From Targeting to Clustering

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This article points to the Identification, an important stage in subsidy targeting. Identification of vulnerable groups or households is important from efficiency aspects of governmental provisions and transfer payments. We define targeting and clarify various procedures of targeting systems with emphasis on identification position in them. Then main methods of individual identification especially "means test" and "proxy means test" will be reviewed and we'll declare some imperfections of these two methods. For get rid of the weaknesses, we will introduce Two Stage Identification (TSI) Test with Endogenous Household Clustering (EHC) method and will try an experiment with Iranian raw household data in urban areas.

Keywords:
Targeting, Identification, Proxy Means Test, Endogenous Household Clustering.

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۱-Introduction

In three last decades, this agreement formed between the economists that economic growth is necessary condition for poverty condition but it is not enough condition. For pro-poor growth, three elements must be emphasized:

۱- Efficient labor-intensive growth based on appropriate market incentives, physical infrastructure, and technological innovation, ۲- Adequate provision of social services, including primary education, basic health care, and family planning services ۳- transfers are needed to help those who would not otherwise benefit-the extremely destitute, the sick, and the aged, and safety nets must be provided to protect those most vulnerable to income-reducing shocks.

With this approach to poverty and growth, supportive and subsidy policies, become prominent and meaningful from economic aspects. So nowadays, social security systems and transfer payments convert to an unseperable part of the development strategies and poverty reduction programs. Besley and Cord (۲۰۰۷) present good review of developing countries pro-poor growth strategies and role of safety nets in them. In addition, statistical evidences show that a significant part of the national income in developed, transition and developing countries distribut to this matter (Tabor, ۲۰۰۲). Nevertheless, choosing a desirable social protection system has remained as a problem in developing and less developed countries.

Two Aspects of a worthy protection system are "*Administrative Feasibility*" and "Techniqual Exactness", that thought different economists and policy makers have their special opinions about elements of them, but there is no disagreement between them in the importance of commitment to this two aspects. Indeed, results of each safety net system definitely issue from achievement of special conditions that forms the characteristics of these two principal and complementary terms (Grosh, ۲۰۰۳). Targeting links to safety net system through these aspects and determines the administrative manner and exactness of protection system. since the financial budget of states are limit, so governments target transfer payment to vulnerable groups for maximization of positive effects of them, constraint to a fixed or limited amount of resources. Generally, targeting maximizes coverage of the poor and vulnerable by social programs with limited budgets.

The structure of the paper is as follows. In section ۲, we summarise seven different targeting system and emphasis identification and database matter in each of them. Section ۳, present common methods of identification and shortcomings of proxy means test. In section ٤, we introduce two-stage identification method with using endogenouse household clustering technique for get ride of these shortcomings and analysis the efficiency of this method with regard to raw Iranian urban

household's data and make some explanatory remarks. This paper ends with a conclustion, where we give a summary of our principal findings.

٢- Targeting and Identification

Policy makers are likely to face a trade-off between targeting and coverage: the greater the number of poor covered by a program, the more difficult it is to avoid leakages (Perry et al, ٢٠٠٦). In addition, experiences of different countries in implementation of several targeting methods for avoid of this trade-off show that success of a targeting program is due to the "precise programming", "effective management" and "countinous monitoring" (Coady and et al., ٢٠٠٤). In an Ideal targeting program, designers must provide systems containing feedback mechanisems and administration improvements for reduction of inclustion and exclusion errors and identification method has an important role from this regard.

From indentification aspect, a standard targeting program contains seven principle stages. ١- *Assessment*, evaluation of scale and extent of needs and subsidy and effects of them on population, ٢- *Verification*, specification of population groups that have more risk of welfare losing, ٣- *Prioritization*, relevant to population under effects of policies and size of resources, ٤- *Planning*, notice to atomic problems and solutions, ٥- *Implementation*, provision of subsidy resource with cash, good, stamp and price systems, ٦- *Monitoring*, appraisal of program efficiency in procurance of goals with reliable indicators and decision making for its improvement and finally ٧- *Evaluation*, assessment of the program effects on vulnerable targeted groups.

Identification of vulnerable groups is common characteristic of all targeting systems and known as the main step in administration of them. In this context, designers generally observe three principal questions, ١- What is the method of targeting? (Individual/Household, Community, Administrative, Market, Geographical, Demographical and Self Targeting) ٢- What is the method of delivering? (Cash transfer, price reduction, good or stamp) and ٣- how must choose subsidies goods and services? (Bread, milk, fuel…). Answer to this question is different with respect to the systems of targeting and identification methods. Next section will pay attention to this discussion with emphasis on identification postion in different targeting system.

٢-١- Individual and Household Targeting

The selection of target groups, households or individuals is often determined through a multistage targeting approach. First, an administrative or a geographic targeting approach leads to the selection of broad service areas (regions, groups of villages, provinces, states), then household-or individual-level eligibility criteria are applied. In this system, identification criterions have signifance role in discrimination of the most needy and less

needy groups within a given community with utilization of household's income and expenditure data. Indeed, this method of targeting, with different degree of delicacy, allows subjective verification of living standards, lowers the under coverage rate and improves the aggregate social benefit of a supporting policy, through direct measurement. When the necessary information is lacking, the cost for data collection on indicators is high and may lead to high under coverage or self-selection biases in program.

٢-٢- Community Base Targeting
Community-based targeting depends on decision-making structures at the community level and In this system, Identification criteria often apply social variables to the selected households or individuals who are most in need for allocation of program goods and services effectively according to the defined program objectives. In addition, information about effective decision-making structures within every community that assures effective expansion of the nature of all participation and internality of marginalized groups has an important role in improving the effectiveness of community base targeting. When this system has explicit selection criteria, it has best result in resource transfers. This method of Targeting has the best result in Communities with minimum difference between poor and less poor people and communities that significant segment of that identify eligible. Indentification criterions that involve differences in cultural norms, standards of living, livelihood sources, ethnic composition and the effectiveness of local political institutions can lead to consistencies in the allocation of benefits, in this system (FAO, ٢٠٠١).

٢-٣- Administrative Targeting
In an administratively targeted program, decisions on the eligibility of individuals, groups and regions determine by program staff base on whether or not candidates meet defined eligibility criteria. Therefore, in this system, identification indicators previously defined for targeting by program staff. In many cases, first on general poverty and likelihood indicators, program resources manage initially at the central level and then base upon more accurate criterions, resources allocat incrementally to lower levels, until they finally reach the beneficiary population. Indeed, identification method relies on the use of objective indicators, and administrative targeting consider an unbias impartial tool for determining eligibility, which is applicable in a standardized way across a variety of different populations in different locations. Thus, it may make program management at the national level easier. Effectiveness of the indentification method in this program rely on this matter that thay seldom include local characteristics because define and assess by outsiders, typically those working in center agencies that may have limited access to information regarding the intended target population

and limited understanding of the primary issues of concern within participating communities. Therefore, application of related targeting indicators may be subject to biases in the social or cultural perceptions of staff that do not have a clear insight into local conditions.

