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# WEIGHING WHAT'S PRACTICAL: PROXY MEANS TESTS FOR TARGETING FOOD SUBSIDIES IN EGYPT

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## ABSTRACT

Despite achieving a significant cost reduction over the past two decades, the absolute cost of food subsidies in Egypt is still high relative to the benefits received by the poor. There is scope for better targeting food subsidies, in particular those for rationed cooking oil and sugar, both because reforms in this area are perceived to be far less politically sensitive than adjusting subsidy policies for bread and wheat flour and because higher income groups presently receive a significant percentage of the benefits. Targeting the high-subsidy green ration cards to the poor and the low-subsidy red ration cards to the nonpoor will require identification of both poor and nonpoor households. An International Food Policy Research Institute (IFPRI) research team in Egypt, in collaboration with the Egyptian Ministry of Trade and Supply, developed a proxy means test for targeting ration cards. This paper describes the process of moving from the optimal income-predicting model to the final model that was both administratively and politically feasible. An ex-ante evaluation of the levels of accuracy of the proxy means testing model indicates that the model performs quite well in predicting the needy and nonneedy households. An effective and full implementation of this targeting method would increase the equity in the ration card food subsidy system and, at the same time, lower the total budgetary costs of rationed food subsidies. Moreover, the experience gained under this reform would facilitate targeting future social interventions to reduce and prevent poverty in Egypt.

## CONTENTS



## TABLES

## APPENDIX TABLES

## ACKNOWLEDGMENTS

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# 1. INTRODUCTION

This study is an outcome of policy research on food subsidies in Egypt, conducted by the International Food Policy Research Institute (IFPRI) in collaboration with Egypt's Ministry of Agriculture and Land Reclamation (MALR) and the Ministry of Trade and Supply (MOTS) from 1996 to 1999. IFPRI's policy research has been conducted under the Food Security Research (FSR) unit of Egypt's Agricultural Policy Reform Program (APRP). One of the primary objectives of the research was to identify policy options for a targeted food subsidy system to protect the food security of the poor in a cost-effective manner.

Since the mid-1980s, the Government of Egypt has used a variety of strategies to gradually reduce food subsidy costs. These strategies have included increasing the price of subsidized food commodities; reducing the number of ration cardholders; and reducing both the number and quantity of subsidized food items available to consumers. As a result, the explicit cost of the food subsidy system has declined appreciably in real terms. As a share of total government expenditures, it has fallen from about14 percent in 1980/81 to 5.6 percent in 1996/97. At present, the food subsidy system includes only four foods: *baladi* bread, wheat flour, sugar, and cooking oil. Subsidized *baladi* bread and wheat flour are available to all consumers without restrictions, while a monthly quota of sugar and cooking oil is available at subsidized prices to those with ration cards. The MOTS is responsible for administering and monitoring the food subsidy system through its nationwide administrative network. IFPRI-FSR research (Ahmed et al. 2001; Ahmed, Bouis, and Ali 1999) suggests that, while the current system of food subsidies has

generally been effective as a social safety net to help protect the poor during economic restructuring, it is weak in four areas.

- The absolute cost of the present food subsidy system is still high relative to the benefits received by the poor. The total cost of Egypt's food subsidy system in 1996/1997 prices was 3.74 billion Egyptian pounds (LE), or about $1.1 billion,[1] of which *baladi* bread accounted for 62 percent; wheat flour, 15 percent; sugar, 13 percent; and oil, 10 percent.
- The current system is not well targeted to the poor: almost 60 percent of benefits go to higher income households constituting the top 60 percent of the population in the income distribution.
- A significant number of the poor has limited access to subsidy benefits.
- Considerable portions of the benefits are misappropriated in the distribution system. In 1997, leakage in the Egyptian food subsidy system accounted for about 16 percent of the total cost of food subsidies.[2]
- Through a combination of poor targeting and systemic leakage, only about one-third of the food subsidy costs incurred by the government goes to the poorest 40 percent of the population.

[1] The exchange rate in 1997 was LE 3.40 to US$1.

[2] Leakage is defined as the amount of subsidized food that disappears at the wholesale level without reaching the intended consumer. The difference between government supply of subsidized foods and purchases by consumers measures the extent of leakage. For details on the estimation method and data, see Ahmed et al. 2001.

There is scope for better targeting the food subsidy system in ways that reduce benefits to the nonneedy (thereby cutting costs) while protecting the poor. In particular, there is scope for reforming the rationed oil and sugar subsidies, because changes in this area are perceived to be far less politically sensitive than adjusting the subsidy policy for *baladi* bread and flour (Gutner, Gomaa, and Nasser 1999). The *baladi* bread subsidy is a relatively effective means of protecting the poor, particularly the urban poor, from shocks that may arise from Egypt's ongoing economic reform process. Targeting bread subsidies, although technically and administratively feasible, is not a priority of the Egyptian government as the political cost may be too high (Ahmed et al. 2001).

## 2. THE RATION CARD SUBSIDY SYSTEM

About three-fourths of the Egyptian population hold ration cards that guarantee a monthly quota of sugar and cooking oil at subsidized prices. In 1997, the total cost of these ration card subsidies was LE 874 million. In that year, 590,000 metric tons of subsidized sugar and 220,000 metric tons of subsidized oil were supplied to outlets. Consumers holding ration cards buy subsidized sugar and oil at outlets *(tamweens)* located in private groceries that also sell nonsubsidized consumer goods. The *tamweens* register with the MOTS to receive rations from government wholesale companies it operates. Ration cardholders register their cards with the grocer of their choice. The grocer records monthly purchases of sugar and oil on the card, which has space for recording purchases over a full decade.

The cardholder must report changes in family size and deaths and migration of members to local offices run by MOTS. However, in 1989, MOTS stopped registering newborn children for the ration system.

There are two categories of ration cards for sugar and cooking oil, a green card and a red card. The green card, originally a ration (not subsidy) card from World War II, now has a high rate of subsidy for low-income families. The red card, initiated in 1981, has a low rate of subsidy intended for people with higher incomes. Table 1 shows the distribution of green and red ration cards, and the population covered under the ration card system in 1999.

The monthly quota for subsidized cooking oil varies between regions. In metropolitan Cairo, Alexandria, coastal cities, and the frontier governorates,[3] the per capita monthly quota is 500 grams, while it is 300 grams in all other parts of the country. Oil is sold for LE 1.00 per kilogram to green cardholders, while red cardholders pay LE 1.25. The private price for cooking oil of similar quality was about LE 3.50 in 1997.

