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Philippine Institute for Development Studies

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Arsenio M. Balisacan

DISCUSSION PAPER SERIES NO. 94-12

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**Agricultural Growth and Rural Incomes:
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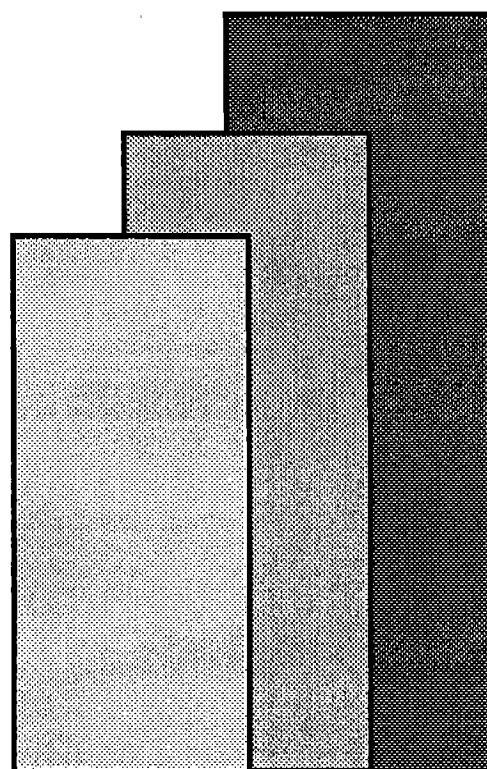
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Agricultural Growth and Rural Incomes: Rural Performance Indicators and Consumption Patterns

Arsenio M. Balisacan

SUMMARY

Usual indicators of rural performance tend to be systematically biased downward owing to the shifting of initially rural areas to urban areas as population increases and/or economic activity expands. While this was not a serious problem for intertemporal comparison of rural poverty in the 1960s and 1970s, this was not the case in the 1980s and 1990s. A large number of initially rural areas in 1980 became urban areas in 1990 when they were found to satisfy the criteria for "urban" areas. This reclassification, in addition to net migration from rural to urban areas, reduced the population share of rural areas from 62 percent in 1988 to 50 percent in 1991. In contrast, the estimated rural population share based on fixed rural areas was virtually the same -- 64 percent -- during the same period.

The implication of this adjustment on rural poverty estimates is remarkably important. Estimates based on fixed physical rural areas show a substantial reduction of rural poverty from 1985 to 1991. Head count poverty fell from 56 percent in 1985 to 48 percent in 1988 and 41 percent in 1991. The poverty gap and the distribution-sensitive indices reveal the same pattern. The usual procedure, on the other hand, of calculating rural poverty directly from rural population counts based on national surveys shows a much less significant reduction, with head count poverty falling only from 59 percent in 1985 to 50 percent in 1988 and then slightly rising to 52 percent in 1991.

The reclassification of physical areas over time has also an implication on rural-urban migration. Many studies have commonly attributed the high urban population growth in less developed countries to rapid migration of population from rural to urban areas. Data on rural-urban migration have been based mainly on published national population censuses. If reclassification of physical areas is the one largely driving the commonly observed high growth of the urban population, as in the case of the Philippines, then the rural-urban migration story in the development literature is somewhat exaggerated.

The little rural poverty reduction in the second half of the 1960s and in the 1970s is surprising considering that agricultural growth was fairly impressive by international standards. This may suggest that rapid agricultural growth is not enough to get rural development moving. Sustained reduction of rural poverty demands an institution of interrelated policy reforms and programs aimed at enhancing the intersectoral employment linkages of agricultural income growth, increasing labor and total factor productivity, and

building the human capital of the poor.

It appears that the *initial* distribution of assets and incomes considerably influences the response of rural (and urban) areas to stimulus provided by agricultural growth. There is little research to bank on for a deeper understanding of this issue. Counterfactual analysis using economywide models that realistically capture the economic structure of the Philippine economy, including size distribution of factor/asset endowments, are needed if further insights are to be gained. The analysis requires actually estimating the parameters of these models using Philippine data. The estimation of consumer demand system that distinguishes various consumer groups, pursued in this paper, is meant to bridge the information gap on the demand side of economic models designed for analyzing the efficiency and distributional effects of technological change as well as certain economic policy reforms.

Parameter estimates of the almost ideal demand system (AIDS) using Philippine data show substantial differences in the demand responses by various population groups to changes in household incomes. For both rural and urban areas, the expenditure elasticity of demand for cereals, housing, and services falls with household income, while that for meat and marine products, beverages, fuel, and clothing is almost invariant to the level of household income. In the case of cereals, the expenditure elasticity is considerably lower for urban areas than for rural areas, especially for high income quintiles. These results have an important implication for the analysis of technological change (or of economic pricing policies), nutrition, poverty and income distribution. For example, a technological change in agriculture that increases the income of the poor, the large majority of whom are located in rural areas, may improve their nutritional status as a result of the increase in their consumption of cereals.

The supply side, especially on agricultural supply response, also requires further work. The effort has to move beyond estimating static supply response functions and include as well a characterization of the dynamics of capital accumulation and technological change in agriculture. Only then can one have a better understanding of the dynamics of rural development.

**Agricultural Growth and Rural Incomes: Rural Performance
Indicators and Consumption Patterns**

Arsenio M. Balisacan

I. Introduction

The present paper is part of a larger study on agricultural growth and rural incomes in the Philippines. This study examines the farm-nonfarm linkages of agricultural growth and the mechanisms by which agricultural development changes the economic welfare of the various groups of population in rural areas. Part of this effort is the construction of consistently defined indicators of rural performance as well as the estimation of behavioral relationships of agricultural supply response and consumer demand systems for various groups of rural (and urban) population. Section two of this paper discusses the construction of rural performance indicators, while section three reports on the estimation of consumer demand systems. In future work, the demand parameter estimates will be incorporated into a simulation model designed for analyzing efficiency and distributional effects of agricultural growth.

