The expenditure on economic services is broken down into transportation and communications (5.9%); agriculture, agrarian reform and natural resources (3.6%); industry including trade and tourism (0.5%); electricity, gas and water (0.9%); and other economic services including subsidy to LGUs (6.4%). The details of budgetary allocation for 2005 are presented in Appendix 3.

In international trade, the Philippines is a net importer in 2005. The annual growth rate in exports is 4%, while imports are growing at 7.3%. Exports relative to GDP are 41.2% while imports are 48.9% of the GDP. Exports of food and live animals are 30% of the GDP in agriculture, while imports account for 54.7%. Among crude materials (excluding fuels), exports are 10.5% of the GDP in agriculture, while imports account for 19.7%. For animal, vegetable oils and fats, exports are 12.9% of GDP in agriculture while imports are only 2.8%.

While the ARCs do not cover all of the rural areas, they cover various representatives of sentinel groups. The ARCs also represent the beneficiaries of homogeneous outputs provided by the government in rural areas. Based on the monitoring system by DAR (2005), where indicators are summarized into a rural development index (0-least or no development, 100-optimal development or fully developed community), the average index is 71.52, still far away from the ideal rural conditions. Among the key result areas, land tenure improvement (92.42) and basic social services provision (87.1) are better off. The other key result areas need more intensive intervention. These include organizational maturity (66.58), economic and physical support services (68.18), farm production increase (66.35), and gender and development (50.95).

In terms of rural infrastructure, 60% of the total length of rural roads needed has been accomplished, 65% of bridges, 62% of irrigation service area, 73% of post-harvest facilities

and 54% of credit needs. The adoption rate of technology is still lower at 38%, requiring a more aggressive advocacy campaign and support services facilitation.

In rural development, the major physical infrastructure included accessibility enhancement and irrigation systems. Augmented with various capacity building activities, community organization and institutional development, and credit, rural development becomes theoretically feasible. The infrastructure and the public expenditure prioritization are presented here.

As discussed in the previous sections, accessibility and irrigation are the two most important components of physical infrastructure needed for agricultural production towards development. For the road system, the national roads are considered as the major arteries of the highway system. The rural roads are built to connect production and residential areas to these national road systems to diminish isolation of the rural communities.

Appendix 3 summarizes the accomplishments in rural and national road systems by region along with bridges and irrigation systems. For national roads, the total length was 28,664 kilometers as of 2005, or a density of about 1 kilometer of road for every 10 square kilometers of land area. In the national capital region (a highly urbanized region), the density is as much as 16 kilometers of road for every 10 square kilometer area. Cagayan Valley and Zamboanga Peninsula had the lowest road density, for every 10 square kilometer land area, a little more half a kilometer of road. For rural roads, almost two thirds of the recognized need has been completed, for a total length of 28,015 kilometers. Some regions, such as the Ilocos Region, are approaching the final fulfillment of the demand for rural roads, but other regions (Soccsksargen, Calabarzon, and Caraga) have barely fulfilled half of the demand for rural road systems.

There is already a total of 88,989 linear meters of bridges in rural areas. However, this is barely half of the total demand for rural bridges in 2005. In terms of density, this is about 3 linear meters for every 10 square kilometer of land area. In the Ilocos Region, there are about 7 meters of bridges for every 10 square kilometer of land area. In Central Visayas and Northern Mindanao, however, there is only 1 linear meter of bridge for every 10 square kilometer area.

From the administrative reports of the National Irrigation Administration, there is a total of 1,413,236 hectares of service area so far served by various types of irrigation from a total of 3,126,340 hectares of irrigable area (45%). In the Cordillera Administrative Region, accomplishment is already 76% because the irrigable area is relatively small due to the region being dominated by upland topography. On the other hand, in the Autonomous Region in Muslim Mindanao (ARMM), accomplishment of irrigated service areas is only 15%.

The total obligated funds for public expenditures in 2005 were 908 billion pesos, a growth of 5.3% from 2004, which in turn was a growth of 4.4% from 2003. The growth rate of public expenditures is even lower than the inflation rates for the period (7.6% in 2005 and 6% in 2004). The capital outlay for public infrastructure in 2005 is about 46 billion pesos, which is 5% of the total obligations, compared to 7% in 2003. The projects in 2005 were allocated 266 billion pesos or 30% of the total budget, of which 16% will be foreign-funded. The total budget of the main agencies responsible for the development of the rural communities (Departments of Agriculture, Agrarian Reform, and Environment and Natural Resources) is barely 1.5% of the total budget. Although the bulk of the expenditures are on education and defense (from which the rural areas benefit in terms of social development and peace and order), the budgetary structure may have allocated fewer resources to push the rural development targeted to alleviate the poor, who are mostly in the rural areas. The agriculture and fisheries modernization program received a total budget of 10 billion pesos, or about 3% of the total budget for projects.

The total appropriation for agriculture and fisheries modernization in 2005 is over 9 billion pesos, of which 33% will fund regular programs and 20% will fund locally-funded projects, while 47% will be for foreign-assisted projects. The regular programs constitute some support services aimed to develop certain aspects of agriculture and fisheries. Locally- and foreign-funded projects, on the other hand, include an integrated development package of physical and economic infrastructure, capacity-building, provision of basic social services, and other support services for the rural communities. Capital outlays commonly used for the physical infrastructure are allocated 5.5 billion pesos or 61% of the total budget for programs and projects.

The agrarian reform program is allocated 5.9 billion pesos, while the environment and natural resource program have 4.6 billion pesos. For the agrarian reform, 68% is for foreign-funded projects while 56% is allocated for capital outlay used in physical infrastructure. For the environment and natural resource program, 13% is allocated to foreign-assisted projects while 9% goes to capital outlay. Most of the interventions in the environment and natural resource programs are on capacity building, information dissemination, other advocacy and education strategies, and regulation/policing of various natural resources.

Policy Direction of the Development Plan

The Medium-Term Philippine Development Plan (MTPDP) for 2004–2010 (NEDA, 2004) serves as the blueprint of the development strategy of the Philippine government. Job generation and decentralization of development are two major agendas of the plan that directly affect the rural sector. To push the job generation agenda, microenterprise development supported by appropriate credit is considered and targets the middle class. This will in turn contribute to the expansion of the middle class base because income alleviation will spread into the lower class and further stabilize their income generation activities. In addition, agribusiness land will be developed (enhancing productivity) and products will be transported to the markets efficiently (marketing support, linkages, and road construction). The decentralization of development is achieved primarily through the development of the network of transport and digital infrastructure that will link the entire country. This will attempt to alleviate the isolation of many rural communities.

Simulation Scenarios

The broad policy thrust of the MTPDP that directly affects the rural sector can be summarized broadly into infrastructure, market development and institutional development. Infrastructure includes social, economic and physical facilities needed by rural households and institutions in the pursuit of development. This infrastructure includes rural roads, credit, irrigation and basic social services. Market development focuses on marketing support among the farmers and fisherfolk that are often at the losing end in their agreement with the middlemen. The interventions leading towards market development include rationalizing the grains sector trading by separating the regulatory and proprietary functions of the National Food Authority (NFA), rural roads and credit. For institutional development that usually facilitates sustainability of various interventions, the following tasks are targeted: stimulate the public-private sector collaboration especially on concerns of credit and rural investments; for sustainability, and ensuring service delivery of irrigation, pursue volumetric pricing, an incentive to properly maintain the distribution system; set up a tax system to prevent conversion and agrarian land ownership reconsolidation; provide interventions and safety nets during natural disasters and economic shocks; and empower the poor and the vulnerable through a comprehensive and integrated convergence approach.

While individually, none of the basic provisions for rural development are missing (need-availability balance is negligible), the pervasive rural poverty and rural-urban inequality needs further assessment. Empirical evidence supports the theoretical exploration on

bundling of infrastructure and support services and participatory provision of intervention presented earlier. The fact that the stakeholders think that there is really nothing more that they need that is not available, and that some things available are not needed, helps explain the need for stakeholder participation. Some projects may have been misplaced due to lacking community involvement in project identification. Also, the stakeholders may have perceived less need for an intervention because of deterioration of infrastructure due to poor maintenance.

In the community-level models, the determinants include ODA, rural roads and bridges, irrigation, farming technologies, and tenure improvement. The present ODA projects under the department of agrarian reform on the average cover about 5% of the agrarian reform communities; some very small projects have less than 1% coverage. One peculiar project that provides only capacity building intervention covered 20% of the communities. Simulation is done on the assumption that 10% more communities will be covered by various ODA projects. Roads, bridges, and irrigation construction that at present have 60%, 65%, and 62% completion rates, respectively, are assumed to reach 80% completion in the simulation. For other post-harvest facilities where the present accomplishment rate is relatively higher, a 90% completion rate is assumed. Provision of credit needs has very low completion rates, so 75% completion is assumed. Adoption rate of farming technologies is assumed to reach 75% from the current 38%. Tenure improvement that is already approaching completion is assumed to have been completed.

Simulating Official Development Assistance

Early development assistance in the rural Philippines was characterized mainly by direct provision of production inputs. Although not sustainable, it provided fast, short-lived relief especially among the highly vulnerable marginal group of farmers and fishermen. The thrust of development assistance has gradually evolved towards facilitation of access to inputs and social services, capacity building and physical infrastructure. These have become more sustainable, particularly if done in bundles of interventions and identified through a participatory approach.

Although there is a variety of development assistance targeting a cross-section of Philippine society as beneficiaries, we will focus only on those directly targeting agrarian reform communities. The effect was measured only at the community level, and contribution of the development assistance is indexed by the number of years a community has been covered by a development project. The effect may be interpreted as the outcome over time of the overall packaging of the project for all its components. Later on, we will consider specific factors of these development projects that may have contributed to development.

In terms of overall index of rural development at the community level, from the present coverage of about 5% of ARCs across various projects, if coverage is increased to cover 10% more (using the same project menu), the overall rural development index will grow by at most 0.18%. This occurred in a project that has a menu that balances provision of rural infrastructure, community development, capacity building, and facilitation of access to basic services. Other projects that are not as comprehensive will produce lower impact. This growth in overall index is only one seventh of the growth in 2005 of the index at 1.3%. As the project matures, however, growth in index to as much as 2% will be expected. Faster growth of the overall index to reach 100 (the maximum) can be achieved if other development assistance similar to this integrated menu is packaged and augmented with other implements discussed in subsequent sections. Otherwise, based on the settings in 2005 alone, it will take several decades before the overall index will attain a level close to 100.

Farm income grows to as much as 2% per year. This can be interpreted as the aggregate effect of all efforts to generate farm income, coming not only from development assistance

but also from all stakeholders. The impact of integrated development assistance is remarkable with at most a 0.63% increase in farm income with expansion of coverage by 10% more. In 2005, nominal farm income is growing by 1.30% and the rural inflation rate is 7.2%. While farm income grows very slowly, slower than the rural inflation rate, an appropriately identified package of development assistance can help fuel such growth.

The annual leverage of off-farm income growth is estimated at 2%. A development project that focuses on rural infrastructure with some support services and capability building assistance can contribute as much as 0.73% more off-farm income by an increase of 10% in the coverage of communities. Furthermore, this contribution can grow further to as much as 2% per year as a result of the project implementation maturing. The advantage of infrastructure-loaded projects (mostly rural roads and irrigation) is illustrated here in expanding livelihood opportunities among rural communities, alleviating their economic vulnerability from dependence on farming.

The total income is expected to grow by 1.69% a year. Expansion of coverage of different integrated development projects to 10% more communities will result in at most a 0.54% increase in total income, a rate that can be expected to grow as the project matures.

Although development assistance requires a certain density of a bundle to exhibit an effect in community-level indicators, coverage will need to expand from the current rate of about 5% of the communities. Otherwise, rural development will manifest among these communities after a longer period of time. A comprehensive package of development projects may be identified and formulated through a participatory approach. Substantial funding that will result in both intensity of intervention and wider coverage will be more efficient than a project that will be implemented in phases spread over time covering different communities in different phases. This will generate both the rural development constructs and the multiplier effect expected that are rather long-term outcomes.

Effect of Roads, Bridges, and Irrigation

In some income models, availability of roads and bridges is indicated by lower transportation cost, lower cost of utilities, and in a mid- to long-term range by diversification of employment opportunities. Electricity and water lines are installed in rural areas along paved road systems. Service cost is expected to be lower if the road system is favorable. A 10% reduction in transportation cost can result in a 0.69% increase in income from agriculture. Furthermore, a 10% reduction in cost of various utilities can result in at most a 0.71% increase in total income, a 0.50% increase in non-agriculture income, and at most a 2.91% increase in income from agriculture. Income from agriculture increases more since roads and bridges are expected to pave the way for other physical infrastructure and support services, and connect the producers to their consumers (more efficient marketing channels), thereby resulting in larger multiplier effects.

Given roads, investments in microenterprises will move towards the rural communities because it will be cost-effective to locate production facilities in areas where the raw materials originate. Employment/occupations will diversify as a result of the new production facilities. A change of occupation from farming to non-farming will benefit non-farm income but will be a loss to farm income. Still, total income will be expected to post a positive net growth. A 10% decline among households reporting themselves to be engaged in farming can result in a 1.1% increase in total income, expectedly coming from non-income sources (2.67% increase in income), but agriculture income can drop by as much as 11%. As a result of the 10% decline in farming households, suppose that any other non-farming occupation increases. Then, non-agriculture income can increase by at most 1.15%, while agriculture income will decline by at most 7%. While income source diversification is expected to propel total income growth, income from agriculture could suffer as a result of labor shortage in a

labor-intensive production system. Thus, reversion of the potential negative effect of improvement in accessibility to agricultural production requires that more efficient faming systems be introduced and adopted by farmers.

At the community level, availability of rural road systems is measured in terms of percentage accomplishment (in length) in comparison to the total requirement of the community. An accomplishment of 20% more required roads can result in a 1.20% increase in overall index of rural development, close to the registered growth in 2005. For farm incomes, 1.56% growth is expected, higher than the actual growth measured in 2005. Off-farm (still agriculture) income is likewise expected by grow by 1.68%. Non-agriculture income, however, benefits the most with an expected 1.95% growth. Total income can grow by as much as 1.57%. Clearly, rural roads here generate the largest impact on the rural development index and income growth. It should be noted, however, that the development assistance discussed in the previous section can partly be responsible for the increase in the accomplishment in rural road provision.

At the household level, the marginal effect of perceived availability and need for rural roads on income and perceptions are not significant. The role of their perception on availability of rural roads, however, is highlighted in bundles of infrastructure and other development interventions. Perceived improvement in accessibility is expected to improve the technical efficiency of the households in generating income by as much as 2.70%.

At the community level, a 20% increase of accomplishment in the provision of irrigation systems can result in a 0.74% increase in rural development index score. The marginal effects on total income and from different sources are not significant since irrigation is often included in the interventions menu of various development projects. Hence, these effects could have been accounted for in the discussion above.

Effect of Tenure Improvement

The distribution of covered land in the comprehensive agrarian reform program is nearing completion, with 92% already distributed in 2005. If land distribution is completed, this will result in a 0.70% increase in the rural development index while non-farm income will increase by 1.70%. If at least 90% of the beneficiaries continue cultivating the land (instead of relinquishing tenurial rights for cash), a 1% increase will result in the rural development index. Improvement in tenure will help loosen agrarian households' bondage to the soil, allowing them leeway to engage in non-farm livelihood activities.

Compared to those having other types of tenurial status, the amortizing owners of land they cultivate will have more than four times the odds of perceiving that there is rural development. Furthermore, the rural development index score can increase by 0.27% if there will be 10% more farmers who will be amortizing owner of the land they cultivate.

Despite the shortcomings of the present design of the agrarian reform program, it can be expected to help avert agrarian unrest as well as result in actual and perceived rural development. To make this expectation a reality, appropriate policies must be in place for the beneficiaries to not easily give up tenure. Community organizing, capacity building and the provision of other support services would also be beneficial.

Effect of Post-Harvest Facilities And Marketing

Like irrigation services, provision of post-harvest facilities is also commonly included in the menus of various projects funded from official development assistance. Thus, the marginal effect of post-harvest facilities alone could be negligible. For example, a 10% increase in the completion of post-harvest facilities among those who need it can result in an increase in

rural development index by 0.40%. An increase of 10% among those who perceived that millers are needed and available to them could mean a 3.44% increase in farm income.