**Table 1—Distribution of ration cards, 1999**

| Type of ration cards | Number of ration cards | Number of beneficiaries |
|---|---|---|
| | (in '000s) | |
| Green ration cards | 8,452 | 36,447 |
| Red ration cards | 1,610 | 6,834 |
| Total | 10,062 | 43,281 |

**Source: Ministry of Trade and Supply (unpublished data).**

[3] Egypt is divided into 26 provincial governments called governorates.

For sugar, the monthly quota per capita is 1 kilogram, which is uniform throughout the country. Sugar is LE 0.50 per kilogram for green cardholders and LE 0.75 for red cardholders. The private market price for sugar of similar quality was about LE 1.60 in 1997.

## 3. POLICY ISSUES

The current ration card system is very loosely targeted, in the sense of providing subsidies to the poor. A majority of wealthy Egyptians carry the high-subsidy green ration cards rather than the low-subsidy red cards, while some of the poorest Egyptians hold red cards or no cards.

The data in Table 2, derived from IFPRI's 1997 Egypt Integrated Household Survey (EIHS), highlight ways in which the ration card system is poorly targeted. First, while it is generally assumed that households without ration cards are richer, 11 percent of households in the poorest quintile and 16 percent in the second poorest quintile do not hold ration cards. Second, 11 percent of households in the poorest quintile and 9 percent of households in the richest quintile hold red ration cards, which are in principle intended for those with higher incomes. Red ration cards are distributed more or less evenly across all income groups. In fact, 61 percent of households that hold green ration cards, which are intended for the poor, belong to the three richest expenditure quintiles. There is clearly room to improve equity by reducing benefits to the nonpoor while expanding coverage to better protect the poor. At present, the Egyptian government is prepared to reform the oil and sugar subsidies.

**Table 2—Households holding ration cards in Egypt, by expenditure quintile**

| | Per capita expenditure quintile | | | | | |
|---|---|---|---|---|---|---|
| | Lowest (1) | (2) | (3) | (4) | Highest (5) | Total |
| | (percent of all survey households) | | | | | |
| Green card | 78.0 | 74.3 | 78.0 | 70.8 | 63.5 | 72.3 |
| Red card | 11.0 | 9.5 | 10.8 | 12.4 | 9.3 | 10.6 |
| No card | 11.0 | 16.2 | 11.2 | 16.8 | 27.2 | 17.1 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| | (percent of ration-cardholding households) | | | | | |
| Green card | 18.8 | 19.8 | 20.0 | 20.4 | 21.0 | 100.0 |
| Red card | 18.3 | 17.4 | 18.9 | 24.5 | 20.9 | 100.0 |

**Source: IFPRI Food Security Research Project in Egypt, "Egypt Integrated Household Survey, 1997."**
Note: The green ration cards provide a higher rate of subsidy to consumers than do the red ration cards.

A policy reform might seek to transfer nonpoor consumers from the high-subsidy green card to the low-subsidy red card and poor consumers from the low-subsidy red card to the high-subsidy green card. Simultaneously, the policy would also bring the poor who currently do not hold any ration card into the green card system. This demonstration of the government's desire to provide a ration-card safety net to the poor who have slipped through the system should enhance the political feasibility of the reform. Moreover, conversion of red cards to green cards for poor families would reflect government efforts to provide a higher level of food subsidy benefits to the poor, which should mitigate public criticism that the reform is aimed mainly at reducing overall subsidy costs by transferring people from green to red cards.

## 4. IDENTIFYING THE POOR

Targeting the green ration cards to the poor and the red ration cards to the nonpoor will require identification of both poor and nonpoor households. In any administrative targeting effort, however, the major challenge facing policymakers is how to create a system to identify these households accurately and cost effectively.

The per capita income of a household can be considered as a measure of its welfare. The MOTS has a standard application form for ration cards that records self-reported incomes of household members. The MOTS also administers this form (every three years) to the existing ration cardholders for "cleaning" the ration card system, i.e., removing the names of the deceased and out-migrants and converting green cards to red cards for wealthy households.

The ration cardholders, however, have an incentive to understate their incomes to qualify for full subsidy benefits. Verifying income is difficult in Egypt because of the difficulty of documenting level and sources of income of household members. Because measurement of household income or expenditure requires expensive and time-consuming surveys, such measures of welfare are rarely used in developing countries to determine eligibility or benefit levels.

An alternative method to measure household welfare is to administer a "proxy means test." Instead of asking about income directly, this approach relies on indicators that are highly correlated with household income (or total consumption expenditure), yet are easy to collect, observe, and verify. Points can be assigned to selected indicators, and eligibility for program benefits can be determined on the basis of a total score, as a proxy

for household income (Grosh and Glinskaya 1997). A comparative study of 30 targeted social programs in Latin America reveals that, among all targeting methods, the proxy means tests used in Chile resulted in the highest targeting rate to the poor (Grosh 1994).

## 5. DEVELOPING THE PROXY MEANS TESTS: TECHNICAL VERSUS POLITICAL AND ADMINISTRATIVE CONSIDERATIONS

### THE TASK FORCE

MOTS requested that IFPRI-FSR develop a scientific yet simple-to-administer method of targeting the green ration cards to the poor and the red ration cards to the nonpoor. The proxy means testing method of targeting was chosen.

IFPRI experience in developing targeted food interventions in Bangladesh suggests that it is essential for the researchers to work closely with the officials of the implementing agency in the design stage for successful implementation of a proxy means test (Ahmed and Bouis 1998; WGTFI 1994). Therefore, IFPRI-FSR initiated the formation of a Task Force for Food Security, comprised of 12 high-level officials of the MOTS, project officers of the U.S. Agency for International Development (USAID), and IFPRI-FSR's Cairo-based research staff. MOTS approved the Task Force and its members in November 1998.

The Task Force, meeting twice a month from November 1998 to March 1999, and then once every week from April to September 1999, was instrumental in developing the proxy means tests. The IFPRI-FSR team presented their progress in these meetings and the Task Force members provided feedback.

## DATA SOURCE

The proxy means test model was developed using the data set from the Egypt Integrated Household Survey (EIHS) undertaken by IFPRI-FSR in collaboration with the Ministries of Agriculture and Land Reclamation, and Trade and Supply in 1997. The EIHS was a nationally representative survey that included urban and rural households. The survey sampled 2,500 households from 20 (out of a total 26) governorates using a two-stage, stratified selection process. The population of these governorates is about 98 percent of Egypt's total population.