**2. Agricultural Growth, Urbanization, and Rural
Performance Indicators**

The usual indicators of intertemporal rural performance, including rural poverty and income distribution, are technically

flawed. First, the definition of "urban areas" in the Family Income and Expenditures Survey (FIES), the main source of data for intertemporal rural household indicators, has changed substantially over the years. In the 1961 FIES, urban areas included all places within the boundaries of chartered cities and provincial capitals and Metropolitan Manila (Manila and adjacent cities and municipalities) as well as provincial capitals and town centers of municipalities. The 1965 FIES added population density as another criterion, qualifying all town centers of municipalities with a population density of at least 500 persons per square kilometer as well as villages contiguous to these centers and having at least 2,500 inhabitants, as urban areas. Since 1971, any district, regardless of population density, with at least six establishments (commercial, manufacturing, recreational and/or personal services), can also qualify as an urban area.

More importantly, the physical area of the "rural sector" is, almost by definition, shifting over time. As population grows and/or economic activity expands, an initially rural area will be classified as urban, sooner or later. While this may not be problematical for purposes of measuring, say, urbanization trends, it tends to create a systematic downward bias on rural performance indicators. Suppose, for example, that rapid, sustained agricultural growth in some regions leads to a similarly rapid expansion of nonfarm employment and incomes. This induces urbanization, thereby reducing the physical size of "rural areas."

To the extent that household incomes rise faster in urbanizing areas than in non-urbanizing areas, poverty incidence in geographically expanding urban areas tends to fall relative to that in contracting rural areas. This is particularly so if there are constraints to the movement of labor from the slow to the rapidly growing areas, or if there are considerable lags to such movement. Thus, while the growth stimulus is initially rural-based, the gains in poverty reduction are registered as urban-based. The data, as reported, say, in population censuses, would seem to suggest that rural development programs, even if they are successful in spurring rural income growth and reducing rural poverty, do not matter much!

The reclassification of physical areas over time has also an important implication on rural-urban migration stories. High urban population growth in less developed countries is, for example, commonly attributed to rapid rural-urban migration (Mills 1993, Nijkamp 1993). Data on rural-urban migration have been based mainly on published population censuses. If reclassification of physical areas is the one largely driving the commonly observed high-urban-population growth, then the rural-urban migration story in the development literature is vastly exaggerated.

2.1 Urbanization and Physical Rural Areas

Table 1 shows rural and urban population counts based on published population censuses (hereafter referred to as Census

Report). It also presents population estimates for fixed physical rural and urban areas. The estimation involves reclassifying geographical areas in the various population censuses according to the urban-rural definition used in the 1970 census of population. These estimates show that rural areas had a population share of 69 percent in 1960, 68 percent in 1970, 66 percent in 1980, and 64 percent in 1990. In contrast, the Census Report population share of rural areas was 70 percent in 1960, 68 percent in 1970, 63 percent in 1980, and 51 percent in 1990. Clearly, for the country as a whole, it is reclassification of physical areas, not physical movement of population from rural to urban areas, that mainly accounts for the growing share of urban areas in total population.

2.2 Rural Poverty Indicators: Data and Measurement Issues

One set of data for the analysis in this section is the various Family Income and Expenditures Surveys (FIES) undertaken in 1961, 1965, 1971, 1985, 1988, and 1991. Although similar surveys were also conducted in 1975 and 1979, the results were not published due to technical problems, one of which was the implausibility of the data generated owing to substantial underrepresentation of households in certain sectors of society.¹

The absence of reliable FIES data from 1972 to the early 1980s is a cause for concern. Significant changes in the economy took place during this period. As shown below, agricultural growth in

the Philippines during the 1965-80 period was impressive by international standards. It would be useful to have indicative figures on the responses of rural poverty and income distribution to this development.

The Labor Force Survey (LFS) provides quarterly income data for a number of years in the late 1970s and early 1980s.² These data are, however, limited only to workers' earnings from employment (wages, salaries, and entrepreneurial incomes from self-employment), thereby excluding other sources of family income, such as shares from crops, remittances, and gifts. Remittances and income transfers were not important sources of household incomes in the 1970s, but they were in the 1980s (Balísacan 1992). Thus, while poverty indices constructed from the LFS data are systematically biased upward and may not be comparable with those based on the FIES, the bias is not expected to be large.

A potential problem with the LFS tabulated data is that the income of a household in one quarter is not matched with the income of the same household in another quarter. There is no available distribution of annual income for each household. It may be inappropriate to simply sum up the quarterly array of household incomes for each bracket to arrive at an annual figure since some households do not stay in the same income brackets from one quarter to the next. In rural areas, especially for families dependent on farming for incomes, income seasonality is considerable, especially for low-income groups. For high-income groups, there may be less

"jumping around" from one income bracket to another because these households are typically in urban areas where seasonality of income is much less. Fortunately, the income range for each bracket is sufficiently wide and the number of brackets are few, thus minimizing the "jumping around" problem for possibly much of the low-income groups. Thus, in this paper, the average of the quarterly incomes for each bracket is deemed reasonable for poverty calculations.

The identification of the poor involves the use of a broad indicator of economic resources. Conceptually, consumption is preferable to current income as indicator of household welfare. However, the use of consumption assumes that capital markets are perfect; households are able to borrow from future earnings to finance current consumption. Current consumption then reflects permanent consumption better than current income. In reality, the access of the poor to credit is extremely limited. It is thus their "opportunity to consume" that matters much to their welfare (Atkinson 1991); that opportunity is given by their current income.

A related issue in poverty identification is the construction of a poverty line or threshold. For practical purposes, a poverty threshold is defined as the critical minimum amount of income below which a person cannot attain a predetermined consumption bundle of goods and services, judged necessary for the fulfillment of certain basic consumption needs, most importantly adequate nutrition. This paper has adopted the official poverty lines for 1988 estimated by

the government's inter-agency Technical Working Group on Poverty Determination (TWG).³ Real poverty lines are held fixed for the period covered by the study. It is, of course, possible that poverty lines are positively related with correlates of development. However, Ravallion et al. (1991) have demonstrated that, for a large number of low-income countries, real poverty lines tend to increase with economic growth, but they will do very slowly for poor countries.

There are also unsettled issues in the aggregation of the data on the poor. Most poverty studies in the Philippines, including virtually all government publications, have focused on the familiar head count (H) index as a measure of poverty. This is simply the proportionate number of the population deemed poor. This index has serious shortcomings. First, it is insensitive to the depth of poverty: a poor person may become poorer but measured poverty will remain the same. Second, it is also insensitive to transfers: for persons i and j whose incomes are below the poverty line, an income transfer from poor i to less poor j does not change measured poverty. Its advantage is that it is easily understood and communicated.

