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POLICY RESEARCH WORKING PAPER 2572

Nonfarm Income, Inequality, and Poverty in Rural Egypt and Jordan

Richard H. Adams, Jr.

Nonfarm income has a greater impact on poverty and inequality in Egypt than in Jordan. In rural Egypt the poor receive almost 60 percent of their income from nonfarm sources, while in rural Jordan they receive less than 20 percent. The reason for this difference is land: in rural Egypt, agricultural land is very productive, but access is quite limited, and so the poor are "pushed" into nonfarm work; while in rural Jordan, land is not very productive, and access is not highly prized. In both countries the best way to reduce poverty and inequality might be to focus on nonfarm unskilled labor.

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Summary findings

The rural economy of developing countries has long been regarded as synonymous with agriculture but in recent years this view has begun to change. Such diverse activities as government, commerce, and services are now seen as providing most income in rural households. Applying decomposition analysis to two new nationally representative sets of household data from Egypt and Jordan, Adams examines how different sources of income—including nonfarm income—affect inequality in rural income. He concludes:

- Nonfarm income has different impacts on poverty and inequality in the two countries. In Egypt the poor (those in the lowest quintile) receive almost 60 percent of their per capita income from nonfarm income. In Jordan the poor receive less than 20 percent of their income from nonfarm income. So nonfarm income decreases inequality in Egypt and increases it in Jordan.
- Access to land accounts for this difference between the two countries. In Egypt the cultivated land base is totally irrigated and very highly productive. Egypt's large rural population seeks access to land but because the land-to-people ratio is so unfavorable, only a minority of rural inhabitants actually own land. The rest—especially the poor—are forced to seek work in the nonfarm sector. By contrast, only 30 percent of Jordan's cultivated land base is irrigated and crop yields are low. So Jordan's rural population does not press for access to land because the attractive economic rates of return are found in the nonfarm sector. Unlike Egypt's rich, rural Jordan's rich earn less than 10 percent of their total per capita income from agriculture and more than 55 percent of it from nonfarm sources.
- The poor in both countries depend heavily on government employment to decrease inequality. Government wages provide 43 percent of nonfarm income for Egypt's rural poor and 60 percent of Jordan's. But since both governments already employ far more workers than they can possibly use, advocating increased government employment to reduce inequality would not be wise policy advice. From a policy standpoint, it would be better to reduce income inequality by focusing on nonfarm unskilled labor (for example, in construction, brick-making, and ditch-digging), an important income source.
- In Egypt nonfarm income decreases inequality because inadequate access to land "pushes" poorer households out of agriculture and into the nonfarm sector. Although agricultural income is positively associated with land ownership in rural Egypt, that ownership is unevenly distributed in favor of the rich, so nonfarm income is not linked to land ownership and is thus more important to the rural poor.

This paper—a product of the Poverty Division, Poverty Reduction and Economic Management Network—is part of a larger effort in the network to identify the sources of poverty and income inequality in the developing world. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Nelly Obias, room MC4-620, telephone 202-473-1986, fax 202-522-3283, email address nobias@worldbank.org. Policy Research Working Papers are also posted on the Web at www.worldbank.org/research/workingpapers. The author may be contacted at radams@worldbank.org. March 2001. (41 pages)

Nonfarm Income, Inequality and Poverty

In Rural Egypt and Jordan*

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In the past many researchers and policymakers have viewed the rural economy of developing countries as being synonymous with agriculture. According to this view, rural households receive most of their income from the production of food and export crops.

In more recent years, this view has begun to change. There is now a growing recognition that rural households receive their income from a diverse portfolio of activities,[1] and that one of the most important of these activities is that connected with the rural nonfarm sector. In some cases the rural nonfarm sector – which includes such diverse activities as government, commerce and services – is now seen as providing the bulk of income to rural households.

This changed view is partly due to the evolving concept of the broader relationship between agriculture, the rural nonfarm sector and the poor. During the 1970s and early 1980s, Mellor and Lele, Mellor, and Johnston and Kilby emphasized the growth linkages effects of agricultural growth.[2] According to this literature, technological change in agriculture boosts production, thereby increasing the incomes of landowning households. In turn, these landowning households use their new income to buy more labor-intensive goods and services, which are produced by the poor working in small-scale firms in the rural nonfarm sector. Thus, accelerated growth in agriculture has both production linkages that provide the poor with more food, and consumption linkages that provide the poor with more employment opportunities in the rural nonfarm sector.

While the dissemination of high-yielding varieties of rice and wheat may have had large multiplier effects on the rural nonfarm sector in certain Asian countries, in many developing countries these multiplier effects have been quite small. For example,

de Janvry and Sadoulet argue that the unequal distribution of land and income in Latin America (and other developing countries) mean that only a handful of landowners benefit from the income effects of agricultural growth.[3] Since these large landowners prefer to buy luxury items produced by imports, they do not demand the type of labor-intensive goods and services which are produced by the poor in the rural nonfarm sector. For this reason, de Janvry and Sadoulet argue that in land-constrained areas of the developing world – like Latin America and certain parts of the Middle East and Asia – focusing directly on the rural nonfarm sector might provide a better way of increasing the income and employment opportunities of the poor. In this view, income earned in the rural nonfarm sector represents the agent of positive change for the poor in the rural economy, rather than income earned from the traditional agricultural sector.

Despite this changed view, there is still no agreement in the empirical literature on two key issues, namely: (a) what is the impact of rural nonfarm income on income inequality?; and (b) what is the link between land, nonfarm income and overall rural inequality? On the one hand, studies by Lanjouw in Ecuador, Adams in Pakistan and Chinn in Taiwan indicate that nonfarm income reduces rural income inequality.[4] According to Adams,[5] nonfarm income benefits the poor because the share of nonfarm income varies inversely with both size of land owned and total rural income. On the other hand, studies in Africa have generally produced very different results. For instance, Reardon and Taylor in Burkina Faso, Collier, Radwan and Wangwe in Tanzania and Matlon in Nigeria find that nonfarm income has a negative impact on rural income distribution because it is mainly large landowners who receive nonfarm income.[6]

Part of this inconsistency may be explained by differences in the key factor noted above, namely, the distribution of land. While many factors affect land distribution,[7] on

the whole, in land-scarce, labor rich countries – like Pakistan and much of Latin America – inadequate access to land may tend to "push" poorer rural households out of agriculture and into the nonfarm sector. Thus, in these countries, nonfarm income may have a positive impact on inequality and poverty. The obverse, then, could hold in land-rich, labor-scarce countries – such as Africa – where ample land access may tend to keep most people in agriculture and to "pull" only richer households into the nonfarm sector.

This paper proposes to clarify the impact of nonfarm income and unequal land distribution on rural income inequality by analyzing the results of two new, nationally-representative household surveys in Egypt and Jordan. The choice of these two countries for analysis is conscious: both countries lie in the MENA (Middle East and North African) region and thus share many economic and social similarities. However, for the purposes of this paper, they also share one key difference: while Egypt is a land-scarce country, where the poor lack access to productive land and are thus "pushed" to work in the nonfarm sector, Jordan represents a different type of land-scarce country, in which the irrigated land mass is so small that the rural rich are "pulled" (by more attractive rates of return) into the nonfarm sector.

The paper seeks to make three contributions. First, it uses standard decomposition techniques based on the Gini coefficient to pinpoint the contribution of different sources of rural income – including nonfarm income – to rural inequality in Egypt and Jordan. This analysis finds that nonfarm income has very different impacts on inequality in the two study countries: in Egypt nonfarm income improves inequality, while in Jordan nonfarm income has a negative impact on inequality. Second, in an effort to understand the reasons for this difference, the study then decomposes the sources of nonfarm income inequality in order to understand how the various types of nonfarm

income contribute to income inequality. This analysis finds that income from government employment represents the largest share of nonfarm income in both countries. Third, the study applies a new income decomposition procedure based on regression analysis to the data from rural Egypt. This procedure, which cannot be applied to Jordan because of the lack of data on landowning, provides a flexible and efficient way for quantifying the role of various household-level variables in "determining" the level of income inequality. This analysis finds that landownership, which is distributed very unevenly in rural Egypt, is negatively and significantly related to the determination of nonfarm income.

