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Abstract

In this paper, I develop a Proxy Means Tests (PMT) model and examine several targeting lines to identify beneficiaries for a targeting subsidy scheme in Iran. Based on the findings of this study, setting a cut-off percentile of 40% is expected to provide compensation for almost 70 percent of the poorest households and to result in the highest accuracy mainly in rural areas where poverty is much more severe than elsewhere in the country. Substituting the current scheme which covers almost all households in Iran with a targeting scheme based on the results of the PMT model will allow for either transferring larger amount of money to the extreme poor at the current budget or reducing the government expenditure in the form of repayment after removing subsidies on fuel and energy.

JEL Classifications: C21, I38, H53

Keywords: targeting subsidy scheme, proxy means test (PMT), Iran

ملخص

في هذه الورقة أقوم بتطوير نموذج اختبارات المتوسطات (PMT) ودراسة العديد من خطوط الاستهداف لتحديد المستفيدين لمخطط إعانة في إيران. وبناء على نتائج هذه الدراسة، نجد أن وضع قطع مئوي من 40٪ سوف يؤدى الى تعويض ما يقرب من 70 في المئة من الأسر الأكثر فقرا وتؤدي إلى أعلى درجات الدقة أساسا في المناطق الريفية حيث الفقر أكثر بكثير من أي مكان آخر في حاد البلاد. استبدال النظام الحالي الذي يغطي تقريبا جميع الأسر في إيران مع ومخطط الاعانة استنادا إلى نتائج نموذج PMT تسمح إما بنقل كمية أكبر من المال للفقراء في الميزانية الحالية أو تخفيض الإنفاق الحكومي في شكل سداد بعد إزالة الدعم عن الوقود والطاقة.

1. Introduction

Iran's fifth—and most recent—Five Year Economic Development Plan proposes a subsidy reform to eliminate subsidies, especially those on fuel and energy as well as on food and to replace them with targeted social assistance. To justify this, the government argues that the majority of subsidies go to the rich and therefore the money saved by eliminating subsidies is supposed to be given to lower-income households in the form of direct payments. From that springboard, the Iranian administration distributed a form asking households to report their incomes. Following that three strata were determined to identify the poor in Iran with the aim of converting most of the old subsidies into cash welfare payments to compensate the poorest households. However, the results of the survey were not reliable because apparently some families had understated their incomes in order to qualify for the benefits. This was not surprising since asking directly about income usually brings about faulty information as is the case in many other developing countries (e.g. Ahmed and Bouis 2002). Ultimately, the defined clusters were not accurate to identify the beneficiaries. Although the payments were primarily supposed to be given to the poorest 70 percent of the population with the upper 30 percent getting nothing, the Iranian parliament (Majlis) argued that ending fuel subsidies would cause even the upper crust to face major jumps in their cost of living. Consequently, the proposed scheme was amended. According to the new scheme, the payments are currently universal, provision-based and cover all registered families, not just the poor ones. To that end, the Iranian government pays a cash amount of 450000 rial per person per month (including 45000 rial for breads) to all registered families (all households in the country in addition to some Iranians living abroad). However, a recent unofficial debate surround the possibility of amending the scheme again because the government tacks the resources to continue paying all. The amendment is expected to follow a targeted model of social provision such that it covers only the poor.

As mentioned in the literature (e.g. Sumarto and Suryahadi 2001; Dutrey 2007; Samson et al. 2010), although a targeting program has potential benefits, it needs strong institutions and does not necessarily target the poor (see Ravallion and Chen, 2003; Ravallion, 2004 and Kraay, 2004 for details on the extent by which a growth is realized to be pro-poor and the ways to measure it). It also entails direct and indirect costs including administrative costs as well as economic, social and political costs imposed on government, beneficiaries and the society at large, most of which cannot be easily quantified.