٢-٤- Market Base Targeting
This method based on the choices of individuals to buy or sell goods or services in the market. That compare to other methods, have more relative simplicity in implementation, and it requires no staff or expenditure for screening and monitoring individual eligibility. Generally, basis of market-based targeting is the supply-demand equation. Identificatin indicators in this method seek the consumption behaviour of individual, households or regions. Application of market-based system relies on the assumptions that resources have sufficient value to imply a significant change in the pattern of incentives and disincentives faced of potential beneficiaries in response to the revised incentives. Here indicators monitor significant changes in behaviors, which vary across different segments of the population and this behavioral indicators can exploit capability of program in reaching to objectives effectively and efficiently. In this method, rather that targeting the poor, objective of identification criterions is targeting of goods and services that used by the poor. Therefore, derivation of household consumption behaviour changes in response to price adjustment policy or quantity reduction of subsidized goods and service by reliable indiators has an important role in increasing effectiveness of targeting program. In addition, a clear understanding of the different characteristics of a selected market is essential in determining the appropriate intervention, its probable effectiveness and coverage and the level of resources necessary to meet the stated objectives that must be derive with targeting indicators.

٢-٥- Geographical Targeting
Geographic or regional targeting can accomplish through a different methods. This method is popular and it is the most common method between developing countries (Coady and et al., ٢٠٠٤). The potential for this approach depends heavily on being able to identify and measure accurately variables that are highly correlated with the welfare concept underlying the analysis, whether it is basic needs, capabilities, or consumption. These methods often use
individual, household, regional and geographical indices in identification process and involve complicated poverty, food insecurity and vulnerability assessment and mapping systems, to depict a picture for policy makers. In other words, geographic targeting allocat resources to geographic areas using information that thought to be a good indicator of the extent of poverty in these areas. For this reason, some times identification approach

in this method referes to poverty mapping. Indeed, new method in geographical identification is construction of a poverty map base on a composite poverty index that usually involve the development of a multivariate index or statistical model aimed at capturing the basic dimensions of the stated targeting criteria by using different socio-economic indicators. For avoid of biases in identification, there is a clear need for a more focused understanding of regional food security and nutrition conditions by reliable indentification indices. In this system, indentification indices usually updated on a relatively infrequent basis, primarily because they typically rely on existing data (census data, secondary data collected annually for various economic and social sectors, or periodic sample surveys or rapid appraisals).

٢-٦- Demographical Targeting
The basic notion of demographic targeting is very simple. This method select groups defined by easily observed characteristics in identification process such as the old, the young, female-headed households, that are poorer than average. In some cases, this method is unique such as in universal child allowance. However, by using rich indices in identification, demographic targeting can combined with other methods. While the criteria for demographic targeting appear remarkably simple, implementation may still require some program administrator effort to reduce risk of inclusion errors. As a stand-alone method, the effectiveness of demographic targeting depends on whether the group identified—the elderly, children, or other categorization—is poorer on average than groups that are excluded or not. There are enormous variations in the poverty levels of these categorizations that must derive by identification indicators.

٢-٧- Self Targeting
The central aspect of self-targeting mechanisms is that the decision of individuals or households on whether or not to participate in a given program is the main determinant of who receives program benefits. In other words, self-targeting occurs when benefits are available to all, but program incentives are set in such a way that the non-needy elect not to participate. ١- the costs of participation, ٢- the quantity and quality of the goods and services to be obtained by participating, ٣- the value that the participants place on those benefits and ٤- the social stigma associated with participation are four main elements influence an individual's decision to participate in the self targeting system. However, different from its name, self-targeting method also need indentification indicators from prevention of manipulation and temptation. In this regard, a key element in success of self-targeting system is enjoyment of clear definition of the target population that included in the eligibility criteria. Also we have some complex indices in this system that require detailed information about

market conditions with regard to supplies and prices of specific foods, and the income and the consumption patterns of different segments of the population (i.e. price elasticity of demand from various income groups). The key of self-targeting effectiveness is the segmentation of the population in order to identify major differences in the preferences and market behavior of various groups, such that differences in the type, quality and cost of the food item(s) offered lead to self-selection by the intended target population. Also the use of a quality differentiation device (based on market mechanisms) to promote self-targeting schemes has been successful in many developing countries, especially in food subsidy program. The design of a self-targeting food subsidy program that is based on quality grading involves examining household expenditure data to determine whether there are significant differences in consumption patterns across income groups, especially with regard to basic food commodities.

۳- Common Methods of Identification

With regard to the prior section, all seven systems of targeting need economic, social and demographical indices for identification process. Household Income and expenditure, old, women, ill or incapacitated head of household, large number of small children, household with no land to cultivate, household with no or very few animals, ages of household members, race, religion, education, female education, health status, employment status, location, literacy, population growth rate and malnutrition used for applying an eligibility index in different targeting systems. Today designers nearly shelf simple identification based on univariate economic variables, such as income conditions. As a replacement, they use composite indicators with compound economic, social, demographical and geographical updated indicators in different process of targeting that had an effective role in improving the quality and reducing the inclusion and exclusion erros. Means test or verified means test (based on income and assets) and proxy means test (based on a multi-dimensional index) are major method in most of these systems that significantly increase the degree of effectiveness.

۳-۱- Means Test (Verified Means Test)

Means testing or verified means test is a form of individual assessment that compares resources such as income under the command of an individual or household with some threshold or cutoff. Today samples of this programs Used in OECD, Central/Eastern Europe and Former Soviet Union (FSU) countries where incomes, expenditures, wealth are formal, monetized and well documented (Castaneda, ۲۰۰۵). Because applications of verified means test requires the collection of information on the total income of households or individuals and to carry higher costs associated with the collection and verification of information, costs associated with the

collection of comprehensive information on household incomes or consumption via a home visit can cost several dollars per applicant household. These costs can be neglect when policy makers ensure that potential benefits are high and implementation of this method can significantly reduce the cost of subsidy program. The effectiveness of targeting based on means testing depends crucially on the ability to collect reliable information on total income at a reasonable cost. This requires either access to formal employment or tax records to validate reported incomes, or the collection of first-hand information on household incomes, wealth, and/or consumption. In reality, Means testing is appropriate for countries with high administrative capacity and well-documented economic transactions that allow third party or applicant supplied verification of income. Means tests will be most applicable to programs that provide large benefits. Indeed, for a program with very large benefits, it is very unlikely that the simplest methods—demographic, geographic or self-targeting alone will be sufficient. Means testing is less appropriate for countries with more limit administrative capacities or as part of a rapid response to a shock. specific transparent income characteristics can be found in developed countries and evidence show prevalent use of this special type of targeting when per capita income of countries increase. This approach is appropriate only where the targeted population of low-income families is largely employ in the formal sector and/or participates in a well-functioning income tax system. Although these conditions may exist in many OECD and some transition economies, neither commonly met in poor countries; they may not meet for the poor populations of middle-income countries.