The study proceeds in six further sections. Section I presents the standard decomposition of the Gini coefficient. Section II discusses the household data sets from Egypt and Jordan. Section III uses the Gini decomposition to analyze the contribution of the different sources of income – including nonfarm income – to overall rural inequality. Section IV presents the new decomposition procedure based on regression analysis, and Section V uses this new procedure to pinpoint the contribution of landownership to nonfarm and agricultural income inequality in rural Egypt. Section VI concludes.

I. Decomposition of Income Inequality Based on Gini Coefficient

According to the literature, any decomposable inequality measure should have five basic properties. They are: (1) Pigou-Dalton transfer sensitivity; (2) symmetry; (3) mean independence; (4) population homogeneity; and (5) decomposability.

Pigou-Dalton transfer sensitivity holds if the measure of inequality increases whenever income is transferred from one person to someone richer. Symmetry holds if the measure of inequality remains unchanged when individuals switch places in the income order. Mean independence holds if a proportionate change in all incomes leaves the measure of inequality unchanged. Population homogeneity holds if increasing (or decreasing) the population size across all income levels has no effect on the measured level of inequality.

The property of decomposability allows inequality to be partitioned either over sub-populations or sources. It is the latter type of decomposition that is the subject of this analysis. Ideally, an inequality measure can be regarded as source decomposable if total inequality can be broken down into a weighted sum of inequality by various income sources (for example, nonfarm and agricultural income).

One of the measures of inequality which meets the five preceding properties is the Gini coefficient. The source decomposition of the Gini coefficient can be developed following the notation of Stark et al:[8]

$$G = \sum_{k=1}^{K} R_k G_k S_k \qquad (1)$$

where:

S_k is the share of source k of income in total group income (i.e. $S_k = \mu_k / \mu$),

G_k is the Gini coefficient measuring the inequality in the distribution of income component k within the group, and

R_k is the Gini correlation of income from source k with total income,[9] defined as:

$$R_k = \frac{\text{cov}[Y_k, F(Y)]}{\text{cov}[Y_k, F(Y_k)]} \qquad (2)$$

Equation (2) shows that the effect of source k income on overall income inequality can be broken down into three components:

(a) the share of income component k in total income (captured by the term S_k);

(b) the inequality within the sample of income from source k (as measured by G_k);

(c) the correlation between source k income and total income (as measured by R_k).

Using this decomposition, it is possible to identify how much of overall income inequality is due to a particular income source. Assuming that additional increments of an income source are distributed in the same manner as the original units, it is also possible to use this decomposition to ask whether an income source is inequality-increasing or inequality-decreasing on the basis of whether or not an enlarged share of that income source leads to an increase or decrease in overall income inequality. On the basis of equation (2):

$$g_k = R_K \frac{G_K}{G} \qquad (3)$$

where g_k is the relative concentration coefficient of income source k in overall inequality.

From equation (3) it follows that income source k is inequality-increasing or inequality-decreasing according to whether g_k is greater than or less than unity.[10]

II a. Data Sets for Egypt and Jordan

Egypt data come from a single-round, nationally-representative household budget survey that was conducted in 1997 on 2,500 households in 20 different urban and rural governorates in Egypt. This survey – the Egypt Integrated Household Survey – was quite broad, collecting data on such diverse topics as: income, expenditures, education, employment, food consumption, health and nutrition, landownings, migration and rural credit.[11] The sample frame used for selecting households in the survey was supplied by the Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS).[12]

The rural portion of this Egypt Integrated Household survey included 1,327 rural households drawn from 17 rural governorates. Of this total, 26 households were excluded because of missing or incomplete data. The analysis is therefore based on data from 1,301 rural households.

Jordan data come from a four-round, nationally-representative household budget survey that was conducted in 1997 on 5,970 households in urban and rural Jordan. This survey -- the Household Income and Expenditure Survey (HIES) -- was done by the Jordan Department of Statistics, and was not nearly as broad as the Egypt survey. For example, the Jordan HIES focused on income and expenditure data, and did not collect any data on health and nutrition, migration and (most importantly for this study) landholding. Two of the rounds -- rounds 2 and 4 -- gathered data on income.

The rural portion of the Jordan HIES included 1,451 households, and the analysis is based on all of these households.

II b. Sources of Income

The concept of income used in this study is as comprehensive as possible, subject to the limitations of the data collected in each survey.

In Egypt the definition of income is more complete, including income received in kind as well as in cash. In Egypt a money value was imputed to receipts in kind, household consumption of crops and crop by-products, and home-consumed livestock. Because of uncertainty about how to deduct imputed land rent from agricultural income, no values for imputed land rent were calculated. Similarly, because of the thin rental market for housing in rural Egypt,[13] no values were imputed for the rent of owner-occupied housing. Finally, because of uncertainty about how to accurately calculate wage rates for family members, no values were imputed for family labor involved in crop and livestock production.

In Jordan the definition of income in the survey is more limited. Because the agricultural sector is much smaller in Jordan,[14] the Jordan HIES did not collect data on either income earned from livestock or crop production. This is an important lacuna, which complicates efforts to compare the results of the Egypt and Jordan surveys. Given this omission, this study did not impute any values for the household consumption of crops, crop by-products or home-consumed livestock. While the Jordan HIES did collect data on income earned from land and house rent, to be consistent with the Egypt survey, no values were calculated for either imputed land rent or the rent of owner-occupied housing. Like Egypt, because of uncertainty about how to accurately calculate family wage rates for family members, no values were imputed for family labor involved in crop and livestock production in Jordan.

The study divided total income for each rural household into five sources (for Egypt) and four sources (for Jordan)[15]

(1) Nonfarm – For both countries, includes wage earnings from nonagricultural labor, government and private sector employment plus net revenues from non-farm enterprises;

(2) Agricultural – For Egypt, includes net income from all crop production including imputed values from home production and crop byproducts plus wages received from agricultural labor; for Jordan, includes gross income from private work agriculture, sales of agricultural goods and services, wages received from agricultural labor and income from land sales.

(3) Livestock – For Egypt, includes net returns from traded livestock (cows, bullocks, buffalo, goats, sheep) and small animals (chickens, pigeons, rabbits, duck), plus imputed values of home-consumed livestock (meat) and animal products (milk, cheese) plus plowing services;

(4) Transfer – For both countries, includes net public and private transfers plus net remittances (in cash and in kind) plus pensions plus interest and dividends received from pensions, securities and savings.

(5) Rental – For Egypt, includes rents (in cash and in kind) received from ownership of such assets as land, machinery and housing; for Jordan, includes only cash rents received from land and housing.

Although the reasons for dividing income into these sources of income should be apparent, in Egypt the rationale for distinguishing between agricultural and livestock income may need clarification. On the one hand, some observers may claim that within a rural economy it is artificial (and empirically difficult) to distinguish between agricultural and livestock income, since outputs from one – such as straw and crop residuals from agriculture, and draft power and manure from livestock – are used as inputs in the other.

On the other hand, the goal of this study is to disaggregate the sources of income inequality as finely as possible. For this reason, it seems essential to distinguish in rural Egypt between agricultural and livestock income, because these two income sources have very different effects on inequality. According to the data, the simple correlation between agricultural income and total income in Egypt is the highest of all five income sources: 0.844. By contrast, the simple correlation between livestock income and total income is one of the lowest: 0.232.[16] It is unfortunate that data for livestock income in Jordan are lacking, in order to compare these results with those of Jordan.