Effect of Credit

Credit is evolving as one major component of a rural development intervention package. Various agencies (government and non-government) have integrated credit in their operations. Among the rural communities in the Philippines, both the agriculture and agrarian reform agencies are using it as a development strategy. Although initially, many credit projects failed because of the difficulty in improving the repayment rate, agencies have gradually implemented sustainability infrastructure. At present, about 55% of credit needs in agrarian reform communities are met by various sources.

At the community level, if credit becomes available to 20% more of those who need it, i.e., at least 3 of those 4 needing credit are able to get access, there will be a 1% increase in the overall rural development index, a 1.48% increase in farm income, a 1.43% increase in off-farm income, a 1.62% increase in non-farm income, and a 1.49% increase in total income. The income growth due to credit availability is a considerable contribution in view of the fact that total income in 2005 grew only by 5.08%. Credit has a high multiplier effect on non-farm income. This illustrates the efficiency and effectiveness of the use of credit for non-farm livelihood or in microenterprise development. The marginal farmers however are in need of capital to procure production inputs, but the repayment rate suffers when crops are destroyed due to weather conditions or infestation. It will be more viable then for sustainability of the microfinancing funds to set aside from the loan proceeds a premium for crop insurance. On the other hand, credit for livelihood should be provided along with appropriate trainings on microenterprise development to ensure efficient use of loan proceeds and later, to guarantee higher if not 100% repayment rates.

Effect of Training on Farming Technologies

Modern farming technologies are important in pushing for efficiency in agricultural production. Training modules have been conducted in various parts of the country but the adoption rate of these technologies remains low. The adoption rate could be a function of the effectiveness of the extension approach, availability of support and necessary implements to adopt the technology, and many others.

At the community level, the adoption rate of modern farming technologies is low at 38%. Suppose this will increase to 50%. This will result in a 1% increase in the overall rural development index (community level), a 5% increase in total income, a 2.54% increase in farm income, and a 7.71% increase in non-farm income. Trainings should not end at the delivery of the know-how, but should be monitored all the way to actual adoption. Once the new technologies are adopted, income will increase naturally. Note that even the non-farm income will increase as a result of improvement in the adoption rate because the efficiency in the farming system will reduce farm labor, freeing workers to engage in non-farm livelihoods and raising non-farm income, which was still very low as of 2005. The adoption rate can be increased through a strategic advocacy campaign and more effective training methods (e.g., exposure to demonstration farms pilot-tested using several technologies).

Spatial Effect

An increase of 10% in the regional average of the rural development index (community level) can result in a net increase in the index for each community by 16.87%. Income effect, although lower, is expected to grow by as much as 8.5% when the regional average income increases by 10%. For the non-farm sources, it is the increase in the average per project site

that will lead to an increase in non-farm income. Intervention per site usually varies and takes into consideration the topographic and site-specific needs of the site.

VI. CONCLUDING NOTES AND RECOMMENDATIONS

Rural roads generate the largest impact on rural development indexes and income growth. Furthermore, the rural households' production (income-generation) potential is also optimized with the availability of an accessibility network that alleviates their isolation. Provision of irrigation systems in a properly identified community necessarily fuels growth in farm income and optimizes the household's technical efficiency in perceiving rural development.

Community organizing and the active participation of stakeholders in various activities during project planning and implementation are some of the crucial elements that can encourage sustainability in development projects. The proportions of households who are members of any community of user's organization are very low. Membership in a user's group or any organization entitles one to avail of the services provided by the organization (e.g., irrigation, credit, marketing support, or even capacity building for some), leading to larger farm income growth. Community organizing and development should be an integral part of a social preparation scheme of any project, and not just be added in post-project evaluation recommendations.

References

Conning, JH and Robinson, JA, 2002 Land Reform and the Political Organization of Agriculture, CEPR Discussion Paper No. 3204.

DasGupta, M., Grandvoinnet, H., and Romani, M., 2003, Fostering Community-Driven Development, Policy Research Working Paper No. 2969, The World Bank Development Research Group.

DBM, 2005, National Expenditure Program Fiscal Year 2005, Department of Budget and Management, http://www.dbm.gov.ph/dbm_publications/nep_2005/nep_2005.htm.

Fedderke, J., Perkins, P. and Luiz, J., 2006, Infrastructural Investment in Long-Run Economic Growth: South Africa 1875-2001, World Development, 34(6): 1037–1059.

Mundlak, Y Larson, DF, Butzer, R, 2002, Determinants of Agricultural Growth in Indonesia, the Philippines, and Thailand, V. 1, World Bank Working Paper 2803, World Bank. NEDA, 2004, Medium-Term Philippine Development Plans 2004–2010, National Economic and Development Authority, Manila.

NEDA, 2005, Socio-Economic Report 2005, National Economic and Development Authority, Manila.

NSO, 2004, Family Income and Expenditures Survey, National Statistics Office, Philippines.

APPENDICES

APPENDIX 1: PANEL MODELS FOR ALDA INDICATORS RESULTS

The random effect model is given by $y_{it} = \mu + \beta x_{it} + u_i + \varepsilon_{it}$
Defined the following variables:

age= Age of the Agrarian Reform Community (ARC)
a_arisp=No. of years the ARC is supported by ARC Infrastructure Support Project
a_arisp2= No. of years the ARC is supported by ARC Infrastructure Support Project Phase 2
a_arcpadb=No. of years the ARC is supported by ARC Program-Asian Development Bank
a_arcdpwb=No. of years the ARC is supported by ARC Development Program-World Bank
a_arcdp2=No. of years the ARC is supported by ARC Development Program-World Bank Phase 2
a_arspeu=No. of years the ARC is supported by the Agrarian Reform Support Programme of the European Union
a_biarsp= No. of years the ARC is supported by the Belgian Integrated Agrarian Reform Support Programme
a_cida= No. of years the ARC is supported by the Canadian International Development Assistance
a_rascp=No. of years the ARC is supported by the Microfinance Project (RASCP)
a_undpsar=No. of years the ARC is supported by the UNDP
a_wmcip= No. of years the ARC is supported by the Western Mindanao Integrated Community Project
a_starcm= No. of years the ARC is supported by the STARCM Project
a_minssad= No. of years the ARC is supported by the MINSSAD Project
a_jica= No. of years the ARC is supported by the JICA Project
a_spots=No. of years the ARC is supported by the Solar Energy Project
areaact=cultivated area in the ARC covered by the Comprehensive Agrarian Reform Program (CARP)
areaper=percentage of CARP area to total cultivated area in the ARC
arbcul=number of Agrarian Reform Beneficiaries (ARB) still cultivating the land
arbculper=percentage of ARBs still cultivating the land
arbact=total ARB in the ARC
arbper=proportion of actual ARB to total potential ARB in the ARC
fmrcom=length of completed farm-to-market roads in the ARC
fmrper=percentage of completed farm-to-market roads to total road requirements of the ARC
brcom=number of completed bridges in the ARC
brper=percentage of completed bridges to total bridge requirements of the ARC.
nirrcom=number of completed irrigation systems in the ARC
nirrper=percentage of completed irrigation to total irrigation needs of the ARC
iareacom=total irrigated area in the ARC
iareaper=percentage of irrigated to total area in the community
arbfarai=total irrigated area among ARBs
arbfarper=percentage of irrigated areas among the ARBs
arbapph=number of ARBs needing post-harvest facilities
arbapphper=proportion of ARBs needing post-harvest facilities
accredit=number of ARBs with access to credit
creditper=percentage of ARBs with access to credit
adoptech=number of ARBs adopting modern farming technologies
adoprate=percentage of ARBs adopting modern farming technologies

For INDEX

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Random-effects GLS regression                   Number of obs      =      5780
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.2576                         Obs per group: min =         1
       between = 0.5998                                        avg =       3.8
       overall = 0.4898                                        max =         4
Random effects u_i ~ Gaussian                   Wald chi2(38)      =   3752.59
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
       index |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   .0239447    .036842     0.65   0.516    -.0482642    .0961537
     a_arisp |   .2262932   .0910592     2.49   0.013     .0478206    .4047659
    a_arisp2 |   .4636895   .1031451     4.50   0.000     .2615288    .6658503
   a_arcpadb |   .2402795    .083257     2.89   0.004     .0770988    .4034602
   a_arcdpwb |   .3297916    .061961     5.32   0.000     .2083503    .4512329
    a_arcdp2 |   .8371574   .2218409     3.77   0.000     .4023571    1.271958
    a_arspeu |   .0210013   .0661395     0.32   0.751    -.1086297    .1506323
    a_biarsp |   .1315045     .06863     1.92   0.055    -.0030079    .2660168
      a_cida |  -.2876651    .201352    -1.43   0.153    -.6823078    .1069775
      a_rascp |   .0306991   .0978262     0.31   0.754    -.1610367    .2224349
   a_undpsar |  -.1114846   .0775886    -1.44   0.151    -.2635556    .0405863
      a_wmcip |  -.0884094   .4000596    -0.22   0.825    -.8725118    .6956931
    a_starcm |  -.4747588   .2516491    -1.89   0.059    -.9679821    .0184644
   a_minssad |   .0433837   .0463508     0.94   0.349    -.0474623    .1342297
      a_jica |    .203304    .147395     1.38   0.168     -.085585     .492193
      a_spots |   .0091568   .2461995     0.04   0.970    -.4733855     .491699
      areaact |  -.0006078   .0000874    -6.95   0.000    -.0007791   -.0004364
      areaper |    .064946   .0070938     9.16   0.000     .0510424    .0788496
      arbcul |   .0003488   .0004772     0.73   0.465    -.0005864    .0012841
   arbculper |  -.0212834   .0042926    -4.96   0.000    -.0296967     -.01287
      arbact |   .0007088   .0002491     2.85   0.004     .0002205    .0011971
      arbper |   .0530334   .0054078     9.81   0.000     .0424343    .0636326
      fmrcom |  -.0000888   .0002095    -0.42   0.672    -.0004994    .0003219
      fmrper |   .0429862   .0027905    15.40   0.000     .0375168    .0484556
       brcom |   .0012071   .0008311     1.45   0.146    -.0004217     .002836
       brper |   .0255379   .0023045    11.08   0.000     .0210211    .0300546
     nirrcom |   .0014771   .0016465     0.90   0.370    -.0017499    .0047041
     nirrper |   .0051608   .0029234     1.77   0.078    -.0005691    .0108906
    iareacom |   .0009106   .0002576     3.54   0.000     .0004058    .0014155
    iareaper |    .029551   .0035547     8.31   0.000      .022584     .036518
    arbfarai |   .0015147   .0005442     2.78   0.005     .0004481    .0025814
   arbfarper |   .0341745   .0034308     9.96   0.000     .0274503    .0408988
     arbapph |   .0005129   .0004547     1.13   0.259    -.0003783    .0014041
  arbapphper |   .0285426    .004103     6.96   0.000     .0205008    .0365845
     acredit |   .0009735   .0002686     3.62   0.000     .0004471    .0014999
   creditper |   .0337382   .0022895    14.74   0.000     .0292509    .0382254
    adoptech |  -.0002332   .0007296    -0.32   0.749    -.0016633    .0011968
    adoprate |   .0579893   .0045956    12.62   0.000      .048982    .0669966
       _cons |   44.36335   .8334782    53.23   0.000     42.72976    45.99693
-------------+----------------------------------------------------------------
     sigma_u |   3.355401
     sigma_e |  4.5727573
         rho |  .34998841   (fraction of variance due to u_i)
------------------------------------------------------------------------------
. sum mindex1

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
     mindex1 |      5780    6.566745    6.273143   .0026579   94.96854
```

For FARM INCOME

```
Random-effects GLS regression                   Number of obs      =      5767
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.0215                         Obs per group: min =         1
       between = 0.1016                                        avg =       3.8
       overall = 0.0677                                        max =         4
Random effects u_i ~ Gaussian                   Wald chi2(38)      =    258.87
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
        finc |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   1046.321   215.9974     4.84   0.000     622.9738    1469.668
     a_arisp |   2329.523   499.3975     4.66   0.000     1350.722    3308.325
    a_arisp2 |   936.5365   584.7486     1.60   0.109    -209.5498    2082.623
   a_arcpadb |    1651.53   474.3926     3.48   0.000      721.738    2581.323
   a_arcdpwb |   591.8391   359.4322     1.65   0.100    -112.6351    1296.313
    a_arcdp2 |  -160.1549   1179.249    -0.14   0.892     -2471.44     2151.13
    a_arspeu |  -466.7405   383.5746    -1.22   0.224    -1218.533    285.0518
    a_biarsp |  -558.9274   398.9206    -1.40   0.161    -1340.797    222.9426
      a_cida |   322.4093   1130.233     0.29   0.775    -1892.807    2537.625
     a_rascp |  -1583.967   513.7286    -3.08   0.002    -2590.857   -577.0779
   a_undpsar |  -377.1545   442.3717    -0.85   0.394    -1244.187     489.878
     a_wmcip |   285.9222   2228.863     0.13   0.898    -4082.569    4654.414
    a_starcm |   1682.178   1441.148     1.17   0.243    -1142.421    4506.776
   a_minssad |  -95.22337   243.4392    -0.39   0.696    -572.3555    381.9088
      a_jica |  -911.8561   817.6022    -1.12   0.265    -2514.327    690.6148
     a_spots |   2167.002   1339.368     1.62   0.106    -458.1106    4792.114
     areaact |  -1.686595   .4853621    -3.47   0.001    -2.637888    -.735303
     areaper |  -23.80173   39.44675    -0.60   0.546    -101.1159    53.51247
      arbcul |  -8.347713   2.604365    -3.21   0.001    -13.45218   -3.243251
   arbculper |   11.58492   23.35447     0.50   0.620      -34.189    57.35883
      arbact |   4.358422   1.318538     3.31   0.001     1.774136    6.942708
      arbper |    5.38778   29.00156     0.19   0.853    -51.45423    62.22979
      fmrcom |  -.4993097   1.137846    -0.44   0.661    -2.729446    1.730827
      fmrper |   41.89383   15.23504     2.75   0.006      12.0337    71.75397
       brcom |  -1.727852   4.587567    -0.38   0.706    -10.71932    7.263613
       brper |   24.12388   12.57547     1.92   0.055    -.5235804    48.77135
     nirrcom |   7.237874   8.923443     0.81   0.417    -10.25175     24.7275
     nirrper |   4.772994   15.80396     0.30   0.763     -26.2022    35.74819
    iareacom |   .5140546   1.461442     0.35   0.725    -2.350319    3.378428
    iareaper |   20.27382   19.23428     1.05   0.292    -17.42468    57.97232
    arbfarai |    8.77971   3.035454     2.89   0.004      2.83033    14.72909
   arbfarper |  -25.44167   18.49427    -1.38   0.169    -61.68978    10.80644
     arbapph |   6.884232   2.476571     2.78   0.005     2.030243    11.73822
  arbapphper |  -44.83026   22.13093    -2.03   0.043     -88.2061   -1.454433
     acredit |  -1.551806   1.457851    -1.06   0.287    -4.409141    1.305529
   creditper |   37.99975   12.40132     3.06   0.002      13.6936     62.3059
    adoptech |   10.38935   3.992927     2.60   0.009     2.563354    18.21534
    adoprate |   56.27623   25.12134     2.24   0.025     7.039308    105.5131
       _cons |   33403.49   4693.877     7.12   0.000     24203.66    42603.32
-------------+----------------------------------------------------------------
     sigma_u |  21130.341
     sigma_e |   23863.36
         rho |  .43948104   (fraction of variance due to u_i)
------------------------------------------------------------------------------
. sum mfinc1

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
      mfinc1 |      5766    143.7707    5418.031   8.73e-06   398372.5
```

For OFF FARM INCOME