The EIHS collected information on a wide variety of topics, including income, expenditures, food consumption, nutrition and health status, education, employment, credit and savings, remittances and transfers, migration, farming, and the use of the food subsidy system by households.[4]

## PREDICTING HOUSEHOLD WELFARE

Which variables best measure household welfare and what weight should be assigned to selected indicators for calculating household scores in implementing the proxy means test?

- Although income data are available in the 1997 EIHS, per capita consumption expenditure was chosen as the most reliable measure of household welfare for two reasons. First, consumption expenditures are likely to reflect permanent income

[4] For more information on the 1997 EIHS, see Datt, Jolliffe, and Sharma (1998).

and are, therefore, a better indicator of consumption behavior. Second, data on consumption expenditure are generally more reliable and stable than income data.

- Ordinary least-squares (OLS) regression, with standard errors that were corrected for the two-stage, stratified sample design,[5] was used to predict per capita household consumption, which, in effect, assigns weights to the individual indicators.[6]
- In selecting the proxy means test indicators, explanatory variables were selected that were statistically significant in "explaining" per capita household consumption. These variables are easy to record and verify by the MOTS field staff and are politically acceptable.
- The weights of the indicators are given by the values of the coefficients of the selected explanatory variables.

## INDICATOR SELECTION PROCESS

For predicting household welfare using per capita expenditure, we selected a large number of variables from the EIHS data set that we expected to be correlated with per capita household consumption. These variables can be broadly classified into seven categories: household demographic makeup, education, utility use, dwelling

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[5] The regression equations have been estimated using the *"svyreg"* command of the Stata statistical software.

[6] One problem with using an OLS regression model is that some of the explanatory variables to be used on the right-hand side of the regression equation may be "endogenous," i.e., some may not be independent of household consumption used in the left-hand side of the regression equation. This is sometimes referred to as simultaneity bias. Nevertheless, the use of OLS regression for proxy means tests is justified, because the purpose is to identify the poor rather than to explain why they are poor.

characteristics, ownership of assets, occupation, and location variables. Appendix Table 9 describes these variables and gives their average, minimum, and maximum values.

Initially, we estimated two regression models to predict household welfare. Appendix Table 10 presents the results of the first model where the dependent variable is monthly per capita consumption. Out of 56 explanatory variables, 31 are statistically significant determinants of household consumption. Household size, education, use of electricity and telephone, number of rooms, ownership of assets, and location of residence by governorate were important in explaining changes in per capita consumption, while the dwelling characteristics and occupation (except agriculture) were not statistically significant. The model explains 58 percent of variation in per capita consumption in the sample (i.e., its R-squared is 0.58).

In the second model, a semi-log functional form is used (taking the natural logarithm of per capita expenditure as the dependent variable), and most of the statistically insignificant variables are dropped. The R-squared of the model is 0.63. We consider this model to be technically optimal for predicting household consumption from the EIHS dataset. The results are presented in Appendix Table 11.

Despite the fact that the semi-log, optimal model fits the data better than the first model, the Task Force recommended against use of the logarithmic transformation of the dependent variable in order to simplify calculation of household scores (taking anti-log of the sum of scores) by MOTS field staff.

The model was revised many times, and various iterations were presented to the Task Force. Task Force members evaluated the results from a practical perspective and

suggested retention of those independent variables that could realistically be used for proxy means testing. We thus dropped a number of statistically significant variables that would require calculations by field staff (e.g., the dependency ratio, rooms per capita, squared household size, etc.), would require judgment of field staff to define (such as female-headed household, urban or rural location of residence), and would require more resources to gather (e.g., asset variables) and hence could increase calculation errors.

Eventually, a model was developed that included nine household-level variables (household size, education, electricity and telephone bills, and ownership of some assets) as well as 19 location dummy variables to control for the governorate-level fixed effects. All variables had statistically significant coefficients. This model was presented at a training program conducted by the IFPRI-FSR team for a large group of MOTS trainees coming from all 26 governorates (the training program is described later in the report).

The trainees were concerned that the governorate-specific targeting of ration card benefits, as the model implies, might lead to political discontent, as there would be differences in the allocation of average per capita benefits among the governorates. To avoid such risks, the Task Force concluded that governorate dummy variables should be excluded from the model.

## THE FINAL MODEL

The description of the nine indicator variables, and their average, minimum and maximum values are presented in Table 3. Table 4 provides the results of the final estimated regression model with monthly per capita consumption as the dependent

**Table 3—Description of the explanatory variables used in the regression model for proxy means tests**

| Variable name | Variable description | Average | Minimum | Maximum |
|---|---|---|---|---|
| hhsize | Household size (number of household members) | 5.91 | 1 | 28 |
| Eduemp | Highest number of years of schooling of any employed household member | 7.32 | 0 | 16 |
| Pvtsch | Dummy: 1 if a child goes to private school, 0 otherwise | 0.04 | 0 | 1 |
| noedu1 5 | Dummy: 1 if any household member aged above 15 years never attended school, 0 otherwise | 0.64 | 0 | 1 |
| Elecbil | Monthly electricity bill in LE | 11.76 | 0 | 90 |
| Phonebil | Monthly telephone bill in LE | 3.53 | 0 | 150 |
| Npvtoilt | Dummy: 1 if the household has no private toilet, 0 otherwise | 0.15 | 0 | 1 |
| car_veh | Dummy: I if the household owns a motor vehicle, 0 otherwise | 0.04 | 0 | 1 |
| Norefrig | Dummy: 1 if the household has no refrigerator, 0 otherwise | 0.40 | 0 | 1 |

Notes: Number of observations = 2,203 for all variables.