Table 1 presents summary data for the various sources of income. The table shows quite clearly the importance of rural income other than agricultural income. In both countries, nonfarm income represents the single most important source of income, accounting for 42.2 and 50.6 percent of total rural household income in Egypt and Jordan, respectively. Although definitions of nonfarm income vary widely,[17] these percentage figures for nonfarm income are comparable to those recorded in other studies. For example, a recent review of rural household budget surveys in 13 African, Asian and Latin American countries found that nonfarm income accounts for between 13 and 72 percent of total rural household income.[18]

The Gini coefficients of per capita rural income for Egypt and Jordan are 0.532 and 0.408, respectively. On the one hand, it is a bit surprising that the Gini coefficient for rural Egypt is much higher than that for rural Jordan. This large difference may reflect the absence of data on crop income in Jordan. In many countries crop income -- since it is dependent on land access -- is unequally distributed, and so the inclusion of this source of income would probably increase the Gini coefficient for rural Jordan.[19] However, it should be noted that the Gini coefficients for Egypt and Jordan are well

within the range of income Ginis recorded for other developing countries. For instance, the income Ginis recorded in the most recent edition of World Development Indicators suggest that Gini coefficients of per capita household income range from a low of 0.420 (Bolivia) to a high of 0.601 (Brazil).[20]

In Table 2 the sources of rural income for Egypt and Jordan are presented by income quintile group. The results suggest that nonfarm income plays a radically different role for the poor in the two countries. While in Egypt the poor -- that is, those in the lowest quintile group – receive almost 60 percent of their total per capita income from nonfarm income, in Jordan the poor receive less than 20 percent of their total per capita income from this source. Furthermore, while in Egypt the share of nonfarm income in total income generally falls as income rises, in Jordan the share of nonfarm income in total income typically increases.

The reasons for this dramatic difference have to do with land. In Egypt the cultivated land base is 100 percent irrigated and highly productive with yields for the main field crops (wheat and rice) among the highest in the world. The large number of people living in rural Egypt therefore all seek access to agricultural land. However, in fact, the very real land constraints in rural Egypt -- 75.7 percent of the households in this sample own no land[21] – force most people (and especially the poor) to earn their livelihood from outside agriculture. In Jordan the situation is quite different. Only 30 percent of the cultivated land base is irrigated, and the main field crops (wheat and barley) are generally grown under rainfed conditions and so yields are low.[22] People in rural Jordan thus do not press for land access, since the really attractive economic rates of return are to be found not in agriculture, but rather in the nonfarm sector. In clear contrast to Egypt, the rich in rural Jordan thus earn less than 10 percent of their total per

capita income from agriculture and over 55 percent of their total income from nonfarm sources.

III a. Rural Income Inequality in Egypt and Jordan, 1997

Decomposing the Gini coefficient provides two ways of measuring the contribution of any income source to overall income inequality. First, it is possible to identify how much of overall income inequality is due to any particular source of income. Second, it can be asked whether inequality in an income source serves to increase or decrease overall income inequality.[23]

Table 3 reports the results of the Gini decomposition. The results show that while nonfarm income has the largest share (S_k) in total rural income in both countries, its contribution to rural income inequality is quite different. In absolute terms ($S_kG_kR_k$) nonfarm income accounts for 0.158 and 0.218 of rural income inequality in Egypt and Jordan, respectively. However, in percentage terms, while nonfarm income contributes only 29.7 percent to rural income inequality in Egypt, it accounts for over 53 percent of such inequality in Jordan. In Jordan, nonfarm income makes the single largest contribution to rural income inequality.

There are at least two reasons for the differing effects of nonfarm income on rural inequality in Egypt and Jordan. The first reason relates to the role of agricultural income. In Egypt agricultural income accounts for the second largest share (S_k = 24.6 percent) of rural income and it is very unequally distributed (G_k = 1.155). As a result, agricultural income makes the largest percentage contribution (40.2 percent) to income inequality in Egypt. By contrast, in Jordan agricultural income -- perhaps because of measurement problems (e.g. not including crop income) and perhaps because of the low returns

involved in rainfed agriculture -- accounts for the lowest share (S_k = 8.5 percent) of total rural income. With a tiny share of income, and a low correlation with total income rankings (R_k = 0.439), agricultural income makes the smallest contribution to rural income inequality in Jordan.

The second reason relates to the correlation of nonfarm income with total income rankings. In Egypt nonfarm income and total income are not highly correlated (R_k = 0.590), but in Jordan the two are highly correlated (R_k = 0.760). This suggests that in Jordan nonfarm income is -- to a large extent -- closely synonymous with total rural income. In Jordan nonfarm income is not only the single, most important source of income, but it is also very similar to nonfarm income as a whole.

The decomposition results in Table 3 can also be used to distinguish between inequality-increasing and inequality-decreasing sources of income. According to the relative concentration coefficients (g), in Egypt two sources of income – agricultural and rental – represent inequality-increasing sources of income. This means that, ceteris paribus, additional increments of agricultural and rental income will increase rural income inequality. By contrast, in Jordan only one source of income – nonfarm – represents an inequality-increasing source of income.

III b. Nonfarm Income Inequality in Egypt and Jordan

For the purposes of policy analysis, it is useful to decompose the sources of nonfarm income in order to answer the question: What is the impact on inequality of different kinds of nonfarm income?

In this study nonfarm income can be divided into five sources (for Egypt) and four sources (for Jordan):

(1) Government employment – For both countries, includes wages from all government and public sector service;

(2) Private sector – For both countries, includes wages from private sector companies;

(3) Unskilled labor – For both countries, includes wages from any unskilled nonfarm activity, such as construction, brick-making and ditch digging;

(4) Self-employment – For Egypt, includes profits and earnings from shopkeeping and artisan activities, such as tailoring and shoe repair.

(5) Other - For Jordan, includes revenues from building sales.

Table 4 presents the sources of nonfarm income disaggregated by income quintile group. In both countries the poor are heavily dependent on one particular source of nonfarm income: government employment. In Egypt, the poor -- those in the lowest quintile group -- receive 43 percent of their nonfarm income from government wages, while in Jordan the poor receive 60 percent of their nonfarm income from this source. There is, however, one key difference. While in Egypt the proportion of nonfarm income from government employment does not vary much by income group, in Jordan the proportion is positively related to income. In rural Jordan those in the top quintile group

receive over 68 percent of their nonfarm income from government employment, which is a much higher share than the poor.

Why is government employment so important to the poor (and nonpoor) in Egypt and Jordan? The best answer to this question comes from Bent Hansen, who observed 15 years ago that in Egypt:

> . . . the government sector predominates everywhere (in urban and rural areas). The government is a realistic employment alternative in all walks of life, including unskilled, illiterate rural workers. 35 percent of government workers (in Egypt). . .have no education whatsoever.[24]

Hansen's observations about the incredible ability of the government sector to absorb all types of workers seems as true today as it was 15 years ago. In Egypt, of the 464 rural males over age 15 who work for the government, 16 percent have no education and 39 percent have an elementary school degree or less; in Jordan, of the 923 rural males over 15 who work for the government, 5 percent have no education and 30 percent have an elementary degree or less.[25]

Table 5 reports the results of the Gini decomposition for nonfarm income. The findings are rather paradoxical. On the one hand, government employment makes the largest percentage contribution to nonfarm inequality: 41.6 percent in Egypt and 69.7 percent in Jordan. In both countries government employment makes the largest contribution to nonfarm inequality primarily because of its large income share (S_k). However, on the other hand, the relative concentration coefficients (g) show that government employment is actually an inequality-decreasing source of nonfarm income. In both Egypt and Jordan g is less than unity because the percentage contribution of government employment to nonfarm inequality is less than its share of nonfarm income. This means that, holding other variables constant, additional increments of income from government employment will actually reduce nonfarm inequality.