```
Random-effects GLS regression                   Number of obs      =      5763
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.0234                         Obs per group: min =         1
       between = 0.0306                                        avg =       3.8
       overall = 0.0250                                        max =         4
Random effects u_i ~ Gaussian                   Wald chi2(38)      =    137.64
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
       ofinc |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   319.7303   94.35288     3.39   0.001     134.8021    504.6586
     a_arisp |   312.4914   210.9354     1.48   0.138    -100.9344    725.9172
    a_arisp2 |   599.8806   250.3511     2.40   0.017     109.2015     1090.56
   a_arcpadb |   21.71326   203.4735     0.11   0.915    -377.0874    420.5139
   a_arcdpwb |  -442.6743   155.9335    -2.84   0.005    -748.2983   -137.0503
    a_arcdp2 |   -68.6596   488.6676    -0.14   0.888     -1026.43    889.1112
    a_arspeu |  -691.1423   166.1529    -4.16   0.000    -1016.796   -365.4885
    a_biarsp |  -674.3514   173.2225    -3.89   0.000    -1013.861   -334.8416
      a_cida |  -292.1282   481.1878    -0.61   0.544    -1235.239    650.9825
     a_rascp |  -297.8126   211.7717    -1.41   0.160    -712.8775    117.2524
   a_undpsar |  -250.8319   190.0883    -1.32   0.187    -623.3982    121.7344
     a_wmcip |   1292.226   945.7373     1.37   0.172    -561.3855    3145.837
    a_starcm |  -268.3062   622.7408    -0.43   0.667    -1488.856    952.2434
   a_minssad |  -2.938736   100.3347    -0.03   0.977    -199.5912    193.7137
      a_jica |   116.3325     345.83     0.34   0.737    -561.4818    794.1467
     a_spots |  -530.1627   560.7068    -0.95   0.344    -1629.128    568.8025
     areaact |  -.3768197   .2056048    -1.83   0.067    -.7797977    .0261583
     areaper |  -16.53676   16.74884    -0.99   0.323    -49.36388    16.29036
      arbcul |  -.2974137   1.093103    -0.27   0.786    -2.439857     1.84503
   arbculper |   13.39228   9.777044     1.37   0.171    -5.770372    32.55494
      arbact |   1.215837    .545204     2.23   0.026     .1472568    2.284417
      arbper |    28.8956   12.05254     2.40   0.017     5.273057    52.51814
      fmrcom |   .1634378   .4776399     0.34   0.732    -.7727193    1.099595
      fmrper |   13.48162   6.391945     2.11   0.035     .9536436    26.00961
       brcom |  -.1016411   1.935803    -0.05   0.958    -3.895745    3.692462
       brper |   9.093743   5.275173     1.72   0.085    -1.245405    19.43289
     nirrcom |    10.6026   3.731277     2.84   0.004     3.289427    17.91576
     nirrper |   6.211644   6.604507     0.94   0.347    -6.732952    19.15624
    iareacom |   .9393237   .6262026     1.50   0.134    -.2880109    2.166658
    iareaper |   7.014714   8.053603     0.87   0.384    -8.770057    22.79949
    arbfarai |   1.198211   1.289461     0.93   0.353    -1.329086    3.725509
   arbfarper |  -14.63117   7.736293    -1.89   0.059    -29.79402    .5316872
     arbapph |   .3720852   1.037103     0.36   0.720      -1.6606     2.40477
  arbapphper |  -.0707571   9.200284    -0.01   0.994    -18.10298    17.96147
     acredit |   .4100608   .6112246     0.67   0.502    -.7879173    1.608039
   creditper |    10.9237   5.185636     2.11   0.035     .7600391    21.08736
    adoptech |   .7010521   1.680097     0.42   0.676    -2.591877    3.993981
    adoprate |   9.188527   10.55902     0.87   0.384    -11.50676    29.88382
       _cons |   6706.432   2004.382     3.35   0.001     2777.915    10634.95
-------------+----------------------------------------------------------------
     sigma_u |  9526.1243
     sigma_e |  9808.4775
         rho |  .48539959   (fraction of variance due to u_i)
------------------------------------------------------------------------------
. sum mofinc1

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
     mofinc1 |      5740    119.1849    311.6268   .0033875    15233.2
```

For NON FARM INCOME

```
Random-effects GLS regression                   Number of obs      =      5738
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.0197                         Obs per group: min =         1
       between = 0.0416                                        avg =       3.8
       overall = 0.0334                                        max =         4
Random effects u_i ~ Gaussian                   Wald chi2(38)      =    148.57
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
        ninc |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   192.0037   152.4796     1.26   0.208    -106.8507    490.8582
     a_arisp |   955.4877   328.4455     2.91   0.004     311.7463    1599.229
    a_arisp2 |   461.7067   394.7212     1.17   0.242    -311.9326    1235.346
   a_arcpadb |   460.1894   320.8447     1.43   0.151    -168.6546    1089.033
   a_arcdpwb |  -591.1549   249.3871    -2.37   0.018    -1079.945   -102.3651
    a_arcdp2 |   422.5921   740.6287     0.57   0.568    -1029.013    1874.198
    a_arspeu |  -1106.925   265.4611    -4.17   0.000    -1627.219   -586.6306
    a_biarsp |  -504.2116   277.3912    -1.82   0.069    -1047.888    39.46523
      a_cida |   -1250.66   751.0379    -1.67   0.096    -2722.667    221.3471
      a_rascp |  -651.6558   318.8222    -2.04   0.041    -1276.536   -26.77583
   a_undpsar |  -229.9831   302.2265    -0.76   0.447    -822.3362      362.37
      a_wmcip |  -494.4128   1470.857    -0.34   0.737    -3377.239    2388.414
    a_starcm |  -172.0527   983.2623    -0.17   0.861    -2099.211    1755.106
   a_minssad |  -178.3875   150.8613    -1.18   0.237    -474.0703    117.2952
      a_jica |   109.8388   535.4698     0.21   0.837    -939.6628     1159.34
     a_spots |  -560.6522   856.0619    -0.65   0.513    -2238.503    1117.198
     areaact |  -.6525782   .3190783    -2.05   0.041     -1.27796   -.0271963
     areaper |   51.22915   26.17741     1.96   0.050    -.0776292    102.5359
      arbcul |  -3.851923   1.679361    -2.29   0.022     -7.14341   -.5604364
   arbculper |   12.89048   14.97461     0.86   0.389    -16.45922    42.24018
      arbact |   2.230966   .8230567     2.71   0.007     .6178041    3.844127
      arbper |   22.98641   18.29224     1.26   0.209    -12.86573    58.83855
      fmrcom |  -.5603719   .7350331    -0.76   0.446     -2.00101    .8802665
      fmrper |   22.83402   9.841656     2.32   0.020      3.54473    42.12331
       brcom |   1.380569   2.992597     0.46   0.645    -4.484813    7.245951
       brper |   1.815278   8.099578     0.22   0.823     -14.0596    17.69016
     nirrcom |  -.3985105   5.701191    -0.07   0.944    -11.57264    10.77562
     nirrper |   8.088152   10.11037     0.80   0.424    -11.72781    27.90411
    iareacom |  -.1329361   .9857782    -0.13   0.893    -2.065026    1.799154
    iareaper |   5.536021   12.28609     0.45   0.652    -18.54427    29.61632
    arbfarai |   5.756926   2.004528     2.87   0.004     1.828124    9.685728
   arbfarper |   3.705822   11.80108     0.31   0.754    -19.42388    26.83552
     arbapph |   2.160557    1.58978     1.36   0.174    -.9553541    5.276468
  arbapphper |  -6.342061   14.01679    -0.45   0.651    -33.81446    21.13034
     acredit |  -.5018821    .934091    -0.54   0.591    -2.332667    1.328903
   creditper |   18.08492   7.938082     2.28   0.023      2.52656    33.64327
    adoptech |   2.241854   2.575895     0.87   0.384    -2.806806    7.290515
    adoprate |   48.37518   16.18183     2.99   0.003     16.65937      80.091
       _cons |   5785.368   3149.042     1.84   0.066    -386.6413    11957.38
-------------+----------------------------------------------------------------
     sigma_u |  15860.981
     sigma_e |  14634.906
         rho |  .54013969   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. sum mninc1

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
      mninc1 |      5647    179.1962    1808.845    .014681   132474.5
```

For TOTAL INCOME

```
Random-effects GLS regression                   Number of obs      =      5771
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.0268                         Obs per group: min =         1
       between = 0.0926                                        avg =       3.8
       overall = 0.0642                                        max =         4
Random effects u_i ~ Gaussian                   Wald chi2(38)      =    266.81
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
      totinc |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   1571.365    352.575     4.46   0.000     880.3307    2262.399
     a_arisp |   3481.423   812.4359     4.29   0.000     1889.078    5073.768
    a_arisp2 |    1794.39   952.9572     1.88   0.060    -73.37151    3662.152
   a_arcpadb |   2104.771    772.714     2.72   0.006     590.2794    3619.263
   a_arcdpwb |  -462.7129    586.359    -0.79   0.430    -1611.955    686.5297
    a_arcdp2 |    32.2741   1914.967     0.02   0.987    -3720.992     3785.54
    a_arspeu |  -1981.775   625.3264    -3.17   0.002    -3207.392   -756.1577
    a_biarsp |  -1698.748   650.8563    -2.61   0.009    -2974.403   -423.0931
      a_cida |  -1271.424   1840.476    -0.69   0.490     -4878.69    2335.843
      a_rascp |  -2589.958   833.7595    -3.11   0.002    -4224.096   -955.8193
   a_undpsar |  -894.9182   720.9793    -1.24   0.215    -2308.012    518.1753
      a_wmcip |   846.4369   3628.205     0.23   0.816    -6264.715    7957.589
    a_starcm |   1029.645   2349.375     0.44   0.661    -3575.045    5634.335
   a_minssad |  -270.0081   395.0827    -0.68   0.494    -1044.356    504.3398
      a_jica |  -622.6569   1330.525    -0.47   0.640    -3230.438    1985.124
      a_spots |   1022.068   2176.412     0.47   0.639    -3243.622    5287.758
      areaact |  -2.805166   .7899197    -3.55   0.000     -4.35338   -1.256952
      areaper |   16.18248   64.18852     0.25   0.801    -109.6247    141.9897
      arbcul |  -12.33615   4.232905    -2.91   0.004    -20.63249   -4.039805
   arbculper |   28.92337    37.9168     0.76   0.446    -45.39219    103.2389
      arbact |    7.85391    2.14041     3.67   0.000     3.658783    12.04904
      arbper |   64.11403   47.08158     1.36   0.173    -28.16416    156.3922
      fmrcom |  -.9598833   1.850054    -0.52   0.604    -4.585922    2.666156
      fmrper |   72.87389   24.76565     2.94   0.003     24.33412    121.4137
       brcom |  -.6734004   7.463006    -0.09   0.928    -15.30062    13.95382
       brper |   35.17681   20.44103     1.72   0.085    -4.886867    75.24048
      nirrcom |   18.11833   14.50439     1.25   0.212    -10.30975     46.5464
      nirrper |   20.08592   25.68332     0.78   0.434    -30.25247    70.42431
    iareacom |   1.616111   2.381261     0.68   0.497    -3.051075    6.283297
    iareaper |    33.8351   31.26035     1.08   0.279    -27.43405    95.10425
    arbfarai |   15.50611   4.941089     3.14   0.002     5.821751    25.19047
   arbfarper |  -36.99232   30.05156    -1.23   0.218     -95.8923    21.90765
     arbapph |    9.66965   4.022755     2.40   0.016     1.785195     17.5541
  arbapphper |  -48.87633   35.83515    -1.36   0.173    -119.1119    21.35926
     acredit |   -1.64749   2.369694    -0.70   0.487    -6.292005    2.997025
   creditper |   65.80037   20.14838     3.27   0.001     26.31026    105.2905
    adoptech |    12.6893   6.490353     1.96   0.051    -.0315563    25.41016
    adoprate |   124.2902   40.82602     3.04   0.002     44.27272    204.3078
       _cons |   44953.07   7642.552     5.88   0.000     29973.94    59932.19
-------------+----------------------------------------------------------------
     sigma_u |  34478.173
     sigma_e |  38571.389
         rho |  .44414198   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. sum mtotinc1

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
    mtotinc1 |      5770    40.52375     45.1367    .007955   894.1651
```

For OM

```
Random-effects GLS regression                   Number of obs      =      5776
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.0342                         Obs per group: min =         1
       between = 0.1995                                        avg =       3.8
       overall = 0.1485                                        max =         4
Random effects u_i ~ Gaussian                   Wald chi2(38)      =    481.81
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
          om |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   .2630841   .0936595     2.81   0.005     .0795148    .4466534
     a_arisp |   .5702934   .1942034     2.94   0.003     .1896618     .950925
    a_arisp2 |   1.264555   .2355096     5.37   0.000     .8029645    1.726145
   a_arcpadb |   .3669563   .1928007     1.90   0.057    -.0109262    .7448388
   a_arcdpwb |   .6768339   .1517942     4.46   0.000     .3793228     .974345
    a_arcdp2 |   1.132186   .4290599     2.64   0.008     .2912436    1.973128
    a_arspeu |   .2552655   .1613101     1.58   0.114    -.0608964    .5714275
    a_biarsp |   .3851838   .1690609     2.28   0.023     .0538305     .716537
      a_cida |   .9344273   .4473153     2.09   0.037     .0577055    1.811149
      a_rascp |   -.018604    .184698    -0.10   0.920    -.3806054    .3433973
   a_undpsar |   .1297427   .1805408     0.72   0.472    -.2241108    .4835961
      a_wmcip |  -1.037528   .8736445    -1.19   0.235     -2.74984    .6747833
    a_starcm |  -.7040443   .5934659    -1.19   0.235    -1.867216    .4591274
   a_minssad |   .0970522   .0870751     1.11   0.265    -.0736119    .2677163
       a_jica |   .0984263   .3167287     0.31   0.756    -.5223505    .7192031
      a_spots |  -.6579774   .4993064    -1.32   0.188      -1.6366    .3206451
      areaact |  -.0004914   .0001892    -2.60   0.009    -.0008622   -.0001206
      areaper |   .0362912   .0154349     2.35   0.019     .0060394     .066543
       arbcul |   .0017364   .0009854     1.76   0.078     -.000195    .0036678
   arbculper |  -.0376059   .0087139    -4.32   0.000    -.0546849   -.0205269
       arbact |   .0002248   .0004765     0.47   0.637     -.000709    .0011586
       arbper |   .0504056   .0105637     4.77   0.000     .0297012      .07111
       fmrcom |  -.0002008   .0004333    -0.46   0.643    -.0010501    .0006485
       fmrper |   .0128295   .0057458     2.23   0.026     .0015679    .0240911
        brcom |  -.0000211   .0017625    -0.01   0.990    -.0034755    .0034332
        brper |   .0036981   .0047366     0.78   0.435    -.0055854    .0129816
      nirrcom |   .0000249   .0033353     0.01   0.994    -.0065122    .0065619
      nirrper |   .0067689   .0058885     1.15   0.250    -.0047723    .0183101
     iareacom |  -.0001833   .0005916    -0.31   0.757    -.0013428    .0009762
     iareaper |   .0071281    .007176     0.99   0.321    -.0069366    .0211927
     arbfarai |   .0026643   .0011902     2.24   0.025     .0003315    .0049971
    arbfarper |   .0043257   .0068532     0.63   0.528    -.0091062    .0177577
      arbapph |  -.0011451   .0009293    -1.23   0.218    -.0029664    .0006762
   arbapphper |   .0066905   .0080871     0.83   0.408      -.00916    .0225409
      acredit |   .0016833   .0005463     3.08   0.002     .0006126     .002754
    creditper |   .0254102   .0046147     5.51   0.000     .0163655    .0344549
     adoptech |   .0015404   .0015077     1.02   0.307    -.0014146    .0044954
     adoprate |   .0748564    .009358     8.00   0.000      .056515    .0931978
        _cons |    49.7861   1.876841    26.53   0.000     46.10756    53.46464
-------------+----------------------------------------------------------------
     sigma_u |  10.067236
     sigma_e |  8.4704866
         rho |  .58550078   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. sum mom1

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
        mom1 |      5734    16.78526    29.09901   .0127031   1095.739
```

For LTI