**Table 4—Results of the final regression model for proxy means tests**

| Variable name | Variable description | Coefficient | t-Statistic |
|---|---|---|---|
| Hhsize | Household size (number of household members) | -10.364 | -12.61** |
| Eduemp | Highest number of years of schooling of any employed household member | 1.240 | 3.12** |
| Pvtsch | Dummy: 1 if a child goes to private school, 0 otherwise | 52.210 | 4.24** |
| noedu1 5 | Dummy: 1 if any household member aged above 15 years never attended school, 0 otherwise | -22.756 | -4.78** |
| Elecbil | Monthly electricity bill in LE | 1.934 | 8.12** |
| Phonebil | Monthly telephone bill in LE | 1.486 | 4.01** |
| Npvtoilt | Dummy: 1 if the household has no private toilet, 0 otherwise | -19.451 | -3.81** |
| car_veh | Dummy: I if the household owns a motor vehicle, 0 otherwise | 87.676 | 5.95** |
| Norefrig | Dummy: 1 if the household has no refrigerator, 0 otherwise | -33.674 | -8.02** |
| Intercept | | 208.460 | 27.55** |

F-statistic = 79.80**
$R^2$ = 0.43
Number of observations = 2,203

Notes: Dependent variable is per capita household consumption expenditure per month in LE.
** Significant at the 1% level.

variable.[7] All nine independent variables are statistically significant at the 1 percent level. The R-squared is 0.43. A comparison of the regression models used for proxy means testing in other countries indicates that the model performs quite well in predicting household welfare. Grosh and Glinskaya (1997) achieved an R-squared of around 0.2 in Armenia, while Grosh and Baker (1995) achieved an R-squared of 0.3 to 0.4 in Latin American countries.

Table 5 presents statistics for the nine explanatory variables used in the final model for the lowest 20 percent and the highest 20 percent of households in the income

**Table 5—Statistics of the final set of indicators for the lowest and the highest income Egyptian households**

| | Per capita expenditure quintile | |
|---|---|---|
| **Indicators** | **Quintile 1 (lowest 20%)** | **Quintile 5 (highest 20%)** |
| Household size (people) | 8.0 | 4.3 |
| Highest schooling of any employed household member (years) | 4.8 | 10.5 |
| Children go to private school (%) | ne | 10.9 |
| Any household member aged above 15 years never attended school (%) | 91.3 | 31.5 |
| Monthly electricity bill (LE) | 7.3 | 17.8 |
| Monthly telephone bill (LE) | ne | 11.8 |
| No private toilet (%) | 29.6 | 0 |
| Owns a motor vehicle (%) | ne | 15.7 |
| Has no refrigerator (%) | 79.8 | 9.8 |

**Source: IFPRI Food Security Research Project in Egypt, Egypt Integrated Household Survey, 1997.**

Notes: ne = negligible.

[7] Consumption per adult equivalent would be a more appropriate measure of household welfare than consumption per capita, because the former takes into account the age and sex composition of household members. However, using per adult equivalent consumption as dependent variable would require the household size' variable on the right-hand side of the regression model to be expressed in adult equivalent household size for consistency. This may not be practical, because the MOTS field staff would then have to convert household size into adult equivalent household size to calculate household scores, which would involve a rather complicated and lengthy calculation. For practical reasons, therefore, we used per capita consumption as the dependent variable.

distribution. A brief discussion of the set of indicators produced by our final model for the proxy means tests is provided here.

- **Household size** has a strong negative effect on consumption. Poorer households tend to be larger. The average household size declines from 8 people for the poorest 20 percent of the households to 4.3 people for the richest 20 percent. This pattern is consistent with similar evidence from other developing countries. For proxy means tests, household size can be verified from the "family identification card" of the household head, which registers the names of household members, their gender, and dates of birth. It is mandatory for every Egyptian family to have the "family identification card," as well as the "personal identification card" for every adult Egyptian citizen.
- **Education** plays a key role in alleviating poverty in Egypt (Datt and Jolliffe 1999; Haddad and Ahmed 1999; Datt, Jolliffe, and Sharma 1998). Three education-related variables were included in the model: (1) highest level of education obtained by any working family member (which has a strongly positive effect on household welfare); (2) whether the household sends a child to private school (which reflects the demand for high-quality education by rich families); and (3) whether any household member aged above 15 years never attended school (which captures the negative relationship between illiteracy and household welfare). Even in the richest quintile, a large percentage of households (31.5)

have at least one member aged above 15 years who never attended school (usually an elderly female, such as grandmother or wife of the household head).

- **Monthly electricity and telephone bills** can be verified from bill stubs. The monthly electricity bill is an excellent composite indicator of the level of household welfare as it reflects the ownership and use of electrical appliances.
- **No private toilet** is more common among poor city dwellers and is a good indicator for identifying very poor households.
- **Ownership of assets**. As expected, ownership of a motorized vehicle (car or truck) is strongly and positively related to household welfare. A household tends to be poor if it does not own a refrigerator, which is reflected by the significant and negative relationship of this variable with per capita consumption.

## 6. ASSESSING THE PREDICTION PERFORMANCE OF THE MODEL

How well does the model predict the poor and the nonpoor? Since prediction by any model is never exact, we expect that some poor will be incorrectly identified as nonpoor and that some nonpoor will be incorrectly identified as poor. The first type of misidentification is an "error of exclusion"; the second, an "error of inclusion." Any action to decrease the first type of error will normally increase the second type of error, and vice versa (Grosh 1994).

The population living below a poverty line is classified as poor. However, recent head-count poverty measures of absolute poverty in Egypt have varied widely. For

example, the 1996 Egypt Human Development Report, prepared by the Institute of National Planning (INP), provides poverty measures based on the 1995/96 Household Income and Expenditure Survey, conducted by the Central Agency for Public Mobilization and Statistics (CAPMAS). The INP poverty estimate yields a national-level head-count index of 22.9 percent (INP 1996). Based on the same data set, Cardiff (1997) finds that 44.5 percent of the Egyptian population is below the poverty line in 1995/96. The IFPRI-FSR project completed a poverty profile for Egypt based on the 1997 EIHS data. Reference poverty lines are estimated following the cost-of-basic-needs approach, which takes into account regional differences in food and nonfood prices, age and composition of households, and food and nonfood consumption preferences. The head-count index of the IFPRI study suggests that 26.5 percent of the population of Egypt were poor in 1997 (Datt, Jolliffe, and Sharma 1998).

For evaluating the performance of the proxy means test model, the Task Force suggested the use of the IFPRI estimate of poverty head-count for consistency, as the model and the poverty head-count estimate are both based on the same data. However, the Task Force advised that we add 10 percent of the population to the head-count estimate of 26.5 percent to define the needy, because households just above the poverty line may also be deserving of higher-subsidy green ration cards. Therefore, we considered 36.5 percent of the population as needy and 63.5 percent as nonneedy.