Two policy conclusions follow from these results. First, despite the previously cited literature on the growth linkages effects of agricultural growth, it is difficult to see how agricultural growth in either Egypt or Jordan has led to an expansion of the most important inequality-decreasing component of nonfarm income: government employment. It would seem more reasonable to argue that in both countries the government has consciously decided to expand its work rolls to absorb as many workers – literate and non-literate, skilled and non-skilled -- as possible. According to a recent World Bank report, "Traditionally, Egypt's primary social safety net (to help the poor) has been (government) employment. (This) has provided significant benefits to the poor and lower middle class . . . ."[26] The second policy conclusion follows immediately from the first. Since the work rolls of Egyptian and Jordanian government employment are already quite over-extended, with far more government workers employed than there are actual jobs to keep them occupied, it would be foolhardy from a policy standpoint to advocate increased government employment as a means of reducing rural income inequality in either country. If the concern is with equity, then perhaps it would be more productive to urge a renewed focus on a second component of nonfarm income: unskilled labor. Table 5 shows that in Egypt unskilled income -- from construction work, brick-making and ditch-digging -- represents the second largest share (23.5 percent) of nonfarm income and it also is an inequality-decreasing source of overall income ($g = 0.777$). In rural Jordan unskilled income represents an inequality-decreasing source of income ($g = 0.804$). More attention to the needs of unskilled nonfarm workers -- such as construction workers, brick-makers and ditch-diggers -- would help improve the distribution of income in both Egypt and Jordan.

IV. A New Decomposition Approach Based on Regression Analysis

The Gini decomposition of income inequality addresses the key questions of which sources of income – such as nonfarm or agricultural income – contribute to overall income inequality, and which income sources help to raise or lower total inequality. However, this approach to income decomposition is of more limited use in identifying the causes of inequality. In other words, the Gini decomposition cannot describe how household-level variables such as land, education and age "cause" or "determine" income inequality.

It is therefore instructive to supplement the standard Gini decomposition with a new approach to inequality decomposition which is based on regression analysis. This new approach provides a flexible and efficient way of quantifying the roles of different determinants of income – such as landownership and other variables – on the level of income inequality. In other words, the new approach answers the question of how much a given determinant of income contributes to income inequality, given a certain level of inequality.

Following Morduch and Sicular,[27] the new decomposition approach can be defined by reference to the income equation:

$$Y = X\beta + \in, \qquad (4)$$

where X is an $n \times M$ matrix of independent variables with the first column given by the n-vector e = (1, 1, ..., 1), β is an M-vector of regression coefficients, and $\in$ is an n-vector of residuals.

The M coefficients can be estimated using appropriate econometric techniques with specification corrections as required. Predictions of per capita income from each source of income $\hat{Y}_k = X\beta$ can be formed using information from the entire data set.[28]

The econometric results yield estimates of the income flows attributed to various household variables. This allows allow us to decompose inequality by factor income – that is, to apportion inequality to the various components of income, where the sum of these components equals total source income, $Y_{ik} = \sum_{k=1}^{K} Y_i^k$. Here the analogues are the $\hat{Y}^m = X\beta^m$, the income contributed by land, education, age etc., as given by the regression results. By construction, total source income is the sum of these flows (plus the regression residual):

$$Y_{ik} = \sum_{m=1}^{M+1} \hat{Y}_{ik}^m \qquad \textit{for all } i, \qquad (5)$$

$$\textit{where } \hat{Y}_{ik}^m = \beta_m X_{ik}^m \qquad \textit{for } m = 1,\ldots,M$$

$$\hat{Y}_{ik}^m = \in_{ik} \qquad \textit{for } m = M+1.$$

These income flows can then be used directly to calculate decomposition components for all regression variables. The shares take the form:

$$s\left(X^m, Y\right) = \beta^m \left(\frac{\sum_{i=1}^{n} a_i(Y) X_i^m}{I(Y)} \right) \qquad \textit{for } m = 1,\ldots,M. \qquad (6)$$

V. Using Regression Analysis to Identify the Determinants of Income Inequality in Egypt

The preceding approach can be implemented by using regression analysis to estimate the determinants of the various sources of income in this study. Since the goal here is to quantify the contribution of land to the determination of different kinds of income, this analysis cannot be applied to Jordan because the 1997 HIES Survey did not collect any data on landownership. The remainder of this section therefore focuses on the 1997 data from rural Egypt.

Two hypotheses are to be tested in this section. First, since land is distributed so unevenly in rural Egypt,[29] and land is such a vital component of agricultural production, it can be hypothesized that the close relationship between land and agriculture "causes" agricultural income to go mainly to the rich. Second, it is possible that nonfarm income is an inequality-decreasing source of income in rural Egypt precisely because nonfarm income has no relationship with size of land owned.

The challenge in using regression analysis to test these hypotheses in rural Egypt is twofold: first, to identify those exogenous household-level factors (including landownership) which somehow "cause" income to be produced; and second, to pinpoint the relative importance of each of those factors in producing different types of income (such as agricultural and nonfarm income).

In the strictest sense, most of the relevant income-producing variables that can be identified in rural Egypt reflect a series of endogenous rather than exogenous choices made by the household. However, the management and taste factors that affect such choices should be fixed, and, therefore should not seriously bias the regression estimates.

Following the standard household model, it can be assumed that a rural household maximizes utility by allocating the land, labor and capital of its family members to various agricultural and non-agricultural tasks. From the first-order optimum conditions, land, labor time and capital service allocation functions can be derived to various household tasks that commonly depend on a set of factor prices, technology, personal characteristics of household members, and ownership of land and nonland resources. Factor prices (including land rent and residual return to land) depend on technology and personal household characteristics (such as management ability) that cannot be assumed to be exogenous. For this reason, it is desirable to estimate the factor price and factor allocation functions simultaneously. Unfortunately, this procedure cannot be used here because the quantities and prices of household-supplied factors for most household activities cannot be accurately estimated, either in this or most other household-level surveys. Therefore, in this section the reduced form income determination functions are estimated without distinguishing factor prices and quantities, which depend on technology, ownership of resources, and other household characteristics.

Specifically, in order to identify the determinants of income, each of the five sources of income in rural Egypt – nonfarm, agricultural, transfer, livestock and rental – are regressed on three types of household-level inputs which are thought to cause income: land (i.e. size of landowned, size of land rented in); labor (i.e. household size, mean age of all household members, number of males over age 15); and capital (i.e. mean education of males over age 15, value of farm equipment owned, value of enterprises owned). In addition, since the Egyptian data come from widely scattered rural areas, differences in land, water and other inputs may affect the determination of income. For

this reason, 16 governorate-level dummy variables are included in the model. Table 6 reports means and standard deviations for the model.

While the model was estimated on all households in the rural Egypt sample, it should be noted that many survey households do not receive a particular source of income. For instance, Table 3 shows that only 60 percent of households receive nonfarm income. With so many zero values for the dependent variable, using ordinary least squares (OLS) to estimate the model would lead to biased and inconsistent results. Proper estimation of the model requires use of either a self-selection procedure or a censored regression. However, estimating the model using the two-stage selection procedure proposed by Heckman produced poor results.[30] For this reason, tobit was chosen as the estimator. The tobit method assumes that the two stages of the decision-making process (for example, the decision to work in nonfarm and the decision to receive nonfarm income) occur simultaneously. In the estimations, a separate tobit equation was estimated for each of the five sources of income in rural Egypt.

The results of the tobit estimation are shown in Table 7. In rural Egypt land owned is positively and statistically related to the receipt of three types of income: agricultural, livestock and rental. However, calculating the marginal effects from the tobit regression suggest that an increase in the amount of land owned by the household will have the largest positive effect on agricultural income. According to Table 8, a one feddan increase in land owned in Egypt will lead to a 68.3 LE increase in per capita household income from agriculture as opposed to only a 7.9 LE increase in household income from livestock income and a 20.7 LE increase in household income from rental income.