```
Random-effects GLS regression                   Number of obs      =      5780
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.3108                         Obs per group: min =         1
       between = 0.8175                                        avg =       3.8
       overall = 0.6967                                        max =         4
Random effects u_i ~ Gaussian                   Wald chi2(38)      =   8637.28
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
         lti |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |  -.1608912   .0371781    -4.33   0.000    -.2337589   -.0880234
     a_arisp |   -.035903   .0989536    -0.36   0.717    -.2298486    .1580425
    a_arisp2 |   .2129764   .1070824     1.99   0.047     .0030988     .422854
   a_arcpadb |   .0237197   .0861442     0.28   0.783      -.14512    .1925593
   a_arcdpwb |   .0790388   .0630066     1.25   0.210    -.0444517    .2025294
    a_arcdp2 |   .0723946   .2474461     0.29   0.770     -.412591    .5573801
    a_arspeu |   .1256449   .0672616     1.87   0.062    -.0061855    .2574752
    a_biarsp |   .1253508   .0696464     1.80   0.072    -.0111536    .2618552
      a_cida |   .0701838    .211133     0.33   0.740    -.3436293    .4839969
      a_rascp |   .0287797   .1108786     0.26   0.795    -.1885384    .2460979
   a_undpsar |   .0010076   .0801964     0.01   0.990    -.1561746    .1581897
     a_wmcip |   .0080279   .4238875     0.02   0.985    -.8227763    .8388321
    a_starcm |  -1.252475   .2590009    -4.84   0.000    -1.760108   -.7448425
   a_minssad |   .0298759   .0525371     0.57   0.570     -.073095    .1328468
      a_jica |  -.0505517   .1563918    -0.32   0.747    -.3570741    .2559707
     a_spots |  -.1136004   .2681775    -0.42   0.672    -.6392188    .4120179
     areaact |  -.0003979   .0000929    -4.28   0.000      -.00058   -.0002158
     areaper |    .462745    .007541    61.36   0.000      .447965     .477525
      arbcul |   .0017117   .0005175     3.31   0.001     .0006975    .0027259
   arbculper |   .0314485   .0046765     6.72   0.000     .0222828    .0406142
      arbact |  -.0001124   .0002797    -0.40   0.688    -.0006607    .0004358
      arbper |   .1806002   .0060042    30.08   0.000     .1688322    .1923682
      fmrcom |   .0000535   .0002299     0.23   0.816     -.000397     .000504
      fmrper |   .0015058   .0030176     0.50   0.618    -.0044086    .0074202
       brcom |   .0009002   .0008867     1.02   0.310    -.0008377    .0026382
       brper |   .0056076    .002494     2.25   0.025     .0007194    .0104958
     nirrcom |   .0032336   .0017931     1.80   0.071    -.0002807     .006748
     nirrper |  -.0037921   .0031955    -1.19   0.235    -.0100551    .0024708
    iareacom |  -.0000477   .0002677    -0.18   0.859    -.0005724     .000477
    iareaper |   .0038965   .0038826     1.00   0.316    -.0037133    .0115064
    arbfarai |    .000167   .0005752     0.29   0.772    -.0009604    .0012944
   arbfarper |   .0041481   .0037648     1.10   0.271    -.0032308    .0115271
     arbapph |   .0005357   .0004943     1.08   0.278    -.0004331    .0015045
  arbapphper |   .0060293   .0045357     1.33   0.184    -.0028605     .014919
     acredit |  -.0008907   .0002921    -3.05   0.002    -.0014633   -.0003182
   creditper |   .0064685   .0025008     2.59   0.010      .001567    .0113701
    adoptech |  -.0016801   .0007886    -2.13   0.033    -.0032257   -.0001346
    adoprate |   .0354758   .0049969     7.10   0.000     .0256819    .0452696
       _cons |   28.75944   .8752242    32.86   0.000     27.04403    30.47485
-------------+----------------------------------------------------------------
     sigma_u |  3.0526819
     sigma_e |  5.2298422
         rho |    .254127   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. sum mlti1

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
       mlti1 |      5778    6.455079    108.9021   .0002899   8252.525
```

For FPI

```
Random-effects GLS regression                   Number of obs      =      5780
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.0115                         Obs per group: min =         1
       between = 0.1346                                        avg =       3.8
       overall = 0.0660                                        max =         4
Random effects u_i ~ Gaussian                   Wald chi2(38)      =    272.69
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
         fpi |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |  -.1579621   .0900317    -1.75   0.079    -.3344211    .0184968
     a_arisp |   .3239472   .2489707     1.30   0.193    -.1640265    .8119209
    a_arisp2 |   .0428238   .2623603     0.16   0.870    -.4713929    .5570405
   a_arcpadb |   .4730248   .2107992     2.24   0.025     .0598659    .8861836
   a_arcdpwb |   .4063367   .1529959     2.66   0.008     .1064702    .7062031
    a_arcdp2 |   .7443813   .6288119     1.18   0.236    -.4880674     1.97683
    a_arspeu |  -.2244933   .1632921    -1.37   0.169    -.5445401    .0955534
    a_biarsp |   .3103092   .1689636     1.84   0.066    -.0208535    .6414718
      a_cida |  -.9087133   .5197009    -1.75   0.080    -1.927308    .1098817
     a_rascp |  -.2654135   .2843968    -0.93   0.351    -.8228209    .2919939
   a_undpsar |   .0594657    .196172     0.30   0.762    -.3250244    .4439557
     a_wmcip |   .1934147   1.050105     0.18   0.854    -1.864754    2.251583
    a_starcm |   .5547519   .6323169     0.88   0.380    -.6845665     1.79407
   a_minssad |   .1925208   .1347426     1.43   0.153    -.0715699    .4566115
      a_jica |   .2300636   .3870701     0.59   0.552    -.5285798     .988707
     a_spots |   .1359992   .6728183     0.20   0.840      -1.1827    1.454699
     areaact |  -.0004748   .0002303    -2.06   0.039    -.0009263   -.0000234
     areaper |   .0277451   .0187098     1.48   0.138    -.0089256    .0644157
      arbcul |  -.0010396   .0012962    -0.80   0.423    -.0035801    .0015009
   arbculper |  -.0078779    .011735    -0.67   0.502    -.0308781    .0151223
      arbact |   .0013153   .0007136     1.84   0.065    -.0000834    .0027139
      arbper |   .0501589   .0152206     3.30   0.001     .0203271    .0799908
      fmrcom |   .0003898   .0005809     0.67   0.502    -.0007488    .0015284
      fmrper |  -.0161295   .0075414    -2.14   0.032    -.0309103   -.0013486
       brcom |   .0004226   .0022008     0.19   0.848    -.0038909     .004736
       brper |   .0047037   .0062352     0.75   0.451    -.0075171    .0169246
     nirrcom |   -.001876   .0044969    -0.42   0.677    -.0106898    .0069378
     nirrper |   .0083135   .0080309     1.04   0.301    -.0074268    .0240538
    iareacom |   .0013865   .0006566     2.11   0.035     .0000996    .0026734
    iareaper |   .0005958   .0097552     0.06   0.951    -.0185241    .0197156
    arbfarai |   .0002956    .001422     0.21   0.835    -.0024914    .0030826
   arbfarper |  -.0140957   .0094823    -1.49   0.137    -.0326807    .0044893
     arbapph |  -.0000265   .0012392    -0.02   0.983    -.0024552    .0024022
  arbapphper |   .0060322   .0114716     0.53   0.599    -.0164517    .0285162
     acredit |   .0015374   .0007323     2.10   0.036      .000102    .0029727
   creditper |   .0081566    .006283     1.30   0.194    -.0041579    .0204711
    adoptech |    .000879   .0019706     0.45   0.656    -.0029833    .0047413
    adoprate |   .1079357   .0125249     8.62   0.000     .0833874    .1324841
       _cons |    55.9272   2.158573    25.91   0.000     51.69648    60.15793
-------------+----------------------------------------------------------------
     sigma_u |  6.9864446
     sigma_e |  13.664845
         rho |  .20722909   (fraction of variance due to u_i)
------------------------------------------------------------------------------


. sum mfpi1

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
       mfpi1 |      5780    21.88053    24.77413   .0003472   568.2824
```

For BSS

```
Random-effects GLS regression                   Number of obs      =      5780
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.0313                         Obs per group: min =         1
       between = 0.1610                                        avg =       3.8
       overall = 0.1066                                        max =         4
Random effects u_i ~ Gaussian                   Wald chi2(38)      =    416.06
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
------------------------------------------------------------------------------
         bss |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |    .027693   .0727187     0.38   0.703     -.114833    .1702189
     a_arisp |   .0689195    .170891     0.40   0.687    -.2660206    .4038597
    a_arisp2 |   .6713741   .1986653     3.38   0.001     .2819973    1.060751
   a_arcpadb |  -.1034974   .1608617    -0.64   0.520    -.4187806    .2117857
   a_arcdpwb |   .2181706   .1213905     1.80   0.072    -.0197504    .4560917
    a_arcdp2 |   .7738552   .4068455     1.90   0.057    -.0235472    1.571258
    a_arspeu |   .0105751   .1295032     0.08   0.935    -.2432465    .2643967
    a_biarsp |  -.0390233   .1346627    -0.29   0.772    -.3029572    .2249107
      a_cida |  -.9792799   .3849365    -2.54   0.011    -1.733742   -.2248183
     a_rascp |   .0418011   .1777239     0.24   0.814    -.3065314    .3901335
   a_undpsar |  -.4962116   .1500589    -3.31   0.001    -.7903218   -.2021015
     a_wmcip |  -1.213026   .7603685    -1.60   0.111    -2.703321     .277269
    a_starcm |  -1.281757   .4883284    -2.62   0.009    -2.238863   -.3246511
   a_minssad |  -.0035187   .0841915    -0.04   0.967    -.1685309    .1614935
      a_jica |   .4464301   .2792821     1.60   0.110    -.1009526    .9938129
     a_spots |  -1.157754   .4583798    -2.53   0.012    -2.056162   -.2593457
     areaact |  -.0007618   .0001657    -4.60   0.000    -.0010866    -.000437
     areaper |   .0578754   .0134544     4.30   0.000     .0315052    .0842455
      arbcul |  -.0001896   .0008921    -0.21   0.832     -.001938    .0015588
   arbculper |  -.0115347   .0079928    -1.44   0.149    -.0272004    .0041309
      arbact |   .0008903   .0004551     1.96   0.050    -1.69e-06    .0017823
      arbper |   .0203056   .0099478     2.04   0.041     .0008083    .0398029
      fmrcom |    -.00075   .0003904    -1.92   0.055    -.0015151    .0000151
      fmrper |   .0153305     .00522     2.94   0.003     .0050995    .0255615
       brcom |   .0004004   .0015686     0.26   0.798     -.002674    .0034749
       brper |   .0123665   .0043084     2.87   0.004     .0039223    .0208108
     nirrcom |   .0022594    .003065     0.74   0.461    -.0037478    .0082667
     nirrper |   .0050014   .0054302     0.92   0.357    -.0056416    .0156444
    iareacom |   .0013636   .0004963     2.75   0.006     .0003909    .0023364
    iareaper |   .0060433   .0066066     0.91   0.360    -.0069054     .018992
    arbfarai |  -.0000109   .0010352    -0.01   0.992    -.0020399     .002018
   arbfarper |   .0096208   .0063569     1.51   0.130    -.0028384    .0220801
     arbapph |   .0021755   .0008481     2.57   0.010     .0005133    .0038377
  arbapphper |   .0110852   .0075691     1.46   0.143      -.00375    .0259204
     acredit |   .0004713   .0005005     0.94   0.346    -.0005096    .0014522
   creditper |   .0105352   .0042544     2.48   0.013     .0021967    .0188737
    adoptech |  -.0003947   .0013658    -0.29   0.773    -.0030717    .0022822
    adoprate |   .0567915   .0085665     6.63   0.000     .0400015    .0735815
       _cons |   70.88487    1.59511    44.44   0.000     67.75851    74.01122
-------------+----------------------------------------------------------------
     sigma_u |  7.0351114
     sigma_e |  8.3035113
         rho |  .41786843   (fraction of variance due to u_i)
------------------------------------------------------------------------------


. sum mbss1

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
       mbss1 |      5779    11.23168    12.02953   .0013971   212.1883
```

For GAD

```
Random-effects GLS regression                   Number of obs      =      5780
Group variable (i): arcid                       Number of groups   =      1505

R-sq:  within  = 0.0157                         Obs per group: min =         1
       between = 0.0487                                        avg =       3.8
       overall = 0.0361                                        max =         4

Random effects u_i ~ Gaussian                   Wald chi2(38)      =    142.34
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
         gad |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |  -.2374262   .0983201    -2.41   0.016      -.43013   -.0447223
     a_arisp |  -.1730696    .219333    -0.79   0.430    -.6029544    .2568151
    a_arisp2 |   .1813757   .2605753     0.70   0.486    -.3293425     .692094
   a_arcpadb |   .1938705   .2118378     0.92   0.360     -.221324    .6090649
   a_arcdpwb |   .5520257   .1624786     3.40   0.001     .2335734     .870478
    a_arcdp2 |   1.262304   .5076744     2.49   0.013     .2672805    2.257328
    a_arspeu |  -.2830664   .1731398    -1.63   0.102    -.6224142    .0562814
    a_biarsp |  -.1258567   .1805418    -0.70   0.486    -.4797121    .2279986
      a_cida |  -.0601019    .500804    -0.12   0.904     -1.04166    .9214559
     a_rascp |   .4095346    .219889     1.86   0.063    -.0214399    .8405091
   a_undpsar |  -.0657413   .1978747    -0.33   0.740    -.4535685    .3220859
     a_wmcip |  -.3344959   .9841444    -0.34   0.734    -2.263384    1.594392
    a_starcm |  -.0415922   .6464341    -0.06   0.949     -1.30858    1.225395
   a_minssad |   .0458306   .1041315     0.44   0.660    -.1582635    .2499247
      a_jica |   .0101701   .3597925     0.03   0.977    -.6950103    .7153504
     a_spots |   .2797387    .580286     0.48   0.630    -.8576009    1.417078
     areaact |  -.0003934   .0002139    -1.84   0.066    -.0008125    .0000258
     areaper |   .0407353   .0173831     2.34   0.019      .006665    .0748057
      arbcul |   .0002571   .0011352     0.23   0.821    -.0019677     .002482
   arbculper |  -.0134766   .0101209    -1.33   0.183    -.0333131      .00636
      arbact |   .0003636   .0005659     0.64   0.521    -.0007456    .0014727
      arbper |   .0079262   .0124501     0.64   0.524    -.0164756    .0323281
      fmrcom |  -.0010577   .0004967    -2.13   0.033    -.0020312   -.0000842
      fmrper |   .0193384   .0066384     2.91   0.004     .0063273    .0323495
       brcom |   .0044793   .0020128     2.23   0.026     .0005342    .0084243
       brper |   -.014353    .005476    -2.62   0.009    -.0250857   -.0036203
     nirrcom |   .0011513   .0038788     0.30   0.767     -.006451    .0087537
     nirrper |   .0046813   .0068582     0.68   0.495    -.0087605    .0181231
    iareacom |   .0008161   .0006519     1.25   0.211    -.0004616    .0020938
    iareaper |  -.0168479   .0083498    -2.02   0.044    -.0332132   -.0004826
    arbfarai |  -.0016623   .0013404    -1.24   0.215    -.0042894    .0009648
   arbfarper |   .0183798   .0080099     2.29   0.022     .0026806     .034079
     arbapph |   .0004293    .001076     0.40   0.690    -.0016797    .0025382
  arbapphper |  -.0055065   .0094992    -0.58   0.562    -.0241246    .0131116
     acredit |   .0016534   .0006341     2.61   0.009     .0004106    .0028963
   creditper |   .0208604   .0053756     3.88   0.000     .0103245    .0313964
    adoptech |  -.0013699   .0017388    -0.79   0.431    -.0047779     .002038
    adoprate |   .0319447   .0108577     2.94   0.003      .010664    .0532254
       _cons |   44.78616   2.081695    21.51   0.000     40.70612    48.86621
-------------+----------------------------------------------------------------
     sigma_u |  9.9781563
     sigma_e |  10.209542
         rho |   .4885398   (fraction of variance due to u_i)
------------------------------------------------------------------------------


. sum mgad1

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
       mgad1 |      5780    28.26275    40.29182   .0024387    1003.84
```

For ECOPISS

```
Random-effects GLS regression                   Number of obs      =      5780
Group variable (i): arcid                       Number of groups   =      1505

R-sq:  within  = 0.5346                         Obs per group: min =         1
       between = 0.8316                                        avg =       3.8
       overall = 0.7394                                        max =         4