Table 6 provides the results of an ex-ante evaluation of the levels of accuracy of the model for predicting the needy and the nonneedy. We ranked the actual per capita consumption of sample households (as measured from the EIHS data) in descending

**Table 6—Assessing the levels of accuracy of the proxy means test model in predicting the needy and the nonneedy**

| | Predicated as needy by the model | Predicted as nonneedy by the model |
|---|---|---|
| Actually needy according to the household survey (EIHS) | 71.8 percent of the true needy are correctly predicted as needy | 28.2 percent of the true needy are incorrectly predicted as nonneedy |
| Actually nonneedy according to the household survey (EIHS) | 16.3 percent of the true nonneedy are incorrectly predicted as needy | 83.7 percent of the true nonneedy are correctly predicted as nonneedy |
| Cutoff = 149 | | |
| Needy as defined = 36.5 percent of the population | | |

**Source: Estimated by the authors using the 1997 EIHS data and the proxy means test model.**

order and ranked the cumulative household members of the corresponding households. We selected the bottom 36.5 percent of the sample population (29.2 percent of the households) to represent the actual needy. Then, we predicted per capita consumption of the sample households from the estimated regression model.[8] This predicted household consumption represents the total "score" of the households. We ranked the household scores in descending order and selected the bottom 36.5 percent as the predicted needy. The maximum household score among the bottom 36.5 percent of the population is 149, representing the cutoff point. Any household with a score at or below the cutoff is considered needy. Finally, we assessed the accuracy of the prediction by comparing the actual with the predicted needy. The results of the assessment, presented in Table 6, suggest that 71.8 percent of the actual needy are correctly predicted, while 28.2 percent of the actual needy are misidentified as nonneedy. In other words, the error of exclusion

[8] The values of the regression coefficients have been rounded to whole numbers, as was recommended by the Task Force to avoid errors from using decimal points in the calculation of household scores by the MOTS field staff. In the prediction, we used the whole numbers of the coefficients.

is 28.2 percent. On the other hand, the error of inclusion (nonneedy inaccurately predicted as needy) was only 16.3 percent.

We also assessed the situation with no error of exclusion (i.e., 100 percent of the actual needy are included). The results of this assessment (Table 7) indicate that the error of inclusion in such a situation increases from 16.3 to 33.6 percent. Moreover, 57.8 percent of total population is included as needy. The resulting cutoff is 217.

**Table 7—Assessing the proxy means tests when all the needy are included**

| | Predicated as needy by the model | Predicted as nonneedy by the model |
|---|---|---|
| Actually needy according to the household survey (EIHS) | 100 percent of the true needy are included | None of the true needy are excluded |
| Actually nonneedy according to the household survey (EIHS) | 33.6 percent of the true nonneedy are incorrectly included as needy | 66.4 percent of the true nonneedy are correctly excluded as nonneedy |
| Cutoff = 217 | | |
| Included as needy = 57.8 percent of the population | | |

**Source: Estimated by the authors using the 1997 EIHS data and the proxy means test model.**

The Task Force members debated about what cutoff to use for proxy means testing, taking into consideration the trade-off between the errors of exclusion and inclusion and their cost implications. The Task Force finally recommended a cutoff of 217 to avoid misidentification of the actual needy as nonneedy by the proxy means tests.

An example of the proxy means test calculations for two households from the EIHS sample—a needy and a nonneedy—is provided in Table 8. The coefficients (rounded to whole numbers) are obtained from the final regression model. Scores are calculated for the needy and the nonneedy households by multiplying the values of the

**Table 8—Proxy means test results for two households from the EIHS sample**

| Indicators | Needy household | | | Nonneedy household | | |
|---|---|---|---|---|---|---|
| | Value | Coefficient | Score | Value | Coefficient | Score |
| Household size (number of household members) | 5 | -10 | -50 | 4 | -10 | -40 |
| Highest number of years of schooling of any employed household member | 6 | 1 | 6 | 12 | 1 | 12 |
| 1 if a child goes to private school, 0 otherwise | 0 | 52 | 0 | 1 | 52 | 52 |
| 1 if any household member aged above 15 years never attended school, 0 otherwise | 1 | -23 | -23 | 0 | -23 | 0 |
| Monthly electricity bill in LE | 9 | 2 | 18 | 32 | 2 | 64 |
| Monthly telephone bill in LE | 0 | 1 | 0 | 21 | 1 | 21 |
| 1 if the household has no private toilet, 0 otherwise | 1 | -19 | -19 | 0 | -19 | 0 |
| 1 if the household owns a motor vehicle, 0 otherwise | 0 | 88 | 0 | 1 | 88 | 88 |
| 1 if the household has no refrigerator, 0 otherwise | 1 | -34 | -34 | 0 | -34 | 0 |
| Constant | | | 208 | | | 208 |
| Total score | | | 106 | | | 405 |
| Cutoff point | | | 217 | | | 217 |
| Ration card eligibility | | Green Card | | | Red Card | |

**Source: Estimated by the authors using the 1997 EIHS data and the proxy means test model.**

indicators (variables) for the respective households with the coefficient values. The total scores of the two households are compared with the cutoff of 217 to determine the eligibility of the households for the green and the red ration cards.

## 7. IMPLEMENTATION OF THE PROXY MEANS TESTS

As mentioned earlier, MOTS administers a standard form once every three years to the ration cardholders for "cleaning" the ration card system. The governorate-level *tamween* (ration) offices of MOTS announce through national and local media that all ration cardholders must come to their nearest *tamween* office to fill out the form and

submit their existing ration cards for review. MOTS would use this system to implement the proxy means tests.

The IFPRI-FSR team, in consultation with the Task Force, developed a new form that would collect information on the proxy means test indicators from the ration cardholders. This new form would replace the existing form. A table is attached to the new form for the *tamween* officials to calculate household scores from the information provided by the ration cardholders. The local *tamween* offices would send the scores of all cardholders in their locality to the MOTS headquarters in Cairo. The MOTS headquarters-based officials would determine eligibility for the green and the red ration cards by comparing the scores with the cutoff. Following is a brief description of the proxy means tests implementation process:

- In July-August 1999, the IFPRI-FSR team, accompanied by local MOTS staff, field-tested the new form in seven selected governorates in Lower and Upper Egypt. The IFPRI-FSR team then re-estimated the regression model on the basis of the field-test results and revised the form by incorporating the revised indicators and their coefficients.
- In August 1999, the IFPRI-FSR team conducted a "training of trainers," where 152 MOTS officials were trained on the implementation procedures for the proxy means tests. These trainees were senior MOTS officials from all 26 governorate-level MOTS offices. The IFPRI-FSR team prepared a training manual that explains the concept and efficacy of the proxy means tests, and provides step-by-

step instructions on how to administer the new form (El-Ganainy, Hegazy, and Tawfik 1999).