By comparison, Table 8 reveals that an increase in land owned in Egypt has a negative effect on the receipt of nonfarm income. For nonfarm income, a one feddan increase in the amount of land owned actually leads to a statistically significant reduction of 26.1 LE in per capita household income from nonfarm (Table 8). These results suggest that while agricultural income is positively associated with landownership in Egypt, which is unevenly distributed in favor of the rich, nonfarm income is not linked with land ownership and thus is more important to the poor.

VI. Results of New Decomposition Approach: Land and Income Inequality in Egypt

The results of the tobit regression can be used in the new decomposition approach to assess the relative magnitudes and distributions of different variables for two types of income in rural Egypt: nonfarm and agricultural income. These two types of income are chosen to highlight the different contributions that one specific variable – landownership – makes to income inequality.

Table 9 represents the bridge between the tobit regression results in Table 7 and the decompositions that follow in Table 10. The first column of Table 9 gives average income shares, which is the faction of the mean of per capita income that is given by the mean value of each variable multiplied by its coefficient from either the nonfarm or the agricultural income equation in Table 7. The results show that the land owned variable generates a large, positive share (30.5 percent) of average income for agricultural income in Egypt. In fact, among statistically significant variables, land owned generates the largest positive share of agricultural income.[31] By comparison, land owned generates a negative and statistically significant share (-4.7 percent) of average income for nonfarm

income. Among the significant variables, the net sum of the age and age squared variables generate the largest positive share of nonfarm income in Egypt.

Table 9 also shows the distribution of the income shares of the explanatory variables across quintile groups in Egypt. The income flows from the household size, age and education variables are distributed relatively equitably, with similar shares going to the top and bottom quintiles of the income distribution. However, as might be expected, the variables relating to asset ownership – land owned, farm equipment and enterprises -- are distributed very unequally, with the top quintile receiving more than 4 times the income share of the bottom quintile. Yet, of these three asset ownership variables, only one – land owned – generates a very large share of income in rural Egypt. Land owned generates both a large proportion (30 percent) of agricultural income and it is also distributed quite unevenly.

Table 10 gives the results from the inequality decompositions for nonfarm and agricultural income in rural Egypt. In the decompositions, when income from a factor is distributed uniformly among households, its proportional contribution to inequality is zero. For this reason, the constant term contributes zero to inequality for both sources of income. Also, since a factor's contribution depends only on the variation of that factor's income around the mean, and not on the mean itself, those factors which are distributed fairly equally among households will not make much of a contribution to inequality. This explains the relatively small contributions to inequality of such variables as household size, mean age, and number of household males over 15 years.

With respect to the land variable, the results in Table 10 suggest very different outcomes. In Egypt the land owned variable reduces nonfarm income inequality, and this relationship is statistically significant. For agricultural income, however, the land owned

variable increases income inequality. In fact, for agricultural income, land owned accounts for the single largest share (38 percent) of agricultural income inequality in Egypt.

Table 10 suggests that it is the close relationship between land owned – which is distributed very unevenly – and agricultural income which skews the distribution of agricultural income in favor of the rich. Unfortunately, however, the findings in Table 10 do not address the key question of causality. In other words, is it inequality in landownership which leads to unequal agricultural income distribution or is it uneven agricultural income distribution which causes the high concentration of land ownership? To adequately answer this question for rural Egypt would require more data, specifically, panel data on how changes in the distribution of agricultural – and other sources of – income are related to changes in the ownership of land.[32]

VI. Conclusion

This study has used decomposition analysis on two new, nationally-representative household data sets from Egypt and Jordan to examine the impact of different sources of income – including nonfarm income -- on rural income inequality. Four key conclusions emerge.

First, the study shows that nonfarm income has very different impacts on poverty and inequality in the two study countries. While in Egypt the poor -- that is, those in the lowest quintile group -- receive almost 60 percent of their total per capita income from nonfarm income, in Jordan the poor receive less than 20 percent of their income from this source. With respect to inequality, nonfarm income represents an inequality-decreasing

source of income in rural Egypt, while in Jordan it represents an inequality-increasing source of income.

Second, the reasons for the differing effects of nonfarm income have to do with land. In Egypt the cultivated land base is 100 percent irrigated and very highly productive. The large number of people living in rural Egypt therefore all seek land access, but given the very unfavorable land-to-people ratio, only a minority of rural inhabitants actually own land. The rest (and especially the poor) are all forced to seek work in the nonfarm sector. By contrast, in Jordan only 30 percent of the cultivated land base is irrigated and crop yields are low. People in rural Jordan thus do not press for land access, since the really attractive economic rates of return are found -- not in agriculture -- but in the nonfarm sector. In clear contrast to Egypt, the rich in rural Jordan earn less than 10 percent of their total per capita income from agriculture and over 55 percent of such income from nonfarm sources.

Third, the analysis shows that the poor in both countries are dependent on one particular source of nonfarm income: government employment. In Egypt the poor receive 43 percent of their nonfarm income from government wages, while in Jordan the poor receive 60 percent of their nonfarm income from this source. As a result, government employment represents an inequality-decreasing source of income in both countries. However, since both governments already employ far more workers than they can possibly use, from a policy standpoint it would not be desirable to advocate increased government employment as a means of reducing income inequality in either Egypt or Jordan. Rather, it would be more productive for policymakers to focus on a second component of nonfarm income: unskilled labor. In both Egypt and Jordan unskilled

labor – in such fields as construction, brick-making and ditch-digging – represents an important inequality-decreasing source of income.[33]

Finally, this study affirms the close tie between land, nonfarm income and the poor. While landowning data are lacking for Jordan, in Egypt it seems that nonfarm income is an inequality-decreasing source of income because inadequate land access in that country "pushes" poorer households out of agriculture and into the nonfarm sector. In this study 75.7 percent of rural Egyptian households own no land and the Gini coefficient of landownership (0.899) is much higher than the Gini coefficient of income (0.532). For this reason, the new income decomposition analysis presented in this study shows that while the variable land owned accounts for the single largest share (38 percent) of agricultural income inequality in Egypt, this variable actually accounts for a negative share (-12 percent) of nonfarm income inequality. In other words, while agricultural income is positively associated with landownership in rural Egypt, which is unevenly distributed in favor of the rich, nonfarm income is not linked with landownership and thus is more important to the poor.

Notes

[1] See Frank Ellis, "Household Strategies and Rural Livelihood Diversification," Journal of Development Studies 35 (October 1998): 1-38.

[2] John Mellor and Uma Lele, "Growth Linkages of the New Food Grain Technologies," Indian Journal of Agricultural Economics 18 (January 1972): 10-15; John Mellor, The New Economics of Growth (Ithaca, NY: Cornell University Press, 1976); and Bruce Johnston and Peter Kilby, Agriculture and Structural Transformation (New York: Oxford University Press, 1975).

[3] Alain de Janvry and Elizabeth Sadoulet, "Rural Development in Latin America: Relinking Poverty Reduction to Growth," in Including the Poor, eds. M. Lipton and J. van der Gaag (Washington, DC: World Bank, 1993).

[4] Peter Lanjouw, Ecuador's Rural Nonfarm Sector as a Route Out of Poverty, World Bank Policy Research Working Paper 1904 (Washington, DC: World Bank , 1998); Richard H. Adams, Jr., Sources of Income Inequality and Poverty in Rural Pakistan, Research Report 102 (Washington, DC: International Food Policy Research Institute, 1995); and D. L. Chinn, "Rural Poverty and the Structure of Farm Household Income in Developing Countries: Evidence from Taiwan," Economic Development and Cultural Change 27 (January 1979): 283-301.

[5]Adams, Jr..