Random effects u_i ~ Gaussian                   Wald chi2(38)      =  12426.72
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
     ecopiss |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   .2193065   .0538914     4.07   0.000     .1136813    .3249317
     a_arisp |   .1814517   .1456916     1.25   0.213    -.1040985     .467002
    a_arisp2 |   .3401074   .1559962     2.18   0.029     .0343605    .6458543
   a_arcpadb |   .2564336   .1254257     2.04   0.041     .0106037    .5022634
   a_arcdpwb |   .0231783   .0914407     0.25   0.800    -.1560423    .2023988
    a_arcdp2 |   .7169447   .3659051     1.96   0.050    -.0002162    1.434106
    a_arspeu |   .0486533   .0976091     0.50   0.618     -.142657    .2399636
    a_biarsp |  -.0061122    .101038    -0.06   0.952     -.204143    .1919187
      a_cida |  -.4309688   .3081718    -1.40   0.162    -1.034974    .1730368
     a_rascp |   .1747161   .1645675     1.06   0.288    -.1478303    .4972626
   a_undpsar |  -.0602284   .1167467    -0.52   0.606    -.2890478    .1685909
     a_wmcip |   .8342952   .6202723     1.35   0.179    -.3814161    2.050007
    a_starcm |  -.5549167   .3767362    -1.47   0.141    -1.293306    .1834727
   a_minssad |  -.0475528   .0779742    -0.61   0.542    -.2003794    .1052739
      a_jica |   .0138078    .228793     0.06   0.952    -.4346181    .4622337
     a_spots |   .2187731   .3945104     0.55   0.579    -.5544531    .9919992
     areaact |  -.0004322    .000136    -3.18   0.001    -.0006988   -.0001656
     areaper |  -.0202718   .0110418    -1.84   0.066    -.0419133    .0013697
      arbcul |  -.0010237   .0007607    -1.35   0.178    -.0025147    .0004672
   arbculper |  -.0487286     .00688    -7.08   0.000    -.0622131   -.0352441
      arbact |   .0009396   .0004143     2.27   0.023     .0001276    .0017516
      arbper |    .056816   .0088697     6.41   0.000     .0394316    .0742003
      fmrcom |   .0003136    .000339     0.92   0.355    -.0003509    .0009781
      fmrper |   .1613759   .0044321    36.41   0.000     .1526891    .1700628
       brcom |   .0030936   .0012987     2.38   0.017     .0005482    .0056391
       brper |   .0940633   .0036637    25.67   0.000     .0868826     .101244
     nirrcom |     .00449   .0026374     1.70   0.089    -.0006792    .0096592
     nirrper |   .0088729   .0047041     1.89   0.059     -.000347    .0180929
    iareacom |   .0011484   .0003901     2.94   0.003     .0003837     .001913
    iareaper |    .116424   .0057151    20.37   0.000     .1052227    .1276253
    arbfarai |   .0047085    .000841     5.60   0.000     .0030601    .0063569
   arbfarper |   .1344731   .0055472    24.24   0.000     .1236009    .1453454
     arbapph |   .0014163   .0007269     1.95   0.051    -8.40e-06    .0028409
  arbapphper |   .1048599   .0066941    15.66   0.000     .0917397    .1179801
     acredit |   .0004742   .0004296     1.10   0.270    -.0003678    .0013162
   creditper |   .0960762    .003681    26.10   0.000     .0888615     .103291
    adoptech |  -.0007144   .0011582    -0.62   0.537    -.0029844    .0015555
    adoprate |   .0244615   .0073481     3.33   0.001     .0100595    .0388635
       _cons |   14.56172   1.278388    11.39   0.000     12.05612    17.06731
-------------+----------------------------------------------------------------
     sigma_u |   4.315816
     sigma_e |  7.7918708
         rho |  .23476658   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. sum mecopiss1

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
   mecopiss1 |      5780    12.02694    42.17304   .0052057   1995.615

.
```

APPENDIX 2: PANEL MODELS FOR ALDA INDICATORS WITH AR(1) ERROR RESULTS

The random effect model with autocorrelated error is given by $y_{it} = \mu + \beta x_{it} + u_i + \varepsilon_{it}$, where $\varepsilon_{it} = \rho\varepsilon_{it-1} + v_{it}$.

For INDEX

```
RE GLS regression with AR(1) disturbances       Number of obs      =      5780
Group variable (i): arcid                       Number of groups   =      1505

R-sq:  within  = 0.2556                         Obs per group: min =         1
       between = 0.6018                                        avg =       3.8
       overall = 0.4903                                        max =         4
                                                Wald chi2(39)      =   3770.15
corr(u_i, Xb)      = 0 (assumed)                Prob > chi2        =    0.0000
------------------- theta ---------------------
  min      5%       median        95%      max
0.0170   0.0776     0.1040     0.1040   0.1040
------------------------------------------------------------------------------
       index |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   .0368805   .0353209     1.04   0.296    -.0323472    .1061082
     a_arisp |   .2438178   .0933791     2.61   0.009     .0607982    .4268374
    a_arisp2 |   .4591688   .1025795     4.48   0.000     .2581166    .6602211
   a_arcpadb |   .2468468   .0812736     3.04   0.002     .0875534    .4061402
   a_arcdpwb |    .340627   .0587976     5.79   0.000     .2253859    .4558681
    a_arcdp2 |   .7363332   .2420782     3.04   0.002     .2618686    1.210798
    a_arspeu |   .0314504   .0634523     0.50   0.620    -.0929138    .1558146
    a_biarsp |   .1535312   .0658744     2.33   0.020     .0244197    .2826428
      a_cida |  -.3448741   .2038833    -1.69   0.091    -.7444781    .0547298
     a_rascp |   .0541502   .1100273     0.49   0.623    -.1614993    .2697997
   a_undpsar |  -.0712112   .0762342    -0.93   0.350    -.2206276    .0782051
     a_wmcip |  -.1367957   .4085042    -0.33   0.738    -.9374492    .6638578
    a_starcm |  -.4132553   .2475308    -1.67   0.095    -.8984069    .0718962
   a_minssad |   .0498515   .0454549     1.10   0.273    -.0392385    .1389415
      a_jica |   .2607634   .1505834     1.73   0.083    -.0343745    .5559013
     a_spots |  -.1967017   .2589692    -0.76   0.448    -.7042721    .3108686
     areaact |  -.0005841   .0000867    -6.73   0.000     -.000754   -.0004141
     areaper |   .0671711   .0070879     9.48   0.000     .0532791    .0810632
      arbcul |   .0003093   .0004735     0.65   0.514    -.0006187    .0012372
   arbculper |  -.0210273   .0042162    -4.99   0.000    -.0292908   -.0127638
      arbact |   .0007245   .0002413     3.00   0.003     .0002516    .0011975
      arbper |   .0529136   .0054097     9.78   0.000     .0423108    .0635165
      fmrcom |  -.0001177   .0002089    -0.56   0.573    -.0005271    .0002918
      fmrper |   .0426697   .0028519    14.96   0.000     .0370801    .0482593
       brcom |   .0013461   .0008375     1.61   0.108    -.0002953    .0029874
       brper |   .0245209   .0023342    10.50   0.000     .0199459    .0290959
     nirrcom |   .0021979   .0017033     1.29   0.197    -.0011405    .0055362
     nirrper |   .0046624   .0029891     1.56   0.119    -.0011961    .0105209
    iareacom |   .0008577   .0002544     3.37   0.001     .0003591    .0013562
    iareaper |   .0289205   .0036222     7.98   0.000      .021821    .0360199
    arbfarai |    .001675   .0005491     3.05   0.002     .0005987    .0027513
   arbfarper |   .0341234   .0034939     9.77   0.000     .0272754    .0409714
     arbapph |   .0004486   .0004626     0.97   0.332    -.0004582    .0013553
  arbapphper |    .029331    .004136     7.09   0.000     .0212246    .0374374
     acredit |   .0009953   .0002735     3.64   0.000     .0004592    .0015314
   creditper |   .0333578   .0023429    14.24   0.000     .0287657    .0379499
    adoptech |   -.000421   .0007535    -0.56   0.576    -.0018978    .0010557
    adoprate |   .0591386   .0045995    12.86   0.000     .0501238    .0681533
       _cons |   44.05495   .8110279    54.32   0.000     42.46536    45.64453
-------------+----------------------------------------------------------------
      rho_ar | -.33673395   (estimated autocorrelation coefficient)
     sigma_u |   1.028841
     sigma_e |  5.1894976
     rho_fov |  .03781838   (fraction of variance due to u_i)
```

```
-------------------------------------------------------------------------------

. predict index2
(17 missing values generated)

. gen mindex2=100*abs(index-index2)/index
(17 missing values generated)

. sum mindex2

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
     mindex2 |      5780    6.562739    6.247788   .0053934   94.77899
```

For FARM INCOME

```
RE GLS regression with AR(1) disturbances       Number of obs      =      5767
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.0187                         Obs per group: min =         1
       between = 0.1058                                        avg =       3.8
       overall = 0.0692                                        max =         4
                                                Wald chi2(39)      =    233.37
corr(u_i, Xb)      = 0 (assumed)                Prob > chi2        =    0.0000
------------------- theta --------------------
  min      5%       median        95%      max
0.0649   0.2363     0.2928     0.2928   0.2928
------------------------------------------------------------------------------
        finc |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   1065.517    207.482     5.14   0.000     658.8597    1472.174
     a_arisp |   2074.864   481.6206     4.31   0.000     1130.905    3018.823
    a_arisp2 |   916.0499    589.334     1.55   0.120    -239.0235    2071.123
   a_arcpadb |   1517.219   464.5207     3.27   0.001     606.7747    2427.662
   a_arcdpwb |   582.7315   340.5353     1.71   0.087    -84.70539    1250.168
    a_arcdp2 |  -456.1328   1282.957    -0.36   0.722    -2970.683    2058.417
    a_arspeu |  -241.1582   366.6858    -0.66   0.511    -959.8492    477.5328
    a_biarsp |  -343.9172   384.3808    -0.89   0.371     -1097.29    409.4554
      a_cida |   545.1855   1131.848     0.48   0.630    -1673.195    2763.566
     a_rascp |  -1567.472   556.6729    -2.82   0.005     -2658.53   -476.4128
   a_undpsar |  -213.7298   434.0112    -0.49   0.622    -1064.376    636.9166
     a_wmcip |   334.2682   2249.116     0.15   0.882    -4073.918    4742.454
    a_starcm |   1318.977   1422.632     0.93   0.354     -1469.33    4107.284
   a_minssad |  -.6618437   228.0846    -0.00   0.998    -447.6995    446.3758
      a_jica |  -1154.643   833.6555    -1.39   0.166    -2788.578    479.2914
     a_spots |   1408.517    1418.36     0.99   0.321    -1371.418    4188.453
     areaact |   -1.52872   .4744064    -3.22   0.001    -2.458539   -.5989003
     areaper |  -22.38752   38.61955    -0.58   0.562    -98.08044     53.3054
      arbcul |  -7.240417   2.515133    -2.88   0.004    -12.16999   -2.310846
   arbculper |   9.427647   22.23847     0.42   0.672    -34.15895    53.01425
      arbact |   4.363232   1.224679     3.56   0.000     1.962906    6.763559
      arbper |   8.379029   27.89808     0.30   0.764    -46.30021    63.05827
      fmrcom |  -.1437293   1.059263    -0.14   0.892    -2.219846    1.932387
      fmrper |   41.28531   15.24605     2.71   0.007      11.4036    71.16701
       brcom |  -4.452724   4.576522    -0.97   0.331    -13.42254    4.517095
       brper |   21.67702   12.45464     1.74   0.082    -2.733624    46.08767
     nirrcom |   12.77711   9.080826     1.41   0.159    -5.020984     30.5752
     nirrper |   -1.99373   15.74257    -0.13   0.899     -32.8486    28.86114
    iareacom |   .0649638   1.438875     0.05   0.964    -2.755179    2.885106
    iareaper |   17.21924   19.13555     0.90   0.368    -20.28575    54.72424
    arbfarai |   9.764045   3.043644     3.21   0.001     3.798612    15.72948
   arbfarper |  -20.24512   18.33329    -1.10   0.269    -56.17771    15.68746
     arbapph |    5.43347   2.457598     2.21   0.027     .6166669    10.25027
  arbapphper |  -20.21494   21.47327    -0.94   0.346    -62.30179     21.8719
     acredit |  -1.690397   1.454934    -1.16   0.245    -4.542015    1.161221
   creditper |   40.96586   12.35084     3.32   0.001     16.75867    65.17305
    adoptech |   8.549147   4.088627     2.09   0.037      .535585    16.56271
    adoprate |    51.4223   24.47802     2.10   0.036     3.446258    99.39835
       _cons |   31132.22   4475.644     6.96   0.000     22360.12    39904.32
-------------+----------------------------------------------------------------
      rho_ar |  -.3304132   (estimated autocorrelation coefficient)
     sigma_u |  10312.671
     sigma_e |  25683.588
     rho_fov |  .13884004   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. sum mfinc2

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
      mfinc2 |      5766    141.1515    5385.226   .0028112   396906.2
```

For OFF FARM INCOME

```
RE GLS regression with AR(1) disturbances       Number of obs      =      5763
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.0215                         Obs per group: min =         1
       between = 0.0313                                        avg =       3.8
       overall = 0.0252                                        max =         4
                                                Wald chi2(39)      =    113.74
corr(u_i, Xb)      = 0 (assumed)                Prob > chi2        =    0.0000
------------------- theta --------------------
  min      5%       median        95%      max
0.1230   0.3449     0.4071     0.4071   0.4071

------------------------------------------------------------------------------
       ofinc |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   301.0416   90.41287     3.33   0.001     123.8356    478.2476
     a_arisp |   122.0516   198.6173     0.61   0.539    -267.2311    511.3343
    a_arisp2 |   467.6983   252.4835     1.85   0.064    -27.16015    962.5568
   a_arcpadb |  -41.98131   199.0128    -0.21   0.833    -432.0393    348.0767
   a_arcdpwb |  -399.5462   147.6543    -2.71   0.007    -688.9433    -110.149
    a_arcdp2 |   10.10725   524.4305     0.02   0.985    -1017.758    1037.972
    a_arspeu |  -564.1707   158.0269    -3.57   0.000    -873.8979   -254.4436
    a_biarsp |  -567.2341   166.6265    -3.40   0.001    -893.8161   -240.6521
      a_cida |  -343.0517   475.7423    -0.72   0.471     -1275.49    589.3861
     a_rascp |  -162.2132   223.8476    -0.72   0.469    -600.9465      276.52
   a_undpsar |  -354.4885   185.1514    -1.91   0.056    -717.3785    8.401522
     a_wmcip |   1096.213   945.5571     1.16   0.246    -757.0453     2949.47
    a_starcm |  -173.2837   609.8268    -0.28   0.776    -1368.522    1021.955
   a_minssad |   38.22364   94.02538     0.41   0.684    -146.0627      222.51
      a_jica |   93.79468   349.7363     0.27   0.789    -591.6758    779.2652
     a_spots |  -354.0846   591.3671    -0.60   0.549    -1513.143    804.9736
     areaact |  -.2461704    .199893    -1.23   0.218    -.6379535    .1456127
     areaper |   -15.3331   16.22814    -0.94   0.345    -47.13968    16.47347
      arbcul |   .1010166   1.048106     0.10   0.923    -1.953233    2.155266
   arbculper |   11.19988   9.249716     1.21   0.226    -6.929227    29.32899
      arbact |   1.039556   .5070906     2.05   0.040     .0456762    2.033435
      arbper |   28.85975   11.48936     2.51   0.012     6.341018    51.37848
      fmrcom |   .2035602   .4336671     0.47   0.639    -.6464117    1.053532
      fmrper |   12.41956   6.324531     1.96   0.050     .0237054    24.81541
       brcom |  -.0126265   1.918412    -0.01   0.995    -3.772646    3.747393
       brper |    7.73265    5.17128     1.50   0.135    -2.402873    17.86817
     nirrcom |   9.693425   3.750551     2.58   0.010     2.342481    17.04437
     nirrper |   6.019817   6.504646     0.93   0.355    -6.729054    18.76869
    iareacom |   .7589541   .6133859     1.24   0.216    -.4432601    1.961168
    iareaper |   7.286512    7.93925     0.92   0.359    -8.274132    22.84715
    arbfarai |    1.84946   1.283563     1.44   0.150    -.6662767    4.365197
   arbfarper |  -13.86401   7.594002    -1.83   0.068    -28.74798    1.019963
     arbapph |   -.204434   1.018936    -0.20   0.841    -2.201511    1.792643
  arbapphper |   5.603605   8.836714     0.63   0.526    -11.71604    22.92325
     acredit |   .1722702   .6049869     0.28   0.776    -1.013482    1.358023
   creditper |      12.47   5.101439     2.44   0.015     2.471358    22.46863
    adoptech |   .0443361   1.705879     0.03   0.979    -3.299125    3.387797
    adoprate |   10.64932   10.20789     1.04   0.297     -9.35778    30.65642
       _cons |    6208.12    1894.93     3.28   0.001     2494.125    9922.115
-------------+----------------------------------------------------------------
      rho_ar | -.26323784   (estimated autocorrelation coefficient)
     sigma_u |  5809.3243
     sigma_e |  10227.795
     rho_fov |  .24392321   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. sum mofinc2