۳-۲-Proxy Means Test
Proxy indicators are alternatives for indicators that more directly reflect the phenomenon or characteristic to measure. Proxy indicators can serve as targeting indicators. A proxy indicator does not provide an equivalent substitute to the more direct indicator, and proxy indicators applied when they are simple and less costly to construct than direct indicators, while still providing useful information. When direct indicators tend to include large measurement errors, such as household income measurement or daily food intake by means of recall methodologies, proxy indicators may be just as valid and capable of discriminating well between the food-or nutrition-insecure and the food-or nutrition-secure (Falkingham and Namazie, ۲۰۰۲). In other cases, the application of a proxy indicator for targeting could be increased inclusion and/or exclusion errors. This risk needs to be weighted against the additional targeting costs associated with applying a direct indicator instead of a proxy indicator. Because of the difficulties associated with collecting and verifying detailed information on household income or consumption levels in many developing countries, governments and development practitioners have tried to identify alternatives that overcome

these difficulties. Proxy means tests use a relatively small number of household characteristics to calculate a score that indicates the household's economic welfare. This score is used to determine eligibility for receipt of program benefits and possibly also the level of benefits. From the start of ۱۹۹۰s, economists and social policy analysts offer Valuable insights into alternative appropriate components for inclusion in asset-based welfare indices.

By reviewing principal studies in this area a standard method of proxy means test can be summarize in this steps: ۱-Measuring household welfare; The first step in designing a proxy means test is to define the measure of household welfare. This requires a full income and expenditure survey. ۲- Identifying correlates of household welfare, the next step in formulating a proxy means test is to identify a set of variables that correlate well with household welfare (per capita expenditure). In selecting the variables, it is important to consider three factors. First, they must closely correlate with consumption to maximise accuracy in prediction and hence in targeting. Second, from a programmatic point of view they must be easily measurable. Third, they need to be easily verifiable. Good predictors of consumption that cannot be measured or verified undermine the administrative feasibility of the programme. Most studies then use stepwise ordinary least squares (OLS) regression to predict expenditure (Grosh and Baker, ۱۹۹۰). In effect, this is equivalent to estimating a consumption function where $y_i = a + bx_i + e_i$. There are a number of problems in using OLS to predict consumption. First, OLS assumes that the covariance of x_i and e_i is zero, which may in fact not be true. Second, many of the independent variables on the right-hand side are endogenous. That is, household decisions making formed the dependent variable, i.e. household welfare. Finally, as Grosh and Baker (۱۹۹۰) point out, OLS does not minimise poverty per se but rather minimises the squared errors between the observed and predicted levels of welfare. However, it can argue that the disadvantages of OLS are outweighed by its advantages. Given that the primary concern is to identify who is poor rather than explaining why they are poor, problems of endogeneity may not be so important. Furthermore, OLS copes well with the large numbers of variables and continuous variables that need for developing a proxy-based means test. Most importantly, however, from a practical point of view, is the fact that policymakers and the public can easily understand the results. Whilst Ravallion and Chao's (۱۹۸۹) algorithm directly minimises poverty, and so theoretically may be a preferable tool for designing a transfer scheme, it is cumbersome to use when a large number of predictive variables are available and, more importantly, is unfamiliar to policymakers (Grosh and Baker, ۱۹۹۰). ۳. Establishing eligibility once the equation specified it is relatively straightforward to use the predicted household welfare level from the

regression equation to assign households to the eligible or ineligible groups. Separate equations can estimate for different regions and for rural and urban areas. The decision as to where to set the cut-off for eligibility (or the 'poverty line') is essentially arbitrary, determined by policy and factors such as available budgetary resources.

٣-٣- Shortcomings of Proxy Means Test

First, must assign that in the selection of proxy means test instead of means test, accuracy is devoted to the cost of project and with using inexpensive information such as surveys of household budgets, that is available in most of developing countries, researchers try to capture accurate estimation of household or individual means. So with this regard, method that improves the practicalness and acurateness of the results about the means of target groups and don't impose more expenditure, is preferable to the other methods and can make better the quality of proxy means test. Separate from problems that mentioned in section (٣-٢) about the techniqual problems of proxy means test, after reviewing essential studies, some defects can counted for the proxy means test from aspect of using its result in targeting projects. Since this method is resulted from inaccessibility to the exact information about the income and assest characteristics of target group and absence of enough budget to gathering this information induced by administrative and institutional rigidities, models that use proxy means test, almost suffer from high level of aggregation that sorely reduce the quality of testing.

Table (١)- Selected Variables and Coeficients of Ahmed and Bouis (٢٠٠٢)

Variable description	Coefficient	t-Statistic
Household size (number of household members)	-١٠,٣٦٤	-١٢,٦١
Highest number of years of schooling of any employed household member	١,٢٤	٣,١٢
Dummy: ١ if a child goes to private school, ٠ otherwise	٥٢,٢١	٤,٢٤
Dummy: ١ if any household member aged above ١٥ years never attended school, ٠ otherwise	-٢٢,٧٥٦	-٤,٧٨
Monthly electricity bill in LE	١,٩٣٤	٨,١٢
Monthly telephone bill in LE	١,٤٨٦	٤,٠١
Dummy: ١ if the household has no private toilet, ٠ otherwise	-١٩,٤٥١	-٣,٨١
Dummy: I if the household owns a motor vehicle, ٠ otherwise	٨٧,٦٧٦	٥,٩٥
Dummy: ١ if the household has no refrigerator, ٠ otherwise	-٣٣,٦٧٤	-٨,٠٢
Intercept	٢٠٨,٤٦	٢٧,٥٥

Source: Ahmed, A.U. and H.E. Bouis, (٢٠٠٢)

Table (٢)- Selected Variables and Coeficients of Raithwait and Ivanova, (١٩٩٩)

Variable description	Coefficient	t-Statistic
Per Capita Official Income	٠,٦٢٠٢٨	٢٩,٩٦
Number of Children in the Family	-٦٦٦٠,٢٩	-٨,٨٨٧
Number of Elderly	-٥٥٣٨,٥٩	-٥,٣٤
Whether the Household is Located in a City other than Moscow	-١٦٣٤٠,٢	-٨,١٢٦
Whether the Household is a Rural Household	٩٣٤٢,٥٨١	٣,٨١
Whether the Household has a Refrigerator	-١٢٦٩٤,٥	-٥,٦٥٢
Whether the Household has a Car	٥٤٣٨,٩١٨	٣,٢٩٣
Number of Unemployed Household Members	-٥٣٥٠,٥٤	-١,٦٨١
Intercept	٥٠٦١٨,٧٨	١٥,٢٨٣

Source: Raithwait, J. and A. Ivanova, (١٩٩٩).