It seems that the major challenge facing the policymakers regarding the targeted payment scheme in Iran is how to create a system that accurately identifies the poor. This depends on how the poverty lines (i.e. the cutoff points separating the poor from the non-poor) are determined, and whether they are absolute or relative. The absolute poverty lines are anchored in some absolute standard to meet basic needs. This way of setting poverty lines has fixed real value over time and space. The relative poverty lines are defined in relation to the overall distribution of income or consumption in a country and they rise with average expenditure (Ravallion 1998). Moreover, the poverty rate remains unchanged by the proportional increase in income of all households when poverty is measured based on absolute poverty line whereas it changes when setting a relative poverty line to measure poverty. Ultimately, the absolute poverty lines are more consistent than the relative poverty lines to evaluate targeting programs.

As stated by Ravallion (2003), utility is the most common concept of welfare used to set poverty lines. In this context, a utility-consistent poverty line is defined as the cost of a bundle of goods to escape poverty and represents the expenditure needed to achieve a minimum level of utility for an individual to not be deemed poor. There are other approaches such as functioning-based concepts of welfare that propose a shift away from measuring utility and income poverty towards identifying functionings (the states of being and activities

which individuals achieve) to set a poverty line. The capability measure of poverty refers to the different combinations of functionings that individuals can achieve and *defines poverty as the absence of function or failure to achieve basic capabilities* (Sen, 1993 and Burchardt 2005).

There are two conceptual problems, namely a referencing problem and an identification problem that arise when such concepts are empirically implemented in poverty analysis (Ravallion 1998/2003). The former is related to the reference level of utility that anchors the poverty line and is a problem of identifying the benchmark below which people are considered poor. The latter is concerned with determining the reference level of welfare above which one is deemed not poor, and the problem here is how to select and weight the different aspects of individual welfare. Addressing both problems requires information that is not readily available in conventional objective socio-economic survey data (Ravallion 2002). Qualitative participatory data can help solve those two important problems.

In practice, the methods to determine poverty lines can be categorized as objective (including food-energy intake and the cost of basic needs) and subjective (based on answers to the minimum income question) (INE, undated). As discussed by Kingdon and Knight (2004), empirical research in developing countries measures poverty in terms of income and consumption and not in terms of subjectively perceived welfare.

2. The Proxy Means Tests (PMT) for Subsidy Reform in Iran

The targeting scheme can be carried out by a variety of methods, the most common of which is means testing. Self-targeting and categorical targeting are the others (for more details see Samson et al. 2010). As an administrative mechanism, means testing is based on income or other income-related characteristics of an individual or family. The PMT are amongst the poverty targeting methods that also include verified means tests, simple means tests and community-based targeting (see Houssou (2010) for a detailed review; Zuhr (2009) for a summary of PMT; Dutrey (2007) and AusAID (2011) for strengths and weaknesses of PMT and the robustness of their implementation; Grosh (1994) for an assessment of the mechanisms of eligibility for social welfare assistance; and Coady and Skoufias (2004) for a comparison of the targeting indicators. As stated by Sharif (2009), PMT may cause inherent inaccuracies, especially when targeting the poorest of the poor. The tests also "*pose practical challenges relating to the frequency of updating its formula, the degree of transparency, the requirements for strong administrative capacity and the importance of outreach"* (Samson et al. 2010). However, available evidence and experience suggest that using proxies for welfare and or consumption expenditure can identify the poor with a reasonable level of accuracy and PMT have successfully been used to measure household welfare as well (Grosh and Baker 1995). According to Persaud (2005), the PMT ensure that benefits go to the needy people in a most efficient and transparent manner. Compared to other targeting mechanisms it produces the best incidence of outcomes (Grosh 1994). The PMT are excellent poverty assessment mechanisms that use a scoring formula to assess the true economic status of each potential beneficiary on the basis of his/her welfare status, rather than on income or wealth as is the case of other assessment mechanisms. As the most objective means test for assessing ones eligibility for social welfare assistance, this method of targeting relies on observable and verifiable characteristics of household and variables that are highly correlated with household poverty and/or welfare. These variables include categories such as household demographics and characteristics of household head; ownership of easily verifiable assets; and location variables. The PMT is either based on a qualitative principal components approach, which constructs a proxy indicator of welfare using the characteristics of the household, or derives a scoring formula using regression analysis. Through the latter, the PMT assigns a score to every household or individual in a formal algorithm to proxy household welfare measured