A class of poverty measures employed in this paper is that proposed by Foster, Greer, and Thorbecke (1984). This is given by:

$$P_{\alpha} = \frac{1}{n} \sum_{i \in q} n_i \left(\frac{z - y_i}{z} \right)^{\alpha} \quad (1)$$

where q is the number of persons whose incomes fall below the poverty line z , y_i is the per capita income of family i , n_i is family size, n is the total number of persons in the population, and $\alpha \geq 0$ is a measure of poverty aversion. The parameter α indicates the importance given to the poorest poor: the larger α is, the greater is the emphasis given to the poorest families. As the value of α becomes very large, P_{α} approaches a "Rawlsian" measure giving weight only to the poorest among the poor. H is a special case of this class of poverty measures (for $\alpha=0$).

Another familiar poverty measure, the poverty gap (PG) index, is a member of the P_{α} class of measures (for $\alpha=1$). This measure is sensitive to both the number of the poor and their degree of poverty. It is, however, insensitive to a redistribution of income within the poor group owing to the equal weights attached to the various income deficits.

Where the weights are the income gaps themselves, the resulting P_{α} measure is distributionally sensitive. For example, for $\alpha=2$, the resulting measure, P_2 , in (1) is then simply the mean of the squared income shortfalls. Unlike the head count and the poverty gap indices, measured poverty using this index decreases whenever a transfer of income takes place from a poor household to a poorer one.⁴ Its drawback is that it is not as easy to

interpret as H and PG . Nonetheless, the key point to bear is that a ranking of dates, socio-economic groups, or policies in terms of P_a should reflect well their ranking in terms of the severity of poverty. It is not the precise number *per se* that makes the measure useful, but its ability to order distributions in a better way than the alternative measures.

All members of the P_a are additively decomposable in the following sense: the aggregate (population) poverty level is simply a weighted average of the subgroup poverty levels, the weights being their population shares. This property proves to be extremely useful for our attempt to get an order of magnitude of the bias in usual rural poverty indicators owing to some shifting of physical areas over time.

The decomposition of P_a class of poverty measures into rural (r) and urban (u) sectors is

$$P_a = \omega P_{a,r} + (1-\omega) P_{a,u} \quad (2)$$

where ω is the population share of rural areas. Let $P'_{a,i}$ ($i=r,u$) be the poverty index for sector i with a population share of ω' after

a change. It can be easily checked that the change in observed aggregate poverty is:

$$P'_\alpha - P_\alpha = \sum_i (P'_{\alpha,i} - P_{\alpha,i}) \omega_i + \sum_i (\omega'_i - \omega_i) P_{\alpha,i} + \sum_i (P'_{\alpha,i} - P_{\alpha,i}) (\omega'_i - \omega_i) \quad i=r,u \quad (3)$$

The first term on the right-hand side is the contribution of the gains to the poor within each sector to the change in aggregate poverty, controlling for their base period population shares. The second term is the contribution of urban-rural changes in population distribution to the change in aggregate poverty. The third term is residuals, arising from the possible correlation between population shifts and intrasectoral changes in poverty.

Collecting all terms for r , the level of contribution of rural areas to the total change is

$$(P'_{\alpha,r} - P_{\alpha,r}) \omega + (\omega' - \omega) P_{\alpha,r} + (P'_{\alpha,r} - P_{\alpha,r}) (\omega' - \omega) = c(P'_{\alpha} - P_{\alpha}), \quad (4)$$

where c is the proportionate contribution of r to the total change in P_α .

By definition, $P'_\alpha - P_\alpha = 0$ at a given date t . If at this date fixed physical rural areas are different from reported rural areas owing to reclassification, $P'_{\alpha,r}$ would be different from $P_{\alpha,r}$, the measured poverty index based on shifting rural areas. In this context, ω' is interpreted as the population share based on rural population distributions for fixed physical rural areas. It can

then be shown that rural poverty at date t for fixed physical rural areas, $P'_{a,r}$, is simply

$$P'_{a,r} = (\omega / \omega') P_{a,r}. \quad (5)$$

Similarly, urban poverty for fixed physical urban areas is

$$P'_{a,u} = [(1-\omega) / (1-\omega')] P_{a,u} \quad (6)$$

The above procedure is only an approximation. It would be useful to estimate the $P'_{a,r}$ directly from distribution of household incomes (or expenditures) for the population of fixed physical rural areas.

2.3 Rural Poverty Indicators: Results

Table 2 summarizes rural-poverty estimates based on the FIES income data. The estimates referred to as FIES estimates are based on rural population distributions reported in the FIES. The other set of estimates, referred to as Fixed Physical Areas (FPA) estimates, is based on rural population distributions for fixed physical areas of villages as defined in the 1970 Population Census. Thus, while the FIES estimates do not control for the "shifting physical areas" problem noted above, the FPA estimates do, thereby providing a better indicator of intertemporal rural poverty.

In both FIES and FPA estimates, rural poverty fell from 1961 to 1965; the change was statistically significant for all poverty

indices. However, the change from 1965 to 1971 was insignificant, implying that the relatively rapid growth of agricultural incomes did not significantly benefit the rural poor. This is consistent with the finding on rising income inequality during this period (Balisacan 1993). As elaborated below, both pricing and infrastructure policies tended to be biased against the rural sector, particularly nonfarm small and medium-scale enterprises in rural areas, thereby weakening the response of the rural nonfarm economy to the stimulus provided by agricultural growth.

The FIES estimates show a relatively mild increase in rural poverty from 1988 to 1991, with head count poverty rising from 50 percent to 52 percent. In contrast, the FPA estimates indicate a considerable decrease in poverty, with the head count index falling from 48 percent in 1988 to 41 percent in 1991. The discrepancy comes mainly from the shifting of physical areas arising from reclassification of villages. The sampling frame for the 1985 and 1988 FIES was based on the 1980 population census, while that for the 1991 FIES was based on the 1990 census. Both censuses applied the same set of criteria in classifying villages into "urban" and "rural" areas. A large number of initially rural areas in 1980 became urban areas in 1990 when they were found to satisfy the criteria for urban areas. This reclassification, in addition to net migration from rural to urban areas, reduced the population share of FIES rural areas from 62 percent in 1988 to 50 percent in

1991. In contrast, the estimated rural population share based on FPA was virtually the same -- 64 percent -- during the same period.