Table (٣)- Selected Variables and Coeficients of Permeh, (٢٠٠٦)

Variable description	Coefficient	t-Statistic
Whether the Household is a Rural Household	-١٢٣٠٥١	-۲,۵۵
Whether the Household has a Car	۲۵۰۱۲۸	۷,۰۷
Whether the Household has a Refrigerator	۳۰۴۰۹۶	۲,۶۲
Whether the Household has a Laundry	۱۳۶۵۹۲	۵,۲۶
Household Size	-۲۸۵۲۸	-۲,۴
Simple Worker	-۱۶۵۲۴۳	-۲,۳۴
Other Unclassified Works	-۱۳۰۱۲۰	-۸,۲۴
Brick and Wood or Stone and Wood Home	-۷۵۸۵۹	-۲,۷۷
Bat and Clay Home	-۱۵۰۹۲۶	-۴,۰۱
Per Capita Home Size	۹۴۳۳	۸,۳۱
Intercept	۴۴۴۸۵۲	۷,۳۷

Source: Permeh , Z., (٢٠٠٧).

Four different deficiencies are the result of this aggregation: ١-propuse same coefficients for different household groups, ٢- limitation of result in utilization and confection of targeting methods, ٣- absence of derivation of consumption repercussions resulted from different demoghraphical characteristics of households and finally ٤- propuse same distribution for variables between different households. Ahmed and Bouis, (٢٠٠٢) for Egypt, Raithwait and Ivanova, (١٩٩٩) for Russia, and Permeh et al. (٢٠٠٦) for Iran are Some Good Example of Proxy Means Test with this deficiencies (see table (١) to (٣)). About the first imperfection, lumpsum assumption of all households, acquire same coefficients for households with different behavioral, domoghraphical, social and economic characteristics. Real responses of households cannot attain with this method of indentification. Second shortcoming point to this matter is that seven targeting system (Individual/Household, Community, Administrative, Market, Geographical, Demographical and Self Targeting) with seven implementation steps (Assessment, Identification, Prioritization, Planning, Implementation, Monitoring and Evaluation) need an indentification method that acquires maximum possibility of researchers in rectifying necessities of them in assessment of vulnerable groups and most possibility to policy makers in utilize and mixture of this different methods. So whatever method of indentification includes signification aggregation, its resust would have less quality and give less possibility and whatever include geographic, age, race, ethnic, religioun, education and health characteristics of households and diminish the level of aggregation, researcher and policy makers can have more possibility in designation and implementation of targeting systems. Third handicap aim the problems in assessment of different effects of targeting on the welfare of consumers that using subsidies goods and services and different repercussions of them to this policy. Because proxy means test does not keep these different sensibilities in its estimation and have a high level of aggregation, it can not answer to the requirement toward designation of a good system of targeting with tendency to the vulnerable group sensibilities. Fourth shortcoming pay attention to this difficulty that for inclusion of all variables in the model and usage of stepwise regression method, that distribution of variables in different clusters of households with different demographical characteristics is equivalent whereas the amount of enjoyment (mean) and distribution (variance) of enjoyment is different and this assumption decrease the quality of identification.. For get rid of the weaknesses, we will introduce Two Stage Identification (TSI) Test with Endogenous Household Clustering (EHC) method and will try an experiment with Iranian raw household data in urban areas in section four.

٤- Two Stage Identification Test (TSI)

"*Two Stage Identification*" follow the accurate finding of vulnerable groups with using the same database and without increasing administrative and information costs of the targeting system. With this innovative method, first on the homogenous behaviour of consumption, household, as the main groups against the supportive policies, clustered and then with regard of the cutoff line (poverty line) vulnerable groups would be identified and second proxy means test would be apply for the identified gourps in the next stage. Reason for the nomination of the two stage identification is the Endogenous Household Clustering (EHC) in the first step and implementation of proxy means test in the second step for vulnerable groups. With execution of this method, without increasing cost of the program and with same database, policy makers have more alternative for choosing and assessment of targeting system and researcher have more possibility in analysis the results of the proxy means test.

٤-١- Endogenous Household Clustering Method

On the object of the study, methodology of the clustering is different. In the district of microeconomic theories of consumer behaivour and demand function, two main methodology are Jarque (١٩٨٧) and Jensen and Manrique (١٩٩٨) that both of them sprit from principal study of Brown and Deaton (١٩٧٢) and offer two different methodology for household clustering. Nevertheless, Jensen and Manrique method in compare to Jarque method have more advantages and is more practical. Jarque methodology is novel from two points. First, he applies multivariate clustering algorithms to form groups of households with 'homogeneous' expenditure behavior and Second, he takes into consideration the fact that expenditures are non-negative and therefore use Limited Dependent Variable (LDV) models. In his paper, he presents a cross-sectional study of expenditure behaviour at the household level. Jarque data come from a ١٩٧٥ Income-Expenditure Household Survey and only the information from ٤٩٤ households of Mexico City selected by him. In addition, the data on the socioeconomic variables contained family size, age, and occupation of the head of the household. This last variable divided into four categories: unemployed (which, includes the economically inactive population), worker, entrepreneur and technocrat. He used the extended linear expenditure system technique for estimation. Jarque assumed that we have the process generating the share of budget on the food expenditure of good i (β_i), conform of $\beta_i = \gamma \cdot + \gamma z_i + u_i$ processes where z_i is vector of socioeconomic variables, $\gamma \cdot$ (vector) and γ (matrix) contain unknown coefficients and u_i is a residual term. In his study he show that best criteria for grouping n entities with respect to k variables is the maximization of 'Overall Relative Explanatory Power' that is related to the trace of the within group sum of

squares of the β standardized by the sample variance. For the computation of this, jource used a subroutine containing the algorithm of Sparks (۱۹۷۳). Results show that at the number of ۱٤ clusters, overall relative explanatory power maximized. However the Jarque clustering is a formal method of clustering and has a tight theoretical basic, but appling this method with the subsidy targeting and measurement of welfare effects in narrow and limited because it needs rich database and also it produce many clusters that increase the complexities of identification. Instead of it, Jensen and Manrique (۱۹۹۸) using an applicable methodology that is compatible with the said objectives. They assume that Differences in household behavior, as expressed by differences in income and household characteristics in the acquisition of goods, were the fundamental criterion behind this classification. Households showing similar consumption behaviors classified as belonging to the same income group. For low-income households, food expenditures almost completely explained by income. For high-income households, food expenditures also depend upon other factors such as household demographic characteristics (ages of household members, race, religion, education, health, employment status, geographic location, etc.). For these households, the part of expenditures not explained by income is more likely to vary. In other words, when estimating food expenditures as explained by income and some of these household characteristics (Engel relations), the values of the disturbances are likely to be small for low-income households and large for high-income households. The method for classifying households into income groups based on an analysis of homogeneity of variances of residuals from these Engel regressions. Clearly, the methodology based on an analysis of homoscedasticity of variance of residuals regression of Engle relations. The procedure has two basic steps: estimation of Engel relations and tests for homoscedasticity of variances.