- The 152 IFPRI-trained MOTS officials would train *Markaz* and village-level *tamween* officials of MOTS in their respective governorates on how to administer the new form for proxy means tests. IFPRI-FSR printed and distributed copies of the training manual for the trainees.
- MOTS would print new forms that would be administered to all ration cardholders in Egypt for determining eligibility for the green and the red ration cards.

## 8. CONCLUSIONS FOR POLICY

Ration cards for subsidized sugar and cooking oil can be made more progressive by converting green ration cards of nonneedy households to red cards, converting red cards of needy households to green cards, and providing green cards to needy households without cards. This reform of the Egyptian ration card food subsidy system would require identification of both needy and nonneedy households, something that is not always easy. To effectively implement a targeted program, it would be necessary to rely on a method such as proxy means testing.

In developing a proxy means testing method, this paper describes the process of moving from the optimal consumption-predicting model to the final model that is both administratively and politically feasible. Targeting ration cards either through the

"technically optimal" model or through the selected "practical" model would have differential impacts on consumers and subsidy costs.

An effective and full implementation of targeting ration card subsidies through the selected "practical" proxy means testing model (with zero exclusion error) would yield the following results:

- Forty-eight percent of the high-subsidy green ration cards (4.1 million cards), currently held by the nonneedy, would be converted to low-subsidy red ration cards. The government would save about LE 98 million annually from converting green cards to red cards.[9]
- Forty-three percent of the red ration cards (686,000 cards), currently held by the needy, would be converted to high-subsidy green ration cards. This would lead to an additional annual cost of about LE 16 million to the government.
- Thirty-two percent of households who currently do not hold any ration cards should receive the green ration cards. These are the needy households among the noncardholder households. This would require MOTS to issue approximately 558,000 additional green ration cards, costing about LE 51 million annually.

[9] The changes in budgetary costs of subsidy arising from the stated reforms in the ration card subsidy system are estimated at the 1997 levels of purchases of subsidized sugar and oil, based on the 1997 EIHS data. We assume that any change in prices of sugar and oil rations due to the change in the level of subsidy would not affect the demand for these commodities. This is a valid assumption, as a recent IFPRI study suggests that subsidized sugar and oil rations are "inframarginal" for Egyptian consumers (Ahmed et al. 2001). Therefore, in theory, any change in ration prices of subsidized sugar and oil would not affect household budget allocation except through an income effect, which is negligible.

The above-mentioned redistribution of ration cards would increase the equity in the ration card food subsidy system and benefit the poor. At the same time, the total annual budgetary cost of rationed food subsidies would decline by about LE 31 million.

What effects of the reforms could be expected from the use of the "technically optimal" model for targeting? The application of the model could generate the following impacts: (1) 4.9 million green cards held by the nonneedy would be converted to red cards, resulting in an annual saving of about LE 117 million; (2) 647,000 red cards held by the needy would be converted to green cards, with an additional annual cost of about LE 15 million; and (3) 526,000 new green cards would be issued to the needy with no cards, costing about LE 48 million annually. The resulting net annual budgetary saving to the government would amount to about LE 54 million, about 74 percent more than the estimated saving from the use of the selected "practical" model. However, taking into consideration the administrative difficulties (for example, compared to the "practical" model, the use of the "technically optimal" model would require at least four times more time to collect data and to calculate scores, and, consequently, would be more prone to errors) and political risks, the "practical" model might nevertheless be a better choice.

IFPRI-FSR research shows that targeting can be achieved at a minimal cost, in particular since current staff at MOTS could manage the targeting without any need for new hiring. The one-time cost of training and materials needed is around LE 14 million, a relatively small amount corresponding to 1.6 percent of the total ration card subsidy cost in 1997.

Once the objectives of equity and increased benefits to the needy are achieved in the ration card subsidy system through improved targeting as described above, the government may wish to remove the red card subsidy for the nonneedy population by raising the ration prices of sugar and oil to market price levels. If the price subsidy were completely removed for red cardholders, the red card would still function as an entitlement to a quantity ration for the nonneedy in the event of a future shortage. This reform would result in a major cost reduction in the ration card food subsidy system.

The proxy means tests will serve a much wider purpose than simply helping to rationalize the food ration card system, important as that is. The experience gained under this reform will facilitate targeting future social interventions to reduce and prevent poverty, because lower cost methods of identifying the poor will be possible using the proxy means tests. These targeted interventions will be crucial to the political survival of the ongoing macroeconomic policy reforms for economic growth as well as to the welfare of individuals who are unable to participate in the growth process.