usually by per capita household consumption expenditure (Sharif 2009). Using household data, several studies applied the ordinary least squares (OLS) regression of this variable on the poverty correlated variables to reflect predicted welfare (Glewwe and Kanaan 1989; Haddad et al. 1992; Grosh and Baker 1995; Grosh and Glinskaya 1997; Ahmed and Bouis 2002; Narayan and Yoshida 2005; Castañeda 2005; and Sharif 2009). Although OLS regression is the most commonly used technique, other approaches are utilized in carrying out PMT. In addition to the OLS, for instance, Houssou et al. (2007) used Linear Probability Model, Probit, and Quantile regressions for predicting the household poverty status.

The coefficients of the variables in the OLS regression are corresponding weights of the predictors and the aggregate score for each household is calculated as the constant plus or minus the weighted variables. A household with low score, for whom her/his predicted expenditure is less than a predefined cut-off line (targeting line), is identified as poor and eligible for assistance, such as a cash payment in case of Iran. As cited in the literature (e.g. Sharif 2009), cut-off lines are taken from the actual expenditure distribution and with the budget available to implement a supporting scheme, policy makers are generally interested in determining such a cut-off line to serve as many of the poorest households as possible.

This paper aims to present a household targeting system for Iran to identify the extreme poor and to determine eligibility for repayments based on a PMT model which is applied to 2008 household survey data.

To construct the PMT in Iran, the household survey data of 2008 collected by the Iranian Statistical Center that cover economic and demographic characteristics of 19707 households in rural areas and 19335 households in urban areas of the country is utilized in this study. As stated by AusAID (2011), it is worth noting that non-sampling and sampling errors are expected to exist in the survey data and that the supplied information by respondents, especially on income and expenditure, may be inaccurate. However, this data set is the only one available on households in the country.

As the first step in designing the PMT, several variables were selected as regressors, some of which are dummies. The variables should be easily verifiable and measurable and well correlated with poverty, yet few enough to include as many households as possible into analysis (see for example Johannsen 2006; Houssou et al. 2007; Coady et al. 2002; Sharif 2009; Zeller et al. 2006). Although taking too many variables raises the burden of verifying them, Grosh and Baker (1995) pointed out that more information is generally preferred for evaluating the targeting programs.

The considered variables in this study fall broadly into five categories:

- Household demographics and characteristics including household size, age, dependents, sex of head, head education level, type of main job, proportion of earners and marriage status.
- Housing quality and characteristics including dwelling, house ownership, house area, construction materials, number of rooms, kitchen, source of drinking water, main and cooking fuels, shower and toilet facilities, etc.
- Household ownership of assets and access to facilities that include radio/stereo, color television, video recorder VCR, DVD, refrigerator, freezer, telephone, personal computer, internet, bicycle, motorcycle, washing machine, dish washer, vacuum cleaner, agricultural land, garden, productive animals, etc.
- Economic activities and features including type of occupation (permanent, temporary, agriculture, non-agriculture jobs, wage/unwaged worker), investing in durable assets, and short term investing, household food share of total expenditure, and shares of entertainments and take away of total expenditure of household.

- Location refers to urban and/or rural areas.

From the large set of variables above, those variables that did not contribute to the model's overall explanatory variables were eliminated from the regression and so based on their significances at the OLS regression, the remaining variables were chosen as final explanatory variables of monthly per capita expenditure (in log term) in this analysis (table 1).