[6]Thomas Reardon and J. E. Taylor, "Agroclimatic Shock, Income Inequality and Poverty: Evidence from Burkina Faso," World Development 24 (May 1996): 901-914; Paul Collier, Samir Radwan and Samuel Wangwe, Labour and Poverty in Rural Tanzania (Oxford: Clarendon Press, 1986); and Peter Matlon, "Income Distribution Among Farmers in Northern Nigeria: Empirical Results and Policy Implications," African Rural Economy Paper No. 18 (Lansing, MI: Michigan State University, 1979)

[7] Among the factors affecting the distribution of land in countries are: wealth accumulation (richer people will own land if land is an asset); and returns to scale (farm size will be larger if there are returns to scale).

[8] Oded Stark, J. E. Taylor and Shlomo Yitzhaki, "Remittances and Inequality," Economic Journal 96 (September 1986): 722-740, esp. p. 725.

[9] As noted by Leibbrandt et al, R_k is a form of rank correlation coefficient, because it measures the extent to which the relationship between Y_k and the rank distribution of total income coincides with the relationship between Y_k and its own rank distribution. See Murray Leibbrandt, Christopher Woolard and Ingrid

Woolard, The Contribution of Income Components to Income Inequality in South Africa: A Decomposable Gini Analysis, Living Standards Measurement Study Working Paper No. 125 (Washington, DC: World Bank, 1996), p. 4.

[10] This analysis ignores feedback effects, that is, the effects that a change in any source income share might have on distribution within any source income. Of course, such an assumption might be quite unrealistic for large changes in any source income share.

[11] This household survey was conducted by the International Food Policy Research Institute, working in collaboration with the Egyptian Ministry of Agriculture and the Egyptian Ministry of Trade and Supply.

[12] For more details on this 1997 Egypt Integrated Household Survey, see Gaurav Datt, Dean Joliffe and Manohar Sharma, "A Profile of Poverty in Egypt, 1997," draft report (Washington, DC: International Food Policy Research Institute, March 1998).

[13]According to the data, 90 percent of rural households in the survey own their own house.

[14] While in Jordan agriculture accounts for 6 percent of GDP and employs about 10 percent of the labor force, in Egypt it accounts for 17 percent of GDP and employs 38 percent of the labor force.

[15] As noted in the text, no livestock income was collected in Jordan.

[16] Only the simple correlation between transfer income and total income (0.204) is lower than that for livestock income. The simple correlations for the other source incomes are: nonfarm income, 0.362; and rental income, 0.442.

[17] It should be noted that the definition of nonfarm income used here is narrower than those used in other studies. For example, Reardon includes migration (remittances) income in nonfarm income. See Thomas Reardon, "Using Evidence of Household Income Diversification to Inform Study of the Rural Nonfarm Labor Market in Africa," World Development 25 (May 1997): 735-747.

[18]Joachim von Braun and Rajul Pandya-Lorch (eds), Income Sources of Malnourished People in Rural Areas: Microlevel Information and Policy Implications, Working Paper on Commercialization of Agriculture No. 5 (Washington, DC: International Food Policy Research Institute, 1991, Table 13). For other estimates of the share of nonfarm income in total rural income, on Africa see Reardon, ibid.; and on Latin America, see Peter Hazell and Stephen Haggblade, "Farm-Nonfarm Growth Linkages and the Welfare of the Poor," in Including the Poor, eds. M. Lipton and J. van der Gaag (Washington, DC: World Bank, 1993).

[19] For more on this point with respect to rural Pakistan, see Adams (1995).

[20]It should be noted, however, that these Ginis of per capita household income for Bolivia and Brazil are based on the distribution of overall (that is, urban and rural) incomes, while the income Ginis used in this study are based on rural household income. In theory, one would expect that the distribution of rural household income to be more egalitarian than that of overall household income. See World Bank, World Development Indicators (Washington, DC: World Bank, 1998, Table 2.8).

[21]There is an active rental market for land in rural Egypt. Thus, while 75.7 percent of the survey households own no land, in terms of land access (that is, land owned plus land rented in) a slightly smaller percentage (61.6 percent) of the survey households have no land access.

[22] For example, during the three-year period 1996-98, while wheat yields in Jordan averaged 1,170 kilograms per hectare per year, those in Egypt averaged 5,742 kilograms.

[23]In analyzing whether an income source is inequality-increasing or –decreasing, it is assumed that additional increments of that income source are distributed in the same fashion as the original units.

[24]Bent Hansen, The Egyptian Labor Market: An Overview, Development Research Department Discussion Paper N. DRD160 (Washington, DC: World Bank, 1985), p. 9.

[25] In Egypt and Jordan government and public sector employment function as a kind of "work-welfare" program by providing work (and income) for large numbers of skilled and unskilled rural inhabitants. However, it should be noted that government/public sector employment in both countries favors the educated. In Egypt, for example, the government employment scheme of the 1960s -- which promised government employment to all high school and university graduates -- has in theory been abandoned. Yet in practice, most high school and university graduates still seek and find jobs with the government.

The continuing link between education and government employment in Egypt and Jordan can be demonstrated by estimating a probit selection model, where one is the decision to work for the government/public sector, and zero is otherwise. The results of this model, which is estimated on all males over 15 years of age, appear in Appendix Table 1. For rural Egypt, there is a steady increase in the size of the positive, "completed education" coefficients moving from elementary to high school and finally to university. For rural Jordan, although the coefficients for high school are not very large, there is the same rate of increase in the size of the education coefficients between elementary and university levels. As shown in the table, most of these education coefficients are highly significant. These results suggest

that education is an important determinant of the choice to work for the government/public sector in both countries.

[26] World Bank, Country Assistance Strategy for Arab Republic of Egypt, Report No. 16533-EGT (Washington, DC: May 1997), page 8.

[27]Jonathan Morduch and Terry Sicular, "Rethinking Inequality Decomposition, With Evidence from Rural China," Development Discussion Paper No. 636 (Cambridge, MA: Harvard Institute for International Development, 1998).

[28]As Morduch and Sicular (ibid) note, one drawback of incorporating regression analysis into the decomposition is that the role of variables that are constant for all observations is not estimable.

[29] While the Gini coefficient for per capita income in this study is 0.532, the Gini coefficient of landownership (including households with no land) is 0.899.

[30]James Heckman, "Sample Selection Bias as a Specification Error," Econometria 47 (April 1979): 153-161.

[31] In the agricultural income equation, the variable mean age squared generates a larger positive income share than the land owned variable. However, the net sum of the age and the age squared variable yields a negative income share (-44.7).

[32] For an interesting effort to use cross-national data to examine the nature of the casual relationship between income and land in a sample of 28 developing countries, see Nguyen Quan, "Concentration of Income and Land Holdings: Prediction by Latent Variables Model and Partial Least Squares," Journal of Development Economics 31 (July 1989): 55-76..

[33]In rural Jordan income from nonfarm unskilled labor represents an inequality-increasing source of income. As discussed in the text, this outcome may be due to the small share of nonfarm income coming from unskilled labor.

Table 1. Summary of Rural Income Data From Egypt and Jordan, 1997

Source of income	Rural Egypt		Rural Jordan	
	Mean annual per capita household income (LE)[a]	Percent of total per capita household income from source	Mean annual per capita household income (JD)[b]	Percent of total per capita household income from source
Nonfarm	414.1 (626.1)	42.2	323.4 (3,702.6)	50.6
Agricultural	241.3 (1,161.3)	24.7	54.5 (1,799.5)	8.5
Transfer	150.9 (360.8)	15.4	174.3 (3,510.8)	27.3
Livestock	92.6 (268.7)	9.4	–	–
Rental	81.3 (311.6)	8.3	87.2 (1,926.1)	13.6
Total	980.2 (1,480.7)	100.0	639.5 (5,988.6)	100.0

Sources: Egypt: Egypt Integrated Household Survey, 1997.
Jordan: Jordan Household Income and Expenditure Survey, 1997.