# APPENDIX TABLES

## Table 9—Description of the explanatory variables used in the initial regression equations

| Variable name | Variable description | Mean | Minimum | Maximum |
|---|---|---|---|---|
| Hhsize | Household size | 5.91 | 1 | 28 |
| hhsize2 | Household size, squared | 43.58 | 1 | 784 |
| hhage | Household head: Age in years | 47.58 | 16 | 96 |
| depratio | Dependency ratio | 0.98 | 0 | 7 |
| femhead | Dummy: Female-headed household =1 | 0.141 | 0 | 1 |
| avgsch | Household average: Years of schooling | 4.95 | 0 | 16 |
| pvttutor | Dummy: Has private tutor =1 | 0.383 | 0 | 1 |
| pvtsch | Dummy: Children go to private school =1 | 0.04 | 0 | 1 |
| noedu15 | Dummy: Any household member aged above 15 years never attended school=1 | 0.64 | 0 | 1 |
| roompc | Number of room per capita | 0.73 | 0.1 | 3 |
| elecbil | Monthly electricity bill in LE | 11.76 | 0 | 90 |
| phonebil | Monthly telephone bill in LE | 3.53 | 0 | 150 |
| floor | Dummy: Cement/concrete floor =1 | 0.72 | 0 | 1 |
| wall | Dummy: Brick/concrete wall=1 | 0.79 | 0 | 1 |
| roof | Dummy: Concrete roof =1 | 0.64 | 0 | 1 |
| rent | Dummy: Living in rented house = 1 | 0.22 | 0 | 1 |
| pipewtr | Dummy: Piped water supply =1 | 0.76 | 0 | 1 |
| npvtoilt | Dummy: No private toilet =1 | 0.15 | 0 | 1 |
| kerosene | Dummy: Fuel source is kerosene =1 | 0.72 | 0 | 1 |
| ownland | Owned arable land in feddan | 0.21 | 0 | 20 |
| car_veh | Dummy: Owned motor vehicle =1 | 0.04 | 0 | 1 |
| tv_vid | Dummy: Owned television or video =1 | 0.81 | 0 | 1 |
| washer | Dummy: Owned washer =1 | 0.79 | 0 | 1 |
| wtrheatr | Dummy: Owned water heater =1 | 0.23 | 0 | 1 |
| fan | Dummy: Owned electric fan =1 | 0.56 | 0 | 1 |
| norefrig | Dummy: Has no refrigerator =1 | 0.40 | 0 | 1 |
| tractor | Dummy: Owned tractor =1 | 0.01 | 0 | 1 |
| n_lstck | Number of owned livestock | 0.28 | 0 | 13 |
| ownbusi | Dummy: Owned business =1 | 0.13 | 0 | 1 |
| casual | Dummy: Casual labor is primary income source of household head =1 | 0.17 | 0 | 1 |
| agricul | Dummy: Agriculture is primary income source =1 | 0.20 | 0 | 1 |
| manuf | Dummy: Manufacturing industry is primary income source =1 | 0.13 | 0 | 1 |
| trade | Dummy: Trade & service is income source =1 | 0.06 | 0 | 1 |
| unem_m | Number of unemployed males, last week | 1.23 | 0 | 8 |
| unem_f | Number of unemployed females, last week | 2.17 | 0 | 9 |
| retired | Dummy: Household head is retired =1 | 0.21 | 0 | 1 |
| Cairo | Dummy: Living in Cairo =1 | 0.09 | 0 | 1 |
| Alex | Dummy: Living in Alexandria =1 | 0.06 | 0 | 1 |
| Suez | Dummy: Living in Suez =1 | 0.01 | 0 | 1 |
| Damietta | Dummy: Living in Damietta =1 | 0.03 | 0 | 1 |
| Dakahlia | Dummy: Living in Dakahlia =1 | 0.06 | 0 | 1 |
| Sharkia | Dummy: Living in Sharkia =1 | 0.05 | 0 | 1 |
| Kalyoub | Dummy: Living in Kalyoubia =1 | 0.10 | 0 | 1 |
| Kafrshkh | Dummy: Living in Kafr El-sheikh =1 | 0.03 | 0 | 1 |
| Gharbia | Dummy: Living in Gharbia =1 | 0.05 | 0 | 1 |
| Menoufia | Dummy: Living in Menoufia =1 | 0.04 | 0 | 1 |
| Behera | Dummy: Living in Behera | 0.05 | 0 | 1 |
| Ismailia | Dummy: Living in Ismailia =1 | 0.02 | 0 | 1 |
| Giza | Dummy: Living in Giza =1 | 0.12 | 0 | 1 |
| BeniSuef | Dummy: Living in Beni-Suef =1 | 0.02 | 0 | 1 |
| Fayoum | Dummy: Living in Fayoum =1 | 0.04 | 0 | 1 |
| Menia | Dummy: Living in Menia =1 | 0.06 | 0 | 1 |
| Assyout | Dummy: Living in Assyout =1 | 0.05 | 0 | 1 |
| Sohag | Dummy: Living in Sohag =1 | 0.05 | 0 | 1 |
| Quena | Dummy: Living in Quena =1 | 0.06 | 0 | 1 |
| urban | Dummy: Living in urban area =1 | 0.46 | 0 | 1 |

Note: Number of observations = 2,203 for all variables.

**Table 10—Initial model of the per capita consumption expenditure, OLS estimates**

| Variable name | Variable description | Coefficient | t-Statistic |
|---|---|---|---|
| hhsize | Household size | -14.457 | -6.77** |
| hhsize2 | Household size, squared | 0.510 | 4.61** |
| hhage | Household head: Age in years | -0.077 | -0.35 |
| depratio | Dependency ratio | -2.440 | -1.17 |
| femhead | Dummy: Female-headed household =1 | -5.946 | -1.24 |
| avgsch | Household average: Years of schooling | 5.031 | 6.27** |
| pvttutor | Dummy: Has private tutor =1 | 6.840 | 2.11* |
| pvtsch | Dummy: Children go to private school =1 | 38.753 | 3.31** |
| noedu15 | Dummy: Any household member aged above 15 years never attended school=1 | -3.728 | -0.88 |
| roompc | Number of room per capita | 51.412 | 7.55** |
| elecbil | Monthly electricity bill in LE | 1.221 | 5.21** |
| phonebil | Monthly telephone bill in LE | 0.734 | 2.55* |
| floor | Dummy: Cement/concrete floor =1 | -1.158 | -0.32 |
| wall | Dummy: Brick/concrete wall=1 | 4.713 | 1.09 |
| roof | Dummy: Concrete roof =1 | 3.407 | 0.83 |
| rent | Dummy: Living in rented house = 1 | -2.903 | -0.57 |
| pipewtr | Dummy: Piped water supply =1 | -3.484 | -1.10 |
| npvtoilt | Dummy: No private toilet =1 | -8.687 | -2.15* |
| kerosene | Dummy: Fuel source is kerosene =1 | -0.466 | -0.09 |
| ownland | Owned arable land in feddan | 0.992 | 0.27 |
| car_veh | Dummy: Owned motor vehicle =1 | 72.485 | 4.98** |
| tv_vid | Dummy: Owned television or video =1 | 6.852 | 1.69 |
| washer | Dummy: Owned washer =1 | 12.611 | 3.32** |
| wtrheatr | Dummy: Owned water heater =1 | 33.587 | 5.17** |
| fan | Dummy: Owned electric fan =1 | 14.252 | 4.05** |
| norefrig | Dummy: Has no refrigerator =1 | -9.340 | -2.21* |
| tractor | Dummy: Owned tractor =1 | 26.810 | 1.16 |
| n_lstck | Number of owned livestock | 5.885 | 3.38** |
| ownbusi | Dummy: Owned business =1 | 12.070 | 2.56* |
| casual | Dummy: Casual labor is primary income source of household head =1 | 2.683 | 0.62 |
| agricul | Dummy: Agriculture is primary income source =1 | 8.998 | 2.29* |
| manuf | Dummy: Manufacturing industry is primary income source =1 | -7.266 | -1.97 |
| trade | Dummy: Trade & service is income source =1 | -13.613 | -2.14* |
| unem_m | Number of unemployed males, last week | -2.851 | -2.33* |
| unem_f | Number of unemployed females, last week | -0.261 | -0.20 |
| Alex | Dummy: Living in Alexandria =1 | 79.668 | 5.78** |
| Suez | Dummy: Living in Suez =1 | 125.448 | 13.15** |
| Damietta | Dummy: Living in Damietta =1 | 41.747 | 3.28** |
| Dakahlia | Dummy: Living in Dakahlia =1 | 21.519 | 2.04* |
| Sharkia | Dummy: Living in Sharkia =1 | 45.407 | 4.66** |
| Kalyoub | Dummy: Living in Kalyoubia =1 | 33.419 | 3.44** |
| Kafrshkh | Dummy: Living in Kafr El- sheikh =1 | 14.194 | 0.98 |
| Gharbia | Dummy: Living in Gharbia =1 | 21.866 | 1.93 |
| Menoufia | Dummy: Living in Menoufia =1 | 68.778 | 6.08** |
| Behera | Dummy: Living in Behera | 36.451 | 3.08** |
| Ismailia | Dummy: Living in Ismailia =1 | 51.341 | 4.06** |
| Giza | Dummy: Living in Giza =1 | 79.092 | 7.47** |
| BeniSuef | Dummy: Living in Beni-Suef =1 | 69.873 | 7.28** |
| Fayoum | Dummy: Living in Fayoum =1 | 85.046 | 10.40** |
| Menia | Dummy: Living in Menia =1 | 43.912 | 3.48** |
| Assyout | Dummy: Living in Assyout =1 | 60.940 | 5.42** |
| Sohag | Dummy: Living in Sohag =1 | 42.474 | 5.04** |
| Quena | Dummy: Living in Quena =1 | 51.304 | 5.21** |
| urban | Dummy: Living in urban area =1 | -1.486 | -0.27 |
| Intercept | | 64.089 | 3.33** |
| F-statistic = 424.82** | | | |
| $R^2 = 0.58$ | | | |
| Number of observations = 2,203 | | | |