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
     mofinc2 |      5740    114.5494    300.4639   .0086627   14690.07
```

For NON FARM INCOME

```
RE GLS regression with AR(1) disturbances       Number of obs      =      5738
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.0173                         Obs per group: min =         1
       between = 0.0449                                        avg =       3.8
       overall = 0.0348                                        max =         4
                                                Wald chi2(39)      =    140.34
corr(u_i, Xb)      = 0 (assumed)                Prob > chi2        =    0.0000
------------------- theta --------------------
  min      5%       median        95%      max
0.1475   0.3874     0.4502     0.4502   0.4502

------------------------------------------------------------------------------
        ninc |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   211.5923   143.0869     1.48   0.139    -68.85291    492.0375
     a_arisp |   581.4555   303.0153     1.92   0.055    -12.44352    1175.355
    a_arisp2 |   382.0748   394.9743     0.97   0.333    -392.0606     1156.21
   a_arcpadb |   238.5115   310.6755     0.77   0.443    -370.4013    847.4244
   a_arcdpwb |  -558.4006   231.8379    -2.41   0.016    -1012.794   -104.0068
    a_arcdp2 |    445.248   797.6827     0.56   0.577    -1118.181    2008.677
    a_arspeu |  -1057.444   247.7532    -4.27   0.000    -1543.032    -571.857
    a_biarsp |  -417.8223    262.297    -1.59   0.111     -931.915    96.27041
      a_cida |  -1253.276   734.9666    -1.71   0.088    -2693.784    187.2321
     a_rascp |  -532.2834   337.8767    -1.58   0.115     -1194.51    129.9428
   a_undpsar |  -264.6663   290.0534    -0.91   0.362    -833.1606    303.8279
     a_wmcip |  -664.0043   1461.383    -0.45   0.650    -3528.261    2200.253
    a_starcm |  -588.2786   951.4116    -0.62   0.536    -2453.011    1276.454
   a_minssad |  -124.5956   141.2823    -0.88   0.378    -401.5038    152.3126
      a_jica |   80.16551   538.9882     0.15   0.882     -976.232    1136.563
     a_spots |  -315.3161   906.5565    -0.35   0.728    -2092.134    1461.502
     areaact |  -.5969988   .3075714    -1.94   0.052    -1.199828      .00583
     areaper |   50.45765   25.11496     2.01   0.045     1.233239    99.68206
      arbcul |  -2.791067   1.600023    -1.74   0.081    -5.927055    .3449209
   arbculper |   9.191399   14.09734     0.65   0.514    -18.43887    36.82167
      arbact |   1.881042   .7645734     2.46   0.014     .3825052    3.379578
      arbper |   27.27196   17.37302     1.57   0.116    -6.778539    61.32247
      fmrcom |  -.5856582   .6584416    -0.89   0.374     -1.87618    .7048636
      fmrper |   20.03966   9.677316     2.07   0.038     1.072473    39.00686
       brcom |   1.198838   2.949769     0.41   0.684    -4.582603    6.980279
       brper |   1.484614   7.895968     0.19   0.851     -13.9912    16.96043
     nirrcom |  -.3754902   5.716271    -0.07   0.948    -11.57918     10.8282
     nirrper |   7.364709   9.920965     0.74   0.458    -12.08003    26.80944
    iareacom |  -.4586477   .9548288    -0.48   0.631    -2.330078    1.412782
    iareaper |   6.445012   12.06922     0.53   0.593    -17.21022    30.10024
    arbfarai |   6.420911   1.980793     3.24   0.001     2.538627    10.30319
   arbfarper |   4.247182   11.54194     0.37   0.713     -18.3746    26.86896
     arbapph |   1.508556   1.555169     0.97   0.332     -1.53952    4.556632
  arbapphper |   2.977531   13.41471     0.22   0.824    -23.31481    29.26987
     acredit |  -.3900083   .9216648    -0.42   0.672    -2.196438    1.416422
   creditper |   20.36513   7.775116     2.62   0.009     5.126187    35.60408
    adoptech |   .8370395    2.61093     0.32   0.749     -4.28029    5.954369
    adoprate |   50.54981   15.57128     3.25   0.001     20.03067    81.06895
       _cons |   4376.021   2938.063     1.49   0.136    -1382.477    10134.52
-------------+----------------------------------------------------------------
      rho_ar | -.26269312   (estimated autocorrelation coefficient)
     sigma_u |  9751.7944
     sigma_e |   15342.22
     rho_fov |  .28775461   (fraction of variance due to u_i)
------------------------------------------------------------------------------
. sum mninc2

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
      mninc2 |      5647     170.944    1773.797   .0038894   130121.3
.
```

For TOTAL INCOME

```
RE GLS regression with AR(1) disturbances       Number of obs      =      5771
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.0235                         Obs per group: min =         1
       between = 0.0975                                        avg =       3.8
       overall = 0.0660                                        max =         4
                                                Wald chi2(39)      =    233.37
corr(u_i, Xb)      = 0 (assumed)                Prob > chi2        =    0.0000
------------------- theta --------------------
  min      5%       median        95%      max
0.0676   0.2428     0.3001     0.3001   0.3001
------------------------------------------------------------------------------
      totinc |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   1588.559   335.5369     4.73   0.000     930.9188    2246.199
     a_arisp |   2733.955   775.7924     3.52   0.000      1213.43     4254.48
    a_arisp2 |   1553.851   952.5867     1.63   0.103     -313.185    3420.886
   a_arcpadb |   1688.345   749.4384     2.25   0.024     219.4732    3157.218
   a_arcdpwb |  -407.1559   550.4927    -0.74   0.460    -1486.102    671.7901
    a_arcdp2 |   -230.869   2067.434    -0.11   0.911    -4282.965    3821.227
    a_arspeu |   -1623.02   592.2244    -2.74   0.006    -2783.759   -462.2814
    a_biarsp |  -1298.054   621.4591    -2.09   0.037    -2516.092   -80.01693
      a_cida |  -1121.965   1826.538    -0.61   0.539    -4701.915    2457.984
     a_rascp |  -2360.421   895.8426    -2.63   0.008     -4116.24   -604.6015
   a_undpsar |   -823.534   701.0305    -1.17   0.240    -2197.529    550.4606
     a_wmcip |   583.5103   3629.524     0.16   0.872    -6530.227    7697.247
    a_starcm |   377.1324   2298.707     0.16   0.870    -4128.251    4882.516
   a_minssad |  -61.13127   367.3147    -0.17   0.868    -781.0548    658.7923
      a_jica |  -898.0666   1345.282    -0.67   0.504    -3534.771    1738.638
     a_spots |   490.6873   2287.859     0.21   0.830    -3993.434    4974.809
     areaact |  -2.473778   .7654793    -3.23   0.001     -3.97409   -.9734665
     areaper |   18.19358   62.28162     0.29   0.770    -103.8761    140.2633
      arbcul |   -9.60184   4.053315    -2.37   0.018    -17.54619   -1.657489
   arbculper |   20.79486   35.80437     0.58   0.561    -49.38042    90.97014
      arbact |   7.257141   1.972661     3.68   0.000     3.390797    11.12349
      arbper |   71.03596   44.90383     1.58   0.114    -16.97393    159.0459
      fmrcom |  -.5727372   1.705365    -0.34   0.737    -3.915192    2.769717
      fmrper |   67.61354   24.57562     2.75   0.006      19.4462    115.7809
       brcom |  -3.554492   7.382741    -0.48   0.630     -18.0244    10.91541
       brper |   30.93679   20.07431     1.54   0.123    -8.408129    70.28171
     nirrcom |   22.58597   14.63734     1.54   0.123    -6.102676    51.27462
     nirrper |   12.71573   25.36943     0.50   0.616    -37.00744     62.4389
    iareacom |    .753647   2.323822     0.32   0.746    -3.800961    5.308255
    iareaper |   32.16346   30.84253     1.04   0.297    -28.28678     92.6137
    arbfarai |   17.62536   4.912036     3.59   0.000     7.997944    27.25277
   arbfarper |    -30.451   29.54332    -1.03   0.303    -88.35484    27.45284
     arbapph |    6.99107   3.958697     1.77   0.077    -.7678344    14.74997
  arbapphper |   -7.69079   34.49207    -0.22   0.824      -75.294    59.91242
     acredit |  -1.900993   2.345335    -0.81   0.418    -6.497765     2.69578
   creditper |   72.27091   19.88744     3.63   0.000     33.29224    111.2496
    adoptech |   8.829203   6.590985     1.34   0.180     -4.08889     21.7473
    adoprate |   122.3202   39.45092     3.10   0.002     44.99784    199.6426
       _cons |   41091.83   7221.706     5.69   0.000     26937.54    55246.11
-------------+----------------------------------------------------------------
      rho_ar | -.32781236   (estimated autocorrelation coefficient)
     sigma_u |  16954.566
     sigma_e |  41310.821
     rho_fov |  .14415816   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. sum mtotinc2

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
    mtotinc2 |      5770    38.96083    43.62637    .006882   882.4811
```

For OM

```
RE GLS regression with AR(1) disturbances       Number of obs      =      5776
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.0319                         Obs per group: min =         1
       between = 0.2021                                        avg =       3.8
       overall = 0.1488                                        max =         4
                                                Wald chi2(39)      =    574.60
corr(u_i, Xb)      = 0 (assumed)                Prob > chi2        =    0.0000
------------------- theta --------------------
  min      5%       median        95%      max
0.1623   0.4021     0.4642     0.4642   0.4642

------------------------------------------------------------------------------
          om |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   .3417079   .0866965     3.94   0.000     .1717859    .5116299
     a_arisp |   .6212805   .1836851     3.38   0.001     .2612644    .9812967
    a_arisp2 |   1.092775   .2381593     4.59   0.000      .625991    1.559558
   a_arcpadb |    .537655    .188299     2.86   0.004     .1685957    .9067144
   a_arcdpwb |   .7358796   .1407369     5.23   0.000     .4600404    1.011719
    a_arcdp2 |   1.093269   .4785882     2.28   0.022     .1552531    2.031284
    a_arspeu |   .3399037    .150215     2.26   0.024     .0454876    .6343198
    a_biarsp |   .5009885   .1589633     3.15   0.002     .1894263    .8125507
      a_cida |   .7465224   .4442673     1.68   0.093    -.1242255     1.61727
     a_rascp |    -.01562   .2036071    -0.08   0.939    -.4146825    .3834426
   a_undpsar |   .1604036   .1746359     0.92   0.358    -.1818765    .5026837
     a_wmcip |  -1.925834    .882724    -2.18   0.029    -3.655941   -.1957265
    a_starcm |  -.1504732   .5770188    -0.26   0.794    -1.281409    .9804629
   a_minssad |   .0538804   .0860255     0.63   0.531    -.1147265    .2224874
      a_jica |   .1423695   .3254191     0.44   0.662    -.4954402    .7801791
     a_spots |  -.9008607   .5446834    -1.65   0.098    -1.968421    .1666992
     areaact |   -.000538   .0001864    -2.89   0.004    -.0009033   -.0001726
     areaper |   .0340122   .0151037     2.25   0.024     .0044095     .063615
      arbcul |   .0019626    .000969     2.03   0.043     .0000634    .0038617
   arbculper |   -.038834   .0085056    -4.57   0.000    -.0555048   -.0221633
      arbact |   .0002372   .0004654     0.51   0.610     -.000675    .0011494
      arbper |    .058452   .0104715     5.58   0.000     .0379282    .0789757
      fmrcom |  -.0001985   .0003997    -0.50   0.619    -.0009819    .0005849
      fmrper |   .0144179   .0058352     2.47   0.013     .0029812    .0258546
       brcom |   .0005347   .0017819     0.30   0.764    -.0029577     .004027
       brper |   .0026554   .0047687     0.56   0.578     -.006691    .0120018
     nirrcom |   .0016524   .0034519     0.48   0.632    -.0051131    .0084179
     nirrper |   .0036982   .0059866     0.62   0.537    -.0080352    .0154317
    iareacom |  -.0001558   .0005779    -0.27   0.787    -.0012884    .0009768
    iareaper |   .0093278   .0073026     1.28   0.201     -.004985    .0236407
    arbfarai |   .0029818   .0011971     2.49   0.013     .0006356     .005328
   arbfarper |   .0041475   .0069639     0.60   0.551    -.0095014    .0177965
     arbapph |  -.0013525   .0009387    -1.44   0.150    -.0031924    .0004873
  arbapphper |   .0076353   .0080617     0.95   0.344    -.0081652    .0234359
     acredit |   .0018029   .0005573     3.24   0.001     .0007106    .0028951
   creditper |   .0263003   .0046853     5.61   0.000     .0171171    .0354834
    adoptech |   .0019677   .0015703     1.25   0.210    -.0011101    .0050455
    adoprate |   .0789928   .0093213     8.47   0.000     .0607233    .0972623
       _cons |   48.12254   1.775966    27.10   0.000     44.64171    51.60337
-------------+----------------------------------------------------------------
      rho_ar |  -.2348909   (estimated autocorrelation coefficient)
     sigma_u |  6.1499951
     sigma_e |  9.1693534
     rho_fov |  .31027564   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. sum mom2

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
        mom2 |      5734    16.75344    29.17103   .0031102   1120.854
```

For LTI

```
RE GLS regression with AR(1) disturbances       Number of obs      =      5780
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.3093                         Obs per group: min =         1
       between = 0.8182                                        avg =       3.8
       overall = 0.6969                                        max =         4
                                                Wald chi2(39)      =   9064.47
corr(u_i, Xb)      = 0 (assumed)                Prob > chi2        =    0.0000
------------------- theta --------------------
  min      5%       median        95%      max
0.0000   0.0000     0.0000     0.0000   0.0000

------------------------------------------------------------------------------
         lti |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |  -.1530019   .0361318    -4.23   0.000     -.223819   -.0821849
     a_arisp |  -.0377658   .1034006    -0.37   0.715    -.2404272    .1648957
    a_arisp2 |   .2291162     .10605     2.16   0.031      .021262    .4369703
   a_arcpadb |  -.0048155   .0843508    -0.06   0.954      -.17014     .160509
   a_arcdpwb |   .0768893   .0605325     1.27   0.204    -.0417522    .1955309
    a_arcdp2 |   .0742407   .2628622     0.28   0.778    -.4409596    .5894411
    a_arspeu |   .1431285   .0652807     2.19   0.028     .0151807    .2710764
    a_biarsp |   .1294084    .067519     1.92   0.055    -.0029265    .2617432
      a_cida |   .0391438   .2139301     0.18   0.855    -.3801516    .4584391
     a_rascp |   .0405477   .1232257     0.33   0.742    -.2009703    .2820656
   a_undpsar |  -.0342412   .0790745    -0.43   0.665    -.1892245     .120742
     a_wmcip |   .0760336    .434059     0.18   0.861    -.7747063    .9267735
    a_starcm |   -1.14419   .2555796    -4.48   0.000    -1.645117   -.6432627
   a_minssad |    .052933   .0515026     1.03   0.304    -.0480102    .1538761
      a_jica |  -.0921285   .1585364    -0.58   0.561    -.4028541    .2185971
     a_spots |  -.1160838    .276097    -0.42   0.674    -.6572241    .4250565
     areaact |  -.0003771   .0000923    -4.09   0.000     -.000558   -.0001963
     areaper |   .4665215    .007561    61.70   0.000     .4517022    .4813407
      arbcul |   .0018776   .0005139     3.65   0.000     .0008704    .0028847
   arbculper |    .026857   .0046001     5.84   0.000      .017841    .0358731
      arbact |  -.0001957   .0002712    -0.72   0.470    -.0007272    .0003357
      arbper |   .1789581   .0060064    29.79   0.000     .1671858    .1907304
      fmrcom |     .00008   .0002338     0.34   0.732    -.0003783    .0005382
      fmrper |  -.0000932   .0030705    -0.03   0.976    -.0061113    .0059248
       brcom |   .0012114   .0008897     1.36   0.173    -.0005324    .0029552
       brper |   .0047834   .0025185     1.90   0.058    -.0001528    .0097196
     nirrcom |   .0041891   .0018359     2.28   0.022     .0005909    .0077873
     nirrper |  -.0038771   .0032517    -1.19   0.233    -.0102502     .002496
    iareacom |  -.0000434   .0002652    -0.16   0.870    -.0005632    .0004764
    iareaper |    .003938   .0039353     1.00   0.317    -.0037751     .011651
    arbfarai |   .0000339    .000579     0.06   0.953    -.0011008    .0011687
   arbfarper |   .0045061   .0038148     1.18   0.238    -.0029707    .0119829
     arbapph |   .0004815   .0005016     0.96   0.337    -.0005015    .0014646
  arbapphper |   .0085675   .0045673     1.88   0.061    -.0003844    .0175193
     acredit |  -.0009601   .0002958    -3.25   0.001    -.0015399   -.0003803
   creditper |    .007536    .002549     2.96   0.003     .0025401     .012532
    adoptech |  -.0018068   .0008061    -2.24   0.025    -.0033867   -.0002269
    adoprate |   .0357862   .0049908     7.17   0.000     .0260045    .0455679
       _cons |   28.66016   .8589669    33.37   0.000     26.97661     30.3437
-------------+----------------------------------------------------------------
      rho_ar | -.31774396   (estimated autocorrelation coefficient)
     sigma_u |          0
     sigma_e |  5.9560443
     rho_fov |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. sum mlti2