Because not everyone in a household has the same consumption pattern, equivalence scales were applied to adjust per capita expenditure. In other words, different members were given different weightings by OECD-modified equivalence scale assigning a value of 1 to the household head, of 0.5 to each additional adult member and of 0.3 to each child. Hence, economies of scale in consumption reflected by the weight of 0.5 in this scale is considered to be more important than in OECD equivalence scale where the weight is 0.7.

The regression thus takes the following form, in which αs are the coefficients to be estimated and Y_i and X_i are defined in table 1. Rounded to the nearest integer, they are used as the corresponding weights of the variables.

$$Log\ Y_i = \alpha_0 + \alpha_i \sum_{i=1}^{30} X_i + \varepsilon_i$$

For easier interpretation, both sides of the regression including the coefficients are multiplied by 100.

Then, the ith household is assigned an aggregate score (predicted expenditure called also PMT score) that is a weighted combination of proxy variables X_1 to X_{30} and calculated as the regression constant α_0 plus or minus the weighted variables. This score identifies whether a household is poor or not compared to a predefined cut-off line. In this study, the benchmarks of 20%, 25%, 30%, 40%, 50%, 60% and 75% percentiles are examined separately for rural and urban households to identify the poor. If the household aggregate score is less than the cut-off score, it is then considered as a beneficiary household and the lower the score, the poorer is the household.

As cited in the literature, two types of errors related to PMT (namely leakage and under-coverage) can occur when the predicted and true expenditures do not satisfy the rule (Grosh 1994; Baulch 2002; Coady and Skoufias. 2004; Zeller et al. 2006; Sharif 2009; Coady and Parker 2009; Johannsen 2006; and Houssou 2010). In other words, if predicted expenditure is greater (smaller) than the cut-off score while the true expenditure is smaller (greater) than the score, then a targeting error occurs. The under-coverage implies that some poor are incorrectly identified as non-poor and leakage refers to identifying some non-poor incorrectly as poor. In other words, these two errors exhibit the percentage of payments not given to the eligible families (under-coverage) and the percentage of payments given to ineligible households (leakage).

The first error refers to exclusion error (type I error) and the latter to inclusion error (type II error) and an appropriate PMT is one where both errors are minimized, and where the total accuracy is maximized.

Following IRIS (2005) and Houssou (2010), five accuracy indicators are discussed in this study to evaluate the performances of a proxy means targeting system:

- Total accuracy is the percentage of total households whose poverty status is correctly measured by the PMT
- Poverty accuracy is the percentage of correctly identified poor households to all poor
- Non-poverty accuracy is the number of correctly identified non-poor households as percentage of all non-poor households

- Under-coverage is the number of poor households incorrectly identified as non-poor measured as percentage of all poor and calculated by dividing the number of cases of type I error by the total number of people who should get benefits.
- Leakage is the number of non-poor households incorrectly identified as poor measured as percentage of all poor and calculated by dividing the number of cases of type II error by the number of people served by the program.

The last two indicators are the most common measures of accuracy in the literature (e.g. Glewwe and Kanaan 1989; Grosh and Baker 1995; Ahmed and Bouis 2002; Narayan and Yoshida 2005; Schreiner 2006; Zeller and Alcaraz 2005; Houssou et al. 2007). As pointed out by Persaud (2005), "*under-coverage reduces the impact of the program on the welfare level of the potential beneficiaries, but carries no budgetary cost. Leakage, on the other hand, has no effect on the welfare impact of the program on the potential beneficiaries, but increases program costs. Low levels of leakages and under-coverage would be preferable. In reality however, a trade-off becomes necessary. If the goal is to assign priority to the poor, it becomes more important to eliminate under-coverage. On the other hand, if cost saving is the priority it becomes important to minimize leakage*".

For this purpose, a two by two cross-table of the actual poverty status of the household (comparing the household's actual expenditures to the poverty line) versus the predicted poverty status is used at selected cut-off lines. The selection of the optimum cut-off is based on the degree of targeting errors that include total accuracy as well as poverty accuracy.