Notes: Numbers in parentheses are standard deviations. Mean income figures include negative source incomes recorded for some households. N = 1,301 households (Egypt) and 1,451 households (Jordan).

(a) In 1997, 1 Egyptian pound (LE) = US$ 0.295.

(b) In 1997, 1 Jordanian dinar (JD) = US$ 1.410.

Table 2. Sources of Rural Income in Egypt and Jordan Ranked by Quintile on the Basis of Total Per Capita Household Income

(a) Rural Egypt

Total per capita income quintile[a]	Average total per capita income	Percent of total per capita income from				
		Nonfarm	Agricultural	Transfer	Livestock	Rental
	(LE)[b]					
Lowest	4.38	59.0	35.8	2.6	5.4	(-2.8)
Second	402.35	52.1	18.7	19.5	8.3	1.4
Third	615.52	51.3	19.4	16.1	10.6	2.6
Fourth	955.25	52.5	20.4	15.1	8.2	3.9
Highest	2,455.28	38.4	26.0	16.6	8.6	10.4
Total	980.83	42.2	24.7	15.4	9.4	8.3

(b) Rural Jordan

Total per capita income quintile[a]	Average total per capita income	Percent of total per capita income from				
		Nonfarm	Agricultural	Transfer	Livestock	Rental
	(JD)[c]					
Lowest	111.6	18.9	18.9	38.3	–	23.9
Second	340.8	41.1	7.4	34.7	–	16.8
Third	478.8	53.9	5.6	25.7	–	14.8
Fourth	661.0	53.2	9.5	23.9	–	13.5
Highest	1,311.7	55.6	8.6	23.9	–	11.9
Total	639.5	50.6	8.5	27.3	–	13.6

Notes:

(a) Quintile groups based on population (not households) because poorer households tend to be larger.

(b) In 1997, 1 Egyptian pound (LE) = US$ 0.295.

(c) In 1997, 1 Jordanian dinar (JD) = US$ 1.410.

Table 3. Decomposition of Overall Rural Income Inequality in Egypt and Jordan

Income source	Proportion of households receiving income source (P_K)	Share in total income (S_K)	Gini coefficient for income source[(a)] (G_K)	Gini correlation with total income rankings (R_K)	Contribution of income source to overall income inequality ($S_K G_K R_K$)	Relative concentration coefficient of income source $\left(g = R_x \frac{G_x}{G}\right)$	Percentage contribution to overall income inequality
(a) Rural Egypt							
Nonfarm	0.607	0.422	0.634	0.590	0.158	0.703	29.7
Agricultural	0.669	0.246	1.155	0.750	0.214	1.628	40.2
Transfer	0.509	0.154	0.848	0.488	0.064	0.778	12.0
Livestock	0.695	0.094	0.935	0.376	0.034	0.661	6.4
Rental	0.317	0.083	0.924	0.805	0.062	1.398	11.7
Total	–	1.000	–	–	0.532	–	100.0
(b) Rural Jordan							
Nonfarm	0.685	0.506	0.567	0.760	0.218	1.046	53.5
Agricultural	0.176	0.085	0.919	0.439	0.034	0.979	8.3
Transfer	0.913	0.273	0.726	0.560	0.111	0.987	27.2
Livestock	–	–	–	–	–	–	–
Rental	0.848	0.136	0.535	0.625	0.045	0.812	11.0
Total	–	1.000	–	–	0.408	–	100.0

Notes: All estimates are based on annual per capita household income.

(a) Source ginis (G_K) are high because they include households with zero and negative incomes from different income sources. Source ginis can exceed unity if many of y_i are negative.

Table 4. Sources of Nonfarm Income in Egypt and Jordan Ranked by Quintile on the Basis of Total Per Capita Household Income

(a) Rural Egypt

Total per capita income quintile[a]	Average per capita nonfarm income (LE)[b]	Percent of per capita nonfarm income from: Government employment	Private sector	Unskilled labor	Self-employment	Other
Lowest	95.64	43.0	17.1	23.6	16.2	–
Second	211.34	38.9	14.7	36.5	9.9	–
Third	313.86	53.7	14.7	19.1	12.4	–
Fourth	500.20	51.3	12.4	20.3	16.0	–
Highest	808.56	42.2	12.5	20.0	25.3	–
Total	414.09	45.9	13.2	21.7	19.3	–

(b) Rural Jordan

Total per capita income quintile[a]	Average per capita nonfarm income (JD)[c]	Percent of per capita nonfarm income from: Government employment	Private sector	Unskilled labor	Self-employment	Other
Lowest	26.42	60.1	26.8	13.1	–	0.0
Second	141.64	72.9	18.3	8.8	–	0.0
Third	257.73	81.8	11.7	6.4	–	0.0
Fourth	349.51	80.7	14.7	4.4	–	0.3
Highest	682.03	68.8	21.3	8.3	–	1.6
Total	323.42	73.5	18.3	7.3	–	0.9

Notes:

(a) Quintile groups based on population (not households) because poorer households tend to be larger.
(b) In 1997, 1 Egyptian pound (LE) = US$ 0.295.
(c) In 1997, 1 Jordanian dinar (JD) = US$ 1.410.

Table 5. Decomposition of Nonfarm Income Inequality in Egypt and Jordan

Income source	Proportion of households receiving income source (P_K)	Share in nonfarm income (S_K)	Gini coefficient for income source[a] (G_K)	Gini correlation with total income rankings (R_K)	Contribution of income source to overall income inequality ($S_K G_K R_K$)	Relative concentration coefficient of income source $\left(\varepsilon = R_x \frac{G_x}{G}\right)$	Percentage contribution to nonfarm income inequality
(a) Rural Egypt							
Government employment	0.550	0.488	0.641	0.435	0.136	0.704	41.6
Private sector	0.147	0.123	0.908	0.369	0.041	0.846	12.6
Unskilled labor	0.324	0.235	0.839	0.367	0.072	0.777	22.0
Self-employment	0.209	0.155	0.897	0.562	0.078	1.273	23.8
Other	–	–	–	–	–	–	–
Total	–	1.000	–	–	–	–	100.0
(b) Rural Jordan							
Government employment	0.526	0.735	0.658	0.625	0.302	0.718	69.7
Private sector	0.145	0.183	0.919	0.528	0.089	0.848	20.6
Unskilled labor	0.079	0.073	0.965	0.477	0.034	0.804	7.8
Self-employment	–	–	–	–	–	–	–
Other	0.006	0.009	0.999	0.898	0.008	1.568	1.9
Total	–	1.000	–	–	–	–	100.0

Notes: All estimates are based on annual per capita household income.

(a) Source ginis (G_K) are high because they include households with zero and negative incomes from different income sources. Source ginis can exceed unity if many of y_i are negative.

Table 6. Means and Standard Deviations for Determinants of Rural Income Regression in Egypt

Variable	
Amount of land owned by household (feddans)[a]	0.43 (1.68)
Amount of land rented in by household (feddans)[a]	0.19 (0.71)
Household size	6.70 (3.54)
Mean age of all household members	26.39 (11.74)
Mean age of all members squared	842.56 (928.38)
Number of household males over 15 years	1.87 (1.32)
Mean education of household males over 15 years	5.56 (4.72)
Mean education of household males squared	54.58 (68.17)
Value of farm equipment owned (LE)[b]	527.66 (3738.95)
Value of enterprises[c] owned (LE)[b]	1058.18 (6624.03)

Notes: N = 1301 households. Standard deviations in parentheses. Governorate-level dummy variables are not reported.

(a) 1 feddan = 1.038 acres

(b) In 1997, 1 Egyptian pound (LE) = US$0.295.

(c) Enterprises include shops, stores, pharmacies and other business activities.