Table 3 shows poverty estimates based on the LFS data.⁵ These estimates show rural poverty falling from 1977 to 1980. While the FIES and the LFS data are, as noted above, not strictly comparable, it is interesting to note that the LFS poverty estimates for 1977 and 1978 have almost the same magnitude as the FIES estimates for 1965 and 1971. In the 1970s, the upward bias of LFS estimates is not expected to be large, which suggests that rural poverty did not change significantly during the 1970s when agricultural growth was impressive by international standards. In East Asia and in many other developing countries where agricultural incomes rose over a sustained period, rural poverty fell considerably (Oshima 1990).

Interestingly, the change in rural poverty based on the head count and poverty gap indices from 1977 to 1978 was statistically insignificant, while that in the other index which is sensitive to the severity of poverty was highly significant. This illustrates the danger of using only the head count index in measuring poverty.

As might be expected, rural poverty increased significantly from 1981 to 1983. This period marked the beginning of economic difficulties precipitated by a combination of unfavorable domestic and global events. GDP contracted by about 10 percent in 1984 and 1985.

It is well known that conclusions concerning intertemporal changes in poverty may be influenced by the choice of poverty line

and poverty index. Differences in needs between households of similar income (consumption) levels, though not easily measurable, are real. There may be also errors in the available data on living standards. Thus, one can ask: how robust are the results of poverty comparisons? We have employed well-known theoretical results on stochastic dominance to obtain at least a partial ordering of poverty distributions in terms of any well-behaved measures of rural poverty.⁶ The results of the analysis suggest that the above-stated conclusion concerning the virtual absence of rural poverty reduction from 1965 to 1971, a period coinciding with the early stage of the Green Revolution, is robust with respect to assumed poverty lines and to poverty measures that are sensitive to the income shortfalls of the poor. The change in poverty is ambiguous from the late 1970s to the early 1980s. However, if poverty measures are restricted only to those which take into account the depth of poverty and the distribution of living standards among the poor (i.e., excluding the head count index), then poverty in 1980 and 1981 is lower than in 1977 and 1978 for all plausible poverty lines. Finally, poverty is unambiguously lower in 1988 than in previous years.

2.4 Weak Rural Response to Rapid Agricultural Growth

The agricultural sector (comprising crops, livestock and

poultry, fishery, and forestry) of the Philippine economy performed remarkably well during the 1965-80 period, the height of the Green Revolution. The sector's growth of 4.6 percent a year was substantially higher than the averages for the developing Monsoon Asian countries (2.3 percent) and the middle-income developing countries (3.6 percent), and compared favorably well with those for Thailand (4.6 percent) and Indonesia (4.3 percent).⁷ However, the growth, was way below the averages for these countries in the 1980s.

The rapid agricultural growth did not, as shown above, translate into substantial reduction of rural poverty. Unemployment and underemployment also continued to swell. Income distribution in rural areas became less egalitarian from 1965 to 1971 (Balisacan 1993). Real wages in rural areas (as well as in urban areas) fell in the 1970s and in the early 1980s (Lal 1986). The decline was also pronounced in the rice sector where relatively rapid yield growth was fuelled by the diffusion of high-yielding seed varieties (HYVs) and by irrigation investments. For the landless workers and for small farmers who also depend on off-farm work for supplementary incomes, the decline in real wages is indicative of deteriorating economic well-being (Papanek 1989, Oshima 1990).

Both demand and supply considerations constrained the linkages of agricultural growth. On the demand side, the stimulus provided by agricultural income growth on domestic nonfarm activities was

weak owing to the fact that the growth was not broadly based. This arose partly from the highly skewed distribution of landholding and the highly capital-intensive plantation farming and large-scale processing in the export crop sector (e.g., banana and plantation). Despite continuing legislation on land reform, there has been much less actual implementation.⁸ Thus, the landholding Gini ratio remained high--about 0.5--from 1960 to 1980 (Balisacan 1991). Accentuating the influence of this agrarian structure on the distribution of the income gains from productivity increases was the greater availability of subsidies on credit and fertilizer for the more affluent farmers (David 1986). Because the consumption pattern of large farmers is most likely geared to those goods and services with high import (or urban) content, the linkages of agricultural income growth were weak in setting in motion a sequence of employment and income multiplier effects on the rural (as well as urban) economy.

On the supply side, unfavorable fiscal and macroeconomic environment prevented the rural nonfarm sector from responding vigorously to the agricultural income growth. High effective protection in the import-substituting manufacturing sector induced a strong policy bias against agriculture and the rural sector. Trade restrictions and highly overvalued exchange rate unduly promoted capital-intensive activities and, in the process, severely penalized labor-intensive activities and backward integration.⁹

Generous fiscal incentives provided a window for the development of export-oriented manufacturing establishments through export-processing zones (EPZs). However, the development of these EPZs, which, with the exception of Cebu (exporting garments and electronics), were located at a distance from sources of labor, "required heavy infrastructural investments, and led to capital-intensive, uneconomic, MNC-dominated operations, which by and large had little impact on rural industry or agriculture" (Ranis and Stewart 1993: 98). Government interventions, especially in the 1970s and early 1980s, also tended to diminish the role of market mechanism in favor of regulations by parastatals as well as promoted a monopolistic structure in important sectors of the economy. The use of governmental functions to dispense economic privileges to some select group close to the ruling elite was rampant.

Investments in physical infrastructure were concentrated in highly urbanized centers and Central Luzon (Pampanga and Nueva Ecija). Metro Manila and Central Luzon had almost one half of the total infrastructural investments in the late 1960s and early 1970s (ILO 1974). While government expenditures in agriculture grew rapidly -- by an average of 13.2 percent a year -- from the late 1960s to the early 1980s, this occurred mainly in the favored rice sector. This pattern of government spending promoted regional inequality. More importantly, the neglect of most rural areas in

the Philippines considerably weakened the rural sector's supply response to the stimulus provided by agricultural growth.

Public investment in human capital--mainly health and education--was likewise biased against the rural areas. In the 1970s and early 1980s, high-quality primary education was limited to less than 10 percent of total elementary population, mostly in private schools in Metro Manila (World Bank 1976). Likewise, access to health services was a sore point for the rural population, as health facilities were concentrated in Metro Manila. Undoubtedly, these biases contributed to the weak rural entrepreneurial response.