3. Results and Discussion

In this section, the results of the OLS estimation of the PMT model are presented followed by the descriptive statistics of the predicted poverty status of Iranian households and the accuracy measures of the model. The section ends with some options for the current cash payment scheme.

The estimated coefficients of the PMT model and the corresponding weights of the predictors are shown in table 2. It should be noted that the score for each variable is its coefficient in the regression, rounded to the nearest integer and multiplied by 100 and the aggregate score for each household is calculated as constant plus or minus the weight on each variable.

For each continuous variable, the score is multiplied by the value of the variable for the household and for each dummy variable the respected score is multiplied by 1 if true for household, and by 0 if not true.

As indicated, all the included predictors are statistically different from zero at least at 0.01 levels. The adjusted R^2 of 0.699 is high enough to reveal the goodness of fit exhibiting that the included predictors can explain a significant proportion of change in the monthly per capita expenditure of households.

As shown by the variables' scores, the beneficiaries are identified based on the variables that are generally associated with low welfare. Those who manage their own job, woman headed households, households with uneducated, unemployed and unmarried heads are poorer than others and are identified as potential beneficiaries for cash payments. Moreover, families in rural areas are identified as extreme poor relative to those who live in urban areas.

With the same scores of -8, the larger households and those families that are headed by older individuals are potential beneficiaries as well. In addition, the more the household pays on food, the poorer the household.

The positive scores imply that the respected variables contribute negatively to household welfare. As examples, those who own car, motorbike, PC, and so on, and/or have their own

garden, invested somehow, or live in larger houses gain a larger aggregate score and therefore not highly eligible for payments.

These findings are more less similar to those of Sharif (2009), which assigned benefits to larger households, households who own fewer durable goods and less land, live in poor quality housing, households with younger or older household heads who are less educated, and where the head is a female who is either widowed, separated or divorced, and has lower levels of education.

Table 3 indicates actual versus predicted poverty in rural and urban areas as well as in the country as a whole. As can be seen, the predicted poverty is almost close to actual poverty at various cut-off lines in the rural areas and in the country as a whol but not in the urban areas. While the prediction performance is more precise at lower levels of thresholds in rural areas, the difference between actual and predicted poverty increases when moving from the 20^{th} cut-off line to the 40^{th} cut-off line and then decreases both in urban areas and in Iran as a whole.

Table 4 crosses the actual household poverty versus the predicted status at various beneficiary cut-off lines or various percentiles of the actual per capita consumption distribution, called also the targeting line.

The results indicate that out of 22,726 actual non-poor households, 19,624 (i.e. over 83%) are correctly predicted as non-poor and 56% of poor are correctly predicted as poor at the eligibility cut-off line of 20%. The predicted figures change to 87% and 61%; 87% and 64%; 87% and 72%; 80% and 72%; 66% and 77%; 64% and 78% at every consequent cut-off line respectively. As can be seen, whilst 12,342 households, out of 39,088 (almost 32%) are truly poor when setting the line at the 20^{th} percentile, the predicted poor families make 42% of total sample households at this line. Thus, as pointed out by Sharif (2009), the model may target a lower/higher percentage of the population on the aggregate even if the cut-off line is set to the same percentile because of the fact that the a given percentile in terms of actual and predicted consumptions are not equal. Moreover, the coverage rate varies with the eligibility cut-off line but is not necessarily equal to the eligibility cut-off line.

To verify the accuracy of the system (i.e. efficacy of the predictions) all performance indicators are calculated and presented in table 5. According to Persaud (2005), poverty accuracy, leakage, and under-coverage exhibit trade-offs and minimizing leakage, for instance, leads to higher under-coverage and lower poverty accuracy. However, this is not the case in this study and minimizing leakage does not correspond to high under-coverage and low poverty accuracy, but similar to Sharif (2009), both under-coverage and leakage rates fall as the cut-off line or the threshold that defines the target group increase.