٤-۱-۱- Estimation of Engel Relations

The objective of the estimation was to obtain residuals of sample observations from Engel regressions. Engel function with the form $EF_i=f(E_i,Z_i,u_i)$ $(u_i \approx N(\cdot,\sigma^2_u))$ will be estimated for where EF_i and E_i is column vectors of expenditures on food and total expenditure for ith household, respectively. Z_i is a column vector of demographical characteristics of households (age, gender, ethnic, occupation, education, gender structure …). Specification for of the Engel function in different but with respect to the qualitative character of Z_i Vector, usually use the linear specification of the function.

٤- ١- ٢- Tests for homoscedasticity of variances

By using "Goldfeld-Quandt" tests on the residuals from step (٤-١-١) performed in order to classify the household observations into groups having different variances.

$$H_0 : \sigma_1^2 = \sigma_2^2 = ... = \sigma_m^2 \qquad (m < n),$$
$$H_1 : \sigma_1^2 \neq \sigma_2^2 \neq ... \neq \sigma_m^2$$

Classification of households into income groups was determined setting income boundaries for groups of residuals. The requirement that the two sample variances be independent means that two separate regression equations must estimated, one for each part of the sample observations. Then, the test statistic is $s_2^2 / s_1^2 \sim F(n_2 - 2, n_1 - 2)$, where s_i^2 is the variance for sample i, and where n_i is the number of observations in sample i. Equation ١ was re-estimated independently for each group of observations identified as having homogeneous variance. The tests performed to see if the variance of the residuals of each adjacent pair of groups of observations were the same. If they were, then the observations in both groups said to belong to the same income group. If they were not the same (i.e., statistically different at $a = ٠,٠٥$), then the observations in each group were said to belong to different income groups. Precise final boundaries were determined for every income group by repeating the Goldfeld-Quandt tests for smaller groups of residuals in the neighborhood of two adjacent groups. This process repeated for each survey. Then, the income groups were reconciled so that the same number of groups existed for every year. Final income groups find by grouping the corresponding yearly income classes.

٤-٢- Algorithm of Clustering for Iranian Urban Household Data

Based on Jensen and Manrique (١٩٩٨) classifying methodology, we have adapted and used this method and introduce a methodology to classify households in income groups based on behavior of urban Iranian households regarding their consumption of goods. An Engel function of the form (١) was estimated for year ٢٠٠٢, where E_i is food expenditures for ith household, A_1 is the number of children ٠-٥ years of age, per household; A_2 is the number of children ٦-١٠ years of age, per household; A_3 is the number of males ١١-٢٠ years of age, per household; A_4 is the number of males ٢١ years and older, per household; A_5 is the number of females ١١-٢٠ years of age, per household; AS_6 is the number of females ٢١ years and older, per household; and M is the total expenditure, per household.

$$E_{1i} = \alpha_0 + \alpha_1 E_i + \alpha_2 A1_i + ... + \alpha_7 A6_i + \alpha_8 G1_i + ... + \alpha_{11} G4_i + \alpha_{12} G5_i$$
$$+ \alpha_{13} X1_i + ... + \alpha_{16} X4_i + \alpha_{17} EM_i + u_i \qquad (1)$$
$$u_i \approx N(0, \sigma_u^2)$$

By regress the equation (١), we obtained residual for the next seven steps:

١- Dividing all households to *m* classes,

٢- Estimate of the equation (١) for each cluster, separately,

٣- Applying Goldfeld-Quandt tests for each *m* classes and if result of this test determines that variances are different for two countinous class, then step four performe,

٤- Determination of the number of odd cluster as the number and main framework of classes,

٥- Breaking the even clusters to *k* subcluster and estimation of equation (١) for them,

٦- Implementation of Goldfeld-Quandt tests for *k* subcluster with their adjacent even clusters, and finally

٧- Add obvservation of *k* subcluster of step ٥ to the odd cluster of step ٧ with regard to results of step ٦.

This algorithm on the number of *m* and *k* repeated respectively until the result of the Goldfeld-Quandt test show the variance equality for each observation of the different clusters.

Table (٢)- Variables used in Endogenous Household Clustering of Iranian Urban

Variable	Variable	Variable
٧- Household Size	٥- Age Composition of Household	١- Head of Household Gender
٨-Household Educational Condition	٥-١- (١-٥) Age Group	١-١- Man ١-٢-Woman
٨-١-*Diploma and Under Diploma*	٥-٢- (٦-١٠)Age Group	٢- Head of Household Marriage Status
٨-٢-*Bachelor*	٥-٣- (١١-٢٠) Age Group (male)	٢-١- Married ٢-٢- Single
٨-٣-*Graduate*	٥-٤- (١١-٢٠) Age Group (female)	٣- Head of Household Employment Status
٨-٤-*PHD and After*	٥-٥- (٢١ & after)Age Group (male)	٣-١- Employed ٣-٢-Unemployment
٩- Expenditures on Food	٥-٦- (٢١ & after)Age Group (female)	٤- Occupational Status of Home
١٠-Total Expenditure	٦- Number of Household Employee	٤-١- Possessive ٤-٢-Other

Source: Iran Center Statistics (٢٠٠٢).

After the implementation of noted algorithm and Jensen and Manrique (١٩٩٨) classifying methodology, five mutually independent clusters achieved that socioeconomic and demographical characteristics of them is illustrated in table (٥) to (٨).

Table (٥) - Distribution of Households in Different Clusters

	Cluster١	Cluster٢	Cluster٣	Cluster٤	Cluster٥	Total
Total Household	٢٠٠١	٢٨٠١	٣٦٠١	٣٦٠١	٢٤٠١	١٤٤١٠
Percent of All	١٤	١٩	٢٥	٢٥	١٧	١٠٠

Source: Current Study

If household number consider as the initial criteria for distribution of observations between clusters, In table (٥), we observe that observation of second, third and fourth cluster (middle clusters) have the most frequency and first and last clusters have the least frequency. Also all clusters adjusted from low to high with respect of income (total expenditure) and population of clusters from ١ to ٤ in increasing and in cluster ٥ deacrease.