3. Consumer Demand Patterns

Information about demand patterns and how they are likely to change as prices and incomes change is an extremely important input into the estimation of the welfare and distributional impact of technological change (or, alternatively, of economic policies). Such information is helpful in identifying the consumption linkages of agricultural growth in the Philippines which, as shown above, was relatively impressive by international standards. The present study employs Deaton and Muellbauer's (1980) almost ideal demand system (AIDS) to extract this information from Philippine data on household consumption. The estimation results include information

about various consumer groups' differential responses to price and income changes.

3.1 Model Structure

In theory, the following restrictions are expected to be satisfied by a system of demand equations: (a) homogeneity of degree zero in prices and income, (b) share-weighted sum of income elasticities equal to unity, and (c) symmetry and negative definiteness of compensated cross-price terms. Demand systems derived from constrained maximization of a specified utility function automatically satisfy these restrictions. Such systems are, however, restrictive; their estimation may be quite complicated and clumsy to handle without the imposition (often unrealistic) of separability conditions in the utility functions (see Deaton and Muellbauer 1980).

An alternative approach to deriving a demand system is the so-called "duality approach." This approach involves only the minimization of a cost problem and, therefore, allows moving relatively easily between demands and the cost function. Moreover, given a correctly specified cost function, the approach guarantees the existence of corresponding preferences, even though the utility function need never be explicitly evaluated (Christensen, Jorgenson, and Lau, 1975; Deaton, 1986). This "flexible" property turns out to be very useful in applied work.

The basic form of Deaton and Muellbauer's AIDS model is one class of flexible functional forms. The model preserves the generality of both Rotterdam and translog models, but has considerable advantages over both. The demand functions derived from it are first-order approximations to any demand system derived from utility-maximizing behavior. The model satisfies the axioms of choice exactly, aggregates perfectly over consumers, and has functional form which is consistent with available household consumption data. While the homogeneity and Slutsky symmetry restrictions of consumer demand theory can be easily imposed, the model allows the testing of these restrictions against the data through linear restrictions on fixed parameters.

Preferences in the AIDS model are represented by the following cost (expenditure) function:

$$\log c(u, p) = \alpha_0 + \sum_j \alpha_j \log p_j + \frac{1}{2} \sum_i \sum_j \gamma_{ij}^* \log p_i \log p_j + u \beta_0 \prod_j p_j^{\beta_j} \quad (7)$$

where p_i and p_j are commodity prices, u is utility, and α_i , β_i , and γ_{ij}^* are parameters. Applying Shephard's lemma to this function and substituting for u into the resulting system of equations (after inverting (7) to give u as a function of p and x), we find

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log (m/P), \quad (8)$$

where w_i is the budget share of commodity i , m is total nominal expenditures, and P is a price index defined by

$$\log P = \alpha_0 + \sum_j \alpha_j \log P_j + \frac{1}{2} \sum_i \sum_j \gamma_{ij} \log P_i \log P_j. \quad (9)$$

In many practical situations, where prices are highly collinear, Stone's (1953) price index given by

$$\log P^* = \sum_k w_k \log p_k \quad (10)$$

provides a reasonable approximation to (9).

The theoretical restrictions on (8) apply directly to the parameters:

$$\sum_i \alpha_i = 1, \quad \sum_i \beta_i = 0, \quad \sum_i \gamma_{ij} = 0 \quad (11)$$

$$\sum_j \gamma_{ij} = 0 \quad (12)$$

$$\gamma_{ij} = \gamma_{ji} \quad (13)$$

Equations (11) and (12) are the adding-up and homogeneity restrictions, respectively, which are implied by utility maximization. Equation (13) provides the symmetry condition. It bears noting that the unrestricted estimation of (8) only satisfies automatically the adding-up restriction. The model thus offers the opportunity of testing homogeneity and symmetry by imposing (12) and (13).

The γ_{ij} parameters measure the change in the i th budget share following a 1 proportional change in p_j with (m/P) constant. The β_i parameters, on the other hand, indicate whether the goods are

luxuries or necessities. With $\beta_i > 0$, w_i increases with m so that commodity i is a luxury; with $\beta_i < 0$, commodity i is a necessity.

Apart from economic prices and incomes, demand patterns are affected by demographic and social factors. In this study, the effect of urbanization on consumption pattern is recognized and modelled in the same manner as in the incorporation of demographic scaling in familiar demand models (see, e.g., Pollak and Wales 1981; Deaton 1986; Gould, Cox, and Perali 1991). In particular, we use a scaling function of the form:

$$\phi_i(R) = e^{\tau_i R} \quad (14)$$

where τ_i is estimated coefficient, and R is urbanization dummy variable. Viewed this way, the scaled prices become

$$p_j^* = p_j \phi_i = p_j e^{\tau_i R}. \quad \text{Incorporating this scaling function into the}$$

LA/AIDS model yields

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_j^* + \beta_i \log (m/P'), \quad (15)$$

where $P' = \sum_j w_j \ln p_j^*$. It is easy to check that (15) can be rewritten as

$$w_i = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log (m/P) + v_i R, \quad (15')$$

where $v = -\tau_i \beta_i$.

In the empirical literature, the homogeneity restriction is almost universally rejected (Thomas, Strauss, and Barboza, 1989). Symmetry (at least conditional on homogeneity), on the other hand, is seldom rejected by the data. It is, of course, well known that, in any test of demand theory, the researcher must maintain that the structure of the model he employs represents the correct underlying behavioral relationship of demand systems. Unfortunately, theory provides little guidance as to actual functional forms. Thus, it is not clear whether what is being rejected is the theory or whether the additional maintained assumption is causing the rejection. In our estimation of the AIDS model, we have chosen to impose homogeneity and symmetry restrictions.