As shown in table 5, the PMT at the 40^{th} percentile targeting line exhibits the highest total accuracy (76.7%) and the lowest leakage (7%). At this level, 18,381 households, out of 25,713 households are correctly identified as poor, implying a poverty accuracy of 71.5%. Likewise, nearly 87% of households are correctly identified as non-poor. Therefore, this cut-off line generates a reasonable level of targeting accuracy and is considered as the most suitable threshold to identify the poor in rural and urban areas of the country.

Table 6, crosses predicted poverty versus actual poverty and presents the accuracy measures of the PMT model at the 40% cut-off line for rural and urban areas. As indicated, the cut-off score in urban areas is higher than that in rural areas which is in accordance with the statistically significant coefficient of location in the PMT model. Based on these lines, the total accuracy of the PMT model is over 81% and larger than the overall accuracy in urban areas.

While poverty accuracy is reasonably high in rural areas, non-poverty accuracy is not so high. This is reverse in the urban areas where under-coverage is notably high at over 61% and much higher than the respective figure for rural areas.

The results confirm the findings of Sharif (2009) who showed that the under-coverage rate in urban areas is considerably higher than that in rural areas, whereas, the gap between rural and urban leakage rates is much smaller. As was shown in table 4, poverty in Iran is mainly rural, however, less than 30% of the total population (21.1 million out of 74.7 million according to the latest official records of the Iranian authorities) live in this areas and therefore high level of under-coverage in urban areas seems to be a problem even if the respective poverty rate in these areas is much lower than in the rural areas. This implies that a higher number of poor in urban areas are wrongfully excluded by the model. One possibility to resolve this is setting a higher cut-off line (e.g. 60^{th} percentile) for the urban areas, yet this depends on how fiscally feasible it is to practically run different models in different areas. Nevertheless, comparing with the current scheme through which almost all households are supported by repayment, the government expenditure including administration costs for a redefining scheme is expected to go down by paying just poor families.

4. Conclusion and Policy Implications

According to unofficial debates, over 72 million people are covered by the current scheme in Iran. Thus, the government pays households an amount of 32400 Billion rial per month regardless of not including administrative costs. Yet the monthly transfer of 450000 rial per person might not be able to cover the extra costs of living accrued from removing the subsidies, at least for some households. On the other hand, the rich people who similarly benefit from the scheme should not be getting repayment. This implies that there are potential options available for a targeting subsidy scheme in such a way that the needy people can get more than they do while the rich get nothing. Still the government would not need more resources for this scheme except for the administrative cost. Regarding the PMT model developed in this study, setting the cut-off line of 40^{th} percentile can result in covering over 70% of the poor with just a 7% leakage. Such an option sounds like a good substitute for the current universal scheme and can support over 34 million extreme poor out of the 48 million needy individuals in the country. In such a scheme, and regardless of the administrative budget to implement the PMT, a poor person with an aggregate score of at most 620 and 660 in rural and urban areas respectively, can get more than 950000 rial per month at the government's current budget, given the tight budgetary constraints. Such a scheme appears to be in accordance with the increasing inflation which the country has recently witnessed. The scheme also reduces the gap between poor and rich and is therefore consistent with the aim of a successful targeting plan in general. Thus, the fixed amount per capita scheme should be switched from all households to below a predefined cut-off percentile of e.g. 40%. As another possibility, the government might not be able to cover all households in the future and so an option is to keep the current per capita payment only for the poor. In this case, the total monthly transfers from the government are reduced to about 15300 Billion rials.

As mentioned earlier, implementing the PMT requires advanced institutional capacities to identify the beneficiaries throughout the country, which in turn entails large amounts of administrative costs and resources that are more than those of a universal program. In this regard, the above discussions need to be expanded to look into the administrative costs of the proposed scheme and consequently the amount that will be available for transferring to the needy families. However, as argued in the literature (e.g. Grosh 1994 and Dutrey 2007), the administrative costs of targeting programs are not easily measured due of lack of data and key information—as is the case in Iran. Still one may take the administrating costs suggested by Grosh (1994) and Grosh et al. (2008) for individual targeting schemes and proxy means-

testing (respectively an average of 9 percent and about 4 percent of total program costs) to roughly account for the amounts that remains for transferring to the poor.