Table 7. Tobit Analysis of Determinants of Rural Income in Egypt

Variable	Annual Per Capita Household Income From: Non-Farm	Agricultural	Transfer	Livestock	Rental
Land					
Amount of land owned by household	-46.104 (-2.778)**	171.802 (5.761)**	3.572 (0.323)	18.021 (2.644)**	82.622 (2.354)**
Amount of land rented in by household	-148.908 (-3.124)**	-367.564 (-4.176)**	-62.105 (-1.934)	66.099 (4.328)**	61.333 (2.354)*
Labor					
Household size	-32.311 (-2.819)**	24.372 (1.078)	0.698 (0.079)	2.743 (0.519)	16.669 (1.730)
Mean age of all household members	42.572 (4.145)**	-18.454 (-0.980)	22.539 (3.400)**	0.577 (0.130)	2.584 (0.319)
Mean age of all members squared	-0.691 (-4.968)**	0.451 (1.966)*	-0.083 (-1.042)	-0.006 (-0.118)	0.144 (1.502)
Number of household males over 15 years	65.319 (2.188)*	91.615 (1.518)	-69.169 (-2.933)**	8.910 (0.626)	13.718 (0.534)
Capital					
Mean education of household males over 15 years	21.019 (1.237)	11.225 (0.322)	-28.622 (-2.210)*	-5.474 (-0.670)	-15.169 (-1.005)
Mean education of household males squared	2.122 (1.894)	-2.850 (-1.192)	1.819 (2.094)*	0.409 (0.743)	1.165 (1.151)
Value of farm equipment owned	0.008 (1.235)	-0.003 (-0.234)	-0.003 (-0.548)	0.008** (2.768)	0.004 (0.881)
Value of enterprises owned	0.020 (5.966)**	-0.005 (-0.746)	-0.006 (-1.374)	0.001 (0.052)	0.004 (1.411)
Sigma	832.5	1615.3	574.9	381.9	610.7
Constant	-276.325 (-1.314).	-1093.366 (-2.465)*	-777.171 (-4.580)**	-347.700 (-3.177)**	-1042.868 (-4.991)**
Log likelihood	-6841.5	-6573.9	-4812.7	-5611.1	-3575.3

Notes: N = 1301 households.
Numbers in parentheses are T-statistics (two-tailed).
Governorate-level dummy variables are not reported. The dependent variable is annual per capita household income from the particular income source.

* Significant at the .05 level.
** Significant at the .01 level.

Table 8. Marginal Effects of Tobit Regression on Determinants of Rural Income in Egypt

Variable	Marginal Effects From Income Equation Based On: Non-Farm	Agricultural	Transfer	Livestock	Rental
Land					
Amount of land owned by household	-26.186**	68.388**	1.358	7.913**	20.773**
Amount of land rented in by household	-84.577**	-146.313**	-23.624	29.023**	15.421**
Labor					
Household size	-18.352**	9.702	0.265	1.204	4.191
Mean age of all household members	24.180**	-7.345	8.573**	0.253	0.649
Mean age of all members squared	-0.393**	0.179*	-0.031	-0.002	0.036
Number of household males over 15 years	37.100*	36.468	-26.311**	3.912	3.449
Capital					
Mean education of household males over 15 years	11.939	4.468	-10.887*	-2.403	-3.814
Mean education of household males squared	1.205	-1.134	0.692*	0.179	0.293
Value of farm equipment	-0.004	-0.001	-0.001	0.003**	0.001
Value of enterprises owned	0.011**	-0.002	-0.002	0.001	0.001

Notes: Marginal effects calculated from tobit results in Table 7; effects of governorate-level dummy variables are not reported.

* Coefficient in income equation significant at .05 level.
** Coefficient in income equation significant at .01 level.

Table 9. Distribution of Income Flows From Independent Variables in Non-Farm and Agricultural Income Equations in Egypt

Variable	Income Share From:		Income Shares to Quintile Group:					Ratio of Top Quintile to Bottom Quintile
	Non-Farm Income Equation	Agricultural Income Equation	Lowest	Second	Third	Fourth	Fifth	
Land								
Amount of land owned by household	-4.7**	30.5**	10.0	10.0	15.0	20.0	45.0	4.5
Amount of land rented in by household	-6.8**	-29.1**	55.5	11.1	22.2	–	11.1	0.2
Labor								
Household size	-52.3**	67.6	22.3	21.5	20.8	18.8	16.5	0.7
Mean age of all household members	271.2**	-201.8	18.4	18.5	18.9	20.3	23.8	1.3
Mean age of all members squared	-140.4**	157.1*	16.4	17.0	17.9	20.1	28.6	1.7
Number of household males over 15 years	29.5*	71.0	20.2	20.2	20.2	19.1	20.2	1.0
Capital								
Mean education of household males over 15 years	28.2	25.8	15.7	17.9	20.1	22.3	23.8	1.5
Mean education of household males squared	27.9	-64.5	16.4	17.0	17.9	20.1	28.6	1.7
Value of farm equipment	1.3	-2.1	9.8	20.8	18.4	11.7	39.2	4.0
Value of enterprises owned	5.1*	-4.4	10.6	7.6	13.5	19.8	48.5	4.6

Notes: Income shares calculated from tobit results in Table 7; income shares of governorate-level dummy variables are not reported.

* Coefficient in income equation significant at .05 level.
** Coefficient in income equation significant at .01 level.

Table 10. Decomposition of Inequality Indices for Non-Farm and Agricultural Income in Egypt

Variable	Non-Farm Income	Agricultural Income
Land		
Amount of land owned by household	-12.102**	38.503**
Amount of land rented in by household	-0.654**	-8.108**
Labor		
Household size	-0.694**	3.150
Mean age of all household members	0.728*	-0.442
Mean age of all members squared	6.025*	1.462*
Number of household males over 15 years	0.050*	3.200
Capital		
Mean education of household males over 15 years	12.110	20.054
Mean education of household males squared	-6.355	-17.014
Value of farm equipment	10.070	13.100
Value of enterprises owned	8.220*	-12.420
Governorates	36.901	25.705
Constant	0.000	0.000
Regression Residual	45.701	32.810
Total	100.000	100.000

Notes:

* Significant at .05 level.

** Significant at .01 level.

Appendix Table 1. Estimation of Probit Selection Model for Egypt and Jordan (Males 15 Years and Older)

Variable	Private vs. Government Employment (Private Sector = 0, Government/Public Sector = 1)	
	Rural Egypt	Rural Jordan
Personal		
Age	0.283	0.071
	(10.497)**	(4.648)**
Age squared	-0.304	-0.001
	(-9.859)**	(-6.397)**
Head of HH (1 if yes)	-0.153	-0.067
	(-1.241)	(-0.540)
Currently married	0.315	0.741
(1 if yes)	(2.459)*	(6.560)**
Completed Education (excluded category is none/illiterate)		
Read, write	0.342	0.186
	(2.934)**	(1.470)
Elementary	0.869	0.674
	(6.694)**	(5.738)**
Preparatory	1.185	0.708
	(6.888)**	(6.340)**
High school (general)	1.347	0.546
	(3.419)**	(4.540)**
High school (technical)	1.373	0.575
	(11.832)**	(1.361)
Higher institute	2.230	0.756
	(9.124)**	(5.187)**
University	1.582	1.271
	(9.530)**	(7.848)**
Higher studies	2.050	0.837
	(5.276)**	(1.856)
Household		
Household size	-0.049	0.001
	(-3.658)**	(0.088)
Number of household	0.061	-0.048
males over 15 years	(1.641)	(-1.903)
Constant	-7.166	-2.165
	(-13.689)**	(-8.003)**
Log likelihood	-725.2	-1419.9
N	1762	2601

Notes: Model is estimated on all males 15 years and older. T-ratios are in parentheses.

** Significant at the 0.01 level.
* Significant at the 0.05 level.

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