The expression for expenditure elasticity in the AIDS model that uses the price index defined by (9) is

$$\eta_i = 1 + B_i / w_i \quad (16)$$

However, if the "linear approximate" AIDS (LA/AIDS) model that uses the Stone's price index defined by (10) is employed, the elasticity formula given by (16) is not appropriate. The correct formula has to take account for the role of expenditure shares as variables in the Stone's price index. We write the expenditure elasticity for the LA/AIDS model as

$$\eta_i = 1 + (\beta_i/w_i)[1 - \sum_j w_j \log P_j (\eta_j - 1)] \quad (17)$$

Notice that (17) expresses the expenditure elasticity of interest in terms of itself and all of the other elasticities. In matrix form, the solution to the system of simultaneous equations can be expressed as (see Green and Alston 1991)

$$N = M + \mathbf{1} = (I + BC)^{-1} B + \mathbf{1}, \quad (18)$$

where N is an n -vector of expenditure elasticities, M is an n -vector with elements $m_i = \eta_i - 1$, $\mathbf{1}$ is a unit vector of length n , I is an identity matrix, B is an n -vector with elements $b_i = \beta_i/w_i$, and C' is an n -vector with elements $c_j = w_j \log P_j$.

The uncompensated price elasticity of demand in the LA/AIDS model is also a function of all relevant price elasticities, i.e.,

$$e_{ij} = -\delta_{ij} + \frac{\gamma_{ij}}{w_i} - \frac{\beta_i}{w_i} \{w_j + \sum_k w_k \log P_k (e_{kj} + \delta_{kj})\}, \quad (19)$$

where δ_{ij} is the Kronecker delta ($\delta_{ij} = 1$ for $i=j$; $\delta = 0$ for $i \neq j$). Again, in matrix notation, the solution to this system of simultaneous equations is

$$E = [I + BC]^{-1} [A + I] - I, \quad (20)$$

where E is an $n \times n$ matrix with elements n_{ij} and A is an $n \times n$ matrix with typical elements $a_{ij} = \delta_{ij} + [\gamma_{ij} - \beta_i w_j]/w_i$.

3.2. Data and Estimation Procedure

Data on household expenditures have been derived mainly from the *Family Income and Expenditures Survey* (FIES) for 1985 and 1988. The FIES is a national household budget survey regularly carried out by the National Statistics Office. The sampling frame of the survey is deemed sufficient to provide reliable estimates of income and expenditure levels for each region of the country.

Expenditures are classified into 7 commodity groups (Table 4). The classification takes into account the parameter requirements of a computable general equilibrium model designed for the analysis of the efficiency and distributional effects of technological change as well as economic policy reforms.

With the 7-commodity classification, average expenditure shares were estimated for each region (including Metro Manila, but excluding the Cordillera Autonomous Region) and by area (whether rural or urban). For both 1985 and 1988 FIES, these make up 50 observations for each commodity group. Table 5 shows average expenditure shares for each quintile by area.

As expected, for both urban and rural areas, the share of cereals in total expenditures declines as per capita income rises. However, the share of cereals is higher for rural areas than for urban areas irrespective of income quintile. The bottom 20 percent of the population in rural areas spend about 40 percent of their incomes on cereals; the corresponding figure for urban areas is about 30 percent. In housing, the average share for urban areas (23 percent) is substantially greater than that for rural areas (13

percent). As also expected, the share of housing in total expenditures rises with per capita income. These differences in the consumption patterns of various groups of households have an important implication on the distributive impact of commodity price policies, especially on food.

The FIES does not contain information about prices. Consumer price indices for each region and for sufficiently disaggregated commodity groups are obtained from the NSO. The regional price indices, however, do not make a distinction between rural and urban areas. Consumer prices for some commodities (e.g., cereals) are expected to be higher in urban areas than in rural areas, and so the expenditure shares may be systematically related with the location of households. We have "augmented" the LA/AIDS model by including an URBAN dummy variable to capture the independent influence of location (see equation (15')). The inclusion of this variable does not affect the homogeneity and symmetry restrictions of the LA/AIDS model.

Because of the fact that the budget shares must add up to one, the error terms across equations of the demand system are correlated. Using ordinary least squares (OLS) would give consistent and unbiased, but inefficient, parameter estimates of the demand system. The iterative Zellner estimation procedure is appropriate in obtaining efficient parameter estimates of the LA/AIDS models. Since the budget shares add up to one, only $n-1$ equations are linearly independent and one equation must be dropped

for estimation purposes. (The Zellner estimation is invariant to which budget share is deleted.) The process thus automatically satisfies the adding-up restriction of consumer demand theory.

3.3 Results

Table 6 presents the parameter estimates of the LA/AIDS model. The coefficients of total expenditures are negative and significant for CEREALS and MEAT, indicating that these commodity groups are necessities. FUEL and HOUSE have positive coefficients, suggesting that they are luxuries, although only the latter is statistically significant. The URBAN dummy variable is significant only for the CEREAL equation.

The coefficients of the price terms are significant for one half of the price parameters of the demand system. Most of the own-price terms, however, are insignificant. This might be due to the limited price variation in the data set.

The expenditure and uncompensated (Marshallian) price elasticities are shown in Table 7. These elasticities are evaluated at the sample means, i.e., means of the expenditure shares and price levels. In general, these estimates suggest that the demand for CEREAL, MEAT, BEVE, CLOTH, and MISC are income inelastic, while FUEL and HOUSE are income elastic. Among the food groups, CEREAL has the lowest income elasticity.

The own-price elasticities have the negative signs, although most of the coefficients from which they are based on are

statistically not significant. The uncompensated cross-price elasticities, the signs of which indicate whether the paired goods are substitutes or complements, suggest that there is a significant substitutability between foodgroups and nonfood groups. The price of CEREAL, for example, has a significantly positive effect on the demand for FUEL and HOUSE and a negative effect on the demand for BEVE, CLOTH, and MISC. The price of BEVE, on the other hand, has a significantly negative impact on the demand for CEREAL, FUEL and HOUSE.

There are substantial differences in the demand response by various population groups to changes in household incomes (Table 8). For both rural and urban areas, the expenditure elasticity of demand for CEREAL, HOUSE, and MISC falls with household income, while that for MARINE, BEVE, FUEL, and CLOTH is almost invariant to the level of household income. In the case of CEREAL, the expenditure elasticity is considerably lower for urban areas than for rural areas, especially for high income quintiles. These results have an important implication for the analysis of technological change (or of economic pricing policies), nutrition, poverty and income distribution. For example, a technological change in agriculture that increases the income of the poor, the large majority of whom are located in rural areas, may improve their nutritional status as a result of the increase in their consumption of CEREAL.

There is little variation in price elasticities across population groups (not shown). This is not unexpected considering that the data set used in this study does not contain information on prices faced by households of different economic circumstances. The regression only captures differences in prices arising from locational differences [i.e., region and area (urban or rural)] of households, but not inter-household differences in relative prices within a region or area.