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Table 1: Definitions of the PMT Variables in Iran

Variable	Definition	Label
Monthly per capita consumption expenditure		Y
Household demographics:		
Household dimension	5 and higher =1	X_1
Head sex	Woman =1	X_2
Head age	50 years and higher =1	X_3
Education	Uneducated =1	X_4
Employment status	Unemployed =1	X_5
Marriage status	Unmarried =1	X_6
Housing characteristics		
Room per person	No of room/ person	X_7
House area per person	Dwelling area/person	X_8
Large house	House area greater than 100 m^2 =1	X_9
House skeleton	Adobe construction =1	X_{10}
Main energy supply	Liquid gas =1	X_{11}
Fresh water	Access to fresh water =1	X_{12}
Ownership of assets		
Car	Owning car =1	X_{13}
Motorcycle	Owning motorcycle = 1	X_{14}
Bicycle	Owning bicycle =1	X_{15}
Radio	Owning radio =1	X_{16}
TV owning	Owning TV =1	X_{17}
Hi-Fi Video	Owning VCR, HiFi, etc. =1	X_{18}
PC	Owning PC =1	X_{19}
Small animals	Owning domestic small animals =1	X_{20}
Garden	Owning garden =1	X_{21}
Long life asset _yes	Purchasing long life assets last month =1	X_{22}
Economic activities and features		
Work1	No. days working unofficial jobs /week =1	X_{23}
Work2	No. days working waged jobs /week =1	X_{24}
Entertainment _yes	Spending on entertainment last month =1	X_{25}
Takeaway _yes	Spending on takeaways last month =1	X_{26}
Investment _yes	Investing last month =1	X_{27}
Value of fixed assets	Value of purchased fixed assets/person	X_{28}
Food ratio	Ratio of food expenditure to total expenditure	X_{29}
Location	Rural =1	X_{30}
Excluded variables		
Shelter ownership	Types of house ownership (owning, renting, etc)	
Shelter area = 50 m^2 less	Shelter area = 51 -99 m^2	
No. of rooms =1	No of rooms =2 and 3	
No. of rooms = 4 higher	Main energy supply is petrol	Main energy
supply = pipe gas	Source of water warming energy	
Household dimension = 2	Household dimension = 3 and 4	
Single head	Widow/divorced head	
Head age = 50 lower	Head age = 65 over	
Access to internet	Having refrigerator	Bath room in the
house	Ownership of agricultural land	
Land area	Ownership of big animals	Average no. of
days members work per week		

Table 2: Estimated Coefficients of the PMT Model and Weights of Variables in Iran

	Unstandardized coefficients				Variable weight
	B	Std. Error	T	Sig.	
Constant	6.310	.052	121.134	.000	631
Car	.118	.005	22.974	.000	12
Motorcycle	.013	.005	2.404	.016	1
Bicycle	.015	.006	2.394	.017	2
Radio	.051	.005	10.677	.000	5
TV	.063	.013	4.851	.000	6
HiFi video	.084	.005	15.929	.000	8
Having PC	.077	.004	18.079	.000	8
Fresh water	.030	.006	5.250	.000	3
Small animal	.001	.000	6.584	.000	0
Work1	-.015	.001	-9.910	.000	-2
Work2	.023	.001	15.584	.000	2
Room per person	.070	.005	12.823	.000	7
House area per person	.001	.000	5.822	.000	1
Value of fixed assets	4.334E-9	.000	26.523	.000	0
Head sex	-.017	.007	-2.413	.016	-2
Education status	-.043	.005	-8.407	.000	-4
Employment status	-.036	.014	-2.632	.008	-4
Marriage status	.045	.016	2.728	.006	5
Large house	.016	.005	3.340	.001	2
House skeleton	-.087	.006	-15.032	.000	-9
Main energy supply	.039	.006	6.715	.000	4
Garden	.035	.011	3.279	.001	4
Entertainment _yes	.104	.004	24.611	.000	10
Takeaway _yes	.130	.004	31.806	.000	13
Investment _yes	.021	.005	4.484	.000	2
Long life assets _yes	.277	.049	5.611	.000	28
Location	-.444	.015	-30.514	.000	-44
Household size	-.083	.005	-17.918	.000	-8
Head age	-.084	.005	-17.811	.000	-8
Food ratio	-.011	.000	-69.871	.000	-1