Table (۶)- Distribution of Economic Variable among the Urban Household in ۵ Clusters

Food Expenditure	C١	C٢	C٣	C٤	C٥
Mean	٨٥٩٩٢٣٤	١٥٦٨٨٤٩٣	٢٣٥٤٤٦٥٩	٣٥٧٣٢٢٧٥	٦١٤٦٩٩٢٥
Standard Deviation	٢٥٠٥٣٨٦	١٩٨٥٥١٨	٢٧٥٦٩٣٦	٤٦٨٩٠٣٩	١٢٥٩٢٣٢٣
Dispersion Coefficient	٠,٢٩	٠,١٣	٠,١٢	٠,١٣	٠,٢
Skewness	-٠,٦٤	-٠,٠٥	٠,١٤	٠,٣	٠,٧١
Total Expenditure	C١	C٢	C٣	C٤	C٥
Mean	٣٢٥٧٧٠٠	٥٥٧٣٥٥٨	٧٧٨١٨٣١	١٠٧٥٧١٥٠	١٥١٥٩٩١٧
Standard Deviation	١٤٦٤٦٠٩	١٩٤٣٣٩٤	٢٧٨٢١٤٣	٤٠١٣٩٠١	٧١٢٠٧٠٩
Dispersion Coefficient	٠,٤٥	٠,٣٥	٠,٣٦	٠,٣٧	٠,٤٧
Skewness	٠,٢٨	٠,٣٣	٠,٥٤	٠,٥٨	١,١٥
Head Employment Status	C١	C٢	C٣	C٤	C٥
Mean	٠,٥٩	٠,٧٤	٠,٧٩	٠,٨١	٠,٨٢
Standard Deviation	٠,٤٩	٠,٤٤	٠,٤١	٠,٤	٠,٣٩
Dispersion Coefficient	٠,٨٤	٠,٥٩	٠,٥٢	٠,٤٩	٠,٤٨
Skewness	-٠,٣٦	-١,١	-١,٤٢	-١,٥٥	-١,٦٣
Number of Employees	C١	C٢	C٣	C٤	C٥
Mean	٠,٨١	١,٠٥	١,١٤	١,٢٦	١,٣٦
Standard Deviation	٠,٧٦	٠,٧٧	٠,٧٦	٠,٨٠	٠,٨٦
Dispersion Coefficient	٠,٩٤	٠,٧٣	٠,٦٧	٠,٦٤	٠,٦٤
Skewness	١,١٢	١,٥٤	١,٤٥	١,١٥	١,٢٥

Source: Current Study

Table (٦) shows the economic variables of Iranian's urban household data. In respect to the average of income, cluster ١ in the bottom of income group and after it, clusters ٢ to ٥ are the richer groups, respectively. Also with attention to the dipersion coefficient of total expenditure, this result can be achieved that minimum dispersion belongs to cluster ٣ and maximum of it belongs to cluster ٥, though this coefficient has very margin difference between clusters ٢, ٣ and ٤.

Table (٧)- Distribution of Home Variable among the Urban Household in ٥ Clusters

Occupational Status	C١	C٢	C٣	C٤	C٥	Number of Rooms	C١	C٢	C٣	C٤	C٥
Mean	٠,٥٥	٠,٦١	٠,٦٩	٠,٧٤	٠,٧٩	Mean	٢,٦	٣,٢٦	٣,٦٨	٤,٠٤	٤,٣٦
Standard Deviation	٠,٥	٠,٤٩	٠,٤٦	٠,٤٤	٠,٤١	Standard Deviation	١,١٧	١,٢	١,٢٢	١,١٩	١,٣٣
Dispersion Coefficient	٠,٩١	٠,٨	٠,٦٧	٠,٥٩	٠,٥٢	Dispersion Coefficient	٠,٤٥	٠,٣٧	٠,٣٣	٠,٣	٠,٣١
Skewness	-٠,١٨	-٠,٤٤	-٠,٨٣	-١,١	-١,٤	Skewness	١,٢٨	٠,٤٩	١,٩٤	٠,٥	١,١٧
Home Size	C١	C٢	C٣	C٤	C٥	Home Skeleton	C١	C٢	C٣	C٤	C٥
Mean	٥٨,٠٧	٨٠,٢٩	٩٤,٧٣	١١٠,٣٦	١٣١,٨٦	Mean	٢,٩٥	٢,٩	٢,٨٢	٢,٦٩	٢,٥٢
Standard Deviation	٣٥,٦٦	٤٤,٥٢	٤٤,٣٥	٤٩,٤	٦٦,٦٥	Standard Deviation	٠,٣١	٠,٤٢	٠,٥٥	٠,٧	٠,٨٢
Dispersion Coefficient	٠,٦١	٠,٥٥	٠,٤٧	٠,٤٥	٠,٥١	Dispersion Coefficient	٠,١	٠,١٤	٠,١٩	٠,٢٦	٠,٣٢
Skewness	١,٢٥	١,٧٤	٠,٩٤	١,١٦	٢,٩٨	Skewness	-٥,٩٢	-٤,٢٢	-٢,٨٥	-١,٨٩	-١,٢٢

Source: Current Study

Tabel (٨) shows the condition of Home Variable among the Urban Household in ٥ Clusters and explain that percent of home ownership with departure from cluster ١ to ٥ increased. In other term, this variable could be a symbol of household poverty (welfare) that is correlated with the income variable (total expenditure). This explanation about the other variables such as home size, room number and home skleton, that illustrate quality of residential place, is the same.

Table (٨) - Distribution of Social Variables among the Urban Household in ٥ Clusters

	Cluster١	Cluster٢	Cluster٣	Cluster٤	Cluster٥	Total
Married	٨٨,٨١	٩٣,٥٩	٩٢,٨٦	٩٠,٧٨	٨٧,٣٦	٧۴,٢١
Man Head	٩٠,٥٢	٩٥	٩۴	٩٢,٥	٨٩,۵۴	٧۶,۶۶

Source: Current Study

Table (٨) outlines two social traits of Iranin the Urban Household. As can be seen it this table, minimum percent of man head households is related to the cluster ١ that this trait in the opportune of implementing targeting can be very useful as a good index. Furthermore, minimum percent of marriage in related to cluster ١ and ٥.