4. Concluding Remarks

Usual indicators of rural performance tend to be systematically biased downward owing to the shifting of initially rural areas to urban areas as population expands and/or economic activity increases. While this was not a serious problem for intertemporal comparison of rural poverty in the 1960s and 1970s, this was not the case in the 1980s and 1990s. A large number of initially rural areas in 1980 became urban areas in 1990 when they were found to satisfy the criteria for "urban" areas. This reclassification, in addition to net migration from rural to urban areas, reduced the population share of FIES rural areas from 62 percent in 1988 to 50 percent in 1991. In contrast, the estimated rural population share based on fixed rural areas was virtually the same -- 64 percent -- during the same period.

The implication of this adjustment on rural poverty estimates is remarkably important. Estimates based on fixed physical rural

areas show a substantial reduction of rural poverty from 1985 to 1991. Head count poverty fell from 56 percent in 1985 to 48 percent in 1988 and 41 percent in 1991. The poverty gap and the distribution-sensitive indices reveal the same pattern. The usual procedure, on the other hand, of calculating rural poverty directly from FIES rural population counts shows a much less significant reduction, with head count poverty falling only from 59 percent in 1985 to 50 percent in 1988 and then slightly rising to 52 percent in 1991.

The little rural poverty reduction in the second half of the 1960s and in the 1970s is surprising considering that agricultural growth was fairly impressive by international standards. This may suggest that rapid agricultural growth is not enough to get rural development moving. Sustained reduction of rural poverty demands an institution of interrelated policy reforms and programs aimed at enhancing the intersectoral employment linkages of agricultural income growth, increasing labor and total factor productivity, and building the human capital of the poor.

It appears that the *initial* distribution of assets and incomes considerably influences the response of rural (and urban) areas to stimulus provided by agricultural growth. There is little research to bank on for a deeper understanding of this issue. Counterfactual analysis using economywide models that realistically capture the economic structure of the Philippine economy, including size distribution of factor/asset endowments, are needed if further

insights are to be gained. The analysis requires actually estimating the parameters of these models using Philippine data. The exercise pursued in section 3 of this paper is meant to bridge the information gap on the demand side of economic models designed for analyzing the efficiency and distributional effects of technological change as well as certain economic policy reforms.

The supply side, especially on agricultural supply response, also requires further work. The effort has to move beyond estimating static supply response functions and include as well a characterization of the dynamics of capital accumulation and technological change in agriculture. Only then can one have a better understanding of the dynamics of rural development.

NOTES

1. For a description of the comparability and limitations of the various FIES, see Balisacan (1993).
2. Quarterly income data were not collected prior to 1977. No ISH data are available for 1987, and only third-quarter income data are available for 1988, 1989, and 1990. Given the significant seasonality of rural incomes, the 1988-1990 data can not be used.
3. The newly revised TWG's procedure of establishing the poverty line is an adaptation of the Orshansky method (Orshansky 1965). Daily and monthly food thresholds are obtained by costing low-cost menus by region, urban-rural, which meet 100% adequacy of the Recommended Dietary Allowance (RDA) for energy (2,000 calories) and 80% adequacy for other nutrients. Estimates of nonfood needs are based on the consumption pattern of FIES sample families whose incomes fall within 10 percentage points above and below the food threshold. That is, to obtain the total poverty line (food plus basic nonfood), the food threshold is divided by the average propensity to consume (APC), defined as the proportion of food to total expenditures, for these sample families. In contrast, TWG's 1985 methodology uses the average consumption pattern for all FIES sample families.
4. The P_α for $\alpha=2$ has been popular in recent empirical work owing to its appealing properties. See, for example, Greer and Thorbecke (1986) and Ravallion and van de Walle (1991).

5. As in FIES prior to 1988, the "shifting physical areas" problem is not an important issue in this data set. The classification of barangays (villages) does not vary markedly for the 1970 and 1980 population censuses, the bases of LFS sampling frames for the years included in Table 3.
6. The analysis follows that of Atkinson (1987).
7. Based on World Bank's *World Development Report* (1990, 1992).
8. The coexistence of numerous small peasant farms and large plantations in the Philippines somewhat resembled that of Latin America. For a comprehensive account of Philippine agrarian structure, see Hayami, Quisumbing, and Adriano (1990).
9. Indeed, this is a common theme in the writing of serious students of Philippine economic development. See, for example, Power and Sicat (1971), de Dios (1984), Bautista (1989), and Krugman et al. (1992).

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Table 1
Rural Areas and Urbanization

	1960	1970	1980	1990
1. Total Population (in million)	27.09	36.68	48.10	60.69
% Change	-	3.01	2.71	2.33
2. Proportion Which is Rural				
Census Report	70.20	68.17	62.49	51.16
Fixed Rural Areas a/	68.55	68.17	66.35	64.16
3. Proportion Which Is Urban				
Census Report	29.80	31.83	37.51	48.84
Fixed Rural Areas	31.45	31.83	33.65	35.84
4. Rural Population Growth				
Census Report	-	2.74	1.84	0.32
Fixed Rural Areas	-	2.98	2.44	1.99
5. Tempo of Urbanization b/				
Census Report	-	0.95	2.51	4.64
Fixed Rural Areas	-	0.80	0.83	0.97

a/ Based on 1970 urban-rural classification of villages.

b/ Urban-rural growth difference.

Sources: National Statistics Office, Integrated Census of the Population, various years.

Table 3

Rural Poverty, LFS Data, 1977-83
(in % except for t-ratios)

	Head Count	Poverty Gap	FGT (a=2)
1977	56.17	28.08	14.04
1978	55.67 (-0.65)	28.39 (0.80)	14.53 (2.51)
1980	48.58 (-10.90)	24.29 (-12.40)	12.14 (-14.23)
1981	49.41 (1.62)	24.70 (1.60)	12.35 (1.64)
1982	57.08 (15.08)	28.54 (15.10)	14.27 (15.09)
1983	60.63 (7.06)	30.32 (7.08)	15.16 (7.08)

Notes: No data available for 1979.
Figures in parentheses are t-ratios for poverty differences between the year indicated and the preceding year. The test is based on Kakwani's (1990) methodology. Critical t-value at 5% significance level is 1.96.