$R^2 = 0.700$ Adjusted $R^2 = 0.699$
Std. Error of the Estimate = 0.360 F = 2864.561

Table 3: Predicted Poverty by PMT Model at Various Thresholds

Cut-off percentile	Rural areas		Urban areas		Iran	
	Actual	Predicted	Actual	Predicted	Actual	Predicted
20%	63.7	61.0	19.7	1.6	41.9	31.6
25%	73.5	69.8	24.5	3.3	49.2	36.8
30%	80.2	75.7	29.8	6.4	55.2	41.4
40%	91.0	83.6	40.1	19.1	65.8	51.6
50%	96.7	86.2	49.4	34.6	73.3	60.6
60%	98.8	86.5	60.1	49.7	79.6	68.3
75%	99.7	87.4	62.1	51.6	81.0	69.6

Note: Actual figures are based on Foster-Greer-Thorbecke (FGT) measure of real per capita consumption.

Table 4: Actual vs. Predicted Household Poverty Status in Iran

Cut-off percentile	Actual poverty status	Predicted poverty status		
		Non-poor	Poor	Total
20%	Non-poor	19624	3102	22726
	Poor	7122	9240	16362
	Total	26746	12342	39088
25%	Non-poor	17219	2635	19854
	Poor	7484	11750	19234
	Total	24703	14385	39088
30%	Non-poor	15229	2267	17496
	Poor	7693	13899	21592
	Total	22922	16166	39088
40%	Non-poor	11581	1793	13374
	Poor	7333	18381	25713
	Total	18914	20174	39088
50%	Non-poor	8322	2130	10452
	Poor	7065	21571	28636
	Total	15387	23701	39088
60%	Non-poor	5260	2718	7978
	Poor	7143	23967	31110
	Total	12403	26685	39088
75%	Non-poor	4741	2666	7407
	Poor	7123	24558	31681
	Total	11864	27224	39088

Table 5: Poverty Accuracy Measures of MPT Model at Various Cut-Off Lines in Iran

Cut-off percentiles	Total accuracy	Poverty accuracy	Non-poverty accuracy	Under-coverage	Leakage
20%	73.8	56.5	86.4	43.5	19.0
25%	74.1	61.1	86.7	38.9	13.7
30%	74.5	64.4	87.0	35.6	10.5
40%	**76.7**	**71.5**	**86.6**	**28.5**	**7.0**
50%	76.5	75.3	79.6	24.7	7.4
60%	74.8	77.0	65.9	23.0	8.7
75%	75.0	77.5	64.0	22.5	8.4

Table 6: Predicted vs Actual Poverty and the Accuracy Measures of MPT Model at 40% Cut-Off Line in Rural and Urban Iran

	Cut-off scores	Actual poverty status	Predicted poverty status			Total accuracy	Poverty accuracy	Non-poverty accuracy	Under-coverage	Leakage
			Non-poor	Poor	Total					
Rural areas	622	Non-poor	670	1099	1769	81.4	85.7	37.9	14.3	6.1
		poor	2563	15375	17938					
		total	3233	16474	19707					
Urban areas	661	Non-poor	10865	694	11559	71.7	38.7	94.0	61.3	8.9
		poor	4770	3006	7776					
		total	15635	3700	19335					