٤-٣- Efficiency Analysis of EHC in Removing Shorcomings of PMT

First to third shortcoming nearly removes by EHC as shown in Table (٥) to (٨). This tables show that clustering could amount to arrangement of households in clusters with different verifiable ability characteristics that besides offering unlike coefficient for different clusters (defect ١ correction), with regard to inclusion of demographic variables (gender, marriage status, employment, age, location and education), obtain more

possibility for choosing and compilation of targeting system (defect ٢ correction). Also, as indicate in past sections, main idea of household clustering is homogeneity of household consumption behaviour and classification of the same behaviours in one cluster and so this method can automatically provide different clusters with different consumption behaviour and sensitivity (defect ٣ correction). Table (٩) shows ١٠ variables from ٤١ selected variables of Iran Center Statistics in ٢٠٠٢ that had most correlation coefficient with income (total expenditure) of ٥ clusters. As we can see in table (٩), for all observation and clusters ١ to ٤, food expenditure has maximum correlation with income (total expenditure) and this variable for cluster ٥ place in second position after the number of students. Average of the correlation coefficient for this variable is ٠٫٧ and decrease from cluster ١ to ٥. Table (١٠) shows the amount of enjoyment (mean) of ٥ clusters from home and location facilities. The greatest values of enjoyment is for electricity, sanitation, regrigerator, Gas Heater, Kitchen and Bathroom that nearly ٩٠ percent of Iranian urban households using this goods and services. Therefore, in the analysis of household there is no need to include these variables because they do not present any diversity. In other words, in the obviation of fourth proxy means test defects, compilation of (١٠), (١١) and (١٢) tables gives this conclustion that variables with nearly equally amount of enjoyment in all clusters, have a small effect on the welfare variety of household and from a techniqual point, variance of its coefficient in regression model redound to statatistical meaningless of them and exclusion from the model. Table (١٢) shows that variable variances are different in different clusters. We examined this matter with three Bartlett (Snedecor and Cochran, (١٩٨٩)), Levene (Levene, H., (١٩٦٠)) and Brown-Forsythe (Brown and Forsythe, (١٩٧٤)) tests. As table (١١) shows, null hypothesis about variance equality of clusters rejected for all variables in high level of significance (٩٩٪) and distribution of this variable is different in ٥ clusters and if researcher run the proxy means test for lumpsum households, receives to equall coefficient for variables, wherea the reality is another thing.

Table (۹)- Variables with Maximum Correlation Coefficients with Household Income

In Different Clusters

	Cluster ۱	Correlation Coefficeint	Cluster ۲	Correlation Coefficeint	Cluster ۳	Correlation Coefficeint
۱	Food Expenditure	۰,۶۰۸	Food Expenditrue	۰,۳۲	Food Expenditrue	۰,۲۵
۲	Marriage Status	۰,۳۲۲	Number of Students	۰,۱۷۷	Number of Students	۰,۱۶۵
۳	Employement Status	۰,۳۱۷	Marriage Status	۰,۱۴۱	Home Skleton	۰,۱۴
۴	Gender Status	۰,۳۱۵	Gender Status	۰,۱۳۵	Number of Employees	۰,۱۱۹
۵	Number of Employees	۰,۲۹۶	Number of Employees	۰,۱۱۸	Gender Status	۰,۱۱۴
۶	Number of Students	۰,۱۸۹	Fan	۰,۱	Marriage Status	۰,۱۰۶
۷	Television (Colourful)	۰,۱۳۶	Home Skleton	۰,۰۹۹	Fan	۰,۰۸۷
۸	Different Cassette Players	۰,۱۲۷	Employement Status	۰,۰۹۹	Employement Status	۰,۰۸
۹	Sewing Machine	۰,۱۰۷	Occupational Status	۰,۰۴	Occupational Status	۰,۰۵۳
۱۰	Fan	۰,۰۹۶	Bike	۰,۰۳۷	Bike	۰,۰۲۵
	Cluster ۴	Correlation Coefficeint	Cluster ۵	Correlation Coefficeint	Total	Correlation Coefficeint
۱	Food Expenditrue	۰,۲۴۹	Number of Students	۰,۲۵۸	Food Expenditrue	۰,۷۰۴
۲	Number of Students	۰,۱۹۶	Food Expenditrue	۰,۲۳۳	Home Size	۰,۳۱
۳	Home Skleton	۰,۱۴۳	Number of Employees	۰,۱۶۵	Room Numbers	۰,۳۰۲
۴	Fan	۰,۱۰۳	Home Skleton	۰,۱۵۱	Number of Students	۰,۲۸۷
۵	Number of Employees	۰,۰۹۷	Bike	۰,۱۱۲	Television (Colourful)	۰,۲۶۹
۶	Gender Status	۰,۰۷	Gender Status	۰,۰۹۸	Refrigerator	۰,۲۶۵
۷	Marriage Status	۰,۰۶۴	Fan	۰,۰۹۷	Video and VideoCD	۰,۲۵۵
۸	Motorcycle	۰,۰۵۶	Room Numbers	۰,۰۹۵	Tellephone	۰,۲۴۹
۹	Employement Status	۰,۰۵۴	Marriage Status	۰,۰۹۴	Vacuum Cleaner	۰,۲۴۶
۱۰	Occupational Status	۰,۰۵۱	Occupational Status	۰,۰۹۳	Number of Employees	۰,۲۲۶

Source: Current Study

Table (۱۰)- The amount of enjoyment (mean) of ۵ clusters from home and location facilities

Variable	C۱	C۲	C۳	C۴	C۵	Total
Electricity	99,3	99,96	99,83	99,94	99,88	99,82
Sanitation	96,7	98,61	98,92	99,53	99,29	98,79
Refrigerator	88,21	97	98,75	99,11	99,29	97,13
Gas Heater	85,81	96,18	98,06	98,89	99,29	96,41
Kitchen	65,52	84,43	92,42	95,17	97,5	88,66
Bath Room	59,87	82,65	91,7	95,45	98,17	87,52
Television (Colour)	42,43	72,33	87,81	93,5	97,21	81,48
Different Cassette Players	41,18	64,01	74,23	81,59	87,34	71,67
Tellephone	36,48	57,16	74,15	83,87	92,21	71,05
Sewing Machine	38,08	61,41	70,87	77,12	82,55	67,98
Fan	52,67	61,73	64,79	62,43	60,35	61,18
Vacuum Cleaner	18,14	41,02	61,01	76,48	87,88	59,52
Refrigerator	3,85	11,85	23,85	43,27	62,97	30,12
Bike	9,75	15,82	21,22	26,1	28,82	21,07