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
       mlti2 |      5778    6.454067    108.3132   .0000156   8207.637
```

For FPI

```
RE GLS regression with AR(1) disturbances       Number of obs      =      5780
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.0113                         Obs per group: min =         1
       between = 0.1337                                        avg =       3.8
       overall = 0.0656                                        max =         4
                                                Wald chi2(39)      =    267.08
corr(u_i, Xb)      = 0 (assumed)                Prob > chi2        =    0.0000
------------------- theta --------------------
  min      5%       median        95%      max
0.0000   0.0000     0.0000     0.0000   0.0000
------------------------------------------------------------------------------
         fpi |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |  -.1673676   .0919564    -1.82   0.069    -.3475988    .0128635
     a_arisp |   .2966674   .2610815     1.14   0.256    -.2150429    .8083778
    a_arisp2 |   .0451493   .2693467     0.17   0.867    -.4827605     .573059
   a_arcpadb |   .4747421   .2141689     2.22   0.027     .0549787    .8945055
   a_arcdpwb |    .382266   .1538585     2.48   0.013     .0807089    .6838231
    a_arcdp2 |   .6740224   .6632659     1.02   0.310    -.6259548       1.974
    a_arspeu |  -.2212188   .1660403    -1.33   0.183    -.5466518    .1042142
    a_biarsp |   .3876907   .1717514     2.26   0.024     .0510641    .7243172
      a_cida |  -.9619747   .5432757    -1.77   0.077    -2.026776    .1028262
     a_rascp |  -.2032452   .3105108    -0.65   0.513    -.8118352    .4053447
   a_undpsar |   .1349021   .2009255     0.67   0.502    -.2589047    .5287089
     a_wmcip |  -.1149735   1.100215    -0.10   0.917    -2.271355    2.041408
    a_starcm |   .6399442   .6496685     0.99   0.325    -.6333827    1.913271
   a_minssad |   .2138217   .1291245     1.66   0.098    -.0392576    .4669011
      a_jica |   .3712404   .4020332     0.92   0.356    -.4167303    1.159211
     a_spots |   .0473144   .6979356     0.07   0.946    -1.320614    1.415243
     areaact |  -.0004448   .0002336    -1.90   0.057    -.0009026     .000013
     areaper |   .0289447   .0191468     1.51   0.131    -.0085824    .0664718
      arbcul |  -.0014075   .0012976    -1.08   0.278    -.0039508    .0011358
   arbculper |  -.0061679   .0116072    -0.53   0.595    -.0289176    .0165818
      arbact |    .001485   .0006806     2.18   0.029      .000151     .002819
      arbper |   .0520401   .0151217     3.44   0.001     .0224021    .0816781
      fmrcom |   .0005013   .0005898     0.85   0.395    -.0006547    .0016572
      fmrper |  -.0161368   .0077665    -2.08   0.038    -.0313589   -.0009146
       brcom |   .0002023   .0022531     0.09   0.928    -.0042137    .0046183
       brper |   .0055548   .0063674     0.87   0.383    -.0069251    .0180346
     nirrcom |  -.0006052   .0046417    -0.13   0.896    -.0097027    .0084924
     nirrper |   .0052893   .0082117     0.64   0.519    -.0108054    .0213841
    iareacom |   .0012076   .0006733     1.79   0.073    -.0001121    .0025273
    iareaper |  -.0005104   .0099368    -0.05   0.959    -.0199862    .0189653
    arbfarai |   .0006841    .001468     0.47   0.641    -.0021932    .0035614
   arbfarper |    -.00973   .0096258    -1.01   0.312    -.0285962    .0091361
     arbapph |  -3.96e-06   .0012674    -0.00   0.998     -.002488      .00248
  arbapphper |   .0043884   .0115112     0.38   0.703    -.0181732      .02695
     acredit |   .0013092   .0007473     1.75   0.080    -.0001556    .0027739
   creditper |   .0083709   .0064383     1.30   0.194     -.004248    .0209898
    adoptech |   .0012048   .0020395     0.59   0.555    -.0027926    .0052022
    adoprate |   .1058915   .0126048     8.40   0.000     .0811865    .1305966
       _cons |   55.69121   2.177173    25.58   0.000     51.42403    59.95839
-------------+----------------------------------------------------------------
      rho_ar | -.32977454   (estimated autocorrelation coefficient)
     sigma_u |          0
     sigma_e |  15.001727
     rho_fov |          0   (fraction of variance due to u_i)

. sum mfpi2

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
       mfpi2 |      5780     21.9035    24.79388   .0028477   566.7706

.
```

For BSS

```
RE GLS regression with AR(1) disturbances       Number of obs      =      5780
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.0297                         Obs per group: min =         1
       between = 0.1636                                        avg =       3.8
       overall = 0.1075                                        max =         4
                                                Wald chi2(39)      =    436.49
corr(u_i, Xb)      = 0 (assumed)                Prob > chi2        =    0.0000

------------------- theta --------------------
  min      5%       median        95%      max
0.0753   0.2404     0.2956     0.2956   0.2956

------------------------------------------------------------------------------
         bss |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   .0481326   .0690629     0.70   0.486    -.0872281    .1834933
     a_arisp |   .1253203   .1674731     0.75   0.454     -.202921    .4535616
    a_arisp2 |   .6741706    .198172     3.40   0.001     .2857606    1.062581
   a_arcpadb |  -.1260847   .1568362    -0.80   0.421     -.433478    .1813085
   a_arcdpwb |   .2373318   .1146937     2.07   0.039     .0125363    .4621274
    a_arcdp2 |   .6553074   .4417959     1.48   0.138    -.2105967    1.521212
    a_arspeu |  -.0006633   .1230607    -0.01   0.996    -.2418577    .2405312
    a_biarsp |  -.0787483   .1285609    -0.61   0.540    -.3307231    .1732264
      a_cida |  -1.197278   .3833786    -3.12   0.002    -1.948686   -.4458695
     a_rascp |  -.0073269   .1932299    -0.04   0.970    -.3860505    .3713967
   a_undpsar |   -.505922   .1461264    -3.46   0.001    -.7923245   -.2195196
     a_wmcip |  -1.195366   .7641425    -1.56   0.118    -2.693057    .3023261
    a_starcm |  -1.195056   .4772057    -2.50   0.012    -2.130362   -.2597496
   a_minssad |   .0048122   .0823999     0.06   0.953    -.1566887    .1663131
      a_jica |   .6313126    .283495     2.23   0.026     .0756726    1.186953
     a_spots |   -1.27363   .4850342    -2.63   0.009    -2.224279   -.3229803
     areaact |  -.0006973   .0001632    -4.27   0.000    -.0010173   -.0003774
     areaper |   .0620848   .0132443     4.69   0.000     .0361265    .0880431
      arbcul |   -.000154   .0008761    -0.18   0.860     -.001871    .0015631
   arbculper |  -.0126896   .0077775    -1.63   0.103    -.0279332    .0025541
      arbact |   .0008554   .0004405     1.94   0.052    -8.08e-06    .0017188
      arbper |   .0167946   .0098245     1.71   0.087    -.0024611    .0360502
      fmrcom |  -.0009059   .0003707    -2.44   0.015    -.0016326   -.0001793
      fmrper |   .0144126   .0052646     2.74   0.006     .0040943     .024731
       brcom |   .0003656   .0015713     0.23   0.816    -.0027141    .0034453
       brper |   .0107001   .0043119     2.48   0.013     .0022489    .0191514
     nirrcom |   .0029561   .0031355     0.94   0.346    -.0031893    .0091015
     nirrper |   .0054442   .0054808     0.99   0.321     -.005298    .0161864
    iareacom |   .0013281   .0004863     2.73   0.006      .000375    .0022811
    iareaper |   .0034304   .0066652     0.51   0.607    -.0096332    .0164939
    arbfarai |   .0002399   .0010356     0.23   0.817    -.0017897    .0022696
   arbfarper |    .011315   .0064063     1.77   0.077    -.0012412    .0238712
     arbapph |   .0019007   .0008514     2.23   0.026     .0002321    .0035693
  arbapphper |   .0163987    .007514     2.18   0.029     .0016715     .031126
     acredit |   .0006328   .0005055     1.25   0.211     -.000358    .0016236
   creditper |   .0113225   .0042911     2.64   0.008     .0029122    .0197329
    adoptech |    -.00084   .0014006    -0.60   0.549    -.0035852    .0019052
    adoprate |   .0551328   .0084842     6.50   0.000     .0385042    .0717615
       _cons |   70.45556    1.52994    46.05   0.000     67.45694    73.45419
-------------+----------------------------------------------------------------
      rho_ar |   -.248996   (estimated autocorrelation coefficient)
     sigma_u |  3.8169915
     sigma_e |  8.9790069
     rho_fov |  .15305305   (fraction of variance due to u_i)
------------------------------------------------------------------------------
. sum mbss2

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
       mbss2 |      5779    11.24344     11.9354   .0032932   211.6363
```

For GAD

```
RE GLS regression with AR(1) disturbances       Number of obs      =      5780
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.0136                         Obs per group: min =         1
       between = 0.0524                                        avg =       3.8
       overall = 0.0376                                        max =         4
                                                Wald chi2(39)      =    146.66
corr(u_i, Xb)      = 0 (assumed)                Prob > chi2        =    0.0000
------------------- theta --------------------
  min      5%       median        95%      max
0.0867   0.2784     0.3379     0.3379   0.3379
------------------------------------------------------------------------------
         gad |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |  -.1861623   .0929505    -2.00   0.045     -.368342   -.0039827
     a_arisp |   -.086297    .213113    -0.40   0.686    -.5039909    .3313969
    a_arisp2 |   .1706958   .2632468     0.65   0.517    -.3452583      .68665
   a_arcpadb |   .2618626   .2076008     1.26   0.207    -.1450275    .6687527
   a_arcdpwb |   .5910515   .1527229     3.87   0.000     .2917201     .890383
    a_arcdp2 |   1.176167   .5664414     2.08   0.038     .0659622    2.286372
    a_arspeu |  -.2963092   .1639246    -1.81   0.071    -.6175955    .0249772
    a_biarsp |  -.0790887   .1721332    -0.46   0.646    -.4164635     .258286
      a_cida |   .0166058   .5026859     0.03   0.974    -.9686404    1.001852
     a_rascp |   .4235346   .2443662     1.73   0.083    -.0554144    .9024835
   a_undpsar |  -.0170904   .1935312    -0.09   0.930    -.3964047    .3622238
     a_wmcip |  -.7243105   .9993956    -0.72   0.469     -2.68309    1.234469
    a_starcm |  -.1748446   .6350041    -0.28   0.783     -1.41943    1.069741
   a_minssad |   .0568089   .1018364     0.56   0.577    -.1427867    .2564046
      a_jica |   .0393545   .3704647     0.11   0.915    -.6867429    .7654519
     a_spots |   .0157417   .6289466     0.03   0.980    -1.216971    1.248454
     areaact |  -.0003998   .0002115    -1.89   0.059    -.0008144    .0000148
     areaper |   .0416063   .0171664     2.42   0.015     .0079608    .0752519
      arbcul |   .0003599   .0011185     0.32   0.748    -.0018323    .0025522
   arbculper |  -.0103364   .0098706    -1.05   0.295    -.0296823    .0090096
      arbact |   .0003896   .0005471     0.71   0.476    -.0006828    .0014619
      arbper |    .002307    .012331     0.19   0.852    -.0218614    .0264754
      fmrcom |  -.0012913    .000468    -2.76   0.006    -.0022086   -.0003741
      fmrper |   .0187758   .0067628     2.78   0.005     .0055209    .0320306
       brcom |   .0046368   .0020364     2.28   0.023     .0006456     .008628
       brper |  -.0154199   .0055251    -2.79   0.005    -.0262488    -.004591
     nirrcom |   -.000034   .0040242    -0.01   0.993    -.0079212    .0078532
     nirrper |   .0043207   .0069851     0.62   0.536    -.0093699    .0180114
    iareacom |    .001027   .0006419     1.60   0.110    -.0002311    .0022852
    iareaper |  -.0191578   .0085002    -2.25   0.024    -.0358179   -.0024976
    arbfarai |  -.0018305   .0013541    -1.35   0.176    -.0044846    .0008235
   arbfarper |   .0175155   .0081397     2.15   0.031     .0015621    .0334689
     arbapph |    .000222   .0010892     0.20   0.839    -.0019129    .0023569
  arbapphper |    -.00899   .0094774    -0.95   0.343    -.0275654    .0095855
     acredit |   .0018833   .0006467     2.91   0.004     .0006159    .0031508
   creditper |   .0175684   .0054703     3.21   0.001     .0068469      .02829
    adoptech |  -.0016333   .0018109    -0.90   0.367    -.0051827     .001916
    adoprate |   .0417788   .0108218     3.86   0.000     .0205685    .0629892
       _cons |   44.57935   1.993592    22.36   0.000     40.67198    48.48672
-------------+----------------------------------------------------------------
      rho_ar | -.28942121   (estimated autocorrelation coefficient)
     sigma_u |  5.2329867
     sigma_e |   11.23397
     rho_fov |  .17829821   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. sum mgad2

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
       mgad2 |      5780    27.97925    39.63384   .0014573     996.96
```

For ECOPISS