Notes: Dependent variable is per capita household consumption expenditure per month in LE. * Significant at the 5% level.; ** Significant at the 1% level.

**Table 11—Results of the technically optimal model for proxy means tests, OLS estimates**

| Variable name | Variable description | Coefficient | t-Statistic |
|---|---|---|---|
| hhsize | Household size | -0.0979 | -7.57** |
| hhsize2 | Household size, squared | 0.0031 | 4.16** |
| depratio | Dependency ratio | -0.0515 | -4.25** |
| femhead | Dummy: Female-headed household =1 | -0.0690 | -2.68** |
| avgsch | Household average: Years of schooling | 0.0214 | 5.56** |
| pvttutor | Dummy: Has private tutor =1 | 0.0834 | 4.37** |
| pvtsch | Dummy: Children go to private school =1 | 0.1365 | 2.88** |
| noedu15 | Dummy: Any household member aged above 15 years never attended school=1 | -0.0273 | -1.39 |
| roompc | Number of room per capita | 0.2919 | 8.87** |
| elecbil | Monthly electricity bill in LE | 0.0070 | 6.69** |
| phonebil | Monthly telephone bill in LE | 0.0023 | 2.42* |
| floor | Dummy: Cement/concrete floor =1 | 0.0518 | 2.20* |
| wall | Dummy: Brick/concrete wall=1 | 0.0498 | 2.29* |
| npvtoilt | Dummy: No private toilet =1 | -0.0786 | -2.90** |
| ownland | Owned arable land in feddan | 0.0272 | 1.39 |
| car_veh | Dummy: Owned motor vehicle =1 | 0.2513 | 4.37** |
| tv_vid | Dummy: Owned television or video =1 | 0.0898 | 3.36** |
| washer | Dummy: Owned washer =1 | 0.0865 | 3.54** |
| wtrheatr | Dummy: Owned water heater =1 | 0.1615 | 5.33** |
| fan | Dummy: Owned electric fan =1 | 0.0994 | 4.26** |
| norefrig | Dummy: Has no refrigerator =1 | -0.1073 | -4.46** |
| n_lstck | Number of owned livestock | 0.0531 | 4.56** |
| ownbusi | Dummy: Owned business =1 | 0.0787 | 2.67** |
| casual | Dummy: Casual labor is primary income source of household head =1 | -0.0372 | -1.47 |
| agricul | Dummy: Agriculture is primary income source =1 | 0.0698 | 2.60* |
| trade | Dummy: Trade & service is income source =1 | -0.0875 | -2.30* |
| unem_m | Number of unemployed males, last week | -0.0142 | -1.63 |
| Cairo | Dummy: Living in Cairo =1 | 0.4303 | 8.83** |
| Alex | Dummy: Living in Alexandria =1 | 0.3632 | 7.85** |
| Suez | Dummy: Living in Suez =1 | 0.5641 | 17.99** |
| Damietta | Dummy: Living in Damietta =1 | 0.2837 | 4.46** |
| Dakahlia | Dummy: Living in Dakahlia =1 | 0.1122 | 3.08** |
| Sharkia | Dummy: Living in Sharkia =1 | 0.3055 | 8.98** |
| Kalyoub | Dummy: Living in Kalyoubia =1 | 0.1769 | 3.80** |
| Kafrshkh | Dummy: Living in Kafr El-sheikh =1 | -0.0673 | -0.37 |
| Gharbia | Dummy: Living in Gharbia =1 | 0.0823 | 1.55 |
| Menoufia | Dummy: Living in Menoufia =1 | 0.4318 | 13.80** |
| Behera | Dummy: Living in Behera | 0.1754 | 3.30** |
| Ismailia | Dummy: Living in Ismailia =1 | 0.3179 | 4.72** |
| Giza | Dummy: Living in Giza =1 | 0.4605 | 9.68** |
| BeniSuef | Dummy: Living in Beni- Suef =1 | 0.4335 | 9.09** |
| Fayoum | Dummy: Living in Fayoum =1 | 0.5619 | 23.19** |
| Menia | Dummy: Living in Menia =1 | 0.1579 | 2.86** |
| Assyout | Dummy: Living in Assyout =1 | 0.3611 | 6.38** |
| Sohag | Dummy: Living in Sohag =1 | 0.2323 | 5.65** |
| Quena | Dummy: Living in Quena =1 | 0.2981 | 8.28** |
| urban | Dummy: Living in urban area =1 | -0.0190 | -0.65 |
| Intercept | | 4.4020 | 51.47** |

F-statistic = 2,066.46**
$R^2 = 0.63$
Number of observations = 2,203

Notes: Dependent variable is log (ln) of per capita household consumption expenditure per month in LE. * Significant at the 5% level. ** Significant at the 1% level.

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