Source: Current Study

Table (۱۱)- F-Statistics (Bartlett, Levene and Brown-Forsythe) for Equality

of Variance Test

	Variable	Bartlett	Levene	Brown-Forsythe		Variable	Bartlett	Levene	Brown-Forsythe
	Age					Other Variables			
۱	Head of Household Age	711,4	269,9	211,3	۲۱	Vacuum Cleaner	572,9	817,2	187,7
۲	(۱-۵) Age Group	113,5	46,6	15,5	۲۲	Laundry	319,3	799,6	157
۳	(۶-۱۰)Age Group	24,2	11,8	7,9	۲۳	Video and VideoCD	813,6	1384,9	232
٤	(۱۱-۲۰) Age Group (female)	241,7	122,8	20,3	۲۴	Camputer	11535,1	1137,4	253,8
٥	(۲۱ & after)Age Group (female)	215	80,2	79,9	۲۵	Cellphone	-	1282,5	283,2
٦	(۱۱-۲۰) Age Group (male)	331,5	107,8	26,5	۲۶	Fan	5,5	37,7	16,9
۷	(۲۱ & after)Age Group (male)	13155,7	2582,4	1926,9	۲۷	Movable Coller	-	68,3	16,4
۸	Food Expenditrue	7255,5	891,7	797,4	۲۸	Motorcycle	317,2	103,2	22,3
	Education				۲۹	Bike	483	334,5	70,4
۹	Diploma and Under Diploma	134,8	28,3	21,5	۳۰	Sewing Machine	212,9	352,3	88,3
۱۰	Bachelor	4619,4	932,4	321,8	۳۱	Radio	530,6	585,3	219,5
۱۱	Graduate	-	118	29	۳۲	Different Cassette Players	487,6	584,8	150,9
۱۲	PHD and After	-	116,6	28,7	۳۳	Television (Colour)	3438,7	1684,3	431,4
	Population				۳۴	Refrigerator	2150,2	1928,6	341,7
۱۳	Employement Status	179,8	211,4	88,2	۳۵	Car	5183	1865,3	499,9
۱٤	Gender Status	-	414,1	119,8	۳۶	Gas	52,1	138	50,8
۱٥	Marriage Status	-	395,4	117,4	۳۷	Bath Room	4398,4	1549,3	458,6
۱٦	Number of Employees	72,8	54,2	18,9	۳۸	Coller	208,1	688,9	119,1
	Location				۳۹	Tellephone	1093,4	1086	248
۱۷	Occupational Status	102,7	88,6	65,1	٤۰	Heat Center	8466,2	795,7	183,6
۱۸	Room Numbers	51,4	8,7	2,9	٤۱	Kitchen	3498,4	1186,7	336
۱۹	Home Size	993,1	69,6	58,3	٤۲	Fuel for Heat	126,8	100,3	61,7
۲۰	Home Skleton	-	675,8	165,8	٤۳				

Source: Current Study

Conclusion

In this study, we describe doctrine of targeting with a new methodology of indentification. After reviewing different system of targeting and focus on the indentification sensibility of them, we analysis inmperfections of means and proxy means test and for get ride of the problem of them, we introduce Two Stage Identification Method with Endogenous Household Clustering (EHC) technique. Statistical results from custering Iranian raw urban household data show that first step of TSI method eliminates four problems with proxy means test and prepare good background for implementation of it in each cluster and accurate identification of households.

Resources

× Ahmed, A.U. and H.E. Bouis, (٢٠٠٢), "Weighing what's Practical: Proxy Means Tests for Targeting Food Subsidies in Egypt", Food Consumption And Nutrition Division, International Food Policy Research Institute.

× Brown, A. and A. Deaton, (١٩٧٢), "Surveys in Applied Economics: Models of Consumer Behavior", The Economic Journal ٨٢،١١٤٥-١٢٣٦.

× Brown, M.B. and A.B. Forsythe, (١٩٧٤), Robust Tests for the Equality of Variances, Journal of the American Statistical Association, Vol. ٦٩, No. ٣٤٦., pp. ٣٦٤-٣٦٧.

× Castaneda, T., (٢٠٠٥), "Targeting Social Spending To The Poor With Proxy–Means Testing: Colombia's SISBEN System", The World Bank, Social Protection Discussion Paper Series No. ٠٥٢٩.

× Coady, David and etal, (٢٠٠٤), "Targeting of Transfers in Developing Countries", World Bank.

× Deaton, A. and J. Mullbauer, (١٩٨٠), "Economics of Consumer Behaviour", Cambridge University Press, New York.

× Fao. (٢٠٠١), "Targeting for Nutrition Improvement Resources for Advancing Nutritional Well-Being", Food and Agriculture Organization of The United Nations.

× Grosh, M. (١٩٩٤). "Administering Targeted Social Programs in Latin America: From Platitudes to Practice", World Bank.

× Grosh, M. and J. Baker, (١٩٩٥) 'Proxy means tests for targeting social programs: Simulations and speculation', LSMS Working Paper, No. ١١٨, Washington DC: World Bank

× Grosh, M.E. (١٩٩٣), "Five Criteria for Choosing among Poverty Programs", World Bank, Working Paper, No:١٢٠١.

× Hoddinott, J. (٢٠٠١), "Targeting: Principles and Practice", International Food Policy Research Institute.

× Jarque, Carlos M. (١٩٨٧), "An Application of LDV Models to Household Expenditure Analysis in Mexico", Journal of Econometrics ٣٦, ٣١-٥٣.

× Jensen, Helen, H. and Justo Manrque, (١٩٩٨), "Demand for Food Commodities by Income Groups in Indonesia", Applied Economics, ٣٠, ٤٩١-٥٠١.

× Levene, H., (١٩٦٠), "Robust Tests for Equality of Variancm," in I.Olkin, ed., Contributions to Probability and Statistics, Palo Alto, Calif: Stanford University Press, ٢٧٨-٩٢.

× Narayan, Amber and Nobuo Yoshida, (٢٠٠٥), "Proxy Means Test for Targeting Welfare Benefits in Srilanks", World Bank.

× Raithwait, J. and A. Ivanova, (١٩٩٩), "Russia: Targeting and the Longer-Term Poor", Volume II, Annex ٤, Report Number ١٩٣٧٧, World Bank.

× Ravallion, M. and K. Chao (١٩٨٩) 'Targeted policies for poverty alleviation under imperfect information: Algorithms and applications', Journal of Policy Modelling, Vol.١١: ٢١٣–٢٤

× Snedecor, George W. and Cochran, William G. (١٩٨٩), Statistical Methods, Eighth Edition, Iowa State University Press.

× Sparks, D.N. (١٩٧٣), "Algorithm AS ٥٨: Euclidean Cluster Analysis", Journal of the Royal Statistical Society, C٢٢, PP.١٢٦-١٣٠

× Tabor, S.R. (٢٠٠٢), "Assisting the Poor with Cash: Design and Implementation of Social Transfer Programs", Social Protection Discussion Paper Series, World Bank.

× World Bank. (١٩٩٠). "World Development Report: Poverty". Oxford University Press, New York.

× World Bank. (١٩٩٧), "World Development Report: The Role of the State". Oxford University Press, New York.

× World Bank. (٢٠٠٠), "World Development Report: Attacking Poverty". Oxford University Press, New York.