```
RE GLS regression with AR(1) disturbances       Number of obs      =      5780
Group variable (i): arcid                       Number of groups   =      1505
R-sq:  within  = 0.5353                         Obs per group: min =         1
       between = 0.8298                                        avg =       3.8
       overall = 0.7385                                        max =         4
                                                Wald chi2(39)      =  10209.37
corr(u_i, Xb)      = 0 (assumed)                Prob > chi2        =    0.0000
------------------- theta --------------------
  min      5%       median        95%      max
0.0000   0.0000     0.0000     0.0000   0.0000
------------------------------------------------------------------------------
     ecopiss |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         age |   .2480861   .0596631     4.16   0.000     .1311485    .3650237
     a_arisp |   .2035101   .1597368     1.27   0.203    -.1095682    .5165885
    a_arisp2 |    .263708   .1717823     1.54   0.125    -.0729792    .6003951
   a_arcpadb |   .2487002   .1363022     1.82   0.068    -.0184473    .5158476
   a_arcdpwb |   .0270371   .0987546     0.27   0.784    -.1665183    .2205926
    a_arcdp2 |   .5092871   .4033779     1.26   0.207    -.2813191    1.299893
    a_arspeu |   .0493311   .1071336     0.46   0.645    -.1606469    .2593092
    a_biarsp |  -.0040153   .1109388    -0.04   0.971    -.2214514    .2134208
      a_cida |  -.4154588   .3460644    -1.20   0.230    -1.093733    .2628149
     a_rascp |    .212978   .1869525     1.14   0.255    -.1534422    .5793981
   a_undpsar |  -.0230424   .1287178    -0.18   0.858    -.2753246    .2292397
     a_wmcip |   .7763206   .6915243     1.12   0.262    -.5790422    2.131683
    a_starcm |  -.5284482   .4172907    -1.27   0.205    -1.346323    .2894266
   a_minssad |  -.0277385   .0750645    -0.37   0.712    -.1748623    .1193853
      a_jica |   .1210393   .2533471     0.48   0.633    -.3755118    .6175905
     a_spots |  -.0021624   .4296564    -0.01   0.996    -.8442734    .8399486
     areaact |  -.0004187   .0001455    -2.88   0.004    -.0007038   -.0001336
     areaper |  -.0159862   .0119578    -1.34   0.181     -.039423    .0074505
      arbcul |  -.0012367   .0007938    -1.56   0.119    -.0027925     .000319
   arbculper |  -.0496209   .0070578    -7.03   0.000     -.063454   -.0357878
      arbact |   .0008785   .0003989     2.20   0.028     .0000967    .0016602
      arbper |   .0480762   .0090469     5.31   0.000     .0303446    .0658077
      fmrcom |   .0005201    .000359     1.45   0.147    -.0001836    .0012237
      fmrper |   .1582629   .0048023    32.96   0.000     .1488506    .1676752
       brcom |   .0034323   .0014051     2.44   0.015     .0006785    .0061862
       brper |   .0929158   .0039237    23.68   0.000     .0852255     .100606
     nirrcom |    .004702   .0028627     1.64   0.100    -.0009088    .0103128
     nirrper |   .0098779   .0050199     1.97   0.049     .0000391    .0197166
    iareacom |   .0012169   .0004286     2.84   0.005     .0003769     .002057
    iareaper |   .1172321   .0060679    19.32   0.000     .1053392    .1291249
    arbfarai |   .0044906   .0009247     4.86   0.000     .0026782    .0063029
   arbfarper |   .1325919   .0058492    22.67   0.000     .1211277    .1440561
     arbapph |   .0018437    .000778     2.37   0.018     .0003188    .0033687
  arbapphper |   .0983769   .0069423    14.17   0.000     .0847702    .1119836
     acredit |   .0004977    .000458     1.09   0.277       -.0004    .0013954
   creditper |   .0906334   .0039405    23.00   0.000     .0829101    .0983567
    adoptech |  -.0008634   .0012642    -0.68   0.495    -.0033413    .0016144
    adoprate |   .0249042   .0077143     3.23   0.001     .0097845     .040024
       _cons |   15.62706    1.36983    11.41   0.000     12.94224    18.31188
-------------+----------------------------------------------------------------
      rho_ar | -.41299048   (estimated autocorrelation coefficient)
     sigma_u |          0
     sigma_e |    9.33901
     rho_fov |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. sum mecopiss2

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
   mecopiss2 |      5780    12.10421    42.24861   .0023524   1997.948
```

APPENDIX 3: DATA USED IN SIMULATION

Accomplishment and Density of Rural and National Roads (2005)

Region	Land Area (In Square Kilometer)	Required Rural Roads (In Kilometer)	Completed Rural Roads (In Kilometer)	Accomplish-ment Rural Roads (%)	Density of Rural Roads (Km/Sq.Km)	National Roads (In Kilometer)	Density of Nat'l Roads (Km/Sq.Km)
Ilocos	12,845	3,201	2,716	84.85	0.2114	1,609	0.1253
Cagayan Valley	26,792	6,707	4,017	59.89	0.1499	1,751	0.0654
Central Luzon	18,211	3,249	2,103	64.71	0.1155	1,981	0.1088
Bicol	17,641	2,188	1,435	65.57	0.0813	2,171	0.1231
Western Visayas	20,224	2,754	1,543	56.02	0.0763	2,875	0.1422
Central Visayas	14,963	1,839	1,211	65.89	0.0810	1,911	0.1277
Eastern Visayas	20,869	2,038	1,250	61.32	0.0599	2,245	0.1076
Zamboanga Peninsula	16,017	3,478	2,281	65.57	0.1424	1,068	0.0667
Northern Mindanao	14,018	3,051	1,770	58.00	0.1262	1,604	0.1144
Davao Region	19,731	3,519	2,376	67.53	0.1204	1,439	0.0729
SOCCSKSARGEN	14,515	2,711	1,262	46.56	0.0870	1,301	0.0896
CAR	14,371	2,923	1,546	52.89	0.1076	1,795	0.1249
CALABARZON	46,987	2,392	1,136	47.50	0.0642	2,394	0.0971
MIMAROPA		3,045	1,882	61.79		2,170	
CARAGA	18,877	2,988	1,488	49.82	0.0788	1,357	0.0719
ARMM	11,432						
NCR	636					992	1.5597
TOTAL	299,995	46,082	28,015	60.79	0.0934	28,664	0.0955

Source: Agrarian Reform Communities Level of Development Assessment (ALDA), Department of Public Works and Highways.

Accomplishment and Density of Irrigation System

Region	Land Area (Square Kilometers)	Estimated Irrigable Area (Has.)	Service Area (Hectares)	Accomplish ment (Percent)	Density of Area (Ha/Sq.Km)	Area of Farm (Hectare)	Irrigated Parcel (Hectare)	Irrigated Farm Area (Percent)
Reference Year		2,005	2,005	2005	2005	2002*	2002*	2002*
Ilocos	12,845	277,180	178,664	64.46	13.909	210,589	185,323	88.00
Cagayan Valley	26,792	472,640	202,386	42.82	7.554	361,374	281,691	77.95
Central Luzon	18,211	498,860	268,438	53.81	14.741	429,743	384,391	89.45
Bicol	17,641	239,660	118,781	49.56	6.733	304,988	217,052	71.17
Western Visayas	20,224	197,250	77,652	39.37	3.840	337,642	256,405	75.94
Central Visayas	14,963	50,740	29,348	57.84	1.961	185,699	142,710	76.85
Eastern Visayas	20,869	84,380	50,118	59.40	2.402	224,820	136,560	60.74
Zamboanga Peninsula	16,017	76,080	36,814	48.39	2.298	148,322	107,657	72.58
Northern Mindanao	14,018	120,700	52,413	43.42	3.739	169,322	99,354	58.68
Davao Region	19,731	149,610	54,327	36.31	2.753	211,614	157,563	74.46
SOCCSKSARGEN	14,515	293,610	83,140	28.32	5.728	271,663	203,917	75.06
CAR	14,371	99,650	75,258	75.52	5.237	142,161	97,270	68.42
CALABARZON	46,987	246,960	122,511	49.61	2.607	176,446	125,796	71.29
MIMAROPA						324,122	254,072	78.39
CARAGA	18,877	162,300	40,117	24.72	2.125	196,254	129,772	66.12
ARMM	11,432	156,720	23,269	14.85	2.035	134,928	111,124	82.36
TOTAL	299,995	3126,340	1,413,236	45.20	4.711	3,875,350	2,930,029	75.61

**From 2002 Census of Agriculture*

Source: Agrarian Reform Communities Level of Development Assessment (ALDA), National Irrigation Administration

Summary of Budgetary Allocation in 2005 (in '000 pesos)

Particulars	2003 (Actual)	2004 (Adjusted)	2005 (Proposed)
Total Obligations	825,113,313	861,628,593	907,589,726
New General Appropriations	609,432,059	573,312,289	446,040,346
Automatic Appropriations	269,861,682	312,926,412	496,403,900
Continuing Appropriations	41,213,150	38,070,860	
All Departments and Agencies	407,133,223	373,213,407	377,667,539
Special Purpose Funds	417,980,090	488,415,186	529,922,187
Capital Outlay: Public Infrastructure	54,189,418	41,405,436	46,807,230
Department of Agrarian Reform	7,863,585	14,763,579	14,748,549
Department of Agriculture	3,088,459	3,115,959	2,916,015
Department of Environment and Natural Resources	5,471,015	5,868,418	5,511,256
Projects	229,334,108	262,363,369	265,903,383
Locally-Funded	193,435,579	227,063,048	224,590,169
Foreign-Assisted	35,898,529	35,300,321	41,363,986
Agriculture and Fisheries Modernization Program	8,408,829	8,686,796	10,025,706
New Appropriation	9,796,627	7,711,869	9,032,531
Automatic Appropriation	653,901	974,927	993,175
Continuing Appropriation	2,372,455	2,797,275	

Source: 2005 Public Expenditure Program, Department of Budget and Management

Budgetary Allocation for 2005 for Agriculture and Fisheries Modernization Program

Particulars	Personal Services	Maintenance and Other Operating Expenses	Capital Outlays	Total
Programs	19,023,000	2,682,872,000	256,779,000	2,958,674,000
Development of the Crop Sector	15,644,000	2,264,158,000	222,346,000	2,502,148,000
GMA Rice and Corn Nationwide Operations		1,877,789,000	151,939,000	2,029,728,000
Technology Gen/./Diss. For Vegetable Industry	6,277,000	8,886,000		15,163,000
Agricultural Intensification and Diversification Program	5,991,000	10,224,000		16,215,000
Bohol Agricultural Promotion Center	3,376,000	6,376,000	168,000	9,920,000
Subsidy for Crop Insurance		113,771,000		113,771,000
GMA High Value Commercial Crop		247,112,000	70,239,000	317,351,000
Development of the Livestock Sector	3,379,000	226,810,000	29,433,000	259,622,000
Breeder Base Expansion-Genetically Superior Breed	3,379,000	5,565,000		8,944,000
GMA Livestock		221,245,000	29,433,000	250,678,000
GMA Fisheries		627,828,000	201,440,000	829,268,000
Various Agricultural Research Projects		155,000,000		155,000,000
VSAT Communication System (National Info. Network)		36,904,000	5,000,000	41,904,000
Locally-Funded Projects	8,661,000	128,062,000	1,712,307,000	1,849,030,000
Repair/Rehab./Const. of Rural Road in Production Areas			200,000,000	200,000,000
Basilan Integrated Peace and Development Strategy		11,766,000	12,302,000	24,068,000
ZAMBAS Integrated Agricultural Development Program		28,457,000	42,775,000	71,232,000
Davao Integrated Development Project		24,400,000	46,832,000	71,232,000
SOCSKSAREN Integrated Food Security Program	8,661,000	13,328,000	59,350,000	81,339,000
Metro Kutawato Development Alliance		9,784,000	11,550,000	21,334,000
CARAGA Integrated Development Project		26,345,000	44,887,000	71,232,000
HH Enhan. and Livelihood Prog. for Muslim Comm.		4,655,000	345,000	5,000,000
Pagkain Para sa Masa for Upland Mindanao		4,319,000	681,000	5,000,000
Iranum Sustainable Integrated Area Development		5,008,000	18,325,000	23,333,000
Casecnan Social Measures Project			30,000,000	30,000,000
Various Irrigation Projects			1,245,260,000	1,245,260,000
Foreign-Assisted Projects (Includes Loan Proceeds)	20,621,000	692,660,000	3,511,546,000	4,224,827,000
Infrastructure for Rural Productivity Enhancement		201,512,000	187,500,000	389,012,000
Expanded Human Resource Development		70,000,000		70,000,000
Phil. Agri. And Fish. Biotechnology Program		98,061,000	5,800,000	103,861,000
Scholarship Program for Agri and Fish. Modernization		109,800,000		109,800,000
Support to Emer. And Live. Assist. And Peace Program		166,359,000	1,640,000	167,999,000
Catubig Agricultural Advancement Project		2,698,000	3,225,000	5,923,000
Gen. Santos Fishport Complex Expansion/Improvement		8,328,000	391,672,000	400,000,000
Upland Development Project in Southern Mindanao	20,621,000	3,000,000		23,621,000
Water Buffaloes and Beef Cattle Improvement		4,802,000		4,802,000
Phil.-Sino Center for Agricultural Technology		28,100,000	1,400,000	29,500,000
Various Irrigation Projects			2,920,309,000	2,920,309,000
Total New Appropriations	48,305,000	3,503,594,000	5,480,632,000	9,032,531,000

Source: 2005 Public Expenditure Program, Department of Budget and Management

Budgetary Allocation for 2005 for Agrarian Reform Program

Particulars	Personal Services	Maintenance and Other Operating Expenses	Capital Outlays	Total
Total New Appropriations	1,505,578,000	659,898,000	2,715,779,000	4,881,255,000
General Administration and Support	138,425,000	23,262,000		161,687,000
Support to Operations	76,156,000	12,370,000		88,526,000
Planning, Monitoring, Policy Research and Proj. Mgt.	29,286,000	2,623,000		31,909,000
Agrarian Reform Information and Education	9,048,000	4,728,000		13,776,000
Agrarian Legal Assistance	4,935,000	637,000		5,572,000
Land Acquisition and Distribution	13,822,000	1,035,000		14,857,000
Land Use Management and Land Development	11,002,000	783,000		11,785,000
Agrarian Reform Beneficiaries Development	8,063,000	2,564,000		10,627,000
Operations	1,290,997,000	44,686,000		1,335,683,000
Agrarian Legal Assistance	13,415,000	891,000		14,306,000
Agrarian Reform Information and Education	16,661,000	2,256,000		18,917,000
Agrarian Legal Services	138,802,000	3,785,000		142,587,000
Land Acquisition and Distribution	1,063,252,000	34,356,000		1,097,608,000
Land Use Management and Land Development	49,002,000	1,856,000		50,858,000
Agrarian Reform Beneficiaries Development	9,865,000	1,542,000		11,407,000
Foreign-Assisted Projects (Includes Loan Proceeds)		579,580,000	2,715,779,000	3,295,359,000
Agrarian Reform Communities Development II		86,800,000	203,400,000	290,200,000
Agrarian Reform Communities Development (ADB)		13,669,000	856,136,000	869,805,000
Agrarian Reform Infrastructure Support II		198,393,000	701,607,000	900,000,000
Mindanao Sustainable Settlement ARC Dev. Project		115,000,000	445,000,000	560,000,000
N. Mindanao Comm. Init. and Res. Mgt. Project		53,328,000	62,026,000	115,354,000
Solar Power Technology Support Project to ARC		112,390,000	447,610,000	560,000,000

Source: 2005 Public Expenditure Program, Department of Budget and Management

Budgetary Allocation for 2005 for Environment and Natural Resources Program

Particulars	Personal Services	Maintenance and Other Operating Expenses	Capital Outlays	Total
Total New Appropriations	3,173,131,000	950,568,000	432,836,000	4,556,535,000
General Administration and Support	692,145,000	169,113,000	20,775,000	882,033,000
Support to Operations				
ENR Sector Plans and Policies	125,028,000	15,814,000	320,000	141,162,000
M&E of ENR Programs and Projects	25,615,000	17,685,000		43,300,000
Information System Development and Maintenance	12,045,000	6,570,000	990,000	19,605,000
Statistical Services	6,872,000	7,468,000		14,340,000
Materials on Conservation, Dev. of NR, Env. Educ.	30,755,000	26,342,000	82,000	57,179,000
Legal Services, Op. Against Unlawful Titling of Land	68,879,000	9,655,000		78,534,00
Specials Studies for Forestry, Mining and Env. Mgt.	7,438,000	23,475,000	1,250,000	32,163,000
Operations Against Illegal Forest Res. Extraction		5,000,000		5,000,000
Laboratory Services		894,000		894,000
Operations	2,190,655,000	385,405,000	112,620,000	2,688,680,000
Forest Management	1,280,471,000	183,880,000	99,731,000	1,564,082,000
Land Management	642,822,000	63,210,000	250,000	706,282,000
Protected Areas and Wildlife Management	124,769,000	67,970,000	11,907,000	204,646,000
Ecosytem Research and Development	142,593,000	70,345,000	732,000	213,670,000
Foreign-Assisted Projects (Includes Loan Proceeds)	13,699,000	283,147,000	296,799,000	593,645,000
Southern Mindanao Integrated Coastal Zone Mngt.	2,608,000	26,500,000	240,428,000	269,536,000
Land Administration Management Project	4,255,000	6,000,000		10,255,000
San Roque Muti-Purpose Irrigation Project		100,000,000		100,000,000
Metro Manila Air Quality Improvement	4,315,000	128,247,000	56,371,000	188,933,000
Water Resources Development Project	2,521,000	22,400,000		24,921,000

Source: 2005 Public Expenditure Program, Department of Budget and Management