Sources of Basic Data:
National Statistics Office, Family Income and Expenditures Survey, Integrated Survey of Households Bulletin, Labor Force, various years.

Table 4
Aggregation of Commodities

Variable Name	Components
CEREAL	Cereals and cereal preparation, fruits and vegetables
MEAT	Meat and dairy products, eggs, fish
BEVE	Beverages, tobacco, miscellaneous foods
FUEL	Fuel, light and water, transportation and communication
HOUSE	Housing and repairs, household furnishing and equipment, household operations
CLOTH	Clothing
MISC	Personal care and effects; medical, recreational, educational, personal, and other services; medical and pharmaceutical supplies; school supplies; other miscellaneous items

Table 5
Percentage Distribution of Per Capita Expenditures by Quintile

Quintile	CEREAL	MEAT	BEVE	FUEL	HOUSE	CLOTH	MISC	TOTAL
RURAL	26.79	18.24	14.47	8.89	13.31	4.45	13.84	100.00
First	42.45	17.99	11.82	8.61	8.69	3.32	7.12	100.00
Second	36.81	18.50	13.45	8.63	9.45	4.23	8.92	100.00
Third	31.88	18.98	15.06	9.05	10.44	4.46	10.14	100.00
Fourth	27.31	19.26	15.54	8.78	12.50	4.59	12.03	100.00
Fifth	18.22	17.39	14.53	9.03	17.01	4.68	19.15	100.00
URBAN	15.83	16.96	14.37	10.86	22.95	3.98	15.06	100.00
First	31.51	19.59	15.21	9.05	12.37	3.84	8.43	100.00
Second	24.29	18.48	17.48	9.49	15.22	4.15	10.89	100.00
Third	19.74	19.85	16.72	9.89	17.55	4.17	12.08	100.00
Fourth	15.96	18.72	15.68	9.98	20.93	4.33	14.41	100.00
Fifth	10.28	14.45	12.15	12.17	28.97	3.72	18.26	100.00

Table 6
Constrained Parameter Estimates of the LA/AIDS Model a/

Equation	Constant	Price							Total Expenditures	Urban
		CEREAL	MEAT	BEVE	FUEL	HOUSE	CLOTH	MISC		
CEREAL	0.5508 (16.56)	-0.0231 (-0.77)	0.0287 (1.37)	-0.0410 (-2.54)	0.0537 (4.06)	0.0968 (3.83)	-0.0516 (-3.24)	-0.0636 (-2.37)	-0.1132 (-9.07)	-0.0343 (-4.75)
MEAT	0.2551 (8.64)	0.0287 (1.37)	-0.0082 (-0.30)	-0.0077 (-0.52)	-0.0045 (-0.39)	0.0106 (0.46)	0.0280 (2.00)	-0.0470 (-1.82)	-0.0270 (-2.40)	0.0023 (0.35)
BEVE	0.1445 (5.67)	-0.0410 (-2.54)	-0.0077 (-0.52)	0.0506 (3.06)	-0.0262 (-2.78)	-0.0622 (-3.36)	0.0235 (2.46)	0.0631 (2.91)	-0.0009 (-0.09)	-0.0012 (-0.20)
FUEL	0.0759 (3.25)	0.0537 (4.06)	-0.0045 (-0.39)	-0.0262 (-2.78)	-0.0135 (-1.23)	-0.0252 (-1.65)	-0.0148 (-2.39)	0.0304 (1.80)	0.0095 (1.11)	0.0073 (1.46)
HOUSE	-0.0685 (-1.46)	0.0968 (3.83)	0.0106 (0.46)	-0.0622 (-3.36)	-0.0252 (-1.65)	-0.0176 (-0.43)	-0.0184 (-1.30)	0.0160 (0.45)	0.0881 (4.96)	0.0136 (1.36)
CLOTH	0.0447 (2.87)	-0.0516 (-3.24)	0.0280 (2.00)	0.0235 (2.46)	-0.0148 (-2.39)	-0.0184 (-1.30)	0.0119 (0.55)	0.0213 (1.55)	-0.0013 (-0.20)	0.0004 (0.11)

Likelihood Ratio test statistic = 51.12.

Critical chi-square at 18 d.f. ($\alpha=0.05$) = 28.87.

a/ Homogeneity and symmetry restrictions imposed.

Note: Figures in parentheses are asymptotic t-ratios. Prices and expenditures are in natural logarithm.

Table 7
Expenditure and Uncompensated Price Elasticities

Equation	With Respect to the Price of							Total Expenditures
	CEREAL	MEAT	BEVE	FUEL	HOUSE	CLOTH	MISC	
CEREAL	-0.703	0.404	-0.313	0.161	0.431	-0.267	-0.095	0.382
MEAT	0.282	-0.954	-0.089	-0.047	0.069	0.136	-0.203	0.805
BEVE	-0.294	-0.054	-0.629	-0.191	-0.453	0.175	0.457	0.990
FUEL	0.487	-0.118	-0.245	-1.135	-0.274	-0.148	0.293	1.141
HOUSE	0.146	-0.271	-0.222	-0.084	-1.151	-0.052	-0.107	1.741
CLOTH	-1.269	0.710	0.588	-0.376	-0.445	-0.705	0.532	0.967
MISC	-0.690	-0.505	0.516	0.252	0.083	0.177	-0.038	0.205

Table 8
Expenditure Elasticities by Quintile

Quintile	CEREAL	MEAT	BEVE	FUEL	HOUSE	CLOTH	MISC
RURAL							
First	0.648	0.801	0.989	1.154	2.341	0.960	1.818
Second	0.594	0.807	0.990	1.153	2.323	0.969	1.654
Third	0.531	0.817	0.991	1.146	2.116	0.970	1.573
Fourth	0.452	0.814	0.991	1.151	1.932	0.971	1.483
Fifth	0.179	0.795	0.991	1.147	1.685	0.972	1.304
URBAN							
First	0.523	0.816	0.991	1.147	1.947	0.965	1.695
Second	0.381	0.806	0.992	1.140	1.769	0.968	1.538
Third	0.238	0.819	0.992	1.134	1.667	0.968	1.485
Fourth	0.058	0.808	0.991	1.133	1.559	0.969	1.406
Fifth	-0.463	0.751	0.989	1.109	1.404	0.964	1.321